ANNUAL REPORT
2000-2001

Department of Scientific and Industrial Research
Ministry of Science & Technology
New Delhi-110 016
Website : http://www.dsir.nic.in

CONTENTS

ANNEXURES

LIST OF FIGURES AND PHOTOGRAPHS

Cover Page

Top : Dynamic facility for FRP sleeper testing

Centre : Development of Energy Efficient Axial Flow FRP Fan System by Parag Fans & Cooling Systems Ltd., Dewas

Bottom : SPV Water Pumping System by CEL in a village in Punjab

Text

IV.7 A view of "Innovative India" Pavilion – PATSER Stalls

VII.1 The website for Intellectual Property Law, inaugurated at Bangalore by the Secretary, DSIR & DG, CSIR

VIII.A.1 Shri N.K. Sharma, MD, NRDC showing Rice Husk Particle Board sample to Hon'ble Dr. Murli Manohar Joshi, Minister for S&T

VIII.A.2 Shri N.K. Sharma, MD, NRDC presenting a cheque to Dr. R.A. Mashelkar, DG, CSIR and Secretary, DSIR for Premia & Royalty collected on CSIR processes

VIII.A.3 Shri N.K. Sharma, MD, NRDC signing licence agreement for commercialisation of Plasticisation for making Bentwood Components

VIII.A.4 Signing of agreement between TDB and Twenty First Century Battery Limited, Chandigarh for Lithium-Lithium Ion Battery Project

VIII.A.5 Hon'ble Minister for Science & Technology and HRD, Dr. Murli Manohar Joshi presenting Award for the development of a bio-inoculant

VIII.A.6 Korean Ambassador Mr. Pak Myong Gu operating the Pedal Operated Rice Mill – an awarded invention

VIII.A.7 Hon'ble Chief Minister Shri Chandra Babu Naidu taking keen interest in the activities of NRDC

VIII.B.1 SPV Water Pumping System by CEL in a village in Punjab

VIII.B.2 SPV Powered Lighting of Medical Centre by CEL in Village Spitzskoppe in Namibia

VIII.B.3 SPV Powered Domestic & Street Lighting Systems by CEL in Village Spitzkoppe in Namibia

VIII.B.4 SPV Powered Domestic Lighting Systems by CEL in a village Spitzkoppe in Namibia

I(A). AN OVERVIEW

1.1 The formation of the Ministry of Science and Technology was announced through a Presidential Notification dated January 4, 1985 (74/2/1/8. Cab.) contained in the 164th Amendment of the Government of India (Allocation of Business) Rules, 1961; the Department of Scientific and Industrial Research (DSIR) forms a part of this Ministry.

During 2000-2001 the Minister In-charge is Dr. Murli Manohar Joshi, Union Minister for Ministry of Human Resource Development and Ministry of Science and Technology. Shri B.S. Rawat is the Minister of State for the Ministry of Science and Technology.

1.2 The Department of Scientific and Industrial Research (DSIR) comprises of the activities of the Council of Scientific and Industrial Research (CSIR), Departmental Schemes viz. Research and Development by Industry (RDI), Programme Aimed at Technological Self Reliance (PATSER), Scheme to Enhance the Efficacy of Transfer of Technology (SEETOT) and National Information System for Science and Technology (NISSAT) and two public enterprises viz. National Research Development Corporation (NRDC) and Central Electronics Limited (CEL).

1.3 Council of Scientific and Industrial Research

The CSIR is the national R&D organisation providing scientific and industrial research for India's economic growth and human welfare. It has a country-wide network of forty laboratories and eighty field centres covering fundamental and applied R&D in all areas of science and technology barring atomic research, developing and nurturing S&T human resource for the country through extra mural support and promoting scientific talent through awards, fellowships etc.

As a result of diverse initiatives taken the external cash flow (ECF) for the period crossed the magic mark of Rs. 250 crore which had been eluding CSIR for some time. The ECF was Rs. 252 crore (versus Rs. 221 crore in 1998-99). The Indian patent filing of 377 achieved was 20% over last year's figure of 310 and foreign patent filing at the level of 199 was 75% increase over the figure of 112 in 1998-99. Despite the emphasis on applied R&D and market orientation the impact factor per scientific paper contributed showed an increase from 1.512 in 1998 to 1.538 in 1999; although small, the upward trend continues. The industrial production based on CSIR knowledge base also increased to Rs. 4400 crore in 1999-2000. On the whole the performance was satisfactory.

Some of the notable achievements of CSIR are: Operationalisation of the New Millennium Indian Technology Leadership Initiative (NMITLI), Bringing succor to Super Cyclone affected people of Orissa by providing them drinking water, Efforts of CIMAP in making India top in Mint Oil production in the world, Maximising blast furnace productivity, celebration of the Golden Jubilee by the National Chemical Laboratory and organisation of 1999 R&D Management Conference with a theme – R&D as a Business.

Some of the scientific and technological achievements of CSIR covering a wide spectrum are as follows:

In the field of Aerospace Science & Technology: Development and type certification of HANSA-3 aircraft; LCA composite wing box test; Composite torque shaft of LCA; Flosolver Mk 5 with FloSwitch 2000; Development of sandwich radome for ISRO; Development of a process for deposition of copper for deep buried contacts; **in the field of Biological Sciences and Technology:** Use of α-arteether as fourth generation antibacterial agent; Luteolin as potential compound for leishmania therapy; New cell secreting insulin; CSIR coordinated programme on development and commercialization of bioactive molecules; An improved process for the isolation of eupalitin 3-O-13-D-galactopyranoside ; Structural and Functional significance of repetitive sequences: Enhanced Myoclonus Epilepsy Repeat; Human genome diversity; Identification of the INO1 gene of *M. tuberculosis;* Method for rapid immobilization of biomolecules; Early sex identification in papaya using DNA markers; Fungal metabolism of hydrocarbons; Bio-Sensors; Large scale screening of menthol mint clones; New sources of aroma oils; Herbal Drug Repository; In vitro shoot regeneration of Sandalwood; **in the field of Chemical Sciences and Technology:** Conversion of light naphtha/NGL to LPG and aromatics (NTGG Process); Impregnating

petroleum pitch; Petroleum streams (90-360°C) using NMP ; Petroleum residue upgradation in a continuous reactor; Pyridine based chemicals; An enzymatic process for acrylamide synthesis; Cyclo-pentane (CP) an environment friendly substitute for CFCs; New catalysts and processes; Improved product quality and process know-how for Zeolite-13-X powder; Photo catalytic auto cleaning of stains; Polyurethane microspheres via particle forming polymerization technique; Improvement in thin film composite membrane performance; Plastic bonded nickel electrode; Semi continuous chrome recovery method; Mechanism of iodine loss from iodized salt; Quality of salt recovered from sub soil brines.; Commissioning of free flow iodized salt manufacturing plant at Mauritius; Fly ash utilization; Scratch resistant coatings; **in the field of Earth & Physical Sciences and Technology:** Gas hydrates; Exploitation of coalbed methane; Gold exploration in Madagascar; Mezozoices in on-land Kutch; Studies in Narmada zone; Noise barrier for Delhi metro rail; Koyna seismic activity; Seismic hazard map; **in the field of Engineering Sciences & Technology:** Micro-hardness tester; Iodine value meter; Digital titrator kit; Powder X-ray diffractometer; Magnetic sensor for characterization of ferromagnetic materials; Measurement of metallic impurities in edible oils; On-line infraguage system for multilayer plastic film thickness measurement; Electronic system for automation of rubber roller sheller; Development of prototype FRP oil vapour seal for hydrogenerator; Development of scientific steel cog; Parallel processing techniques for nonlinear finite element analysis; C-band 60 W TWT for space applications; Integrity assessment of steel offshore platform structures; High performance concrete (HPC) mixture for superstructure of flyover bridge; High reliability interconnections for advanced components; Distillery wastewater management; Counter Gravity low pressure casting apparatus (CLA) for casting of engineering components; **in the field of Food Science & Technology:** Ginger paste and garlic paste; Biopreservation of vegetables; Water-soluble turmeric colorants; Quick cooking, germinated and dehydrated pulses ; Sugarless biscuits; Protein hydrolysates from protein rich materials; Production of *Spirulina* with enhanced iron content; Spray dried coconut milk powder; Biosensor for detection of lactate; Technology protocols for export of mango *var. Neelum*; **in the field of Information Science & Technology:** Software for pavement properties determination; REPLIGEN Software; Computer-aided design software for steel industrial structures; Software for assessing effects of fire on compressive strength of concrete members; Database of SSI clusters in India; **in the field of Material Science & Technology:** Composite coatings; CSIR-HZL nickel technology proving plant; Enrichment of nickel content in chromite overburden ore; Bismuth germinate single crystals; Magnesium plungers for de-oxidation and de-sulphurization of low carbon micro-alloyed steel; Self propagating high temperature synthesis (SHS) of Zirconium diboride; Aluminium alloy castings; Aluminum matrix composites for defence automobile applications; Metal-incorporated mesoporous materials; Lanthanum optical glasses; High temperature ceramic filter for molten metal; **in the field of Societal Science & Technology:** Multi-sectoral Rural Network System of Group Enterprises; Training programme for salt manufacturers.

1.4 The major programmes of Department Of Scientific and Industrial Research (other than CSIR) have been grouped as under:

I. Research and Development by Industry (RDI) consisting of:

a) In-house R&D in industry.

b) R&D by Scientific and Industrial Research Organisations (SIROs).

c) Fiscal Incentives for Scientific Research.

II. Programme Aimed at Technological Self-Reliance (PATSER) consisting of:

a) Development of new or improved technologies.

b) Development of special/custom built capital Goods.

c) Absorption and Adaptation of imported technology.

d) Studies and interactions concerning Technology Evaluation and pre-industry feasibility of major sectors/products.

e) Technopreneur Promotion Programme.

III. Scheme to Enhance the Efficacy of Transfer of Technology (SEETOT) consisting of:

a) National Register of Foreign Collaborations (NRFC).

b) Transfer and Trading in Technology (TATT).

c) Promotion and Support to Consultancy Services (PSCS) which also include the

Consultancy Development Centre (CDC).

IV. Linkages with International Organizations

V. National Information System for Science and Technology (NISSAT).

VI. Public Enterprises viz.

a) National Research Development Corporation (NRDC).

b) Central Electronics Limited (CEL).

Some of the achievements under these programmes are as follows:

1.5 Research and Development by Industry (RDI)

DSIR is the nodal department for granting recognition to in-house Research and Development centres; there were 1178 units having valid recognition as on 31 December 2000. 65 in-house R&D centres incurred an annual expenditure of over Rs.5 crores and 218 in-house R&D units incurred an annual expenditure in the range of Rs. 1 crore to Rs. 5 crores. During the year, 60 in-house R&D centres were accorded fresh recognition and 439 centres were accorded renewal of recognition. During the year 2000, Fourteenth National Conference on in-house R&D in industry was organised; DSIR National Awards were presented to 7 industrial units. A publication on "Outstanding in-house R&D Achievements (2000)" and 4 issues of "In-house R&D in Industry Update" were brought out.

Scientific research foundations in the area of medical, agriculture, natural and applied sciences and social sciences seek DSIR approval as Scientific and Industrial Research Organisations (SIROs) under the DSIR scheme of granting recognition to Scientific and Industrial Research Organisations (SIROs). SIROs approved by DSIR are eligible for availing customs duty exemption on import of equipment and consumables / material, and excise duty exemption on the purchase of essential scientific and technical instruments, apparatus, equipment (including computers), accessories and spare parts thereof and consumables required for research and development activities and programmes.

During the year, 33 new SIROs have been accorded DSIR recognition. 5 certificates for accelerated depreciation allowance on plant and machinery set up based on indigenous technology involving Rs. 2708 lakhs, 25 certificates for import of capital equipment and consumables/materials for R&D projects supported by DSIR, 850 essentiality certificates for claiming customs duty exemption amounting to Rs. 45 crores, 73 essentiality certificates for claiming excise duty exemptions amounting to Rs. 16.52 crore were issued by DSIR.

DSIR is nodal department for registration of Public funded research institutions/universities/ IITs / IISc., Bangalore/RECs other than a hospital for availing Customs Duty Exemption and Central Excise Duty Exemptions. During the year, 40 such institutions were registered with DSIR. Secretary, DSIR who is designated as the Pescribed Authority under section 35(2AB) of IT Act 1961approved in-house R&D centres of 27 companies. Agreements of cooperation for research and development were signed with these companies on behalf of the Secretary, DSIR.

1.6 Programme Aimed at Technological Self Reliance (PATSER)

Under the "Programme Aimed at Technological Self Reliance" PATSER) the Department has so far supported over 110 R&D projects of Industrial units. These projects cover products and processes in various important industries such as metallurgy, electrical, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives. 35 PATSER projects have so far been completed and a number of projects have been commercialized. Some of the products/ processes developed under PATSER projects since inception of the scheme include, digested organic supplement from agricultural waste, Earth moving machinery such as 70T dumper, 200 HP front-end loader, 10T excavator, 460 HP Wheel dozer, Xenon and Crypton lamps for Laser pumping, 6-Hi cold rolling mill, Ginger oil based on green Ginger in Manipur, upgradation of technology for Solar Photovoltaic Cells, Interactive voice response system (multilingual), Detonating Cards for shaped charges and Indigenous catalyst for recovery of Sulphur from sour gas in ONGC, Hazira, Nuclear based moisture & density gauge, Special Aluminas & Hydrates based on Sodium Aluminate Liquor, Deep hole site mixing slurry explosives, etc.

Under PATSER, about 75 projects are in progress and these have considerable commercial potential for products/ processes such as L(+) Tartaric

Acid from Tamarind, a mechanized process for utilization of distillery effluents for production of biocomposts, Heat resistant slurry explosives, 500 KW Gas Turbine for co-generation in process plants, PC based CNC system for Machine tools, a new process for Pyrazinamide based on methyl pyrazine and cyano pyrazine, 12 KV Load Break Switch, High Speed Machining Centre, Computerized Braille Printing system and Material handling stackers, tow tractors, ASICs for STD-PCO/ Pager/ Telephone.

PATSER projects have strengthened the linkages with more than 25 national research laboratories/ institutions such as NAL, Bangalore; RRL, Trivandrum; IICT, Hyderabad; CMRI, Dhanbad; IIP, Dehradun; C-DAC, Pune; NML, Madras; Institute of Plasma Research, Ahmedabad; ER&DC, Trivandrum; Dalmia Centre for Biotechnology, Coimbatore; CMTI, Bangalore; which have been collaborating with industry in the specific Research, Design, Development and Engineering (RDDE) projects of high techno-socio-commercial impact. During the remaining period of 9th Plan, DSIR would further enhance its efforts to strengthen industry's linkages with CSIR and other research labs including networking with other funding schemes such as Technology Development Board (TDB), Home Grown Technology Activity (HGTA) of TIFAC and financial institutions. DSIR has also been interacting with other ministries for identification of technology development projects and, in this direction, task forces with Railways for networking and technology development in the areas of signaling/ communications and electrical equipment/ power electronics have been formed. More such interactions with other economic ministries are being planned. Under PATSER projects, over 20 Patents have been filed/ under filing/ being scaled up.

Besides the project, support under PATSER has been given to technology related studies and interactions/ workshops. In this direction, one study and 10 Workshops/ Seminars related to new technologies/ technology developments were supported under PATSER. These have involved numerous industries, national labs/ institutions.

The Scheme has been successful in synergising the R&D efforts of industry and national research organizations. Many of the PATSER projects involve interaction/ collaboration amongst industries, IITs, IISc, and other national research organizations. It is expected that several completed projects would lead to significant commercial production in the years to come.

As a new initiative during 1998-99, the Ministry of Science & Technology has launched a novel programme known as "Technopreneur Promotion Programme (TePP) jointly operated by DSIR and DST to tap the vast innovative potential of the citizens of India. TePP is a crucible to promote individual innovators to become technology based entrepreneurs. The activities under TePP include providing financial support to individual innovators having original ideas and convert them into working models, prototypes, etc. It also helps in providing linking with technology finance schemes so that the innovative idea would come to fruition in the market place, finally with a benefit to industry and society. Ministry of Science and Technology has so far supported over 40 projects under TePP activity which are under development. The Department also participated in **"Innovative India"** Exhibitions concerning TePP and PATSER in Science Congress at New Delhi.

1.7 Scheme to Enhance the Efficacy of Transfer of Technology (SEETOT)

The Department continued its activities relating to the scheme on National Register of Foreign Collaborations & Technology Management (NRFC & TM). A compilation of primary data on Foreign Collaborations (FCs) for the year 1999 was brought out. Computerisation of data collected on foreign collaborations for 2000 has been completed. During the year, studies on status and prospects of Electronic Industries in the Eastern and North Eastern States, Valuation of Intellecual Property Rights, compilation of current cases in Trade Secrets and R&D capabilities available in select institutions in India has been completed. Studies on status of Minor Forest Produce based Industries in the state of Madhya Pradesh and Essential and Medicinal Plants Species in the North Eastern Region - their status and strategy for development are being finalised. Studies on status of Technology Management Education in India, Status of Technology Management Education in select countries and Technology Audit in select Small and Medium Enterprises are in progress. With a view to enhance capabilities in the area of Technology Management, a number of programms have been initiated and are in progress.

Under the Scheme on Transfer and Trading in Technology, major activities carried out include:

bringing out a Publication on "Technologies Exported & Exportable Technologies during 1998-99"; release of 4 quarterly issues of a Newsletter on "Technology Exports"; organisation of a "Technology Exports Pavilion and HERBO: 2000 Exhibition" at India International Trade Fair (IITF) '2000, Pragati Maidan, New Delhi; support to a Seminar on Herbal Products & Technologies during IITF '2000; support to the activities of Technology Export Development Organisation (TEDO), a cell jointly setup by DSIR & CII; support for participation of R&D laboratories in INDIATECH: 2000 at Cairo, Egypt, and brining out monthly Newsletters on "IPR for Industry".

The scheme relating to promotion and support to consultancy services essentially aims to strengthen our consultancy capabilities for domestic and export markets. During the period under review, the Food Processing Technologies and Services Centre at Kanpur, Consultancy Clinic for Textile Industry at Bhilwara and Consultancy Clinic for Lime Kiln Industry at Katni primarily to help small and medium industries became operational. Besides, final reports on. (i) Status of Consultancy services in India, and (ii) Policies and Incentives for Consultants in various countries were printed and (iii) a Study on Role of Consultants in R&D and Innovation was completed through NISTADS. Institutional and programme support to Consultancy Development Centre (CDC) was provided.

CDC was promoted in January 1986 as a non-profit society, primarily with a view to implement some of the programmes of DSIR. CDC is implementing a programme "Consultancy Development, Promotion & Assistance (CDPA)" maintains a computerised database of consultants, organises training particularly on ISO-9000 and ISO-14000 and Human Resources development Programmes for promoting consultancy, conducts consultancy related programmes sponsored by other agencies. DSIR is providing recurring and non-recurring support to CDC. 4th National Consultancy Congress on "Consultancy in the Knowledge Economy – Prospects and Profits" was organised on 15-16th January, 2001. To enhance technological and managerial capabilities of consultants as well as export capabilities, interactions with international organisations such as World Bank, APCTT, ITC and ESCAP were organised by CDC. Several Interactions Meets and Training Programmes in various areas including ISO-9000 & ISO-14000 systems were organised by CDC. Second General Council Meeting of Technical Consultancy Development Programme for Asia and Pacific (TCDPAP) was held in Kuala Lumpur during April 2000, in which CDC was retained as secretariat for a further period of 4 years w.e.f. September 1, 2000.

1.8 Linkages with International Organizations

During the year, the Department continued to participate in the activities of various international organisations such as UNCTAD, WIPO, UNIDO, ESCAP and APCTT at various levels and fora on issues related to Technology Development and Technology Transfer in co-ordination with other concerned Ministries.

DSIR participated in the Sixteenth Technical Advisory Committee meeting of Asian Pacific Centre for Transfer of Technology (APCTT) and the Fifteenth session of the Governing Board of APCTT held in Bali, Indonesia.

1.9 National Information System for Science & Technology (NISSAT)

The National Information System for Science & Technology (NISSAT) commenced its operations in 1977 with the objectives of organizing information support facilities for a customer base largely dominated by people engaged in research and academics. In tune with the changing global scenario and in pursuance of the national efforts in liberalization and globalization of the economy, NISSAT reoriented its programme activities continually in order to be useful to a wider base of clientele in diverse subjects. Besides establishing the internal linkages between the information industry, its promoters and users, NISSAT has been making efforts to establish a bridge between information resource developers and users in India and other countries.

NISSAT supported information centres are well equipped with modern information technologies. Besides providing documents and preparing bibliographies on request, they offer related services. The nine national access centres on international databases (NACIDS) for online access to database services continued to provide services on full cost recovery basis.

NISSAT established web sites/servers for wider dissemination of Indian S&T information. NISSAT encourages and supports a variety of manpower development programmes which cover topics such as CDS/ISIS, WWSIS, Internet and Web Designing, TQM in Library Services, Patent Information for R&D and Industry, ISO 9000 Quality

Management System, etc. Seventeen courses were organized during the current year.

NISSAT organizes a national meet of information industry, promoters and users, every year. ITT 2000 was held during November 22-24, 2000 at the National Aerospace Laboratory, Bangalore with a focused theme on Knowledge Management.

1.10 Public Enterprises

Two public enterprises namely, National Research Development Corporation (NRDC) and Central Electronics Limited (CEL) attached to the DSIR were engaged in important activities of development and commercialisation of indigenously developed technologies.

Some of the major technologies licensed by NRDC during 1999-2000 include Infectious Bovine Rhinotracheitis (IBR) Vaccine, Preparation of Katha from Uncaria Gambier, Glycol Based Antifreeze Coolant, Test Kit for Microbiological Quality of Drinking Water, 20 HP Tractors, Digital Sensing and Analysis of Bio-signals for Medical Data Base Management System , Anti Corrosive Treatment for Steel Reinforced Rods, Small Capacity Rice Husk Fired Water Tube FBC Boilers, Resham Jyothi (A Silkworm Bed Disinfectant), Manufacture of Sacrificial Anodes, Magnesium Alloy and Zinc Alloy Anodes for Cathodic Protection and A technique for wood plasticisation for making Bent wood.

Central Electronics Limited (CEL) holds a unique position among the family of Public Sector Enterprises in electronics, with its emphasis on indigenous technology inducted both from its in-house developments and from the National Laboratories, for its production programme in diverse high-technology areas of national importance. The activities of CEL are sharply focused in three thrust areas:

i) Solar photovoltaic cells, modules and systems for a variety of applications.

ii) Selected Electronic Systems-Equipment for Railway Signalling and Safety, Cathodic Protection Equipment for Oil Pipelines, Rural Automatic Exchanges (RAX), Switching Systems and Very Small Aperture Terminals (VSATs).

iii) Selected Electronic components-professional (Soft) Ferrites, Electronic Ceramics, Piezo Electric Elements and Microwave Components.

CEL has been the pioneer in the country in the areas of solar photovoltaics, ferrites and piezo ceramics. Today, it enjoys the international status of being among the top producers of single crystalline silicon solar cells in the world.

2. During the year 2000-2001, there was an all-round progress and growth in the activities under different programmes of DSIR

I(B). FINANCIAL SUMMARY

The financial summary giving the Actuals 1999-2000,BE 2000-2001, RE 2000-2001 AND BE 2001-02 of Various Plan and Non-Plan schemes (Headwise/broad category wise) is as under:-

(Rs. In crores)

S.No.	Head of Development Projects	Actual Expenditure 1999-00			Budget Estimated 2000-01			Revised Estimates 2000-01			Budget Estimates 2001-02		
	Programmes/Schemes	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
1	Assistance to Council of Scientific & Industrial Research (excluding NER & Sikkim)	249.730	543.240	792.970	299.350	612.140	911.490	274.350	580.000	854.350	332.000	600.220	932.220
2	Technology Promotion Development and Utilisation Scheme	13.903	0.070	13.973	15.900	0.090	15.990	15.900	0.090	15.990	17.550	0.100	17.650
3	Research and Development (APCTT & NISSAT)	1.648	0.000	1.648	2.550	0.000	2.550	3.030	0.000	3.030	2.750	0.000	2.750
4	Investment in Public Enterprises												
4.1	Central Electronics Limited	2.500	0.000	2.500	2.500	0.000	2.500	1.000	0.000	1.000	2.500	0.000	2.500
4.2	National Research Development Corporation	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250
5	Loans to Public Enterprises												
5.1	Central Electronics Limited	2.500	0.000	2.500	2.500	0.000	2.500	1.000	0.000	1.000	2.500	0.000	2.500
5.2	National Research Development Corporation	0.250	0.000	0.250	0.250	0:000	0.250	0.250	0.000	0.250	0.250	0.000	0.250
6	Secretariat Economic Services	0.200	2.163	2.363	0.200	3.146	3.346	0.200	3.040	3.240	0.200	3.150	3.350
7	Administration and Infrastructure	0.000	0.000	0.000	1.000	0.000	1.000	1.000	0.000	1.000	2.000	0.000	2.000
8	Provision for NER & Sikkim	0.000	0.000	0.000	30.500	0.000	30.500	30.500	0.000	30.500	0.000	0.000	0.000
	Grand Total	**270.981**	**545.473**	**816.454**	**355.000**	**615.376**	**970.376**	**327.480**	**583.130**	**910.610**	**360.000**	**603.470**	**963.470**

II. COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH (CSIR)

1. INTRODUCTION

Council of Scientific & Industrial Research (CSIR) is a national R&D organisation providing scientific and industrial research of value for India's sustained growth, strategic needs and nurturing of national human resource in S&T. It has country-wide network of 41 Laboratories and 80 Field Centres (See list of establishments) undertaking fundamental and applied R&D in diverse areas of Science & Technology.

CSIR continued its efforts to provide scientific and industrial R&D of value to the nation. The 2000-2001 Report highlights the more significant contributions made by the Council for the advancement of science & technology, to the growth of economy and in addressing societal concerns and issues.

1.1 Performance During the Year

As a result of diverse initiatives taken the external cash flow (ECF) for the period crossed the magic mark of Rs. 250 crore which had been eluding CSIR for some time. The ECF was Rs. 252 crore (versus Rs. 221 crore in 1998-99). The Indian patent filing of 377 achieved was 20% over last year's figure of 310 and foreign patent filing at the level of 199 which was 75% increase over the figure of 112 in 1998-99. Despite the emphasis on applied R&D and market orientation the impact factor per scientific paper contributed showed an increase from 1.512 in 1998 to 1.538 in 1999; although small, the upward trend continues. The industrial production based on CSIR knowledge-base also increased to Rs. 4400 crore in 1999-2000. On the whole the performance was satisfactory.

1.2 *New Millennium Indian Technology* Leadership Initiative (NMITLI) – CSIR to Manage and Operationalise

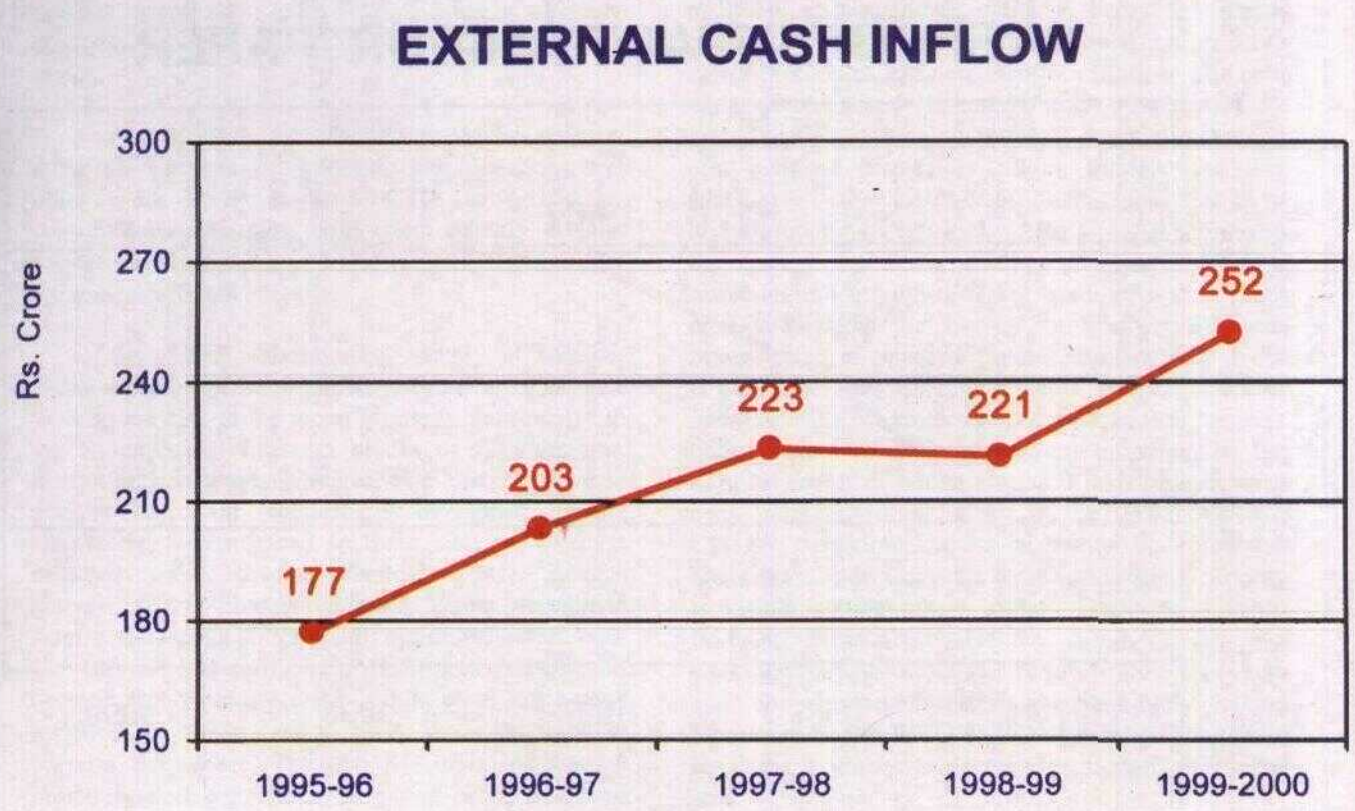
The Hon'ble Finance Minister in the Budget – 2000 announced the launching of a new scheme titled New Millennium Indian Technology Leadership Initiative (NMITLI) to realise the vision of developed India in S&T. The initiation of NMITLI owed its *inspiration to the address of Hon'ble Prime Minister* at the Indian Science Congress, at Pune on 3rd January 2000 wherein he called upon the scientific community to make the 21st Century India's Century – Ikkeesvin Shatabdi Bharat ki Shatabdi. Soon thereafter (on 21st February 2000 on the occasion of the Bhatnagar Awards Presentation Ceremony) Prof. Murli Manohar Joshi, Hon'ble Minister for Science & Technology exhorted scientists to take up the challenge to create Indian Science that will lead and not follow. This was followed on 28 February 2000 by the announcement of Finance Minister on NMITLI.

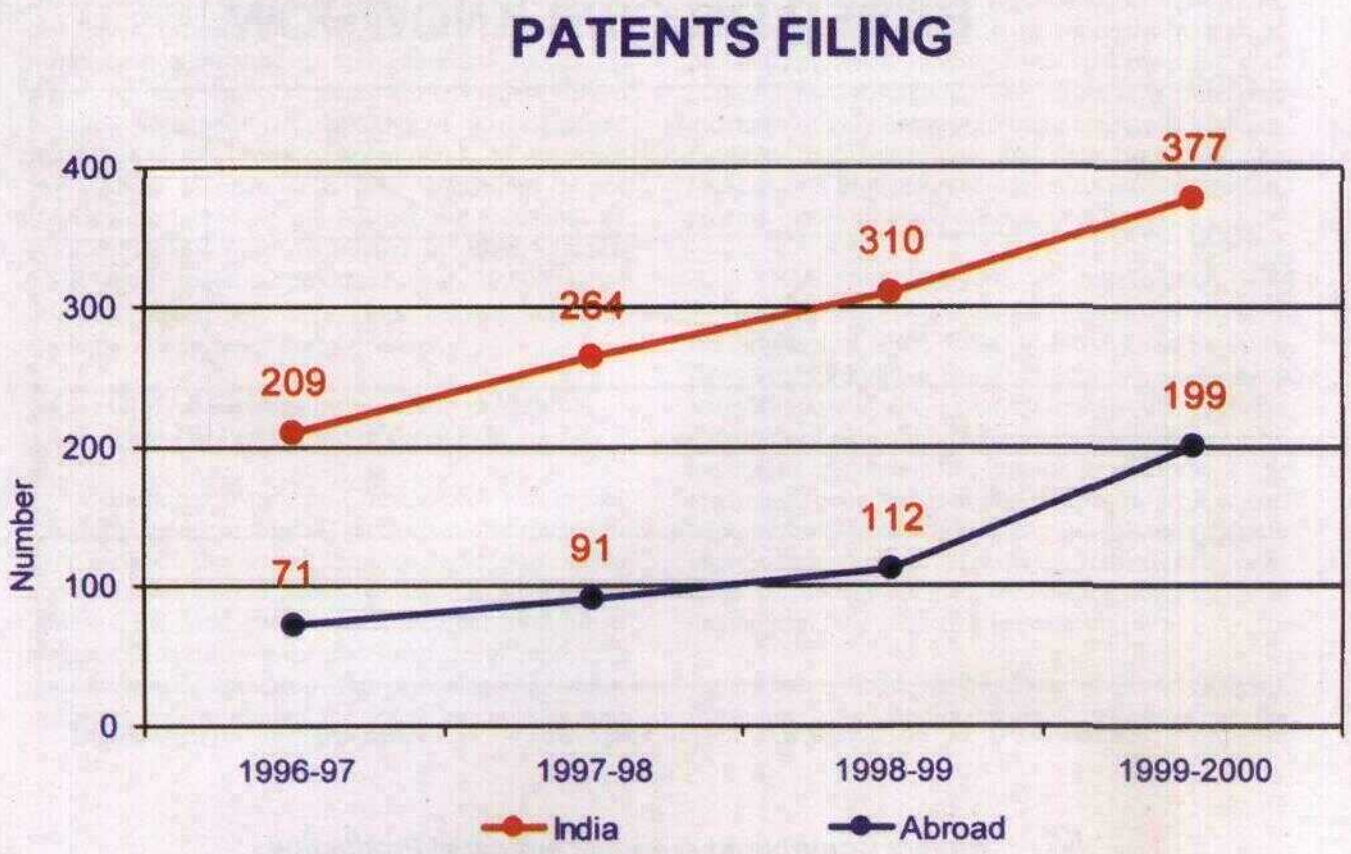
NMITLI envisages to support innovation centered scientific and technological developments as a vehicle to attain for the country a global leadership position, in some selected niche areas in a true 'Team India' effort. It thus sought for synergistic networking of publicly funded institutions, academia as well as private industry. The challenging task of conceptualizing, operationalising and implementing the scheme was assigned to CSIR with an outlay of Rs. 50 crore for it in the budget of 2000-2001.

CSIR initiated work on the Scheme in earnest to identify the mechanisms for implementation of the potential niche areas which could fetch and deliver the technology advantage to India. Wideranging and widespread national consultations were initiated through 1000 personal letters addressed by DG, CSIR to leaders in diverse walks of life seeking suggestions for the areas where India could emerge as a global leader. Detailed microlevel planning on operationalising the initiative in a transparent and participative manner is in progress.

1.3 Bringing Succor to Super Cyclone Affected People

In Orissa, during 1999 the first cyclone occurred on October 17 marginally affecting the state and causing damage in the district of Ganjam only. This was followed by another catastrophic super cyclone within a very short span of less than two weeks on October 29 and 30, resulting in massive devastation of the state and severely affecting 13 coastal districts. The post cyclone situation called for immediate and urgent aid and relief to the victims. Moreover, the surface water bodies like open wells,

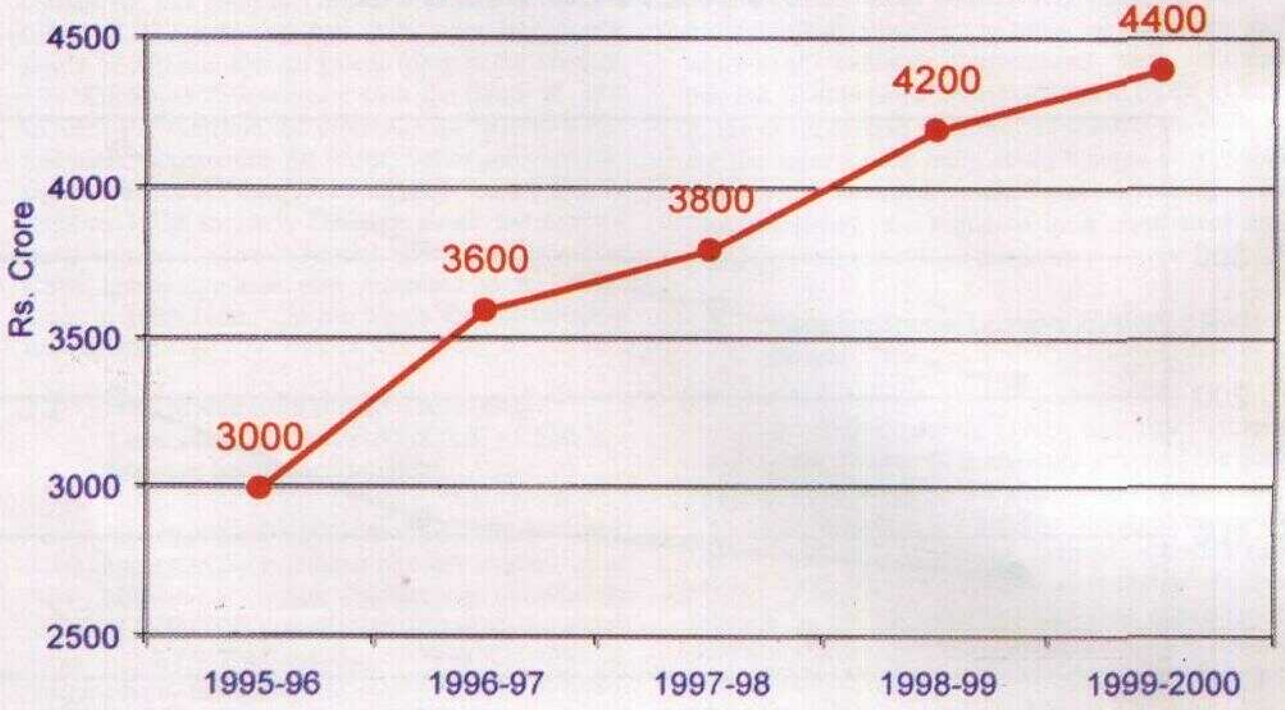




II.1 External Cash Inflow & Patents filed by CSIR

PAPERS CONTRIBUTED
AVERAGE IMPACT FACTOR /PAPER

ANNUAL INDUSTRIAL PRODUCTION
BASED ON CSIR KNOWHOW



II.2 Papers Contributed & Annual Industrial Production based on CSIR knowhow

ponds, shallow tube-wells were severely contaminated with the influx of mountains of sea water.

Nevertheless, the affected areas also posed a threat of outbreak of epidemic like diarrhoea and other water borne diseases. CSIR as a socially conscious organisation responded quickly to the calamity by launching a 'drinking water mission' for the cyclone affected people.

Six CSIR laboratories namely, CSMCRI, IICT, ITRC, NCL, NEERI, RRL-Bhubaneshwar, took up the task in the worst hit areas, particularly in the Kujanga and Erasama blocks of Jagatsinghpur district and Astaranga block of Puri district. Diverse devices based on technologies developed by the laboratories were rushed to these sites. The units installed were Reverse Osmosis (RO), Electro *dialysis (ED), Electro-oxidation (EO), membrane* filters, terra-cotta filters and pot-chlorination unit. The RO and ED units of CSMCRI provided salt and bacteria free drinking water, while other units were installed in sweet water open wells to provide *bacteria free water. The two RO units installed at* Palkasahi and Naiguan of Kujanga block produced 6000 L of safe drinking water, which was distributed through two tractors carrying sintex tanks to 12 nearby villages. The ED unit of CSMCRI installed at Pandua provided 600 L of water per day, while four EO units installed at Sailo, Bharala, Patila and Khuranta produced approximately 12800 L of water per day. Fifteen units of membrane filters were installed in eight villages and generated 5000 L of water per day and 137 units of terra-cotta filters installed in about 15 villages of Kujanga and Astaranga blocks produced about 600 L. of water per day. About 40 open wells were chlorinated by pot chlorination technique of NEERI and thousands of chlorine tablets were distributed in other villages. CSIR units together produced over 30,000 L of drinking water per day. Thus helping to avert epidemic due to water borne diseases.

1.4 CIMAP Enables India to Top in Menthol Mint Oil Production in the World

India has overtaken China, which was earlier the global leader in mint oil production and catered to over 60% of the world demand. India now meets about 70% of world Menthol Mint Oil demand of 20,000 TPA and even exports menthol mint oil to China and Brazil, which used to be major producers and exporters hitherto. This position has been achieved greatly due to the R&D work of several institutes and agencies, CIMAP being the prime contributor. CIMAP has developed competitive agrotechnologies and new mentha varieties. The new varieties christened 'Himalaya' and 'Kosi' are early maturing (90 days as against 120 days), disease and pest resistant (especially blight, mildew and leaf spot), give higher yields of oil (30% higher) and have higher content of menthol. Also CIMAP pioneered the concept of planting mint as a post rabi crop. As a result around one-third of the mint cultivators plant mint crop after the harvest of traditional winter season crops of mustard/ potato/ lentil/ wheat. India is thus now able to produce about 15,000 tonnes of menthol mint oil from an area of 1,25,000 hectares only. About 10 lakhs persons are employed by the mint oil sector of which around 3 lakh persons have been inducted in the sector in the last five years. CIMAP developments have greatly benefited the areas of the Indo-Gangetic region and rural prosperity is visible among others around Lucknow, Sitapur, Badaun, Moradabad, Udham Singh Nagar etc. Commercial agriculture has begun to take root there and the Indian farmers are resolutely taking advantage of the WTO and 'globalisation' to realise *for India a global leadership position in this niche* area.

1.5 Team India Project on Maximising Blast Furnace Productivity – an NML Initiative

Indian Steel Industry is around 100 years old and has a total aggregate capacity of over 20 Mtpa. The blast furnaces in the Indian industry operate at productivity levels ranging from 10-25% lower than that of Japan, Korea etc. The levels of performance are due not only because of more modern equipment, facilities and better raw materials used, but also because of a high level of advanced instrumentation, process monitoring and control models.

NML has catalysed, in collaboration with SAIL and TISCO, with financial support provided by the Ministry of Steel, Govt. of India, from the Steel Development Fund, a Rs. 60 crore project to develop knowledgebase for characterising the process dynamics of the iron making in the blast furnace with a view to enhancing the furnace productivity. The envisaged benefits from the proposed project are: 18% improvement in productivity, 3% reduction in energy consumption; Significant reduction in coke rate; partial replacement of coking-coal by non-coking coal; and reduction in pollution.

Tata Steel and SAIL will completely instrument two designated blast furnaces in the

plants. NML in association with C-MMACS, IITs at Kharagpur and Kanpur, IISC, Bangalore, IGCAR, Kalpakkam, MECON, Ranchi will undertake various experimental runs to develop mathematical models for the blast furnace. The model will be fine tuned with data gathered from the two instrumented blast furnaces. The model so developed will help in optimising the performance of the blast furnaces.

1.6 NCL Golden Jubilee Celebrations

NCL today is the crown jewel of the CSIR. The planning for setting up of NCL was initiated in 1942 at the time of the establishment of CSIR itself. The foundation stone of NCL in Poona was laid in April 1947 by Shri B.G. Kher, Prime Minister of the then Bombay State in pre-Independent India. It was inaugurated by Pandit Jawaharlal Nehru on 3rd January 1950. Exactly 50 years later to the day Prime Minister Shri Atal Bihari Vajpayee presided at the concluding function of the celebrations of the Golden Jubilee of NCL. The Prime Minister's address very succinctly captured in a capsule the joys and achievements of NCL in these 50 years. He said :

"I am very happy to be present at the National Chemical Laboratory on this momentous occasion – the conclusion of its Golden Jubilee year celebrations. This is no doubt a proud day for India's scientific community, and especially those associated with NCL. The entire country shares your joy as it recalls fifty years of outstanding service to the nation by one of our foremost scientific institutions.

We have to be grateful to the architects of modern India. They were men and women of great vision and foresight. They were well aware that the newly independent country's economic progress and the well being of its citizens were inseparably linked to the development of science and technology.

They established the Council of Scientific and Industrial Research (CSIR) to provide a strong foundation for the growth of science and its application through various technologies. The dream of a nascent nation, subjugated for centuries, to stand up as an equal in the comity of nations. It was the dream of a liberated country, proud of its scientific and cultural heritage, and determined to chart its own way to emerge as a secure, self reliant, modern, and economically advanced nation.

The National Chemical laboratory is one of the earliest laboratories to have been set up under the aegis of the CSIR. Today, as we celebrate its fifty years, we pay our respectful homage to the memory of Pandit Jawaharlal Nehru, who laid the foundation for this great institution. We also salute the memory of Professor Shanti Swarup Bhatnagar, Professor Homi Bhabha, and many other pioneering Indian scientists whose faith in resurgent India was persevering and indomitable.

I am happy to note that NCL has fulfilled the dreams and aspirations of its founders. It has emerged as a vibrant and internationally recognised research laboratory devoted to the field of chemical sciences. Its scientific contributions have received accolades around the world. The recognition of the pioneering research, done by Dr. Mashelkar in this very laboratory won him the Fellowship of the prestigious Royal Society in London. It is heartening that his Guru, Prof. M.M. Sharma, who too is an FRS, is also in our midst today.

NCL was established long before the chemical industry took roots in India. It has indeed helped the Indian chemical industry in all its phases of growth. Thus, one can say that NCL established the right chemistry between itself and the industry, much before the need for such partnership began to be widely appreciated.

Today India's chemical industry is among the most developed in the developing world. It also compares well with its counterpart in the developed world. It is vibrant with innovation and entrepreneurship. NCL's assistance to the Indian chemical industry in areas such as pesticides, organic fine chemicals, pharmaceutical intermediates, catalysts, and polymers has been widely acknowledged as pathbreaking.

I commend your institution for another important reason. Since the 1990's NCL has blazed a new trail in 'Knowledge Export' to may advanced countries of the world. It has set an example to other research laboratories by filing and securing the largest number of patents outside of India, especially in the USA, creating significant intellectual capital for our country. Not surprisingly, today NCL is a favored destination for many organizations around the world to perform collaborative research.

Distinguished scientists, we have now entered a new century. Our country, however, is faced with many old challenges. India needs to conquer poverty and underdevelopment. For this, our agriculture must become far more productive and our industries need to become globally competitive. The inputs of

science and technology are critical for the realization of these objectives.

They are also vital for improving the living standards of our growing population – in food, shelter, clothing, healthcare, sanitation, safe drinking water, clean air – besides providing affordable, yet high-quality consumer products. I must also add here the responsibility of our scientific and technological establishment to respond to the growing needs of our national security – both external and internal. The challenges in this field are becoming increasingly complex, needing highly sophisticated intellectual, managerial, and infrastructural capabilities.

We thus see that India's needs span the entire spectrum – from the most basic to the most advanced. Chemistry and chemical industry can make an important contribution to meeting them. What they have already contributed in the past is quite weighty. But what the present and the future expect from them is weightier still.

We need new chemistry, and new applications for it in industry that promote rapid economic development, while protecting our environment. They should harness our rich bio-diversity and also the vast repository of India's traditional knowledge. They should develop new processes and products that excel in quality and exceed in performance against global benchmarks.

I am confident that our S&T establishments, and especially those working in chemistry and in the chemical industry will rise to the occasion. In this endeavor, I am sure, NCL will participate with even greater successes than it has recorded the past five decades.

Before I conclude, I wish to express my pleasure at having launched the CD-ROM series on India's traditional medicine, based on 50 plants most widely used in Ayurvedic practices. The vast knowledge contained in this disc includes both ancient knowledge and that based on modern scientific research. Preserving our heritage for posterity in such electronic databases, and marking them available for commercial and scientific use globally is a highly commendable project.

Earlier, CSIR had successfully won the patent battle on turmeric. With this project, it has taken another important step that helps in preventing wrong patents being granted to foreigners for natural and intellectual resources that rightfully belong to us.

I wish all of you well, as you cross one landmark and begin your journey towards the next. I congratulate every one of you for making what NCL is today"

1.7 1999 R&D Management Conference: R&D as a Business

CSIR collaborated with the R&D Management Association (RADMA), UK for organisation of the 1999 R&D Management Conference at New Delhi. The R&D Management Conference is organized each year, the world over, by the R&D Management Association (RADMA) and brings out the well known R&D Management Journal. The Conference is a prestigious feature for the R&D Managers the world over. The theme for the 1999 conference was "R&D as a Business" suggested by CSIR, as it had pioneered and spearheaded the movement in India for recognizing and managing of R&D as a Business.

CSIR took up the Conference activity in a project mode. It was strategically decided that the Conference be self-sustaining to demonstrate that even this aspect of R&D could be run as a Business. A record breaking 155 participants registered for the event (the highest for any RADMA Conference so far) out of which 35 were foreigners representing 11 countries. Nearly 100 abstracts of papers for presentation in the Conference were received out of which after a thorough peer review only about 60 were selected for presentation. A Conference Book covering all the papers to be presented was brought out as a pre-conference publication. The Keynote address was given by Dr. Ashok Ganguly, the author of the well-known book 'R&D as Business' while the theme presentation was given by Dr. R.A. Mashelkar, the founder of 'R&D as a business movement' in India. The Conference aroused keen interest in the participants and a universal recommendation that CSIR took the lead to organise annually an R&D Management Conference in the country to promote research and to advance the knowledge on management of R&D in the country and provide a forum for practitioners and academics to meet on a common platform.

2. SCIENTIFIC & TECHNOLOGICAL ACHIEVEMENTS

2.1 AEROSPACE SCIENCE & TECHNOLOGY

2.1.1 Development and type certification of HANSA-3 aircraft

NAL's HANSA-3 all-composite aircraft received its type-certification from the Director

General of Civil Aviation (DGCA) under JAR-VLA category on 1 February 2000. HANSA is now certified for day/night flying and also equipped with lightning protection. HANSA's type certification was a fitting climax to a remarkable aeronautical adventure spanning a whole decade in which four HANSA aircraft (HANSA-2RE, HANSA VT-XAL, HANSA VT-XBL and HANSA VT-HNS) were successfully built and test flown. The HANSA aircraft has now logged in over 250 hours of trouble-free flying.

2.1.2 LCA composite wing box test

The Light Combat Aircraft (LCA) has been designed to fly with wings made of advanced fibre composites. It is necessary to demonstrate the structural integrity of these wings by actual testing up to the design ultimate load (DUL). NAL evaluated several test boxes, representative of the LCA wing box construction, under both room temperature and hot-wet environmental conditions. The tests were successfully completed in NAL's special test rig to evaluate the structural integrity of aerospace components. Such complex component level hot-wet tests have been performed for the first time in the country.

2.1.3 Composite torque shaft of LCA

The torque shaft of the LCA rudder is a very complex part that was originally made out of a titanium alloy. The fabrication process included NC machining and electroless beam (EB) welding. The machining was a tough and slow process because titanium is a hard material. The EB welding was also a slow process involving multistage inspection. All these factors made fabrication very expensive, increased the cycle times and required special facilities. NAL successfully replaced the titanium torque shaft with a composite torque shaft. The task involved a difficult and intricate curing process. The static and fatigue strength capability of the composite torque shaft was also successfully demonstrated.

2.1.4 Flosolver Mk 5 with FloSwitch 2000

The latest parallel supercomputer of the Flosolver series, Flosolver Mk 5, is now operational at NAL. Mk 5 used 32 parallel Pentium II/III processors, which exchange information through the fast, and innovative, indigenously built FloSwitch. Flosolver Mk 5 thus achieved both parallel processing and parallel communication. Each processor has 64 MB of RAM. Mk 5 is expected to have a peak computing speed of 15 GFLOPS and a sustained speed of 1 GFLOP for CFD codes.

2.1.5 Development of sandwich radome for ISRO

NAL developed a 12.88m diameter sandwich paneled radome to cover the 9m diameter antenna reflector of the Doppler weather radar (DWR) project of ISTRAC, ISRO. The technology of large curved sandwich panel production using hard rigid foam vacuum bonded in between composite skins has been fully developed and standardised. Software development work was also undertaken for the prediction of electromagnetic (EM) fields in the presence of the antenna-radome interaction. The radome has now been installed at the LRDE, Bangalore, test site for electromagnetic performance evaluation of the radome coupled with the antenna reflector.

2.1.6 Development of a process for deposition of copper for deep buried contacts

NAL has proposed a surface engineering procedure to improve the Martin Green deep buried contact method for the manufacture of ultra high efficiency silicon photo voltaic cells. The Martin Green method consists of grooving the silicon surface with a laser beam and then filling the groove with copper by electroless plating. This method had two serious drawbacks from the production point of view: it took eight hours to achieve a 12mm copper deposit and the deposit formed big nodules at the entrance of the groove, leading to the formation of internal voids. NAL solved this problem by introducing two additives, working in synergy, in a high speed copper deposition bath. The additives ensured uniform deposits and deposition was achieved in less than four hours. This project was undertaken for CEL, Sahibabad.

2.1.7 Studies on FE principles and practices

A detailed study on of the non-linear behaviour of beams and box-beams using analytical and finite element approaches have been carried out at NAL. Work was initiated on a finite element (FE) software package and a beam element with von Karman non-linearity and updated Lagrangian computation has been implemented and validated against analytical solutions and NASTRAN models. Field- and edge-consistent QUAD4 elements with composite laminate properties for static, dynamic and stability problems have been developed and validated on the FEPACS 4.0 version of the frontal solver.

2.2 BIOLOGICAL SCIENCES & TECHNOLOGY

2.2.1 Nitric Oxide (NO) in pathophysiology

Nitric Oxide (NO) has emerged as a novel bio-regulatory molecule involved in regulating diverse physiological and pathological conditions. CDRI findings indicate:

- NO released from polymorphonuclear leukocytes (PMNs) inhibited platelet aggregation;
- NO and free radical scavengers offered protection against thrombosis;
- NO released from PMNs was also augmented following thrombosis;
- Both exogenous and endogenous NO modulated the free radical generation from PMNs in a biphasic manner. At low concentrations, NO increased the intracellular calcium via ADP-ribosylation and Protein kinase C-activation augmented the free radical generation while higher concentrations of NO directly inhibited the NADPH-oxidase activity and scavenged free radicals;
- NO as a predictive marker of Parkinson's disease; and
- Protective effect of NO in peptic ulcers.

2.2.2 Use of α-arteether as fourth generation antibacterial agent

Arteether, a semisynthetic derivative of artemisinin, is a potent drug for treating complicated cerebral malaria. A novel property of • -arteether has been detected in vitro by CIMAP. The • isomer of arteether was found active against E. coli and Mycobacterium smegmatis strains, which were resistant to quinolones, such as, ciprofloxacin, nalidixic acid and lomefloxacin. Fluoroquinolones are used widely to treat urinary tract infections. However, bacteria tend to develop resistance against fluoroquinolones, primarily due to mutations in DNA gyrase, the target enzyme of quinolones. Such drug resistant pathogens are hazardous. The • -isomer of arteether was able to inhibit the growth of such fluoroquinolone resistant E. coli cells in a stereospecific manner. This novel use of • -arteether has been filed for US patent.

2.2.3 Luteolin as potential compound for leishmania therapy

Interaction of several flavonoids with DNA topoisomerases have been studied at IICB in order to locate molecular targets in the parasites and compounds with potential therapeutic value that act through established cellular targets. It has been found that the flavonoids luteolin and quercetin were potent antileishmanial agents. The therapeutic potential of luteolin lied in DNA topoisomerase II mediated kinetoplast DNA cleavage leading to apoptosis of cells.

2.2.4 New cell secreting insulin

Studies at IICB have revealed that 'Carp Adipocyte' secretes immunoreactive insulin which causes hypoglycemia in rats. Hybridization of adipocyte RNA with zebrafish and rat cDNA showed insulin gene expression in these cells. Based on the conserved sequence of insulin gene of different animals, oligonucleotide prepared have been used to clone and sequence adipocyte insulin gene.

2.2.5 Microbial resistance to plant antibiotics

The primary phytoalexins of leguminous plants called isoflavanoids are well known for antifungal effects. But, additional, novel effects of isoflavanoids on free-living soil amoebae (called dictyostelids or cellular slime moulds) were discovered at the CCMB. These effects represent a facet of a novel plant-microbe interaction wherein the amoebae continue feeding on bacteria in the vicinity of root lesions (the site of isoflavanoid production) and thus effectively disinfect the lesion from potentially pathogenic bacteria.

2.2.6 Low levels of platelets glutathione in Eales disease

Eales disease is an idiopathic obliterative vasculopathy of the peripheral retina of young adults. The retina because of its high oxygen requirement and content of polyunsaturated fatty acids (PUFA), is an elective site for oxidative stress. Since platelets also contain high proportion of PUFA, the study was undertaken at ITRC based in a tertiary care centre of 18 Eales' disease cases and 20 healthy controls to determine the comparative status of platelets glutathione (reduced GSH form). Platelets GSH levels were significantly lowered in Eales' disease patients compared to the controls. Since GSH is one of the major antioxidant defence systems in the retina, lowered levels of GSH may contribute to enhanced oxidative stress in Eales' disease.

2.2.7 CSIR coordinated programme on development and commercialization of bioactive molecules

The flagship programme of CSIR is progressing admirably well. Advanced equipment for new drug discovery have been established at seven laboratories. Significant work on screening of extracts (1463 plant, 288 microbial and fungi and 11 insects) was taken up for bioactivity against 14 diseases. The results have exhibited strong active in vitro and in vivo activity and accordingly 32 discovery groups are for malaria, hypertension, ulcer, hepatoprotective cum immunomodulation memory enhancer, cancer, tuberculosis filarial and inflammation. A new antiulcer formulation has been designed and formulated. This has shown higher antiulcer activity as compared to the best drug clinically used for antiulcer activity. New mechanisms has been discovered for bioenhancing activity of piperine. In addition to piperine two more plant extracts have been found having bioenhancing activity, one of them is even better than piperine, the earlier bioenhancer discovered by CSIR. A new drug delivery system has been designed so that the drug can be targeted to the cancer tissue of liver. The model molecule is being entrapped in virosome which are delivered into the Cytosol through membrane fusion. Rational drug design technique has been established and number of new compound have been designed for anti-inflammatory activity.

2.2.8 An improved process for the isolation of eupalitin 3-O-13-D-galactopyranoside

An anti-osteoporosis compound eupalitin 3-O-13-D-galactopyranoside has been isolated from Boerhavia diffusa (Nyctaginaceae) by RRL, Jammu. It has shown stronger activity as compared to the ipriflavone a clinically used natural product derivative in Japan and Italy. An Indian Patent on the improved process for the isolation of this compound has been filed.

2.2.9 Plant based health promoter

A standardized bioactive composition having hepatoprotective, immunostimulatory and anticomplementary activities has been isolated at RRL,Jammu. This single plant drug also showed anti-asthmatic activity .It is an excellent herbal drug for the treatment of liver disorders and as prophylactic treatment against viral diseases such as common cold and fever. It is also effective in the control of asthma and can be used as tonic to give vital support to immune system, to combat physical and mental stress.

2.2.10 Structural and Functional significance of repetitive sequences: Enhanced Myoclonus Epilepsy Repeat

Studies on enhanced myoclonus epilepsy (EPM 1) at CBT have established that a twelve mer repeat amplified upstream of cystatin B gene d(CCCCGCCCCGCG)n/d(GGGGCGGGGCGC) was present in 2-3 copies in normal individuals. However in epilepsy patients it can expand from 16 to 75 repeats. The structure of this repeat and its complementary strand has been characterised. Oligonucleotides containing 1, 2 & 3 copies of G-rich as well as C-rich strand of EPM1 repeat sequence have been synthesized successfully. It was observed that with increase in the length of the repeat G-strand oligonucleotides tend to fold back and predominantly form intramolecular structures involving Hoogstein type of G-G base pairing. PAGE experiments, P1 nuclease and hydroxylamine probing indicated that the C-rich oligonucleotides adopt unique, compact, intramolecular structures. Thus both the strands of EPM1 repeat sequence adopt different conformations in a length dependent manner which could provide nucleation for the expansion of these repeats.

2.2.11 Deletion of amelogenin gene on Y chromosome of normal males and its implication in forensic applications and prenatal diagnosis

Various strategies have been adopted to utilise the minimum quantity of sample to detect maximum variability in a single Polymerised Chain Reaction. For the gender identification, amelogenin gene is included along with the multiplex STRs. Amelogenin is present on the short arm of the X (AMEL X) and Y (AMEL Y) chromosome of human and other primates. Studies at the CCMB using profiler plus kit showed deletion of amelogenin in three males who possessed normal SRY gene. But for the detection of presence of SRY gene and other Y-chromosome specific STRs (DYS19, DYS389, DYS390, DYS391 and DYS393) these individuals would have been identified as females. This would have serious consequences for forensic investigation and prenatal sex identification of foetus with known family history of genetic disorders affecting only the male child. CCMB coined a term for those males as deleted-amelogenin males (DAM). Analysis of family members of one of the amelogenin-deleted males confirmed the transmission of 50% of his

alleles to his offspring. CCMB has suggested the use of additional Y chromosome markers such as SRY and/or Y-STRs for gender identification, considering the importance of sex-identification of forensic samples and prenatal diagnosis in cases with known history of genetic disorders, which affect only male children.

2.2.12 Human genome diversity

CCMB has taken up a study on genetic diversity in various castes and tribal populations to construct haplotypes which would be are useful to construct the evolution tree. 300 samples from different caste, and tribal populations including Great Andamanese and Nicobares were analysed using various Y chromosome specific STRs and biallelic markers, sequence variation at the hypervariable region and the 9bp intergenic deletion of the mtDNA. *DNA sequencing facility has been set up at CCMB.* Other studies have shown that the 9bp intergenic deletion is more predominant in Asian populations. However, only 7 out of 300 samples showed 9bp deletion. The populations including Onges and Great Andamanese did not show the deletion, suggesting that the frequency of 9bp deletion is very low among Indian populations. Analysis of HVRI of the mtDNA D-loop showed population specific haplotypes. Two Great Andamanese showed a transversion at the nucleotide position 16,265, which is a characteristic feature of one of the major lineages in PNG Island and Melanesia. This observation is one of the proofs that the Andamanese represent one of the earliest human lineages.

2.2.13 *Peptide membrane interactions*

CCMB has established the identity of antibacterial peptides from the skin secretions of the amphibian species Rana tigerina by extensive use of protein sequencing techniques and mass spectrometry and confirmed by synthesis and biological activity. The peptides are composed of 12 amino acids and have the motif (CXXXXXXXC) where X are either hydrophobic or cationic amino acids and C is cysteine. The motif and sequences are unique among host-defence amphibian antibacterial peptides. Circular dichroism studies and theoretical calculations suggest that the peptides adopt β-turn structures. The peptides appear to exert their activity by permeabilizing bacterial membranes.

2.2.14 Lamin gene regulation

CCMB has demonstrated a new role for lamins in supporting nuclear compartments containing RNA splicing factors, also called nuclear speckles. These were identified by confocal microscopy of mammalian cells using monoclonal antibodies raised to recombinant lamin A and antibodies to the RNA splicing factors SC-35 and U5-116 kD in colocalisation experiments. These studies substantiate the proposal that the regulation of nuclear events by compartmentalization of essential factors is structurally dependent on the nucleoskeletal network of proteins.

2.2.15 Identification of the INO1 gene of *M. tuberculosis*

A gene coding for the inositol-1-phosphate synthase activity in Mycobacterium tuberculosis has been identified by IMT. This activity was hitherto unknown in prokaryotic organisms. This enzyme should serve as a good drug target for anti-tuberculosis drug development.

2.2.16 Method for rapid immobilization of biomolecules

A rapid and efficient method for covalent immobilization of biomolecules onto an activated surface has been developed by CBT using microwave mediated reaction. This invention particularly related to a quick and efficient procedure for immobilization of biomolecule preferably proteinaceous ligands (such as enzymes) onto an activated surface. The immobilized biomolecule would be useful for various chemical, biochemical and biological techniques such as for the detection of substrates and can have applications in diagnostics, industry, food technology, environmental studies etc.

2.2.17 Early sex identification in papaya using DNA markers

Papaya is a nutritionally and industrially important fruit plant. The cultivation of papaya is hampered due to its diocious nature where only 50 % of the plants are female and the sex of the plant grown is known only after six to eight months. NCL has developed a PCR-based assay to detect male specific differences in papaya. In order to circumvent inherent drawbacks of low stringency PCR, the 0.8 kb RAPD fragment was converted into SCAR, which involved elution of the band from the gel piece, cloning it into a vector, sequencing and synthesizing locus specific primers. The PCR-based method to amplify the SCAR marker then was further modified to develop a practical diagnostic assay. Multiple field trials conducted to identify the sex of juvenile papaya

plants demonstrated the accuracy, high reliability and convenience for mass screening of seedling plants using the diagnostic assay.

2.2.18 Fungal metabolism of hydrocarbons

The microbial degradation of hydrocarbons is stimulating as it has potential application in bioremediation technology and in the production of commercially important secondary metabolites and novel enzymes derived from the hydrocarbon substrates. A breakthrough in elucidation of the sub-cellular sites of the key enzymes involved in the metabolism of alkane, namely alkane mono-oxygenase, alcohol dehydrogenase, fatty acid oxidases, etc. has been made at RRL-Jt in collaboration with University of Massachusetts. The existence of fatty alcohol oxidase (FAOD) in the filamentous fungi has been reported for the first time. Using a modified methodology, the presence of vacuoles of various shapes and sizes in the hydrocarbon grown cells of a filamentous fungi was also demonstrated with the aid of fluorescence microscopy.

2.2.19 BOD Biosensor

CBT has developed a BOD bio-sensor which works at pH ranging from 5.0-8.0. It uses a modified membrane (support) which had an added advantage of holding the biocatalyst (micro-organisms) in place by way of leading to a more specific and strong binding between the two. The binding thus prevented the leaching of microorganisms from the support thereby increasing the shelf-life and stability of the immobilized microbial membrane.

2.2.20 Bio Sensors

A variety of biosensors are under advanced stage of development at NPL viz:

(a) Lactate biosensor: Prepared from lactate oxidease and lactate dehydrogenase by co-immobilizing into electrochemically prepared polyaniline films by physical adsorption technique.

(b) Cholesterol biosensor: Fabricated by co-immobilizing cholesterol oxidase and horseradish peroxidase onto sol-gel matrix by physical adsorption, sandwich configuration and micro- encapsulation techniques. The sensor can be utilized for cholesterol estimation from 2-10 mM and is stable for about 8 weeks at 25° C and about 12 weeks at 4-5° C.

(c) Urea biosensor, urease and glutamate dehydrogenase have been co- immobilized on electrochemically prepared polypyrrole-polyvinyl sulphonate film. Urease catalysis the conversion of urea to ammonia and bicarbonate ions and the ammonium thus released is coupled with 2- oxoglutarate in the presence of glutamate dehydrogenase and NADH to form glutamate and in the process NADH gets oxidized which is monitored at 340 urn spectrophotometric ally.

2.2.21 Complexation of 1,2,4 benzene triol with inorganic and ferritin released iron in vitro

The reactive metabolite(s) responsible for the expression of benzene toxicity is not clearly known despite extensive information on the metabolism and heamatotoxicity of benzene. It is now widely believed that haematotoxicity of benzene is due to the concerted action of several metabolites which arise from multiple pathways of benzene. In an earlier study from ITRC, it was proposed that iron polyphenol chelates as possible toxic metabolites of benzene due to their prooxidant activity. In continuation, the formation of iron and 1,2,4 –benzenetriol (BT) complex, when added together was demonstrated by G-10 column chromatography. Further it was also observed that iron released from ferritin in the presence of BT formed a complex with 1,2,4 benzentriol.

2.2.22 Large scale screening of menthol mint clones

A novel rapid methodology to generate and select menthol rich plants through in vitro selection of vegetatively propagated or tissue culture generated clones, against end product cellular toxicity, has been developed by CIMAP. The method is simple and simultaneously confirms the genetic stability of the genotypes. Using this protocol, a few menthol rich genotypes have been developed and their genomic change through RAPD analysis has been confirmed. The menthol yield, in these clones, increased upto 83% while the parent plant from which these were developed produced 78% menthol. A US patent was awaited for the development.

2.2.23 Oil cells as the site of citral accumulation in lemongrasses

Essential oil bearing plants are unique in possessing specialized secretory structure to accumulate large quantity of monoterpenoids. The secretory structures are of various types, viz., glandular trichomes, glandular hairs, resin ducts, secretory cavities, and occur in different plant parts such as flowers, leaves, and roots. A histochemical procedure has been standardized by CIMAP to identify citral accumulating cells in the leaves of east (Cymbopogon flexuosus), west (C. citratus) and north (C. pendulus) Indian species of lemongrass. All these species yield lemongrass oil of commercial value, having citral as the main constituent. The oil accumulating cells were present on the adaxial side of the leaf mesophyll, adjacent to non-photosynthetic tissue and between the vascular bundles. Identification of oil cells has direct implication in developing high essential oil yielding cultivars of lemongrass.

2.2.24 Superior strain of essential oil bearing damask rose developed

CIMAP has developed a damask rose (Rosa damascena) variant strain (V1HS-4-18), which, besides excelling the three best local varieties for yield in the main flowering season (March-April), also gave additional flower yield during off-season months (September-October). Flowers and oil yields of this strain were 52q/ha and 4 kg/ha respectively.

2.2.25 New sources of aroma oils

Exploratory studies conducted at RRL-Jt. have established newer aroma sources as follows:

Macropanax undulatum - The essential oil from fresh leaves contains α-pinene (49.5%), β-pinene (22.2%) limonene (11.5%), (Z)-p-ocimene (11.8%);

Michelia montanna - The leaf oils contains thirty components. The major constituents were asaricin (syn.sarisan-81.5%) and safosole (13.0%). The identity of principal compound were isomers of Myristicin.

2.2.26 Herbal Drug Repository

A well stocked herbal drug repository has been set up at RRL, Jammu. This referral facility will be accessible to pharmaceutical industry , traders, medicinal practitioners, natural product chemists, students, and academics. With the addition of chemical finger print profiles and data on anatomical features of medicinal and aromatic plants, this repository could be a national facility for certification of raw materials to the drug industry and other users. Presently in this repository , a total of 600 crude drug samples of authenticated parts of the plants, used as medicine, have been housed. The crude drugs comprising root, stem, leaves, flower, fruit, seed, root & rhizome, stem & leaves, fruit & seed, stem bark, root bark, heart wood, whole plant, whole plant without root, exudate gum/resin, tuber and bulb, have been classified on the most scientific and modem lines. The collection is a continuous process and is targeted at 1000 specimens.

2.2.27 In vitro shoot regeneration of Sandalwood

Sandalwood (Santalum album L.) is a hard wood tree and industrially important as a natural source of santalol. In vitro complete plant regeneration of Sandalwood through micropropagation is difficult. A simple protocol for shoot regeneration, via organogenesis, has been standardised at NEERI. From one explant 150-200 shootlets were regenerated on Murashige & Skoog medium. Repeated shootlet regeneration was obtained successfully from an organogenic mother callus through subculture to hormone free basal medium. It was observed that rooting of regenerated shootlets was sporadic and root development was very slow. Experiments are under- way to increase the efficiency of root formation, reduce the time period of rooting and develop healthy root system to raise complete plants for transplantation in the field.

2.2.28 Micropropagation of Swertia chirata

Complete protocol for the micropropagation of Swertia chirata, a valuable medicinal plant has been developed. The plant is widely used by pharmaceutical industries all over the world. This, species has been extensively exploited, so much so that it is now a threatened species. Presently supply depends on wild source which is being critical on account of over harvesting and progressive clearance of its habitate. It would therefore certainly be, helpful to utilize tissue culture procedure for large scale propagation and germplasm conservation. Besides, the strategy evolved will maintain quality and homogeneity of herbs.

2.2.29 CO_2 sequestric mechanism for high altitude plants

Spiti valley, a cold desert in western Himalayas, is characterized by scanty vegetation, very low rainfall and low mean temperature, yet have some very important plants. These plants harbour important genes, imparting low temperature stress tolerance and valuable information on plant adaptation and survival. By using biotechnological approaches, a novel CO_2 sequestric mechanism has been found by IHBT for the plants growing at high altitude. Also the relevant genes for cold adaptation from high altitude plants was cloned. Novel antioxidant with enormous utility in pharmaceutical, cosmetic and food industry has been purified and its antibodies have been raised.

2.2.30 Biochemical basis of disease defence in tea

Blister blight is the major fungal disease of tea, causing enormous yield loss and quality deterioration. Screening of selected tea germplasm at IHBT showed marked differences in disease response against pathogen populations. Studies undertaken to elucidate biochemical basis of disease resistance showed development of lignin halo in phloroglucinol-HCl reaction around necrotic spots in resistant reactions and its absence in susceptible reactions. A negative correlation was observed between contents of total polyphenols and catechins and the clonal disease response. The resistant materials can be employed for breeding resistance through conventional and molecular biological techniques.

2.2.31 Eucheuma cultivation

Eucheuma is exploited commercially for the production of K-carrageenan in the world. Most of the raw material used for the production of carrageenan is met from the farmed material from the Philippines, Indonesia and recently from Tanzania. This is an exotic alga introduced on Indian coast. This alga is being cultivated commercially by mono line method using preferably apical vegetative fragments. However CSMCRI has improved the cultivation technology by growing the alga in transparent polythene bags with perforations which help to obtain pure raw material and ensure protection from grazers and siltation. A variant has also been developed which grew with a growth rate of 8% per day, as compared to 5-6% in the control parent plants (exotic plant) grown in open waters. This variant compensated the loss of attenuated growth that was encountered in growing in plastic bag.

2.2.32 Training in cultivation and processing of medicinal and aromatic plants

A training programme was organised by IHBT aimed to impart skills in the field of cultivation, processing, quality control and marketing of medicinal and aromatic plants and products thereof. The programme was sponsored by the Ministry of Rural Development. Progressive growers, farmers, small-scale plant extractors and extension/NGO workers participated.

2.2.33 Green House facility

A green house facility having pre-hardening and hardening arrangements and post hardening spaces has been developed at IHBT for tissue culture raised orchids/bamboos/ornamental plants. The facility will enable IHBT to generate over 1,00,000 nucleus disease free planting material for floriculture and other high value crops.

2.2.34 Enzymatic transesterification of Jojoba oil for the preparation of Jojoba Body Cream.

A solvent-free process was developed by CSMCRI for T. E. Jojoba oil using enzymatic transformation. The T.E. Jojoba oil is the premium and best cosmoceutical ingredient. The same was used successfully for the preparation of Jojoba Body Cream. The step change in the process was solvent less & eco-friendly product which was time saving, cost effective and at low temperature as compared to chemical processing. The product made was undergoing toxicological evaluation.

2.2.35 Yeast as a model for elucidating the anti-oxidant and detoxifying pathways of glutathione

Identification, cloning and characterization of the first glutathione transporter to be described from any system so far has been achieved at IMT. Although gluthione transporters have been biochemically demonstrated from prokaryotes to eukaryotes, the transporter has evaded identification and cloning. Scientists at IMT were able to identify, clone and characterize this transporter from yeast. Owing to the central role played by glutathione in living cells (redox buffer/oxidative stress/detoxification) this discovery will have a major impact in the field and will now trigger the cloning & understanding of similar transporter from plants and animal systems and also enable one to determine the role they play in glutathione homeostasis.

2.2.36 Chrysanthemum: Chimera management for securing flower colour mutation

An efficient shoot regeneration protocol from ray florets was established in the previous year. Using this protocol, attempts have been made to regenerate shoots from chimeric ray florets, appeared as natural sport or due to gamma ray treatment in different cultivars, to isolate the mutant in pure form:

Kasturba Gandhi – It is a white coloured large flowered chrysanthemum cultivar. This cultivar produced 20 yellow ray florets due to spontaneous mutation. Attempt was made to retrieve mutant in pure form from this chimeric yellow floret; and

Purnima – A white flowered chrysanthemum cultivar, developed yellow sector of ray florets on exposure of rooted cuttings to 1.5 and 2.0 Krad gamma rays. These mutated sectors appeared only in a small sector of ray florets. These mutated ray florets were cultured on agar solidified MS medium supplemented with sucrose and different combinations of BAP/ Kinetin and NAA. Further work was in progress.

2.3 CHEMICAL SCIENCES & TECHNOLOGY

2.3.1 Conversion of light naphtha/NGL to LPG and aromatics (NTGG Process)

IIP has developed a process for the conversion of low value feedstocks such as light naphtha and NGL to LPG and aromatics rich high octane gasoline using a modified pore zeolite catalytic materials with optimized content of metals. The shape selective feature of the catalyst selectivity converts straight chain and singly branched paraffins to LPG and/ or aromatics depending upon requirements of the particular product. GAIL is putting up a demonstration plant of 6000 TPA capacity based on IIP catalyst, process and basic engineering package.

2.3.2 Impregnating petroleum pitch

IIP has developed a technology for petroleum pitches based on catalyst aided thermal polymerization of aromatic rich feedstocks. IIP has licensed this technology to Graphite Indian Limited (GIL) which is setting up a semi-commercial plant of 200 TPA capacity.

2.3.3 Petroleum streams (90°-360°C) using NMP

IIP has developed a novel process for dearomatisation of petroleum streams (boiling in the range of 90°-360°C) using NMP as solvent through re-extraction route for hydrocarbon recovery to produce various value added products. The technology is environment friendly and has the potential to replace the present liquid SO_2 process by retrofitting the existing plants.

2.3.4 Petroleum residue upgradation in a continuous reactor

Efforts at CFRI have lead to achieving of a conversion level of ~ 80% of desired product slate boiling below 600°C consisting primarily of middle distillates and vacuum gas oil. Work was in progress for desulphurisation and denitrogenation in the range of 25-30% of the starting feed material.

2.3.5 Malononitrile

Synthesis of malononitrile from cyanoacetamide was achieved by using a novel procedure developed at IICT which ensured smooth process operation, high purity (98+%) and shelf-life. The process know-how has been transferred for commercial exploitation. An international patent has been filed for the development.

2.3.6 Triphenyl phosphine

This is the first Indian technology developed by IICT which employed sodium sand for production of triphenyl phosphine. High yield (>80%) and purity (96%) and single pot conversion were important features. The know-how has been demonstrated successfully to the interested parties both on laboratory and pilot plant scales.

2.3.7 Naphthoquinone

CECRI has developed a novel process production of producing 1,4 naphthoquinme from naphthalene. The process developed generate electrochemically the oxidant Ce (IV) and used it for oxidation of naphthalene to 1,4 naphthoquinone. The novelty of the present process is that : spent oxidant Ce (III) is used to regenerate Ce(IV) by electrochemical technique; its pollution free; provides high selectivity for 1,4 naphthoquinone. The same oxidant can be used to prepare other industrially important quinones and aldehydes. The technology is ready for commercialization. User industry like dye stuff industries, paper & pulp and other chemical industries will be benefited from the technology.

2.3.8 Pyridine based chemicals

CFRI has developed processes for the ammoxidation of 4-picoline to 4-cyanopyridine, 3-picoline to 3-cyanopyridine, 3-cyanopyridine to nicotinamide and 4-cyanopyridinet to INH (isonictonic acid hydrazide). The work has been conducted in a single tube S.S. reactor with 100 ml catalyst for the ammoxidation of 3-picoline to 3-cyanopyridine. The maximum yield of 3-cyanopyridine achieved was 73% wt. Further work is in progress to increase the yield of 3-cyanopyridine.

2.3.9 An enzymatic process for acrylamide synthesis

Acrylamide is one of the most important commodity chemicals used in making coagulators, soil conditioners, adhesives and polymers for petroleum recovery RRL, Jt. has isolated a Rhodococcus sp. from a soil sample, which possesses nitrile hydrate activity. A bench scale process for conversion of acrylonitrile to acrylamide by using immobilized cells of Rhodococcus sp. was developed. The innovation has opened up prospects for development of an indigenous and environmentally benign technology for acrylamide production.

2.3.10 Cyclo-pentane (CP) an environment friendly substitute for CFCs

CP is a zero ozone depleting substance with low thermal conductivity, appropriate boiling point and easy availability. Technology for production of CP is being developed at IIP using petroleum stream, IBP-50°C as feedstock and a selective solvent for separation of CP from C5-paraffins. CP purity of more than 80% has already been achieved and this is suitable for foam blowing.

2.3.11 New catalysts and processes

Concerted R&D efforts at NCL have lead to development of:

- A new class of homogeneous catalyst consisting of transition metal complexes with bifunctional ligands. These catalysts were shown to be highly active and selective for the synthesis of aryl propionic acid derivatives having important applications as drugs;

- A new methodology for encapsulation of Rh-complex catalyst for hydroformylation of olefins. The work was presented at 12th International Congress on catalysis 2000, Madrid, Spain and was selected for the 'Young Scientist Award';

- New types of water-soluble tertiary amine ligands and water- soluble metal complexes. These catalysts have useful applications in reactions like hydrogenation, hydroformylation, carbonylation, etc., involving Biphasic systems;

- An alternative route, employing carbon monoxide, phenol and Bisphenol-A, polycarbonate was produced in good yields. A highly active and selective catalyst system has been developed and process optimized using this catalyst system;

- Alternate route for manufacture of isocyanates for aprivate sector was developed eliminating use of toxic phosgene and corrosion problems;

- A novel reactor/separation strategy for liquid phase oxidation process. The work had direct relevance to some of the commercial processes and NCL's capabilities in reaction engineering were utilized in the development of a 'breakthrough, technology for LP oxidation (The work was under sponsorship of a multinational);

- A single step process for hydrogenation of nitrobenzene to P-aminophenol (CUSP 6,028,227, Feb. 22, 2000). This has applications for the manufacture of paracetamol.

2.3.12 p-Methoxy phenyl acetic acid

Esterification of phenol was effected by solid base catalyst developed by IICT using methanol as an alkylating agent in place of dimethyl sulfate as currently practiced. Acylation of anisole to p-methoxy acetophenone was promoted by solid acid catalyst dispensing with the use of conventionally employed acylating agent viz., anhydrous aluminium chloride. The process is protected with an international patent. The process has been successfully demonstrated to client.

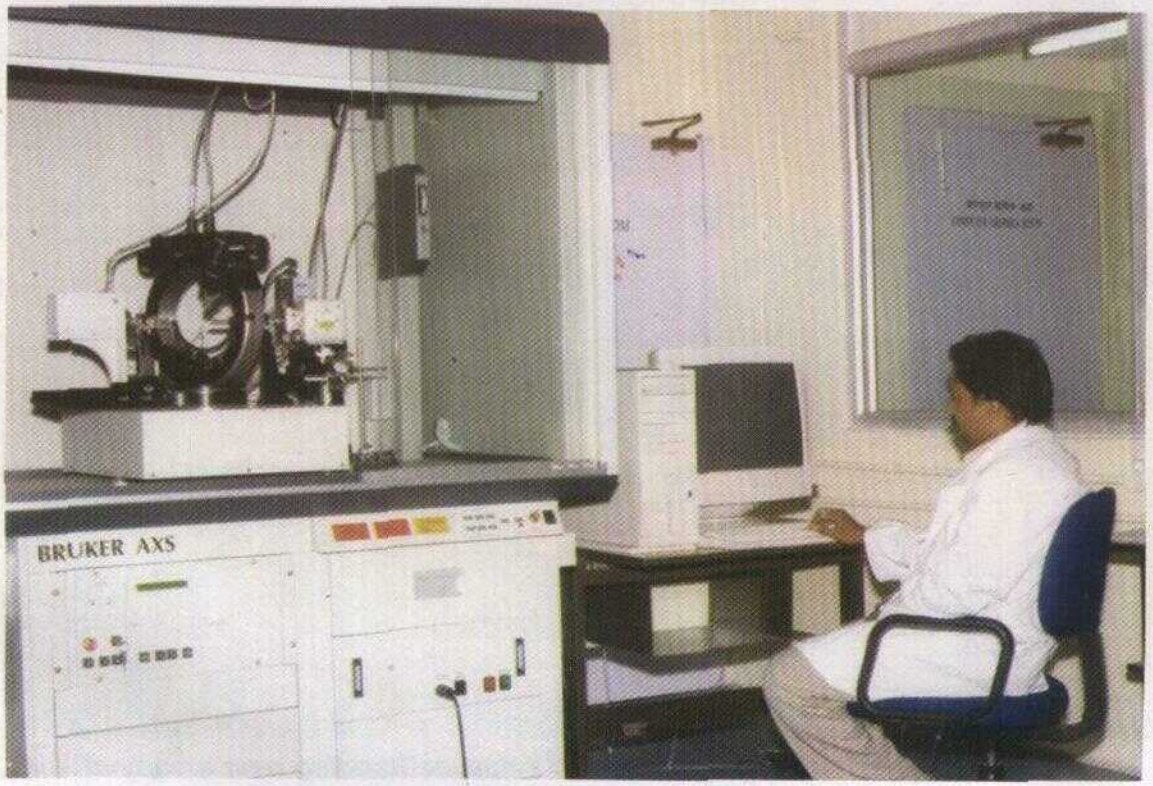
2.3.13 Improved product quality and process know-how for Zeolite-13-X powder

Zeolite-13X based molecular sieves are widely used for the separation of large molecules from small ones. CSMCRI has modified earlier

II.3 *Providing safe drinking water to super cyclone affected people of Orissa at Navgaum by CSMCRI developed RO plant*

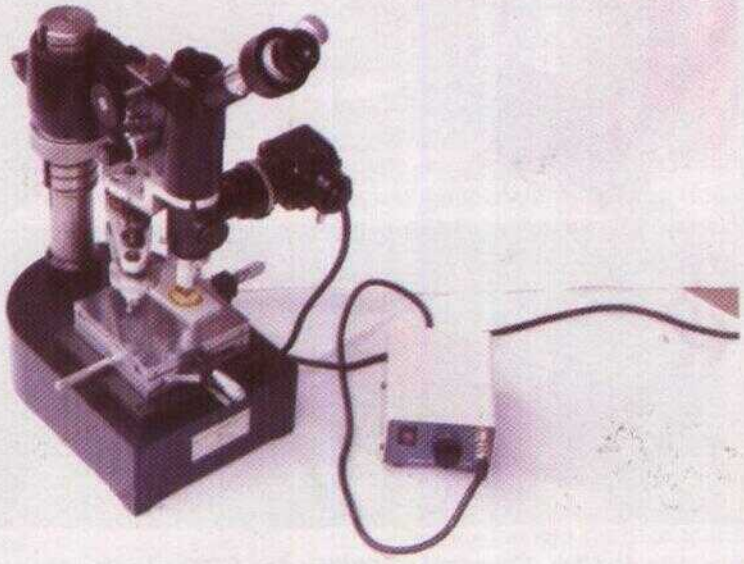
II.4 *Hon'ble Prime Minister Shri Atal Bihari Vajpayee handing over a copy of the CD-ROM to Dr. Murli Manohar Joshi, Hon'ble Minister for Science & Technology and HRD during NCL's Golden Jubilee celebration function*

II.5 X-ray crystallography facilities set up at CDRI for structure elucidation of new molecules

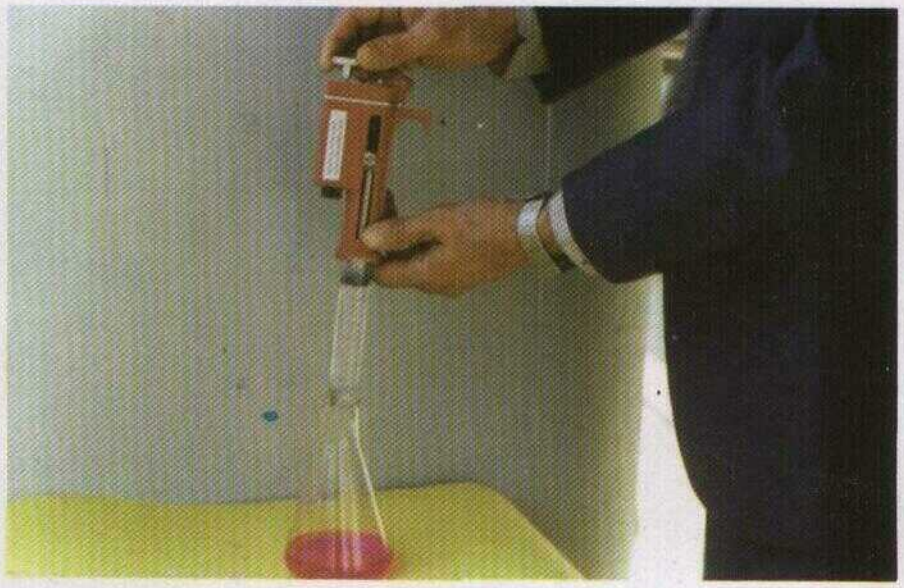


II.6 X-ray crystallography facilities set up at CDRI : Single crystal diffractometer system

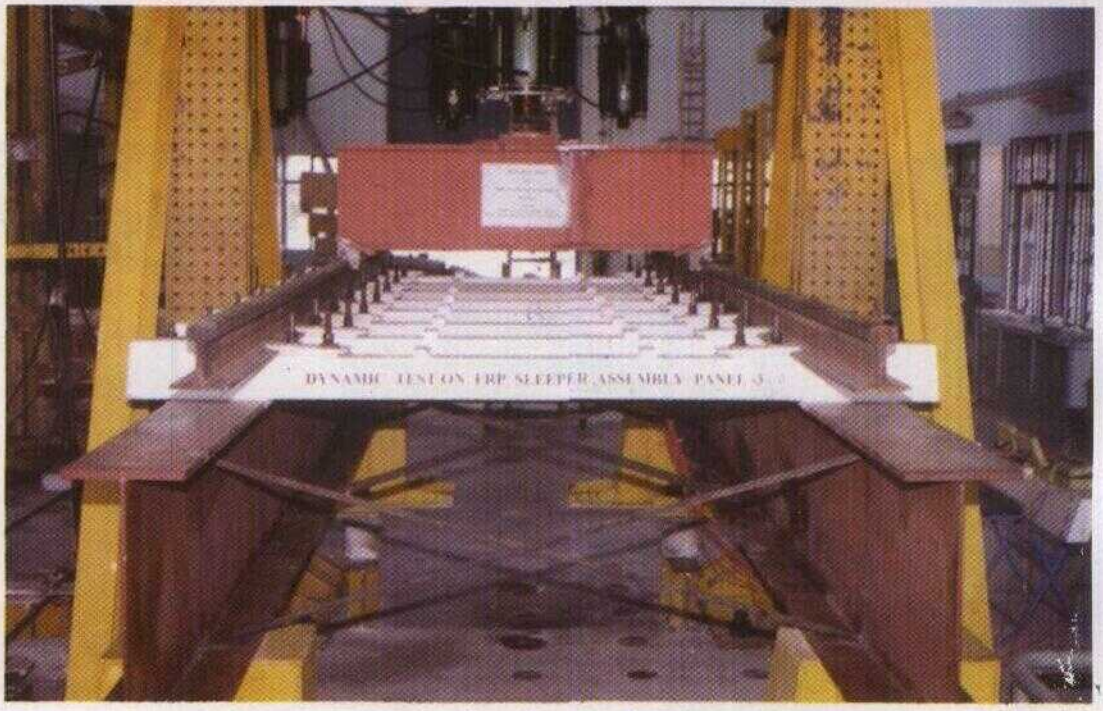
II.7 Automated DNA sequencing facility at the CCMB



II.8 CSIO developed micro hardness tester



II.9 Digital titrator kit by CSIO



II.10 Dynamic facility for FRP sleeper testing

process of producing detergent grade zeolite-A and could get product having whiteness index > 99% >98% earlier. A process has been developed to manufacture impurity free zeolite-13X powder involving simple unit operations, preparing homogeneous reaction mass (aluminosilicate gel) at ambient temperature, avoiding high pressure and temperature synthesis in autoclave, without adding seed crystals, and controlling number of reaction variables after understanding the pathways and kinetics of zeolite-13X synthesis.

2.3.14 Photo catalytic auto cleaning of stains

The photo catalytic oxidation with TiO_2 either in coated/thin film or dispersion form has been known for destruction of environmental contaminants like halocarbons, organic dye / dyestuffs, biological stains from waste water, anionic/ or non-ionic surfactants etc. using UV light or solar light. CSMCRI has developed a photo catalytically active surface, which is activated even by an ordinary fluorescent tube light. The surface has been developed specially for the autocleaning/stain removal of the Indian kitchens/platforms/walls, where coloured stains occur due to use of spices and condiments as cooking ingredients and the surfaces, especially the walls that were not easy to reach for routine cleaning process.

2.3.15 Polyurethane microspheres via particle forming polymerization technique

Polymer microspheres show great potential in many applications including ion exchange, chromatography, controlled release systems, biomedical diagnostics, coatings, paints, etc. Studies at NCL have shown the feasibility of a non-aqueous dispersion polymerization of an isocyanate with a diol to prepare free flowing polyurethane particles, with uniform particle size, in the range of 0.1 to 100μ. The method was applicable to a wide variety of diols and isocyanates. The key to successful particle forming polymerization was the use of novel steric stabilizers. The process developed has been shown to be useful for preparation of microcapsules of water-soluble active agents.

2.3.16 Improvement in thin film composite membrane performance

The desalting of saline water is efficiently achieved by using Thin Film Composite (TFC) Reverse Osmosis (RO) membranes; usually prepared from polysulfone (PS) and polyamide (PA). The porous sub-layer of PS supports the thin layer of PA prepared onto PS support by interfacial polymerization. The TFC membrane performance is mainly dependent on the thin layer characteristics and by carefully altering the membrane fabrication parameters they could be optimised to improve upon the permeability through these membranes. Thus, the earlier flux of 20-22 gfd (1000-1100 Imd) could be increased significantly with salt rejection ranging between 95-96 percentage. The parametric studies carried out at CSMCRI involved temperature and R.H. of thin film preparation along with the coating and curing rates on the concentration of the reactants forming the thin film of PA. This improvement led to increase in the flux of desalted water to 30-35 gfd. (1500-1750 Imd), from 20-22 gfd (1000-1000 Imd) obtained earlier, with 96% salt rejection. The performance was comparable to most of the TFC membranes reported to be in use for brackish water desalination at low operating pressures.

2.3.17 Preparation of heterogeneous membranes for ED process

Preparation of conventional interpolymer type ion-exchange membranes involves use of hazardous chemicals. Efforts were therefore directed at CSMCRI towards preparing heterogeneous membranes through a simple technique involving casting of a solution containing a binder and a poly-electrolyte. Heterogeneous ion-exchange membrane using polyvinyl chloride (PVC) as a binder and ion-exchange resin powder as polyelectrolyte by solution casting method has been prepared by using a specially constructed coating machine. The effect of particle size and loading of resin on the properties of the membranes such as dimensional stability, bursting strength, ion-exchange capacity, electrical resistance, transport number etc. have been studied. It was found that with respect to dimensional stability the properties of the heterogeneous ion-exchange membranes prepared by using resin of suitable particle size and loading, were almost as good as interpolymer ion-exchange membranes. Thus these membranes may replace interpolymer membranes in some of the elctrodialysis (ED) applications.

2.3.18 Plastic bonded nickel electrode

Fabrication and study of plastic bonded nickel electrodes with the addition of binder by hot rolling and pressing has been undertaken at CECRI. The performance characteristics discharge characteristics and improvements of ED by addition agents have been studied. It was observed that the cobalt added

electrodes gave better capacity and cycle life while during cycling (> 150 cycles) the capacity reduced slowly due to the shedding of active material from the grid. To stabilize the active material various types of stabilizers and binders were studied. The work was under progress.

2.3.19 Epoxy coal tar paint system

CECRI developed a paint system consisting of epoxy resin and coal tar as basic ingredients. The system is for providing protection against corrosion to structures exposed to highly aggressive environment especially in the splash zone areas. In these areas the surface coatings get damaged in short durations due to the high corrosivity of the medium, the high velocity at which the medium.

2.3.20 Semi continuous chrome recovery method

A technology for the application of semi continuous chrome recovery from spent chrome tanning solution has been standardized at CLRI. The approach involved the regulation of rates of nucleation and particulation of chrome hydroxide in a flow path. Using this approach online separation of chromic hydroxide from supernatant fluids was now possible. System design has been adjusted to maintain constant inflow to outflow ratio. The system can be used for treating wide range of chrome streams in large quantities. The method assumes significance in view of cluster grouping of tanneries and establishment of Common Effluent Treatment Plants.

2.3.21 Reduction of hexavalent chromium present in chromite mine water discharges

A simple, economic process for reducing the hexavalent chromium to a relatively harmless trivalent form has been developed by RRL (Bhu). The treated water is suitable for use in agriculture and domestic consumption. The process uses in-situ electrolytic generation of ferrous ion at the natural pH and turbid conditions and it does not involve addition of any extraneous chemicals. A pilot plant capable of treating 260 m^3 of raw mater per day was designed, fabricated, erected and demonstrated in May, 1999 at the South Kaliapani Chromite mine of Orissa Mining Corporation.

2.3.22 Mechanism of iodine loss from iodized salt

Iodine is an essential element required for human body for various metabolic activities. By insufficient in take of iodine, one falls the victim of "Goitre" which is difficult to cure, once formed. Salt has been recognised as the best carrier of iodine to human body and potassium iodate as the best iodating agent.

Investigations at CSMCRI on the stability of KIO_3 in solid and solution phases by classical and electrochemical methods revealed that iodine of KIO_3 in iodised salt got sublimed in the presence of hydrolysable salts, ascorbic acid (Vitamin-C) and carbohydrate polysaccharides which were commonly present in edible items. Based on the above observations, further studies were undertaken to study the kinetics and rate constants of the reaction of potassium iodate in iodised salt with ascorbic acid, potassium iodide and D- Glucose at different temperatures in solution phase as well as solid phase in order to have an insight into the details of iodine loss in iodized common salt.

2.3.23 Quality of salt recovered from sub soil brines.

Salt industry is one of the major industries of the country the annual salt production of the country has crossed 12.0 million tonnes out of which more than 30 per cent is produced from subsoil brines. An innovative route has been developed by CSMCRI for the production of industrial grade salt in situ from subsoil brines using the waste effluent of silicate industries. It was possible to remove more than 75 per cent of calcium impurities through the above process. The process has successfully been worked out at 2 ton scale.

2.3.24 Commissioning of free flow iodized salt manufacturing plant at Mauritius.

CSMCRI has commissioned a 1 t/hr capacity plant for the manufacture of free flow iodized salt was commissioned for M/s. Saliere de L'Ouest at Mauritius. The process developed used screw classifier for the removal of insoluble and soluble impurities. It did not employ any solid coating materials. The final product remained free flowing under extreme humid conditions due to use of a novel free flow aid. The personnel from the company were also trained for the quality control aspects of the product.

2.3.25 Thin Film Composite (TFC) membrane based RO technology for desalination and waste water treatment.

Employing TFC membranes a pilot plant of 40,000 l/d capacity has been successfully installed at

MRL, Chennai by CSMCRI for the treatment of domestic sewage to produce process water for the industry and has been reported to be operating quite satisfactorily. The plant was giving comparative and consistent performance to the imported TFC membrane modules as tested by them. MRL has, therefore, proposed a collaboration to develop large size spiral modules from the TFCs.

2.3.26 Fly ash utilization

RRL, Bhopal has carried out extensive bench scale and pilot scale experiments on use of fly ash as land reclamater and soil modifier and nutrient supplier for upgrading fertility status of the soil for its use in agriculture. Studies indicated that fly ash contained primary and secondary micronutrients such as Ca, Mg, S, K, P, Cu and Zn. Fly ash also improved physical and morphological properties of the soil. The process has been successfully implemented on a large scale in various parts of the country like Dodhar and Nilgiri sites at NTPC, Rihand Nagar (Uttar Pradesh), NALCO, Angul and Damanjodi (Orissa) and MPEB, Sarni (Madhya Pradesh) with financial support by the respective industries and Fly Ash Mission, TIFAC, DST, New Delhi.

Crops, such as wheat, paddy, maize, sunflower, sugarcane, tomato, potato, cabbage, pea, carrot, onion, okra, berseem, aromatic and medicinal plants have been grown in wastelands and soils treated with coal ash. The agricultural products grown on wasteland soil and soil treated / filled with fly ash were tested to check consumer acceptability and toxic elements uptake. It was found that heavy metals uptake was within the permissible limits and met the food quality standards. As a whole, pilot studies carried out on use of coal ash towards soil amendment and land reclamation for increasing the productivity showed that coal ash could be used to increase the soil fertility due to its physico -chemical, mineralogical, morphological and biological properties. The crop yields were remarkably increased with application of coal ash.

2.3.27 Scratch resistant coatings

A process has been developed at CGCRI for deposition of scratch and abrasion resistant coatings on polycarbonate sheets. The coatings were based on inorganic-organic hybrids deposited by sol-gel technique. The coatings composed of boehmite nanoparticle incorporated polyethylene oxide/polymethacrylate silica composite materials were 5-10 μm thick. Taber abrasion test of the polycarbonate sheets (4m x 4.5m)as per ASTM D1044 (using CS10 wheels/1000 cycles/250 gm load) showed a loss of only 0.8 mg material indicating high wear resistance of the coating. Transmission of visible light increased by 4% on application of the above hard coating followed by a silica-enriched inorganic-organic coating at the top.

2.4 EARTH & PHYSICAL SCIENCES AND TECHNOLOGY

2.4.1 Gas hydrates

Gas hydrates can be detected from seismic reflection data by the identification of an anomalous reflection known as bottom simulating reflection (BSR) that roughly parallels the seafloor. With the aim of locating and mapping the spatial distribution of BSR-like features on the western continental margin of India, about 5000 line km of regional seismic reflection data available with NIO have been specially processed and analyzed. The results suggested the presence of BSR-like features at several locations between 1000 and 3000m water depths and 200 to 900 ms (TWT) below the seafloor. These positive indications call for detail multidisciplinary geophysical, geochemical, microbiological and oceanographic investigations of the Indian offshore areas for exploring gas hydrate deposits, which could become the fuel resource of the future.

2.4.2 *Exploitation of coalbed methane*

CMRI in collaboration with ONGC has carried out gas desorption studies in four coalbed methane wells drilled in the Shobhasan area of north Gujarat. The main objective of the study was to encourage the application and the use of CO_2 in enhancing coalbed methane recovery with concomitant CO_2 disposal (ECBM- CO_2) within the seams as a greenhouse gas mitigation strategy. CO_2 injection can enhance the recovery of methane and simultaneously dispose of CO_2. For this gas in place, absorption capacity and several other gas desorption characteristics of coalbeds vis-a-vis their rank and maturing have been determined for coal core samples retrieved from four wells. The 50, thick main Shobhasan coal seam of Mehsana contained more than 7 m^3/t of the gas at the depth of 1400 m. Data generated for the wells will be used for coalbed methane reservoir simulation.

2.4.3 Gold exploration in Madagascar

NGRI undertook for NMDC Ltd. a gold exploration programme in the Precambrian parts of central and eastern Madagascar. Geological mapping, grid pattern sampling, magnetic, SP surveys and geochemical analysis have indicated favourable prospects. Further detailed work was in progress.

2.4.4 Induced phase transition in minerals

Investigations on the dehydration induced phase transition in minerals like gypsum and amphiboles have been carried out at NGRI. These investigations have resulted in understanding the structural mechanisms including dynamics of water molecules responsible for the manifestation. It has been established for the first time that fullerene (o60) can exist even in low grade metamorphic rocks such as shungite found in USSR.

2.4.5 Panel and barrier method of extraction

Panel and barrier method of coal extraction has been evolved and introduced by CMRI at Digwadih and Bhelatand colleries of TISCO to ensure zero subsidence for the protection of surface features from damages due to underground mining. It is expected that it would be possible to extract a substantial amount of locked up coal in those mines.

2.4.6 Mezozoices in on-land Kutch

NGRI acquired seismic, gravity and magnetotelluric data in Kutch which was processed for delineating suitable structures for oil exploration. The seismic refraction work in Kutch indicated that its southern coastal region had thick columns of Mesozoic sediments underlying the Tertiaries and Deccan Traps. It appeared that the sub-Trappean Mesozoics of Saurashtra were extending to on-land Kutch through the Gulf-of-Kutch.

2.4.7 Studies in Narmada zone

An improved velocity model for the Indian shield was obtained by NGRI using a travel time grid search method. The presence of elliptical, possibly serpentinized, mafic intrusives above the Moho was inferred to explain the occurrence of deep, lower crustal earthquakes along the Narmada- Son lineament in central India. Also an anomalous high velocity (6.6-6.7 kms-1) zone at shallow crustal depths of 1.5 and 9.0 km was present in the entire region.

2.4.8 Noise barrier for Delhi metro rail

The Delhi Metro Rail corridor passes through some of the high density traffic zones. The introduction of trains on the metro will contribute to enhancement on the noise level. A noise barrier was designed of NPL for control of environmental noise pollution consisting of a half T(Y) systems in a metal framework in the place of railings. The barrier attenuation of this combination is expected to be 10-12 dB.

2.4.9 Rehabilitation of the back fill areas

RRL, Bhopal carried out a study for a client on rehabilitation of the back fill areas at Gorbi mines, Northern Coalfield Ltd. using fly ash with suitable plant life. Detailed survey, sampling and data collection at the Gorbi mines site was conducted. Since the Singrauli Super Thermal Power Plant (SSTPP) was in the vicinity, scope to utilise fly ash to fill the pits was studied. Soil characteristics and natural vegetation in the area were studied. Overburden dump materials and water samples from representative locations at the quarry pits were also analysed.

2.4.10 Koyna seismic activity

Detailed monitoring of earthquakes by NGRI near Koyna (and now the new Warna dam 25 km south of Koyna) has provided explanation for unusually long spell of seismicity in terms of triggering of earthquakes due to reservoir filling and migration of active areas. The active faults have been identified. Nucleation of earthquakes in top 1 km. depth under the influence of reservoirs and subsequent migration of the rupture to 8-10 km depth were important findings.

2.4.11 Seismic hazard map

A new probabilistic seismic hazard map of the Indian plate region was prepared by NGRI under the Global Seismic Hazard Assessment Program. This map depicted Peak Ground Acceleration (PGA) values of the order of 0.35g-0.4g for the Burmese arc and the Hindukush seismic zones, about 0.25g for the Himalaya and Andaman arc, between 0.05 and 0.1g for the Indian shield and about 0.2g for the Koyna region. The PGA values for the Indian region computed at a uniform grid interval of 0.5° x 0.5° have been incorporated in the global seismic hazard map published during 1999.

2.5 ENGINEERING SCIENCES & TECHNOLOGY

2.5.1 Micro- hardness tester

CSIO has developed a low cost opto-mechanical instrument which can be used for measuring microscopic hardness. It comprised of a microscope with a Filar micrometer eye piece, a loading and unloading mechanism attached to microscope, an illumination system and a rotating table having X and Y movements. The principle of operation of the instrument was based on pressing a diamond indenter (square based pyramid with an angle of 136°) into the specimen under test with a certain load in gms and consequently measuring linear value of the diagonal of the indenter print obtained.

2.5.2 Iodine value meter

Iodine number is a measure of degree of unsaturation of edible oil. CSIO has developed a portable and low cost instrument to measure Iodine number of the edible oils. Presently Iodine number is being determined by wet chemical analysis method which is tedious and requires large number of chemicals. The instrument is based on measurement of potential drop across two electrodes, one reference and other sensing electrode when immersed into the solution of halogen reagent containing oil or fat, the change in potential is a direct measure of Iodine number.

2.5.3 Digital titrator kit

A digital kit has been developed by CSIO for quick and accurate determination of saponification value, acid value, peroxide value and free fatty acid. The titrator is a precision dispensing device compatible with concentrated titrants in compact cartridges.

2.5.4 Powder X-ray diffractometer

A versatile powder X-ray diffractometer has been developed under a sponsored project. Automation of the diffractometer has been accomplished. To give precise rotations to the specimen (8 rotation), detector (28 rotation), and ensure zero setting of the diffractometer. Acquisition of data, display of diffraction pattern, data analysis and final display of results which give inter-planar spacings, intensity ratios and half widths are some of the important features of this system. All the hardware and software have been tested and diffraction patterns of a variety of specimen including that of a silicon certified reference materials have been recorded.

2.5.5 Magnetic sensor for characterization of ferromagnetic materials

A low cost, portable magnetic sensor has been developed by NML using nanocrystalline magnetic material as a sensing core. The device can be used for detecting magnetic field of small amplitude. Thus, it can detect the movement of ferromagnetic particles from a distance and can be used as a proximity/security sensor. The device is highly suitable for evaluation of component integrity in steel structures either during their fabrication or after they have been in service for some period of time. The sensor device can also detect the small percentage of ferrite that is introduced in the weldment of austenitic stainless steel. Utilising the fact that as magnetoelastic energy changes due to the presence stress, the device is also suitable to measure the residual stress in a component. It has been found suitable for characterization of fatigue damage.

2.5.6 Measurement of metallic impurities in edible oils

CSIO has developed a system suitable for determination of metal ions like Nickel, Copper, Iron and Phosphorus in edible oils. The salient features of the instrument are direct display of concentration of ions in ppm, stable and dedicated reagents, no standard required for calibration, portable and low cost.

2.5.7 On-line infraguage system for multilayer plastic film thickness measurement

CEERI has developed a novel on-line thickness gauging system consisting of infraguage sensor and an industrial computer with a high-resolution graphic terminal and interface cards mounted in a 19" Industrial Rack. The sensor was mounted on a steady 'C' frame structure to position it at the edge of the layered flat film. Since the sensor was located near the edge of the flattened tubular film, it measured thickness of two points which were very near (only 30 mm apart) and thus average thickness indication will be almost the same as measured on single layer basis. The system deploys a user friendly, menu driven windows application software developed in Microsoft visual C++.The system has a built in calibration utility to enable the

user to build up product calibrations as and when a new product was manufactured.

2.5.8 Electronic system for automation of rubber roller sheller

The rubber roller sheller is a key unit operation in the milling of paddy. CEERI has developed an electronic system for automation of rubber roller shellers. The that ensures uniform shelling rate and reduces the fluctuation in the load on the paddy separator and the polisher. The system controls the gap between the rubber rollers automatically to the set gap and it monitors the peripheral speed of the rollers and interchanged their speed every 10 minutes automatically in order to maintain uniform wear and tear of both the rollers.

2.5.9 Development of prototype FRP oil vapour seal for hydrogenerator

Oil vapour seal assemblies are used in hydrogenerators to seal the oil vapours coming out of thrust and guide bearings. Light weight modified FRP material would be used as structural material for the new oil vapour seal. RRL, Bhopal in collaboration with BHEL, Bhopal has developed a new design of oil vapour seal which was amicable to FRP processing technique as well. The prototype was being fabricated.

2.5.10 Development of scientific steel cog

CMRI has designed and developed an improved tele-set-remote.canopy type scientific steel cog as an effective and economic support for underground mine roof. The advantage of this cog compared to other existing cog is that it can be adjusted in a wide range of variable heights, does not block much underground space; and can be withdrawn easily. It is light in weight and can be separated in four parts for easy transportation. The manufacturing cost is also low.

2.5.11 Parallel processing techniques for nonlinear finite element analysis

The parallel code developed at SERC, Madras, for nonlinear finite element analysis has been implemented with a parallel profile solver. In order to improve the computational efficiencies, a sparse data structure has been devised and implemented with preconditioned conjugate gradient iterative solvers. Two distinct approaches have been devised for sparse solution of equations that arise in nonlinear finite element computation: (a) Global Subdomain Implementation (GSI) of preconditioned conjugate gradient technique and (b) Primal Subdomain Implementation (PSI) of preconditioned conjugate gradient. So far, Diagonal preconditioner, Incomplete Cholesky preconditioner and the inverse of Schur complement matrix of the submesh have been developed and the codes are under implementation in the parallel finite element code under MPI software development environment.

2.5.12 A new method for measurement of high voltage

NPL has the responsibility of maintaining National Standards of units of measurements and providing calibration facilities at the highest level in the country. It provides traceability to all measurements made any where to the national and the international standards. R&D is pursued to upgrade the standards and to establish new techniques of measurements. It has been found that the well-known 'Stark effect' in spectroscopy can be used for measuring high voltage. The energy levels of atoms split on application of high electric fields. Therefore, by measuring the splitting experimentally the electric field and hence the voltage can be determined. It has been found that a high level of accuracy can be attained in this measurement. It can serve as a reference standard for measurement of high voltage with low level of uncertainty, may be of an unprecedented level in this field. Further work was in progress.

2.5.13 High temperature superconducting (HTSC) squid electronics

CEERI has developed at low cost HTSC squid electronic system consisting of a RF head and a control unit. RF head has a RF Oscillator operating at 19 MHz, it biases the HTSC Squid at the desired operating point and an amplifier unit. Amplification of detected signal, noise filtering, phase sensitive detection and integration were accomplished in the second part, the Control Unit. The novelty of the system was to detect signal even at a low percentage of modulation as low as $< 0.5\%$ with noise performance comparable the best in the world.

2.5.14 C-band 60 W TWT for space applications

This device is required in satellite transponders as high power microwave amplifier. CEERI has designed all the assemblies for C-band 60W high efficiency, high gain space TWT. The first

prototype was successfully developed and processed by BEL. The tube delivered minimum of 60 W(pulsed) and 40 W (CW) output power from 3.6 GHz to 4.2 GHz at 3.0 kV and 60 MA. The maximum output power was 60 W(CW) at 3.4 GHz at 3.0 kV and 60 mA. The design has been further improved.

2.5.15 Numerical simulation of viscoelastic fluid flow

Non-Newtonian fluid dynamics has wide industrial applications where the flows of viscoelastic fluids like polymeric solutions are involved. Most conventional rheological models for the viscoelastic fluids are mechanical models. The Energetically Crosslinked Transient Network (ECTN) model, on the other hand, takes into account the chemical structure of the polymers and is thus able to explain some of the unusual rheological phenomena seen with such fluids. Computations with this model have been carried out at C-MMACS to understand phenomena involved in the flow past immersed bodies (single cylinder, two cylinder and multiple cylinder systems) with the goal of finding probable solutions to the hitherto unresolved flow anomalies like time dependent settling velocities of consecutively dropped identical spheres, large restoration time required for the successively dropped identical spheres to achieve the same terminal velocities etc.

2.5.16 Master plan for rural roads in Andhra Pradesh

CRRI carried out a study under sponsorship of the Government of AP seeking to provide all weather road access to each village in 19 districts of Andhra Pradesh. The core network designed ensured 100% basic road accessibility to each village. Various rural roads were ranked and priority for upgradation was worked out on the basis of cost-effectiveness criteria.

2.5.17 Integrity assessment of steel offshore platform structures

Realistic estimates of the ultimate strength of offshore steel platform structures is necessary for integrity assessment. SERC, Madras used non-linear a jacket J platform in 72 m water depth. The structure was modelled as rigid jointed 3-D frame consisting of 392 members and 193 nodes. Three dimensional beam elements with six degrees of freedom per node were used for modeling the jacket members. The material is considered as elastic-perfectly plastic.

2.5.18 High performance concrete (HPC) mixture for superstructure of flyover bridge

SERC, Madras undertook the development of a HPC mixture for Visakhapatnam Port Trust who construction of superstructure of a flyover bridge across the dumper lines in the Port. An appropriate HPC was designed using OPC 53 concrete and ground granulated blast furnace slag (GOBS) as binder. In order to ensure on-site quality of HPC mixture proportions instructions were provided depending upon ambient conditions, machinery, tools/plants being deployed, and the mode of transport adopted from the batching plant to the work site.

2.5.19 Dynamic testing or FRP sleepers

SERC, Madras took up the dynamic testing of Fibre Reinforced Plastics (FRP) sleeper assembly panels. The FRP sleepers have been developed by RDSO in collaboration with R&D(Engrs.). The objective of the dynamic test was to assess the performance of FRP sleepers on linked track over girder bridges. The test had to be conducted on each panel (assembly of eight numbers of sleepers) of linked track over simulated girder support, by applying pulsating load on each rail seat. All the sleepers in the panel and the fitting plates were checked for their integrity at various stages (every two lakh cycles) during the qualifying test. The sleepers are under qualification test for up to 2 million cycles before they could be declared acceptable as having performed successfully under dynamic loading.

2.5.20 *Nonlinear dynamic analysis of* prestressed/RC concrete structures for impact and blast loading

Concrete is a highly non-linear material. The non-linear response is mainly attributed due to the progressive cracking and inelastic deformations. Triaxial tests on concrete carried out by SERC-G showed that concrete was a pressure sensitive material and depending upon the confining stress levels it could act as a quasi-brittle, plastic softening or plastic hardening material. It was clearly established that axial strength increased with increasing confining pressures. Under very high confining stresses, extreme high strengths have been recorded. The dynamic behaviour of concrete was

significantly different from the static behaviour. Experimental results indicated that concrete strength (compressive, tensile and flexural) increased as the rate of loading increased. Thus, the strain rate sensitive behaviour has been modelled for dynamic loading. A three-dimensional finite element software (DYNARB/DDYNIB) has been developed to model the above mentioned aspects of non-linearity, for a realistic analysis of prestressed and/or reinforced concrete structures under impact and blast loading. A preprocessor for discretisation of the structure and a postprocessor for plotting deflected shapes and crack patterns during the inelastic analysis were also developed.

2.5.21 High reliability interconnections for advanced components

A novel low-temperature technology for Si/Si interconnection has been developed by CEERI to achieve high- temperature stable interconnections. It is based on the 3D integration of processed Si wafers pre-aligned with respect to each other to obtain the functional module. The process essentially consist of stacking Si wafers, having a Cu coating at the device pad locations with a pre-sputtered thin film of low melting joining material like Sn, In or Sn-In eutectic, on top of the Cu coating. The Cu layer reacted with the joining material, resulting in growth of intermetallic phases at a specified temperature and pressure for a certain reaction time in the process of diffusion soldering, thereby establishing Si/ Si joints.

2.5.22 Distillery wastewater management

Distillery effluent that has been treated through conventional anaerobic and aerobic methods possesses intense brown color. The discharge/application of the colored wastewater is not acceptable. Therefore, removal of color from the final treated effluent is of great importance. Work was initiated at NEERI using electrochemical methods for color removal. The color of the effluent can be treated with an efficiency of around 90% simultaneously giving 30-40% COD reduction. The Tamil Nadu Distillers Association (TNDA), Chennai has sought the assistance of NEERI to examine wastewater management issues in nine of the 15 distilleries in Tamil Nadu. Special field trials on land use at four sugar & distillery units in Tamil Nadu were designed, planned and executed by NEERI in the fields with different types of soils and varying concentrations of spent wash optimisation of results is in progress.

2.5.23 Design installation and operation of CETP at Balotra, Rajasthan

The Government of Rajasthan approached NEERI to design and install a Common Effluent Treatment Plant for textile processing units at Balotra. A CETP of 6.0 MLD capacity has been designed and constructed by NEERI. The CETP has been commissioned and presently it is in operation and being monitored for process efficacy. NEERI is to operate the plant up to July 2000 and train the manpower operators deployed by the trust.

2.5.24 Counter Gravity low pressure casting apparatus (CLA) for casting of engineering components

CLA technology is used in manufacture of reliable components for aerospace engineering automobiles, components for consumer durables. The CLA technology is guarded closely under patent laws. Therefore no relevant technical information pertaining to the process parameters, design, etc. is available. CMERI has taken up the project on design & development of Counter Gravity Low Pressure Casting Apparatus (CLA) for casting of engineering components based on inhouse core expertise in Design Engineering, Metallurgical Engineering, Electronics & Instrumentation, Manufacturing and Foundry.

2.6 FOOD SCIENCE & TECHNOLOGY

2.6.1 Ginger paste and garlic paste

Fresh spice flavours are liked by consumers. However, the availability of fresh spices is seasonal and they have limited keeping quality. CFTRI has developed process for the production of ginger paste and garlic paste having good fresh flavour and keeping quality. The process used low NaCl concentration and it also avoided application of acetic acid and sulphur dioxide which are not favoured in some countries. Scale up work was in progress.

2.6.2 Biopreservation of vegetables

Consumers are increasingly demanding foods with fresh-like/natural qualities, free from preservatives and excessive processing. CFTRI has worked out process parameters for biopreservation of different vegetables in batch size of 25 kg each using potent cultures of lactic acid bacteria with antibacterial activity. The suitably packed and

processed fermented vegetables have been stable for more than six months at ambient temperature. The lactic fermented vegetables have the benefits of bio-preservative effects, bio-availability of vitamins, acceptable sensory and microbiological characteristics and the associated therapeutic properties of lactic acid bacteria.

2.6.3 Water-soluble turmeric colorants

Turmeric is an important spice and source of the natural yellow pigment curcumin. The direct use of turmeric powder or turmeric oleoresin as a natural yellow colorant in processed foods is restricted because of the inherent aroma and water insoluble nature of the pigment. Pure curcumin free of aroma is isolated from turmeric oleoresin. The mother liquor does not find ready market or other outlets for utilization. A process has been developed by CFTRI for the deodourisation of the mother liquor, also known as Curcumin Removed Turmeric Oleoresin CRTO. Colorant formulations have been developed using curcumin and deodourised CRTO with permitted diluents and emulsifiers.

2.6.4 Quick cooking, germinated and dehydrated pulses

The germinated legume are nutritionally beneficial to consume as they provide biologically broken high molecular weight carbohydrates and proteins and elaborated vitamins. They also make micro-nutrients more bio-available. However the consumption of germinated legumes is limited due to tedious preparation, short shelf-life and long cooking time. CFTRI has developed a process for germinated dehydrated pulses, which can be suitably packed and marketed as shelf-stable products. The dehydrated pulses can be quickly cooked by boiling in water for 8 - 20 minutes depending upon type of pulse.

2.6.5 Sugarless biscuits

CFTRI has developed and standardised a formulation for sugar free biscuit which can be consumed by diabetics. These biscuits are made from soft dough based on the creaming method and processed in rotary moulder. The biscuits are baked in a continuous tunnel type oven as followed for sweet "gluco" type biscuits. Ordinary "gluco" type biscuits contained about 450 calories and contain sugar up to 25%. The sugar-free biscuits do not contain any added sugar.

2.6.6 Protein hydrolysates from protein rich materials

CFTRI has developed diverse protein hydrolysates with varying degree of hydrolysis and high nitrogen content in a convenient form by combination of multiple enzymes starting with protein rich oilseed flours and casein. These protein hydrolysates have a high solubility over a wide range of medium and can be used as good additives both in acid and alkaline pH to improve the nutritional as well as functional characteristics. The hydrolysate can be incorporated without imparting any undesirable off flavour to the finished product. The associated essential amino acid make up is very good for both animal and human nutrition. The protein hydrolysates could be used in different functional foods. They could be good ingredients to improve the nutritional quality of athletic foods and protein rich foods. These could also be incorporated into many pharmaceutical, nutritional and health foods.

2.6.7 Production of *Spirulina* with enhanced iron content

Spirulina – a blue green algae is a rich source of protein and other health promoting substances, and is approved by FDA for food applications. Iron available in *Spirulina* is absorbed more efficiently by the human system then that from fruits, vegetables and food grains. CFTRI, therefore, conducted study to understand the possibility of enriching the cytosolic iron in *Spirulina*. Salts in *Spirulina* cultivation medium enhanced iron content upto 1.5% (dry weight) without suppressing the growth. The bio-availability tested by *in vitro* methods, indicated that a very high level of 65 mg/g of Spirulina is available to human body from iron-enriched sample.

2.6.8 Spray dried coconut milk powder

CFTRI has developed a process for production of dehydrated coconut milk powder which retains the natural flavour and texture of coconut milk. It has good keeping quality & greater convenience. The process had four major steps namely, extraction of coconut milk, formulation of the milk, homogenisation and spray drying.

2.6.9 Biosensor for detection of lactates

CFTRI has developed a L-Lactate Biosensor useful for the simple, and accurate determination of L-lactate in food, agricultural, dairy, clinical and other samples. It could also be used for L-lactate measurement in samples containing sugars and

carbohydrates which pose problems in chemical methods of analysis. It had a stable behaviour and operational life of over 60 days. The device was adaptable for continuous measure.

2.6.10 Technology protocols for export of mango *var. Neelum*

India occupies first position in the production of mango with 10.8 million tonnes equivalent to 60% of the world production. Mango Var. Neelum is one of the important commercial varieties grown in South India. Although India occupies 1st position in the production of mangoes, its export performance is not satisfactory due to diverse reasons and it occupies fourth position among mango exporting countries. Keeping this in view R&D work was carried out at CFTRI and pre and post harvest technology protocols were developed for export of mango var. *Neelum* by ship. he technology protocols included pre harvest spray treatments to control fungal infections and insect infestations, optimum stage of maturity for harvest, post harvest treatments to control spoilages, design of suitable CFB boxes for packing, optimum low temperature conditions for storage etc. A shelf life of 28 days is achieved by storing at optimum low temperature.

2.7 INFORMATION SCIENCE & TECHNOLOGY

2.7.1 Software for pavement properties determination

CRRI has developed a model and a software package alongwith numerical scheme for determination of stresses, strains and displacements at any point in a multilayered road system for given surface load. The surface and vertical displacements results obtained by the model were compared with the results obtained with falling weight deflectometer. The model and software can be used to obtain the values of stresses, strain and displacements at any point in the n-layered medium for both the uniformly distributed and concentrated surface loads.

2.7.2 REPLIGEN Software

A software that stands for retrieval of peptides from libraries of genomes christened REPLIGEN has been developed by CBT. It consists of three modules namely Genome Explorer, Genomic Calculator and Proteome Card. The software will be highly useful in areas like comparative genomics and proteomics. The first module Genome explorer gave an insight of a chosen genome through a peptide window of length 'N'. It helped in locating peptides of interest once the sequences/frequency of occurrence was given. The second module Genome calculator was unique in a sense that like any other calculator it allowed one to manipulate several genomes at one go.

2.7.3 Computer-aided design software for steel industrial structures

In order to develop efficient procedures for analysis of steel frames taking into account flexibility of connections, SERC, Madras took up development of computer software for the design of industrial truss structures using hot rolled/ cold formed steel structural members.

A computer program was developed for the design of members subjected to axial compression, bending, and combined bending and axial forces. The program, written in Fortran, has the capability to determine their capacity and design cold-formed purlin members as per IS: 801-1975. An exhaustive data base on hot rolled open and tubular J sections available in the country was compiled. Example problems have been worked out and the computer program has been validated. An industrial truss of 16 m span with truss spacing of 4.5 m was designed using the program, for both hot rolled and cold rolled sections. Purlin and column designs were also made using the program.

A computer program, "CONNECT" was developed to generate the moment rotation characteristics of flexible beam to column connections in steel structures. The program can be used to compute the Moment rotation (M-cP) characteristics of (i) double web angle connection, (ii) top and seat angle connection, and (iii) top, seat and web angle connection. These three connections represent the range of connection stiffnesses from nearly hinged to extremely rigid connection in steel structures.

2.7.4 Software for assessing effects of fire on compressive strength of concrete members

The analysis of the RCC structural members, subjected to fire, is a complex problem, due to the non-linearity of various factors viz. variation of fire

temperature & material properties with time, shape of the member and initial imperfections in the members. A software has been developed at SERC-G to analyze the RCC section (square, rectangular or circular shape) subjected to fire and to estimate the variation of temperature over the cross-section using Finite Difference method and also to predict the reduction in compressive strength of the concrete. This software package can analyze circular sections subjected to fire from all the sides and rectangular/square RCC sections subjected to any one of the following fire loading combinations at a time i.e. fire from: all the four faces; two longer and one shorter faces; one longer & two shorter faces; two longer opposite faces; two shorter opposite faces; two adjacent faces; one longer face only; and one shorter face only.

2.7.5 Database of SSI clusters in India

INSDOC has been assigned the task of creating a "Database of Exporting Small Scale Industries and SSI Clusters in India" by the Ministry of Industry. The creation of the database involved: identification of small scale industries whose products were being exported through any channel; identification of the places/towns where a considerable number of small industries were situated, manufacturing a similar kind of product or related products; identification of emerging or potential growth centres of small industries in remote and backward areas and economic analysis of all the identified industry clusters.

It will serve as a useful information tool for the potential foreign investors for setting joint venture industries as well as for the importers of Indian goods.

2.7.6 INSDOC-KIT abstracting project

INSDOC has entered into an agreement with Royal Tropical Institute (KIT) of the Netherlands to contribute bibliographic data to KIT's TROPAG database. KIT provides a monthly list of titles of articles published in Indian journals for which INSDOC prepares full bibliographic details (cataloguing, indexing, abstracting) in a format defined by KIT. A total of 1000 records will be processed per year.

2.7.7 Publication of research journals

NISCOM continued publishing of thirteen scholarly research journals of international repute (covering all the major disciplines of science). The papers published in the journal are indexed and abstracted in most of the international indexing and abstracting services. The total number of papers published during 1999 -2000 were 1495 and the total number of pages printed in the research journals were 9314. In order to acquaint young research scientists with frontline research areas, special issues were brought out on specific themes of contemporary relevance. The various special issues brought out were: Management of Information Technology, Organizations and Beyond (Journal of Scientific & Industrial Research), Contemporary Theoretical Chemistry Research in India (Indian Journal of Chemistry) and Solid State Ionics (Indian Journal of Pure & Applied Physics).

To keep the scientific community abreast with the current developments in different areas of science and technology, Advance Abstracts of the journals are being brought out regularly and sent to various R&D departments, research institutes and universities in addition to major abstracting, indexing and current awareness services. The contents of the periodicals, Indian Journal of Chemistry (Sec. A) , Indian Journal of Chemistry (Sec. B) and Journal of Scientific & Industrial Research are being published in the form of graphical abstracts for the benefit of not only research scientists but also abstracting, indexing and current awareness services.

Chinese editions of Indian Journal of Chemistry, Section A & B, are being published in collaboration with Shanghai World Publishing Corporation, Shanghai, People's Republic of China for the benefit of researchers in China and neighbouring countries. To achieve worldwide reach, three of NISCOM journals, viz., Indian Journal of Experimental Biology, Indian Journal of Biochemistry & Biophysics and Indian Journal of Marine Sciences have been made available on internet by Bioline publications, UK, under an agreement with NISCOM.

2.7.8 Reflections on the possibility of a post colonial theory of science

In the light of the larger discussion on postcolonial theory of science, NISTADS conducted a study which highlighted the inadequacy underlying Harding's construction of postcolonial epistemology on three counts. In the first instance it was non-critical in its engagement with the complexity of the postcolonial situation. Secondly, Harding derived postcolonial epistemology without questioning whether her sources confront the demarcation problem. And finally, the assertion that the internal history of science in Eurocentric overlooked the recognition of Eurocentrism of internalists. While inductivist history of science has manifested Eurocentric possibilities, the conventionalist philosophy of science beared distinctly different possibilities. It was argued that the varieties of postcolonialism needed to be situated if we were to arrive at a globological perspective of the history of science. Within the history of mathematics the study puts the historiography of proof in arithmomorphic orient. These nuances apart, the study agreed that the integration of postcolonial perspectives and the identification of prejudices in our historical constructions would lead us on to a stronger objectivity. This has been independently argued by historians of mathematics who have suggested that the social history of mathematics would go far towards providing a more comprehensive picture of the history of mathematics.

2.7.9 Models of technology substitution

A class of new models of technology substitution has been proposed by NISTADS in which conversion factor was defined as a function of both time and market share. These models were general and useful for technological forecasting purpose. Applicability of these models is illustrated with the help of case studies related to the substitution of technology in the Indian context. Further, attempts were being made to modify the existing models and develop new models in the field of technology innovation and diffusion. In another study related to information revolution, parameters like work force and GDP have been used to analyse future growth prospects in the Indian economy. Attempts have been made to project the contribution of service sector in GDP and employment generation in India for future studies.

2.8 MATERIAL SCIENCE & TECHNOLOGY

2.8.1 Composite coatings

CECRI has developed various composite coatings, namely:

Diamond- nickel composite: Process for the production of diamond-powder incorporated nickel matrix composites on steel discs for gem polishing were perfected for three more size powders. Operating conditions and plating sequences have been standardised to coat on grinding wheels, cut off wheels etc.;

Pt-PTTE composite : In a novel effort Platinum was codeposited with PTFE and its characterisation studies were in progress;

Silver – molybedenum di sulphide composite: As a self lubricating coating, MoS_2 was codeposited with silver and its properties such as hardness, wear resistance and structural aspects were studied in detail;

Electroless nickel – phosphorous composite: Suitable bath formulations have been standardised to codeposit Al_2O_3, Cr_2O_3 and SiC particles along with Ni-P alloy. Properties of the composite coatings such as wear resistance, hardness and corrosion resistance were evaluated. Influence of heat treatment on hardness and wear resistance of the coatings were also studied.

2.8.2 Column Flotation for zinc concentrate

The lead-zinc ore beneficiation plant of 2400 tpd ore capacity at Rajpura Dariba Mines was designed to give a zinc concentrate of 53% Zn with more than 80% metal recovery. However, the concentrate produced during the last ten years, on an average, analysed 49% zinc which was below smelter requirement of 50-53.5% Zn with less than 4% ISM ad 3% silica. Amenability studies carried out at RRL(Bhu) and HZL established the feasibility of achieving the desired result with the use of flotation column technology. A team India project on development of column flotation technology 900 tpd stream at RDM was taken up. Two flotation columns (1.75m dia and collection zone height of 10m)

operating at 12-15 TPH of rougher concentrate as feed were designed, fabricated & installed at around Rs. 375 lakhs. The floatation columns are successfully operated to designed specifications.

2.8.3 CSIR-HZL nickel technology proving plant

A joint initiative between CSIR and Hindustan Zinc Ltd. (HZL) has resulted in setting-up a Technology Proving Plant (TPP) with a low grade ore processing capacity of 10 Tons/day at the premises of RRL, Bhubaneswar. CSIR is represented by Regional Research Laboratory, Bhubaneswar for development of process technology and IICT for detailed engineering of the project. The primary objective of setting-up the Rs.10 crore plant was to demonstrate the restandardized process technology of RRL, Bhubaneswar and engineering design of commercial plant as developed by the IICT.

M/s HZL, the recipient of CSIR technology, has taken the major responsibility of erection and operation of the plant. A low grade nickel ore in the form of chromite overburden, a waste material obtained during chromite mining in the Sukinda region of Orissa is being utilized for extraction of nickel, a strategic material for steel industry for making a variety of alloy steels. At present, it is mostly imported (20,000 TPA) and its demand is on the rise. The project will enable India to move a step closer towards indigenous production of nickel for the first time. The plant erection has been completed and the commissioning trials have commenced from December 1999. The process restandardization work in the demonstration plant is expected to be completed before 2001.

2.8.4 Enrichment of nickel content in chromite overburden ore

NML has developed a novel chemical enrichment process to raise the nickel concentration of chromite overburden of Sukinda from 0.4 to 1.6% or above. With 1.6% of the nickel concentration, it is possible to use directly the enriched material for making ferro-nickel. The process developed uses acid leaching at atmospheric pressure.

2.8.5 Bismuth germinate single crystals

Bismuth Germinate (BGO) is one of the most promising scintillator materials with many special properties like non-hygroscopic nature and short decay time. Nearly perfect crystals of BGO have been grown at NPL by low thermal gradient Czochralski method. Structural characterization of these crystals by high x-ray diffraction techniques has revealed many interesting features. Their diffraction curves are very sharp with half widths of about 9 arc sec.

2.8.6 Magnesium plungers for de-oxidation and de-sulphurization of low carbon micro-alloyed steel

Magnesium and calcium metals are strong de-oxidizers and de-sulphurizers. However, because of their high vapour pressure and low solubility in liquid metal their use is limited. Systematic trials were conducted to test the feasibility of system starting from the treatment of cast iron to steel melt. It was observed that the use of magnesium and calcium metal reduces the oxygen and sulphur level and also modifies the inclusions present in steel.

2.8.7 Self propagating high temperature synthesis (SHS) of Zirconium diboride

A novel process has been developed at NML for the synthesis of Zirconium diboride that is cost effective, energy efficient and industrially viable. The advantage of this process is that the processing is carried out at room temperature at very fast rate. The processing time being of the order of 60 seconds for a 200 gm batch. The produced powders are very fine in the range of 200nm to 5mm with BET surface area of 12.08 m^2/gm. The powders are spherical in shape and hence suitable for spray deposition as wear and corrosion resistant coatings. The powder also shows a better sinterability compared to the conventionally produced powders.

2.8.8 Aluminium alloy castings

RRL, Tvm. has developed and supplied three types of premium quality Al alloy castings to be utilised in ISRO's cryogenic upper stage engine. The castings were radiographically examined (100%) for their internal soundness and the attached samples were tested for their mechanical properties. They met the specification required by ISRO. These Al alloy castings were intend to replace the forged Ti alloy components in cryogenic upper stage engine giving considerable weight reduction. The simulation tests are to be carried by ISRO.

2.8.9 Aluminum matrix composites for defence automobile applications

Computer simulation of Al alloy matrix composites using modeling and FEM analysis; and synthesis of prototype composite components like brakedrum for modified Jonga jeep using the optimized parameters. Three A1-alloys such as ADC-12. A356 & LM13 were chosen for matrix material. Reinforcement such as SiC (size 50-80J.1m) was used for making composites. The amount of SiC varied from 10-15%. The microstructures showed reasonably uniform distribution of particles in aluminum matrix and good interfacial bonding between the ceramic phase and metallic matrix. The composites showed an improvement (10-15%) in mechanical properties. Attempts were made to synthesise aluminium composites by squeeze casting technique in collaboration with IISC Bangalore. Squeeze cast composites showed refined microstructure, sound interfacial bonding, fairly uniform distribution of particles as compared to the gravity cast one. It is now proposed to produce composite components using squeeze casting technique.

2.8.10 Metal-incorporated mesoporous materials

The crystalline, microporous alumino-silicates (zeolites) and metallosilicate molecular sieves have revolutionized their applications in many catalytic reactions. The pore restrictions imposed by the microporous materials have been overcome at NCL by developing a new variety of mesoporous materials such as MCM-41, MCM-48 and HMS types, which are originally prepared as all silica polymorphs, using surfactants. Subsequently, silica-alumina mesoporous materials have been prepared with an intention to provide acidic sites and strong acidity in those materials. Other materials such as Sn have also been incorporated. The environment and location of these metals in MCM-41 and their catalytic activity in low temperature liquid phase oxidation and epoxidation reactions were being studied. The successful preparation and anchoring of these metals provide an opportunity to carry out the oxidation, hydroxylation and epoxidation of a variety of organic substrates which are larger, bulkier, and are difficult to diffuse in microporous metallosilicates such as TS-1 or TS-2.

2.8.11 Electroleaching of semiconducting minerals

A novel approach for leaching of semi-conducting oxidic pyrolusite (MnO_2) and sulfide minerals (MS) together was adopted by RRL (Bhu). In the method pyrolusite and the sulfide mineral dissolved at a much faster rate compared to the dissolution rates when the minerals are leached individually owing to galvanic interaction between MnO_2-MS minerals and cyclic action of a redox couple like Fe^{2+}/Fe^{3+} present in the leaching medium.

2.8.12 Lanthanum optical glasses

CGCRI has developed three varieties of optical glasses containing lanthanum viz. lanthanum crown LaK 691547, LaK 64060 and lanthanum flint LaF 788474, after optimising the compositions, melting schedules and other parameters to meet the growing demands especially from Defence. Optical properties were characterised and found to conform to the required specifications.

2.8.13 High temperature ceramic filter for molten metal

There is a need to prevent inclusions from oxides, dross, gas and slag during casting of metal parts particularly in the foundry industry. Use of high temperature ceramic filter during casting process reduces re-work, improves yield and upgrades the overall quality of the parts. CGCRI has developed from reticulated polyurethane foams. Prototype filters of sizes upto 3.5" x 3.5" x 1". Field trials of the product were in progress.

2.9 SOCIETAL SCIENCE & TECHNOLOGY

2.9.1 Multi-sectoral Rural Network System of Group Enterprises

A new approach was developed by NISTADS that build upon the interdependency of products, skills and technologies in a rural region to provide for economies of scale and scope. The technological inputs were designed to enable artisans; agricultural laborers and peasants become entrepreneurs in group enterprises capable of utilizing local resources and commercial financial channels.

2.9.2 Societal Programme

RRL Jt. took up activities for promotion, cultivation and processing of citronella and lemongrass in rural areas of NE India. In the year 350 people were given training and process demonstration. This programme helped to generat self-employment and opened up avenues for employment to daily wage earners (500 people) in rural sector.

2.9.3 Salt scrape for Salt Farms.

This equipment reduced the drudgery of the salt workers, as otherwise these operations were carried out manually, that too in the summer months in scorching sun. CSMCRI has developed an equipment which was an attachment to a standard tractor. It helped in loosening the salt bed, scraped it and made a long ridge of salt. The capacity of the scraper was 100tph, and currently being used at 50% of the rated capacity considering the idle period for turning, starting etc. The special feature of this device was that it could work on a salt bed that was only 75-100 mm thick. It eliminated raking operation resulting in manpower saving.

2.9.4 Training programme for salt manufacturers

CSMCRI organised three programmes at Doogri (Dist. Valsad), Port Victor (Dist. Amreli) and Kharaghoda (Dist. Surendranagar), all in Gujarat State for small and medium scale salt manufacturers. The programmes which were of 5-7 days duration created awareness among small scale salt producers (Agarias) about the necessity of quality salt. The problems were discussed at site for quality salt production and training was provided on use of simple instruments like baume meters etc. Also information was provided on value addition to salt products viz. free flow iodised salt, powdered salt etc. In all more that 1000 participants derived the benefit of the three programmes.

III. RESEARCH AND DEVELOPMENT BY INDUSTRY (RDI)

The plan scheme "Research and Development by Industry" was approved with an allocation of Rs.1.40 crores for the IX plan (1997-2002). The broad objectives of the scheme are to:

- bring in-house R&D into sharper focus;
- strengthen R&D infrastructure in industry and Scientific and Industrial Research Organizations (SIROs);
- promote R&D initiatives of the industry and SIROs;
- ensure that the contributions made by the in-house R&D Centres and SIROs dovetail adequately in the overall context of technological and industrial development.

The scheme on Research and Development by industry covers the following areas:

A) In-house R&D in Industry

B) R&D by Scientific and Industrial Research Organisations (SIROs)

C) Fiscal Incentives for Scientific Research

Activities and achievements in each of above areas are presented below:

III.(A) IN-HOUSE R&D IN INDUSTRY

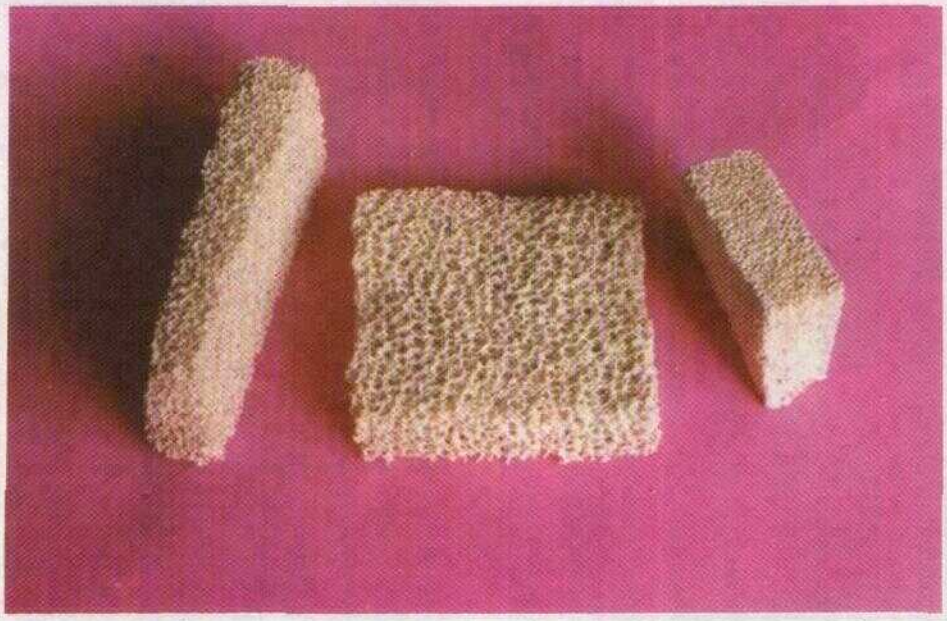
1. RECOGNITION OF IN-HOUSE R&D UNITS

A strong S&T infrastructure has been created in the country. This covers a chain of national laboratories, specialised R&D centres, various academic institutions and training centres, which continuously provide expertise, technically trained manpower and technological support to the industry. Various policy measures have been introduced from time to time, to meet the changing industrial and technological requirements of the industry. The Government has been giving special attention to promotion and support to industrial research in industry. Several tax incentives have also been provided which encourage and make it financially attractive for industrial units to establish their own in-house R&D units.

A scheme for granting recognition to in-house R&D units in industry is operated by the Department of Scientific & Industrial Research. The incentives and support measures presently available to recognised in-house R&D units include: income tax relief on R&D expenditure as per IT Act; weighted tax deduction for sponsored research programs in approved national laboratories, universities and IITs; weighted tax deduction on in-house R&D expenditure in chemicals, drugs, pharmaceuticals, electronic equipment, computers, telecommunication equipment and manufacture of aircrafts and helicopters; accelerated depreciation allowance on new plant and machinery set up based on indigenous technology; customs duty exemption on goods imported for use in Government funded R&D projects; excise duty waiver for 3 years on goods designed and developed by a wholly Indian owned company and duly patented in any two countries out of : India, USA, Japan and any one country of the European Union; exemption from price control for bulk drugs produced based on indigenous technology; financial support for R&D projects; National Awards for outstanding in-house R&D achievements and commercialisation of results of public funded R&D and other indirect benefits.

The in-house R&D units qualifying for recognition are expected to be engaged in research and development activities related to the line of business of the firm, such as development of new technologies, design and engineering, process/ product design improvements, developing new methods of analysis and testing; research for increased efficiency in use of resources, such as, capital equipment, materials and energy; pollution control, effluent treatment and recycling of waste products.

The R&D activities are expected to be separate from routine activities of the firm such as production and quality control. The in-house R&D units should have staff exclusively engaged in R&D and headed by a full-time R&D manager who would have direct access to the chief executive or to the



II.11 CGCRI developed high temperature ceramic filter for molten metal

III.A.1 Overall side view of 6 High Rolling Mill

III.A.2 Per-acetic acid and Epoxidation of Alpha-Pinene plant

III.A.3 Waste Heat Recovery Steam Generator

board of directors depending upon the size of the unit.

Number of in-house R&D units recognised by DSIR has increased steadily from about 100 in 1973 to about 275 by 1975, to over 700 by 1980, around 925 by 1985, over 1100 in 1990 over 1200 in 1995 and thereafter is hovering around 1200; and was 1178 as on December 2000. Of these nearly 1070 are in the private sector and the remaining units are in public/joint sector. A revised and updated 'Directory of Recognised in-house R&D Units' was brought out during October 2000. This Directory lists 1163 recognised in-house R&D units, giving their registration number, name and mailing address of the company, location of the in-house R&D unit(s) and validity of DSIR recognition.

For the purpose of recognition, the R&D units have to apply to DSIR as per a standard proforma. The proforma and other details about the scheme are available with the department and are issued on request. The proforma is also available at DSIR website. The applications after initial scrutiny in the DSIR are circulated for comments to various other departments/agencies such as concerned administrative ministries, DCSSI, CSIR, ICAR, ICMR, ICAS, DBT, DCPC, , DOT, DRDO, MIT and NRDC. The units seeking recognition are visited if need be, by teams comprising of representatives of DSIR and experts from outside agencies like : concerned administrative ministries, CSIR, NRDC, ICAR, ICMR, DRDO, MIT, DOT, IITs and local educational and Research Institutions, before they are taken up for consideration. In order to obtain first hand information on R&D activities of the applicant firms discussion with the chiefs of the R&D unit and executives of the firm are also held in DSIR in many cases. During the discussion, outside experts are invited and their comments are sought. The applications along with comments from outside agencies, visit reports, and the Department's own evaluation, are considered by an Inter-Departmental Screening Committee constituted by the Secretary DSIR. The Committee meets every month to consider the applications and makes recommendations to the Secretary, DSIR based on its evaluation of R&D infrastructure and R&D activity of the applicant firms.

During the year 2000 the Screening Committee met 12 times and considered applications for recognition; 60 R&D units were granted fresh recognition and 46 applications were rejected.

The pendency at the end of December 2000 was 42 of which 18 applications were received during the month of December 2000. A statement giving month-wise receipt, disposal and pendency of applications for recognition of R&D units is given at Annexure III.A.1.

Nearly 85 In-house R&D units were visited till the end of December 2000 by expert teams for a first hand assessment of the R&D work, infrastructural facilities and other claims made by the in-house R&D units. Also, over 350 discussions/meetings were held with heads of in-house R&D units.

2. RENEWAL OF RECOGNITION

Recognition to R&D units is granted for a period ranging from 1 to 3 years. The R&D units are advised to apply for renewal of recognition well in advance (3 months) of the date of expiry of the recognition. Applications received for renewal of recognition are circulated to CSIR, NRDC and/or the concerned administrative department of Government of India for comments. The applications are examined in DSIR taking into account the inputs received from other agencies for taking suitable decision on their renewal. During 2000, 512 in-house R&D units were due for renewal of recognition beyond 31 March 2000; of which 457 applications were received. Based on the evaluation of the performance of the R&D units, renewal of recognition was granted to 439 R&D units. Recognition granted to 18 Companies could not be renewed because their R&D performance was not up to the mark. A statement showing month-wise receipt, disposal and pendency of the cases of renewal of recognition of the R&D units is given at Annexure III.A.2.

3. ZONAL DISTRIBUTION OF IN-HOUSE R&D UNITS

The in-house R&D units are distributed throughout the country. There are around 190 units in the Northern Zone (Delhi, Haryana, Punjab, Uttar Pradesh, Jammu & Kashmir), around 100 units in Western Zone (Rajasthan and Gujarat), around 450 units in the Central Zone (Maharashtra, Madhya Pradesh and Orissa), around 340 units in the Southern Zone (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu) and around 100 units in the Eastern Zone covering Bihar, West Bengal, Assam and other north eastern states.

4. R&D EXPENDITURE

The expenditure incurred by in-house R&D units in industry has steadily increased. During 1980-81 it was of the order of Rs. 300 crores. In 1985-86, it was of the order of Rs. 500 crores. It is estimated that the present R&D expenditure of the 1178 recognised R&D units is of the order of Rs.2,200 crores. The share of public and joint sector is about 23 % and that of private sectors about 77%. 65 in-house R&D units spend over Rs. 5 crores each on R&D, 218 in-house R&D units spend between Rs. 1 crore to Rs. 5 crores each per annum on R&D. The list of these R&D units is given in Annexure III.A.3 and III.A.4 respectively.

5. R&D INFRASTRUCTURE

The in-house R&D Centres have created impressive infrastructural facilities for R&D including sophisticated testing facilities, laboratory equipment and pilot plant facilities. Analytical facilities such as HPLC's, IR spectrophotometers, UV-Vis spectrophotometers, NMR spectrometers, electron microscope, high temperature test and evaluation facilities, CAD-CAM facilities, and EDM's are available with many in-house R&D units.

6. R&D MANPOWER

There has been a steady increase in R&D manpower employed by the in-house R&D units. By 1975-76 about 12,000 R&D personnel were employed by recognised in-house units; by 1981-82 the figure was over 30,000. The present estimated manpower for the 1178 in-house R&D units is around 50,000 out of which around 17,500 R&D personnel are employed in public sector in- house R&D units and around 32,500 R&D personnel are employed in the private sector In- house R&D units. Of the total 50,000 R&D personnel, around 2700 are Ph.D's, 16,500 Post Graduates, 14,000 graduates and the rest are technicians and support staff.

7. SECTORWISE BREAK-UP OF IN-HOUSE R&D UNITS

A broad sector-wise break-up of the recognised in-house R&D units is as below:

Chemical and Allied industries	425
Electrical and Electronics industries	310
Mechanical Engineering industries	220
Process industries (Metallurgical, Refractories, Cement, Ceramics, Paper, Leather and others)	170
Agro and food processing industries and others	55

8. IN-HOUSE R&D UNITS: OUTPUT

Some of the R&D achievements reported by the recognised in-house R&D units are listed below:

Chemical and Allied Industries

- Development of process for alpha-pinene epoxide, alpha-campholenic aldehyde, dihydromyrcene and dihydromyrcenol.
- Development and commercialization of Pendimethalin, a herbicide and Hexaconazole, a fungicide.
- Development and commercialisation of secnidazole and nifurosol.
- Development and commercialisation of process covering cetirazine and salmeteire (Anti-asthmatics/Anti-histamine); and for finastride (Anticancer rug); meloxicam, nabumetone (Anti inflammatory drugs/analgesics); and sidenafil citrate.
- Development of "Once-a-day" oral controlled delivery system for Ciprofloxacin.
- Development of process for recovery and recycling of unwanted diastereomers of the analgesic drug tramadol.
- Improvements in the process & development of analytical methodology for the cardio- vascular drug "Pentoxiphylline".
- Development of process for the recycling of unwanted isomers of the antidepressant drug sertraline.
- Commercialisation of absorption of imported technology for the manufacture of Thiabendazole (TBZ).

- Formulation development and standardization of a stable suspension dosage form of ibuprofen.
- Development of technology for henna based hair dye powder and herbal cosmetics.
- Development of indigenous capabilities in FCC process technology.
- Development of environment friendly industrial lubricants.
- Design of a novel type of reactor to carryout pyrolysis to undecenoic acid and heptaldehyde.
- Modification of the anticoagulant preservative solution for storage of blood in PVC bags by in corporation of nicotinic acid.
- Development of technology for platelet storage bags.
- Development & commercialisation of Nylon-6 mono and multi filament finish oil.
- Development of technology for manufacture of amino acid based liquid bio-fertilizer.
- Development of DNA sequencing services and cloning for manufacture of a number of enzymes, proteins and bio-chemicals.
- Absorption and upgradation of imported technology for manufacturing Carbamazepine, (an anti-epileptic bulk drug).
- Developments of foaming abrasive & polishing tooth paste, aluminium chloride containing stylic gum gel and children's tooth gel in different flavours.

Electrical and Electronic Industries

- Development of gun display unit for Bofors 155mm guns based on micro-computer and FPGA for software control, trigonometric calculations and logic operations resulting in 40% reduction in total hardware size.
- Development and commercialisation of 18mm image intensifier tube with straight fiber output, SMD version of PSU for 1.1 mm tube, microprocessor based H.V. power supply.
- Design of SIGMA INDX 2000 lines integrated PBX (With ISDN and CTI facilities) voice mail cards (based on flash storage) and reference design tester for DSP based products.
- Development of NIR Spectrophotometer and NIR Spectrofluorometer.
- Design and development of electronic water level indicator.
- Design and development of microprocessor based PC compatible multi-zone doorframe metal detector.
- Development of pulse plasma nitriding technology.
- Development and commercialisation of optical module transceiver.
- Design and development of nickel cadmium aircraft batteries for Indian military aircrafts and silver oxide zinc primary battery for under water propulsion.
- Design and development of automatic LED traffic signal system.
- Development and commercialisation of microwave ferrites & dielectric materials.
- Development and commercialisation of digital automatic tyre inflator.
- Development of CNC controlled PCB prototyping machine.

Mechanical Engineering Industries

- Design and development of advanced composites structures for LCA program; landing gear for LCA & ALH; and advanced state-of-the-art test rigs for structures and systems for aerospace applications.
- Development of a gas turbine jet fuel starter (JFS) of 110kW capacity for starting the main engine of Light Combat Aircraft (LCA).
- Design and development and integration of wing mounted searchlight on DO-228 aircraft with specialized features and super mare radar for DO-228 aircraft.

- Design and development of AEROCON, a prefabricated sandwich panel using cement, fly ash and vermiculite as principal core material.
- Development of 860 mm 6 Hi cold rolling mill with annual production capacity of 80,000 MTPA.
- Design and development of CNG conversion kit for three wheelers.
- Design and development of firing technology for Corex™ gas for JINDAL TRACTABLE project.
- Design and structural analysis of linkage for 5.74 m^3 loader for higher breakout force and reduced cycle time.
- Development of application specific non-asbestos metallic composite for disc brake pads (NAM - 102) for Opel vehicles and high temperature adhesive for disc brake pad, asbestos free rubber composite (AFRC) for two wheeler brake application.
- Commercialisation of in-house developed Low NOx burner installed in GAIL/AURAIYA projects.
- Development of dual fuel burners for automatic and controlled simultaneous firing of producer gas and liquid fuels.
- Development of a complete range of biomass gasifiers for fine biomass materials.
- Development of Lycra fabric for garments.
- Design and development and commercialisation of throttle body assembly, delivery pipe assembly, fuel filter, and pressure regulator for multi point fuel injection systems for cars.
- Design and development of a fully automatic hydrodynamic unit for transmission of power from the diesel engine of 597 kW rating.
- Development of a fully automatic dry gas based cottonseed de-linting plant.

Processing Industries

- Development and commercialisation of beneficiation processes for 4 grades of calcined kaolin (clay).
- Development of non-sparking hand tools made of Cu-Al and Cu-Ti alloys.
- Development of a process for forged bars of titanium alloy (Ti-6Al-4V) with the high ultrasonic transparency to meet to international quality for commercial and aeronautical application.
- Development of process for the manufacture of 44GSM low cost economy/ standard newsprint using recycled fibres.
- Development of process to prepare keratin hydrolysate from cattle horns.
- Process commercialisation of high quality direct bonded mag-chrome bricks for Indian copper industry.
- Development of process to make higher hydration resistant lime-magnesia sinters at much lower temperature (1600^0C) to make direct bonded bricks for cement rotary kiln, various types of converters of steel plants, steel ladles etc.
- Optimization of process parameters of *Jamadoba washery resulting in increase of clean* coal production by 7800 tons/month.
- Development of technology on desalination of reclaimed sewage for conservation of fresh water resources.
- Development of liquid phase redox process technology for removal of hydrogen sulphide and recovery of sulphur from sour gases.
- Development of technology for isolation and formulation of Trichoderma Viridae based soil fungicide.
- Development of protease enzyme for de-hairing of animal skins.

Agro and Food Processing Industries

- Development of new hybrids and varieties of rice, wheat, maize, pearl millet, cotton, sunflower, tomato, chilies, sugarcane and barley.
- Development of micro-propagation techniques for banana, sugarcane, grape rootstocks, bamboo, horticultural & ornamental crops.

- Studies on rice genome and molecular mapping of Bt-genes.

- Development of extraction, process and bio-pesticide from medicinal plants such as neem, turmeric, garlic, rauwolfia and henna.

- Development of few novelties in Aglaonema and Hibiscus in ornamental horticulture.

- Development of neem oil based 1500 PPM Azadirachtin formulation

- Development of integrated pest & nutrient management technologies for achieving higher productivity particularly for crops like sugarcane and cotton.

- Development of hybrid variety of chicken for rearing under Indian rural conditions (without cages).

- Development of new veterinary vaccines for successful control of commonly occurring diseases in cattle, chicken and prawns.

9. IMPORTS MADE BY R&D UNITS

The recognised in-house R&D units have imported a variety of equipment, raw materials and samples for their R&D activities. These include: NMR, GLC, IR, HPTLC, high speed centrifuges counter current and droplet counter current chromatographs, Beta Scope, Perkin-Elmer GC-FTIR system, FT-NMR spectrometer, Inverted phase contrast fluorescence microscope, 4 channel 100 MHz Oscilloscope, Microsheen digital opacity reflectometer, colour image analysis system, laser based particle size analyzer, digital distortion analyser, dielectric loss analyser, high performance liquid chromatograph, X-ray spectrophotometer, ASIC development system, CAD, Stereo Zoom Microscope, Single Beam UV-VIS-NIR Fiber-Optic spectrophotometer for absorbance, transmittance and reflectance; Karl Fischer Titrator, UV-VIS dual beam spectrophotometer, cryptometer, computer for colour matching, CO sensor and filter, frictional distillation unit total organic carbon analyser, rapid prototyping machine, EDM, microprocessor based double ended inertia dynamometer, computer controlled eddy current dynamometer, CAD system logic analyser, fiber optics evaluation kit and intelligent universal programmer.

10. CERTIFICATE OF INDIGENOUS DEVELOPMENT OF TECHNOLOGY/ KNOW-HOW FOR BULK DRUGS

Bulk drugs manufactured through process know-how developed through In-house R&D are eligible for exemption from the price control as per provisions of Drug Price Control Order. The Department examines the requests of the in-house R&D Units for issuance of a certificate of indigenous technology development for seeking price control exemption. The examination is through detailed discussions, inputs and views of experts in the field of drug development and discovery, and visits by expert teams. Taking into account the various inputs and also considering the novelty and innovativeness of the process, the certificate of indigenous development of process know-how is issued for seeking price control exemption to deserving cases. During the year, certificate of indigenous development of technology/process for manufacture of bulk drug (pentazocine) for claiming exemption from price control were issued to Ranbaxy Laboratories Ltd., New Delhi.

11. OTHER BENEFITS AVAILED BY THE RECOGNISED R&D UNITS

The Department provides assistance to recognised in-house R&D units in a number of ways, such as cases of industrial R&D units requiring allotment of special controlled materials for R&D and permission to export of specialised products reserved for small scale industries by medium scale industries for test marketing in other countries are examined for making suitable recommendations to concerned agencies on case to case basis.

A number of cases regarding locational clearance with respect to expansion of R&D have been dealt with. A number of applications regarding disposal of R&D equipment and also, pilot plant produce; and permission for allotment for special controlled materials required for R&D were examined and the decisions of the Department conveyed.

12. COMPUTERISATION OF DATA ON IN-HOUSE R&D UNITS

Names, addresses and also location of in-house R&D units as well as validity of recognition of the recognised in-house R&D units are computerised and updated. As on 31 December 2000, there were 1178 in-house R&D units recognised by DSIR.

13. CONFERENCE, AWARDS & PUBLICATIONS

a) 14th National Conference on in-house R&D in Industry:

Department of Scientific and Industrial Research (DSIR) organised the 14th National Conference on in-house R&D in Industry in association with the Federation of Indian Chambers of Commerce and Industry (FICCI) on 9-10 November 2000 in New Delhi. The theme of the Conference was "Emergence of Brick and Click Economy in India: Synthesizing the Old and the New". The Conference had four technical sessions viz. Challenge of Creating the Synthesis between Old and New Economy; Preparing Indian Industry for the Global Challenges; Barriers to Growth of Knowledge Industry: Creating the Indian `hassle free dot com'; Indian Knowledge Industry in the wake of Emerging IPR Challenges. Attended by over 400 delegates from industry, national laboratories, IITs and universities, scientific and industrial research organisations (SIROs), consultancy organisations, Government departments, the Conference was inaugurated by Shri Suresh P. Prabhu, Union Minister for Power on 9 November 2000 in FICCI Golden Jubilee Auditorium. The Minister presented the DSIR National Awards for Outstanding in-house R&D Achievements (2000) to seven industrial units. Shri Suresh P. Prabhu also released the DSIR special publication "Outstanding in-house R&D Achievements - 2000".

b) National Awards for R&D Efforts in Industry:

In order to provide recognition to the efforts of industry towards innovative research and technological development, National Awards for R&D Efforts in Industry were instituted in 1987 by the Department of Scientific & Industrial Research. These awards are in the form of silver shields and are presented along with citations at the inaugural session of the annual National Conference on in-house R&D in Industry. So far, 113 companies have won the DSIR National R&D Awards for Outstanding in-house R&D Achievements.

Following is the list of the award winners in the year 2000:

Chemical and Allied Industries

Camphor & Allied Products Ltd., Vadodara and Rallis India Ltd., Navi Mumbai

Electronic Industries

Saraswati Dynamics Pvt. Ltd., Roorkee

Processing Industries

MECON Ltd., Ranchi

Agro and Food Processing Industries

Indo-American Hybrid Seeds (I) Pvt. Ltd., Bangalore

New Materials

Hyderabad Industries Ltd., Hyderabad

Technology Absorption

Max India Ltd., New Delhi

c) Outstanding in-house R&D Achievements - 2000:

The DSIR publication "Outstanding in-house R&D Achievements (2000)" covering the award winning achievements of 7 companies was released during the inaugural session of the 14th National Conference on in-house R&D in Industry on 9 November 2000.

d) In-house R&D in Industry - Information Update:

As the number of in-house R&D Centres has increased while the activities of DSIR have also diversified significantly with respect to in-house R&D units, it was felt appropriate to devise a quick communication system between DSIR and in-house R&D units. Accordingly, the DSIR started bringing out a quarterly Information Update on in-house R&D in industry on a regular basis since April 1988. The Information Update intended to provide a fast communication link between DSIR, in-house R&D units and SIROs and serve to disseminate useful and important information relevant to R&D in Industry. During 2000-01, four issues of 'In- house R&D in Industry' were brought out in April, July, October 2000 and January 2001. These have been widely disseminated to industry, SIROs Government Departments, missions abroad and others and are well received.

III(B). SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS

1. INTRODUCTION

Scientific research associations, institutions, trusts, companies incorporated u/s 25 of the Companies Act, universities and colleges which undertake research in the area of medical, agricultural, natural and applied sciences and social sciences have been seeking approval under section 35 (1) (ii) or (iii) of the Income Tax Act, 1961 if they wish to obtain donations from industry or other sources. The organisations notified under the section obtain benefit to the effect that any sum obtained by them for research purposes is wholly exempted from the levy of Income Tax. The donors who pay sums to such notified organisations were allowed deductions from their income to the extent of donations up to the financial year1999-2000. From 1.4.2000, this deduction has been raised to 125% of the donations given for scientific research.

Prior to 1 June 1982, ICAR, ICMR or ICSSR were the Prescribed Authorities for approving research organisations for notification by the Ministry of Finance in the areas of Agricultural Sciences, Medical Sciences and Social Sciences respectively. With effect from 1 June 1982, Secretary, Department of Science & Technology was designated as the single Prescribed Authority to deal with approval of all the above areas. Consequent to the creation of Department of Scientific and Industrial Research, Secretary, DSIR was designated as the single Prescribed Authority for approval u/s 35 (1)(ii)/(iii) of I.T. Act 1961.

Through an amendment by the Direct Tax Laws (Amendment) Act, 1987, effective from 1 April 1988, certain provisions under section 35, inter-alia, were deleted. Government however, reintroduced the provisions withdrawn earlier under section 35 of the Income Tax Act with modifications by Direct Tax Laws (Amendment) Act 1989 w.e.f. 1 April, 1989. The Prescribed Authority for Section 35 was the Director General (Income Tax Exemptions) in concurrence with Secretary, Department of Scientific & Industrial Research.

The Ministry of Finance, Department of Revenue, Central Board of Direct Taxes vide their notification S.O.No.500(E) dated 25th June, 1999 has made the following amendments in the Income-Tax Rules through 22nd Amendment in the Rules.

In the Income-tax Rules, 1962 in rule 6 in sub-rule (1) for the words, brackets and figure "sub-section (1)" the words, brackets and figure "clause (i) of sub-section (1)" shall be substituted.

In Appendix II to the Income-tax Rules, 1962, in Form No. 3CF, in the Notes occurring at the end:

A) in Note 2, for the words "prescribed authority", the words "Central Government" shall be substituted:

B) for Note 3, the following Note shall be substituted, namely:

"This application form (in triplicate) should be sent to the Central Board of Directed Taxes through the Commissioner of Income-tax having the jurisdiction over the applicant."

C) for Note 4, the following Note shall be substituted, namely:

"The applicant is also required to furnish any other particulars or details required by the Central Government."

Further to the notification mentioned above, the Ministry of Finance, Department of Revenue, Central Board of Direct Taxes issued a circular No. 778 dated 20th August, 1999 laying down the procedure dealing with applications for approval under clause (ii) & (iii) of sub-section (1) of section 35 of the Income Tax Act, 1961; which is reproduced as under:

"The Finance Act, 1999, has made amendment in section 35(1) of the IT Act, 1961, by which the approval under section 35(1)(ii) and section 35(1)(iii) of the IT Act shall be granted by the Central Government instead of prescribed authority {Director General of Income Tax (Exemption), in concurrence with Secretary, Department of Scientific and Industrial Research}. Subsequently consequential changes have also been made in Rule 6 of IT Rules 1962 and form 3CF vide Gazette Notification dated 25.6.99.

It has been now decided that henceforth, the following procedure shall be adopted for dealing with

the pending as well as fresh applications for approval under section 35(1)(ii) and 35(1)(iii) of the IT Act, 1961.

A) Fresh applications for approval under section 35(1)(ii) & 35(1)(iii) for assessment year 2000-2001 onwards shall be filed in Form 3CF with Central Government.

B) All applications pending with DGIT(E) as on 25.6.99 i.e. the date of Gazette notification of amendment of Rule 6 of Income tax Rules 1962, for approval under section 35(1)(ii) & 35(1)(iii) pertaining to assessment year 2000-2001 or subsequent year shall stand transferred to Central Government.

C) DGIT(E) in concurrence with Secretary, Department of Scientific and Industrial Research shall continue to be the Prescribed Authority for approval of cases under section 35(1)(ii) & 35(1)(iii) pertaining to assessment year 1999-2000 or any earlier year.

D) Approval already granted by the Prescribed Authority under pre-amended section 35(1)(ii) & 35(1)(iii) for assessment year 2000-2001 or any subsequent year, prior to 25.6.99 i.e. the date of Gazette of amendment of Rule 6 of Income tax rules, 1962, shall continue to be valid and no further notification or approval from Central Government shall be required in such cases for those assessment years."

2. RECOGNITION OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS (SIROs)

The DSIR had launched a scheme of granting recognition to Scientific and Industrial Research Organisations (SIROs) in 1988. SIROs recognised by DSIR are eligible for Customs Duty Exemption and Excise Duty Waiver in terms of notification Nos. 51/96-Customs dated 23.7.1996 and 10/97 - Central Excise dated 1.3.1997 respectively.

The DSIR has brought out Guidelines for Recognition of Scientific and Industrial Research Organisations (SIROs), which give procedural details and application proforma for seeking recognition under the SIRO Scheme. Functional SIROs having broad based governing council, research advisory committee, research personnel, infrastructural facilities for research, well defined time bound research programmes and clearly stated objectives of undertaking scientific research are considered eligible for recognition by DSIR. The investments of surplus funds not needed for immediate research should be in accordance with the Income Tax Act, 1961.

Applications for seeking recognition under the SIRO scheme are considered in DSIR by an Inter-Departmental Screening Committee with members from Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Indian Council of Social Sciences Research (ICSSR) and University Grants Commission. The recommendations of the Screening Committee are put up for approval of Secretary, DSIR. The recognition is effective from the date of approval of Secretary. Retrospective approval is not granted.

During the period January 2000 to December 2000, the screening committee met 5 times and recommended 28 cases for recognition as scientific and industrial research organisations under 1988 Scheme of DSIR. These include 24 cases in the natural & applied, agricultural and medical sciences; and 4 cases in the social sciences. List of these SIROs is furnished at Annexures III-B.1 and III-B.2.

Recognition granted to SIROs is for duration ranging from 1 to 3 years. The SIROs are advised to apply for renewal of recognition well in advance (3 months prior to the date of expiry of recognition). Such applications received for renewal of recognition are examined by Research Review Groups by involving representatives from ICAR, ICMR, CSIR and ICSSR depending on the area. Based on the evaluation made by the Research Review Groups, renewal of recognition is granted to SIROs.

At present there are 552 SIROs duly recognised by DSIR. Of these, 204 are in the area of natural & applied sciences, 169 are in the area of medical sciences, 38 are in the area of agricultural sciences, 123 are in the area of social sciences and 18 are universities/colleges. DSIR has brought out a directory of recognised scientific & industrial research organisations in November 2000.

The SIROs have employed qualified scientists and researchers and have also established good infrastructural facilities for research. They have developed new processes, procedures, techniques and technologies and also filed several patents. They have also organised seminars/symposiums/ workshops and published research papers/ reports/books.

III(C). FISCAL INCENTIVES FOR SCIENTIFIC RESEARCH

1. *INTRODUCTION*

Government have evolved, from time to time, fiscal incentives and support measures to encourage R&D in industry and increased utilisation of locally available R&D options for industrial development. The union budget for 1996-97, 1997-98, 1998-99, 1999-2000 and 2000-2001 has introduced a set of new incentives to encourage investments in R&D by industry.

Fiscal incentives and support measures presently available include: (a) Income tax relief on R&D expenditure; (b) weighted tax deduction for sponsored research; (c) weighted tax deduction on in-house R&D expenditure (d) customs duty exemption on capital equipment, spares, accessories and consumables imported for R&D by approved institutions / SIROs; (e) excise duty weaver on indigenous items purchased by approved institutions/ SIROs for R&D; (f) excise duty waiver for 3 years on goods produced based on indigenously developed technologies and duly patented in any two of the countries out of India, European Union (one country), USA and Japan; (g) accelerated depreciation allowance on plant and machinery set-up based on indigenous technology (h) price control exemption on domestic R&D based bulk drugs; (i) customs duty exemption on imports for R&D projects supported by Government.

2. DEPRECIATION ALLOWANCE ON *PLANT AND MACHINERY SET UP* BASED ON INDIGENOUS TECHNOLOGY

Government have introduced a system of allowing accelerated depreciation in respect of blocks of assets and rationalised the rate structure by reducing the number of rates as also by providing for depreciation at higher rates.

Secretary, Department of Scientific & Industrial Research, Ministry of Science and Technology, is the Prescribed Authority to certify expenditures where higher rate of depreciation is to be allowed for the plant and machinery using indigenous know-how. Guidelines have been issued for making applications for obtaining the aforesaid certificate. All such applications received are examined in the department, and discussions and technical visits to verify the claim are made to the plants by expert teams. Based on a detailed examination, certificates in deserving cases are issued for eligible expenditure.

During the year 2000, 5 certificates involving Rs. 2708 lakhs on cost of plant and machinery were issued by DSIR. Details of these cases are given at Annexure III.C.1.

3. CUSTOMS DUTY EXEMPTION ON GOODS IMPORTED FOR USE IN GOVERNMENT FUNDED R&D PROJECTS

The Union budget for 1996-97 introduced the provision of customs duty exemption on specific goods imported for use in R&D projects funded partly by any department of the Central Government and undertaken by the company in their in-house R&D unit recognised by DSIR. A certificate from the ministry or department, as the case may be, funding the research project stating the essentiality of the item(s) in each case at the time of importation would make the item(s) eligible for duty free import for that R&D programme by the company. During the period January-December 2000, 25 certificates worth Rs. 85.91 lakhs for import of capital equipment and consumables/ materials for R&D projects supported by DSIR were issued.

4. REFERENCE UNDER SECTION 35(3) OF I.T. ACT, 1961 REGARDING SCIENTIFIC RESEARCH

In the implementation of various incentive schemes for the promotion of research and development, the Income Tax Act, inter-alia, provides that expenditures made on capital equipment and related to research activities are allowed to be written off 100% in the year in which the expenditures are incurred. The Government has however, provided that if a question arises under section 35 of IT Act 1961 as to whether and, if so, to what extent any activity constitutes or constituted or any asset is or was being used for scientific research the Central Board of Direct Taxes would refer the

question to the Prescribed Authority. Director-General of Income Tax (Exemptions) in concurrence with Secretary, DSIR is the Prescribed Authority for deciding such cases in respect of companies. On receipt of the reference in DSIR, the department collects information/ background regarding the description of the activity claimed as scientific research, date of commencement of the relevant projects, date of completion of research work as also the results obtained from the specific project. After obtaining all these details, the matter is examined in DSIR. In case where it is considered necessary, a team of technical experts is constituted for on the spot appreciation of the research work done at the premises of the company. After receiving the technical assessment report from the visiting team, a discussion is also normally held so that the point of view of the Company is taken into account before arriving at a decision. After completing the processing of the case in the above fashion, the case file is placed before the Secretary, DSIR for giving a decision. The Secretary, DSIR gives his decision by setting out a reasoned order duly signed by him, which is communicated, to Director General of Income Tax (Exemptions).

During the year recommendations of Secretary were sent to DG (ITE) in the case of one company namely M/s Ramco Industries Ltd., Rajapalayam.

5. EXCISE DUTY WAIVER

The Union budget for 1996-97 introduced the provision of exemption of all goods falling under the Schedule to the Central Excise Tariff 1985 (5 of 1986) from the whole of the duty of excise livable thereon provided such goods are manufactured by a wholly Indian owned company, such goods are designed and developed by such Indian company, the goods so designed and developed are patented by such Indian company in any two countries from amongst India, USA, Japan and any one country of the European Union, for a period of 3 years from the date of issuance of certificate to the effect by DSIR.

The Department has approved one case during the year 1999-2000.

6. CUSTOMS DUTY EXEMPTION TO RECOGNISED SIROs

All Scientific and Industrial Research Organisations recognised by DSIR are eligible for customs duty exemption on the import of scientific equipment, instruments, spares, accessories as well as consumables for research and development activities and programmes.

The procedure for issuing the essentiality certificates to SIROs for obtaining the customs duty exemptions has been formalised. A committee comprising of three directors and one principal scientific officer has been setup, which meets normally once in a fortnight to examine the requests. The recommendations of the Committee are put up to the Head of the RDI Scheme, for approval.

During the year around 850 essentiality certificates were issued for claiming customs duty exemption on import of scientific equipment, accessories and components, including consumable items. The value of scientific equipment instruments and the consumables was over Rs. 45 crores.

7. EXCISE DUTY EXEMPTION TO RECOGNISED SIROs

All Scientific and Industrial Research Organisations (SIROs) recognised by DSIR are eligible for excise duty exemption on the purchase of scientific and technical instruments, apparatus, equipment (including computers); accessories and spare parts thereof and consumables; computer software, compact disc-read only memories (CD-ROM), recorded magnetic tapes, micro films, microfiches; and prototypes for research and development activities and programmes.

This provision was introduced by Ministry of Finance (Deptt. of Revenue) vide notification No. 10/97-Central Excise dated 1 March 1997. The procedure for issuing essentiality certificates to SIROs for obtaining the excise duty exemptions has been formalised. A committee has been set up in DSIR to examine the applications received. The committee normally meets periodically and essentiality certificates are issued with the approval of Head of RDI Scheme.

During the year 1999, 73 essentiality certificates for a total amount of Rs. 165.18 Lakhs were issued for claiming excise duty exemptions.

8. REGISTRATION OF PUBLIC FUNDED RESEARCH INSTITUTIONS AND OTHERS

Public funded research institutions, universities, IITs, IISc, Bangalore; Regional Engineering Colleges, (other than a hospital) are eligible for availing customs duty exemption on import of equipment, spares and accessories and consumables for research purposes. The pass book scheme which was hitherto operated by the Department of Science and Technology and the Ministry of Human Resources Development was superseded by a simple registration with the Department of Scientific and Industrial Research. The ceiling on the value of goods imported for R&D was also removed and the head of the public funded research institutions/organisations duly registered with DSIR can certify the R&D goods for duty free import as per the notification No. 51/96-Customs dated 23 July 1996. As per the Government notification No. 10/97-Central Excise dated 1.3.1997, the public funded research institutions, universities, IITs, IISc, Bangalore, regional engineering colleges, registered with DSIR are also eligible for central excise duty waiver on purchase of indigenously manufactured for scientific research purposes.

The procedure for registration of public funded research institutions, universities, IITs, IISc, Bangalore; regional engineering colleges has been reviewed during the year and an inter-departmental screening committee has been constituted for recommending the registration. The committee met 3 times during the year and considered 52 applications from various public funded research institutions.

During the period 1 April 2000 - 31 December 2000, about 40 registration certificates were issued to such public funded research institutions universities, IITs, IISc, Bangalore, regional engineering colleges for availing customs duty exemption on import of scientific equipment, spares and accessories, consumable items and central excise duty exemption on indigenous purchases for scientific research purposes. Apart from these 30 public funded research institutions, which are already registered with DSIR for availing customs duty exemption were issued certificate of registration for availing central excise duty exemption on indigenous purchases.

9. APPROVAL OF IN-HOUSE R&D CENTRES AND CERTIFICATION OF EXPENDITURE UNDER SECTION 35(2AB) OF I.T. ACT 1961

Finance Bill 1997 introduced a sub-section (2AB) in Section 35 of the IT Act 1961. This sub-section was introduced in order to encourage research & development in chemicals, drugs, pharmaceuticals, electronic equipment, computers, telecommunication equipment, and manufacture of aircrafts and helicopters. The sub-section provides for weighted tax deduction of a sum equal to one and one-forth times of any expenditure incurred on scientific research (not being expenditure in the nature of cost of any land/building). The in-house Research and Development Facilities of the companies engaged in the business of manufacture or production of the above said items should be approved by the 'Prescribed Authority' i.e. Secretary, DSIR. Also the company should enter into an agreement with the prescribed authority for co-operation in such research and development facility and for audit of the accounts maintained for that facility.

The provision was introduced for expenditure on R&D incurred up to 31st March 2000. The Ministry of Finance, Department of Revenue, Central Board of Direct Taxes, notified the provision vide Notification No. S.O.259 (E) dated 27 March 1998. Finance Bill 1999 introduced in Lok Sabha on 27 February 1999 extended this provision till 31 March 2005. During the year about 65 applications were received. Secretary, DSIR who is designated as the Pescribed Authority under section 35(2AB) of IT Act 1961approved in-house R&D centres of 27 companies. Agreement of cooperation for research and development were signed with these companies on behalf of the Secretary, DSIR.

IV. PROGRAMME AIMED AT TECHNOLOGICAL SELF RELIANCE (PATSER)

1 OBJECTIVES OF PATSER

The **objectives** of the scheme **"Programme Aimed at Technological Self Reliance (PATSER)"** include :

A) Supporting industry for technology absorption, development and demonstration.

B) Building indigenous capabilities for development and commercialisation of contemporary products and processes of high impact.

C) Involvement of national research organisations in joint projects with industry.

2 ACTIVITIES

The **activities** under **PATSER** include the following :

2.1 Financial Support to Research, Development, Design and Engineering (RDDE) Projects of Industry:

The Department provides on a selective basis partial financial support to Research, Development, Design and Engineering (RDDE) projects to be proposed by industry in the following areas:

a) Development and demonstration of new or improved product and process technologies including those for specialised capital goods, for both domestic and export markets.

b) Absorption and Upgradation of imported technology.

The partial financial support by DSIR in the above areas primarily covers prototype development and pilot plant work, test and evaluation of products flowing from such R & D, user trials etc. Bulk of the cost of the project is met from industry's resources.

The Department under PATSER Scheme has so far supported about 110 R&D projects of Industrial units. These projects cover products and processes in various important industries such as metallurgy, electricals, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives.

During the year, a number of new R&D projects of industry were supported on partial financial support basis. The Department had invited, through advertisements in leading newspapers, project proposals for technology absorption, development and demonstration from industrial units whose in house R and D Units are recognised by DSIR. During the year, more than 100 responses from industrial units seeking further details about the scheme, indicating their technology development projects were received by the Department. Till December 2000, these proposals were evaluated for aspects such as their novelty, commercial potential, track record of executing agencies and collaborating agencies (wherever associated) and based on this, 22 projects were submitted for consideration of the Technical Advisory Committee to PATSER for partial financial support by DSIR. More projects are likely to be considered by TAC in the period January - March 2001.

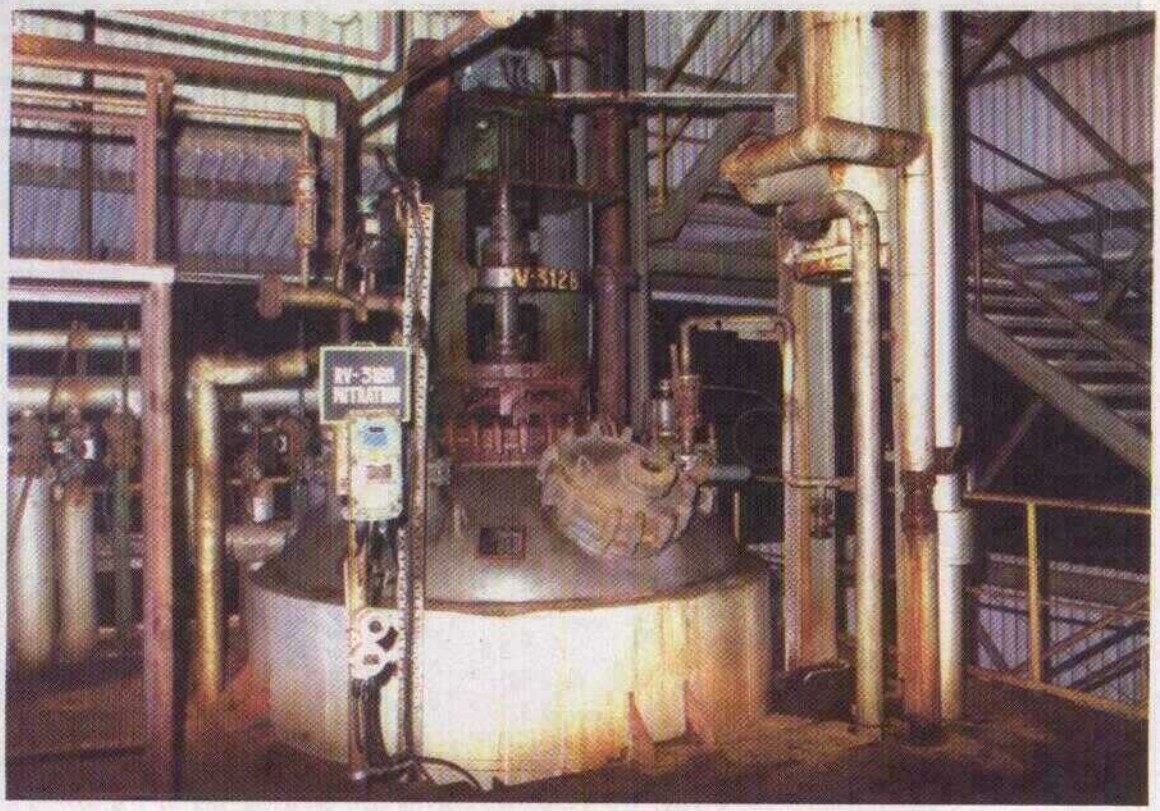
During the year till December, 2000, under "Technopreneur Promotion Programme" (TePP). jointly operated by DSIR under its PATSER Scheme and DST under its Home Grown Technology Scheme. 8 innovative projects received from individuals have been considered for support and more are expected to be considered for support in the period January – March, 2001.

The highlights of various projects under PATSER Scheme during the year are as given below:

A. COMPLETED PROJECTS

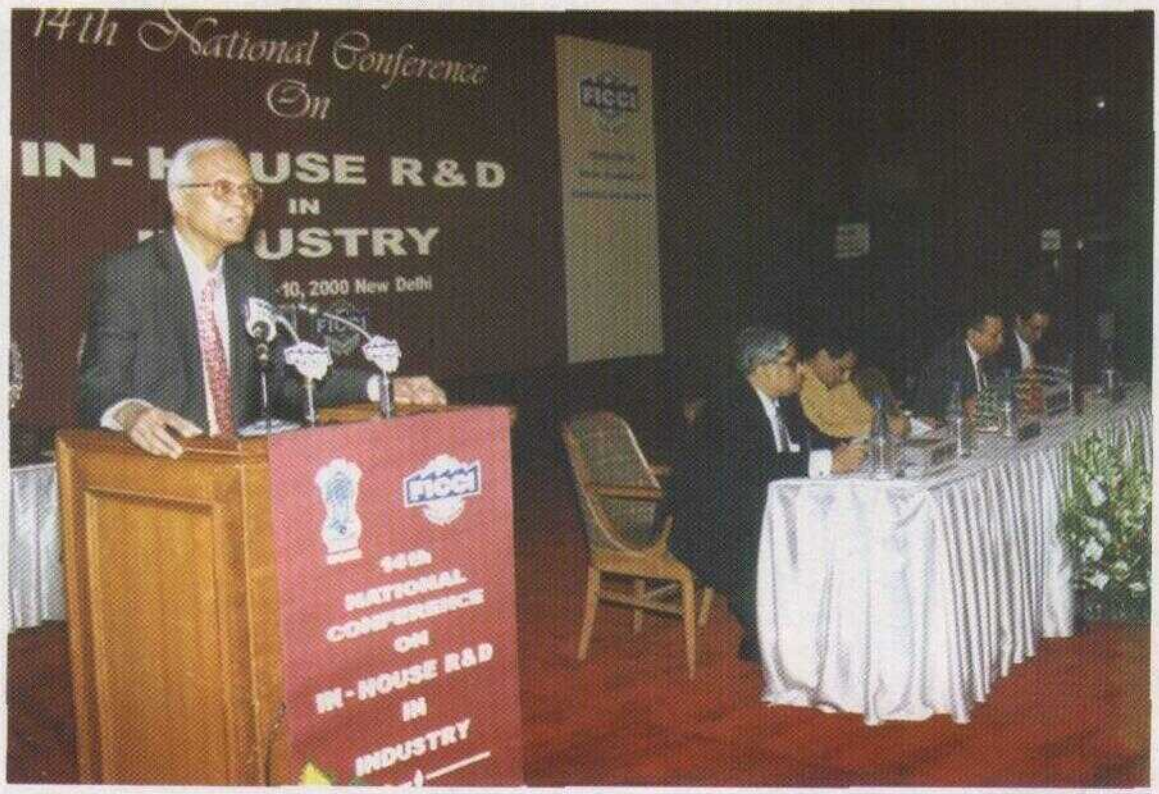
2.1.1 M/s. ABR Organics Ltd., Hyderabad

The Project by M/s. ABR Organics Ltd., Hyderabad on 'Technology Upgradation of Polyimide Resins' has been supported by DSIR with a financial support of Rs. 35 lakhs out of a total project outlay of Rs.150 lakhs. The project has resulted in the development of technology for (a) a polyimide system with cure temperature of about 100^0 C; (b) polyimide film casting; (c) enamelling of continuous copper strips; (d) FRP laminate with R-750; (e)

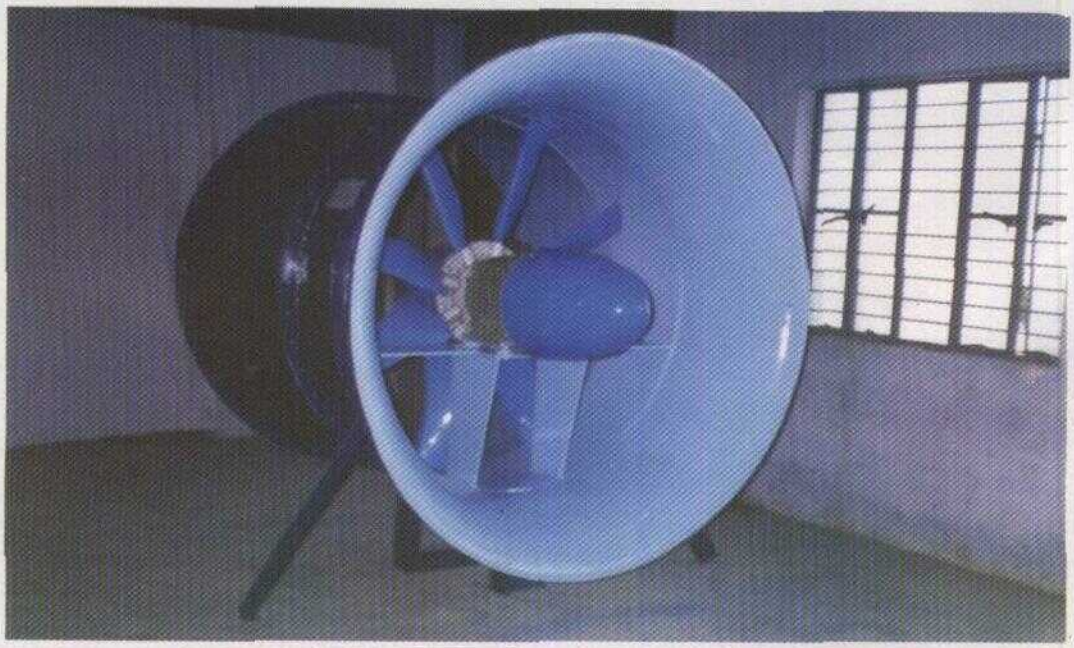


III.A.4 Pendimethalin Plant – Nitration reactor

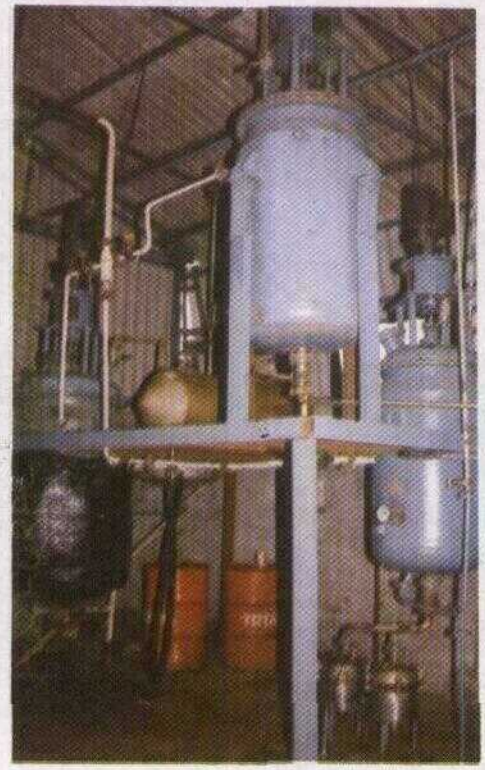
III.A.5 DSIR National R&D Awards (2000) Winners



III.A.6 Dr. R.A. Mashelkar, Secretary, DSIR addressing the delegates at the inaugural session of the 14th National R&D Conference



IV.1 Development of Energy Efficient Axial Flow FRP Fan System by Parag Fans & Cooling Systems Ltd., Dewas



IV.2 Furfural Alcohol Plant by Delta Agrochemical Industries

IV.3 Electric Stacker 1500 kg developed by Maini Materials Movement Pvt. Ltd., Bangalore

coating of SS surfaces and (f) moulding components based on ABRON PR100, S-10, R-750. The Project is completed.

2.1.2 M/s. Bharat Earth Movers Ltd., Bangalore

The Project by M/s. Bharat Earth Movers Ltd., Bangalore on 'Upgradation of 60-T dumper' has been supported by DSIR with a financial support of Rs. 25 lakhs out of a total Project outlay of Rs. 155 lakhs. The prototype fitted with indigenous planetary axle & transmission system has completed field trials satisfactorily. The project has been completed.

2.1.3 M/s. Central Electronics Ltd, Sahibabad and Electronics Research & Development Centre, Thiruvananthapuram

The joint project of M/s. CEL and ER&DC is for "development and design of SPV Charger for *Ni Cd batteries using Smart charging technology*" with DSIR's support of Rs. 24 lakhs (Phase I) out of the total project cost of Rs. 34.2 lakhs. Improved *version of the prototype has been developed. The* project has been completed.

2.1.4 Central Power Research Institute, Bhopal and M/s. G. K. Electrical Industries Ltd., Bhopal

The joint project by CPRI, Bhopal and M/s. G.K. Electrical Industries Ltd., Bhopal on 'Development of 12 KV Load Breaker Switches for use in Electrical Sub Stations' has been supported by DSIR with a financial support of Rs. 5.5 lakhs out of a total Project outlay of Rs. 15 lakhs. Second prototype has been successfully developed. Project is completed.

2.1.5 M/s. IBP Co. Ltd., Gurgaon

The Project by M/s. IBP, Gurgaon on 'Development of Emulsion explosives' has been *supported by DSIR with a financial support of Rs. 10* lakhs out of a total Project outlay of Rs. 31 lakhs. The project has been completed.

2.1.6 M/s. Minda Industries Ltd. Delhi

The Project by M/s. Minda Industries Ltd. on 'Reduction in Design to Delivery Time in Developing a Product by Employing CAD/CAM & Rapid Prototyping Techniques' has been supported by DSIR with a financial support of Rs 25 lakhs out of a total Project outlay of Rs. 88.4 lakhs. The project is completed.

2.1.7 M/s. Mishra Dhatu Nigam (MIDHANI), Hyderabad

The Project by M/s. MIDHANI, Hyderabad on 'Development of Wires with High Surface finish' has been supported by DSIR with a financial support of Rs. 12 lakhs out of a total Project outlay of Rs. 36 lakhs. High surface finish is required for wires which are used in specialised applications such as for spark plugs and electrostatic precipitators. MIDHANI has been successful in developing such wires and trial lots produced under the project has been approved by the customers. The project has been completed.

2.1.8 M/s. Mishra Dhatu Nigam (MIDHANI), Hyderabad

The Project by M/s. MIDHANI, Hyderabad on 'Bulk Filtration of Liquid metal for production of clean steel' has been supported by DSIR with a *financial support of Rs. 37 lakhs out of a total Project* outlay of Rs. 74 lakhs. Suitable filters have been developed under the project and trials have shown the effectiveness of the filters. The project has been completed.

2.1.9 M/s. National Aluminium Company Ltd., Bhubaneswar

The Project by M/s. National Aluminium Company Ltd., Bhubaneswar on 'Pilot Scale Development of Special Alumina and Hydrates' has been supported by DSIR with a financial support of Rs. 100 lakhs out of a total Project outlay of Rs. 491 lakhs. Speciality aluminas and hydrates are widely used in various industrial products such as toothpaste, grinding wheels, polishing media etc. The project has been completed.

2.1.10 M/s. National Fertilisers Ltd., New Delhi and Raman Centre for Applied and Interdisciplinary Sciences, Calcutta

The project for 'Pre-pilot Plant Trials of Slow Release Zinc Polyphosphate Fertilizer' was undertaken by Raman Centre for Applied and Interdisciplinary Sciences (RCAIS), Calcutta in collaboration of M/s National Fertilizers Ltd. (NFL), New Delhi, with DSIR support of Rs. 4.15 lakhs out of a total project cost of Rs. 8.9 lakhs. M/s. NFL has extended its support of Rs. 4.765 lakhs to RCAIS. DSIR had assisted in development and field testing of

this product which has been patented by Dr Chandrika Varadachari of RCAIS. The field trials of this fertiliser at three major national centres had shown encouraging results and adequate data on the process technology has been collected for scaling up the technology to pilot level. The project has been completed.

2.1.11 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh

The Project by M/s. SCL, Chandigarh on 'Development of ASIC for Line Card and Conference Card' has been supported by DSIR with a financial support of Rs. 20 lakhs out of a total Project outlay of Rs. 50 lakhs. The project has been completed.

2.1.12 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh

The Project by M/s. S C L, Chandigarh on 'Development of ASIC for Microcontrollers' has been supported by DSIR with a financial support of Rs. 46.5 lakhs out of a total Project outlay of Rs. 93 lakhs. The project is completed.

2.1.13 M/s. Central Electronics Ltd, Sahibabad

The Project by M/s. Central Electronics Ltd., Sahibabad on 'Development of Solid State Interlocking system for Railways' has been supported by DSIR with a financial support of Rs. 84 lakhs out of a total Project outlay of Rs. 109 lakhs. The SSI system has been tested successfully on Lajpat Nagar Railway Station under field conditions. The project has been completed.

2.1.14 M/s. Encon Furnaces Ltd., Faridabad and Indian Institute of Petroleum (IIP), Dehradun

The joint project by M/s. ENCON, Faridabad, and IIP, Dehradun, on 'Development of Industrial Gas Burner' has been supported by DSIR with a financial support of Rs. 11 lakhs out of a total Project outlay of Rs. 30 lakhs. These industrial gas burners have been tested at the user's sites of Gujarat and Ferozabad (U.P.). The project is likely to create a good demand for the tea industries. The project has been completed.

2.1.15 M/s. Electronics Corporation of India Ltd.,(ECIL), Hyderabad, and Central Road Research Institute (CRRI), New Delhi

The joint project by M/s. ECIL, Hyderabad, and CRRI, New Delhi, on 'Development of Moisture Meter' has been supported by DSIR with a financial support of Rs. 19.5 lakhs out of a total Project outlay of Rs. 31 lakhs. The prototype of the equipment has been developed and tested under various soil conditions in Andhra Pradesh, Rajasthan and Delhi. This gauge has also been tested at number of sites of Delhi Metro Rail System. This project is likely to create good demand of this equipment by various road, dams, flyover construction agencies. The project has been completed.

2.1.16 M/s. MECON, Ranchi and M/s. Hero Cycles Ltd., Ludhiana

The Project by M/s. MECON, Ranchi on 'Development of 6-Hi rolling mill' has been supported by DSIR with a financial support of Rs. 98 lakhs out of a total Project outlay of Rs. 1443.04 lakhs. Performance and guarantee trials have been completed. The mill at M/s. Hero Cycles Ltd., Ludhiana, has started commercial production and so far more than 50,000 tonnes strips of various sizes have been rolled out. The project has been completed.

2.1.17 M/s. Gujarat Narmada Fertilizer Corporation Ltd., Vadodara

The project by M/s. Gujarat Narmada Valley Fertilizer Corporation Ltd., Bharuch in collaboration with Engineers India Ltd., on "Development of Liquid Phase Oxidation Process for Hydrogen Sulphide and Recovery of Sulphur from Sour Gases" has been supported by DSIR with a financial support of Rs.100 lakhs out of a total project outlay of Rs.207 lakhs. An iron chelated liquid catalyst (named CATSOL-II) for desouring of the natural gas has been developed by GNFC - EIL and has been successfully demonstrated at ONGC, Hazira Plant. The catalyst developed is cost competitive with the imported ARI Catalyst and has matching quality and performance ability compared to ARI Catalyst. The project has been completed.

PROJECTS BEING COMPLETED

2.1.18 M/s. Intra Industries, Pune

The Project by M/s. Intra Industries, Pune, on 'Development of 22.5 KVA Inverter for Railways' has been supported by DSIR with a financial support of Rs. 21.8 lakhs out of a total Project outlay of Rs. 63 lakhs. The project is under execution and prototype as per Revision 3 of RDSO specifications is ready. The project is being completed.

2.1.19 M/s. Punjab Tractors Ltd., SAS Nagar

The Project by M/s. Punjab Tractors Ltd. on 'Development of IGBT Based SSDC Controllers For Fork Lift Trucks' has been supported by DSIR with a financial support of Rs. 10 lakhs out of a total Project outlay of Rs. 31.8 lakhs. The project is being completed.

2.1.20 M/s. S. M. Electronics & Services Ltd., New Delhi, and Centre for Development of Advanced Computing, Pune

The Project by M/s. S.M. Electronics & Services Ltd. on 'Development of Multilingual Pagers' has been supported by DSIR with a financial support of Rs. 36 lakhs out of a total Project outlay of Rs. 80.48 lakhs. Pagers for Hindi, Marathi, Kannada and Tamil have been developed. The project is being completed.

2.1.21 M/s. Triveni Structurals Ltd., Naini

The Project by M/s. Triveni Structurals Ltd., Naini, on 'Development of EHV Self Supporting & Guyed Type Transmission Line Towers' has been supported by DSIR with a financial support of Rs. 20 lakhs out of a total Project outlay of Rs. 86 lakhs. Prototypes have been developed. Project is being completed.

2.1.22 CBRI, Roorkee/ CPRI, Bangalore

The Project by CBRI and CPRI on 'Recycling Marble Waste' has been supported by DSIR with a financial support of Rs. 11.5 lakhs. The project is being completed.

2.1.23 M/s. H M T, Bangalore

The Project by M/s. H.M.T, Bangalore on 'Development of State-of-the-art Machining Centre' has been supported by DSIR with a financial support of Rs. 75 lakhs out of a total Project outlay of Rs. 197 lakhs. The cutting trials at the user's end for various tractor components have been completed. High speed cutting trials on aluminium auto components are in progress. The project is being completed.

2.1.24 M/s. MATA Foundation, Imphal

The Project by M/s. MATA Foundation on 'Integrated Pilot Demonstration Plant for Spice Processing' has been supported by DSIR with a financial support of Rs. 60 lakhs out of a total Project outlay of Rs. 135.5 lakhs. The project is being completed.

PROJECTS NEARING COMPLETION

2.1.25 M/s. Delta Agro Chemicals Ltd., Serinarasannapalem, Krishna Dt., A.P.

The Project by M/s. Delta Agro Chemicals Ltd., Krishna on 'Development of Process for Manufacture of Furfuryl Alcohol by Hydrogenation of Furfural' has been supported by DSIR with a financial support of Rs. 18.5 lakhs out of a total Project outlay of Rs. 45 lakhs. Technology has been demonstrated at pilot plant level and trial runs are under way. The project is nearing completion.

2.1.26 M/s. Dolphin Industrial Cooperative Society Ltd., Vizianagaram

The Project by M/s. Dolphin Industrial Cooperative Society on 'Development of Glazing on Terracotta Clay Products' has been supported by DSIR with a financial support of Rs. 27 lakhs out of a total Project outlay of Rs. 55.33 lakhs. Erection of demonstration plant has been completed under the project and trial runs have commenced. The project is nearing completion.

2.1.27 M/s. Hindustan Zinc Ltd., Udaipur and CSIR, New Delhi

The Project by M/s. Hindustan Zinc Ltd., Udaipur, and CSIR, New Delhi, on 'Installation of Nickel Extraction Technology Proving Plant for Recovery of Nickel From Chromite Overburden' has been supported by DSIR with a financial support of Rs. 100 lakhs out of a total Project outlay of Rs. 1000 lakhs. Trial runs have already commenced in the pilot plant. The project is nearing completion.

2.1.28 M/s. Praj Industries Ltd., Pune

The Project by M/s. Praj Industries Ltd., Pune, on 'Development and Demonstration of Energy Efficient Drying Systems' has been supported by DSIR with a financial support of Rs. 24 lakhs out of a total Project outlay of Rs. 49.5 lakhs. The pilot plant of the ring dryer has been developed and various feed materials have been tested in the pilot plant to establish parameters for efficient ring dryer system. The project is nearing completion.

2.1.29 M/s. Priya Bricks (P) Ltd.,Kolkata

The Project by M/s. Priya Bricks (P) Ltd., Kolkata on 'Development and Demonstration of Stiff Extrusion Technology for Extruding Solid, Perforated and Hollow Building Blocks' has been supported by DSIR with a financial support of Rs. 45 lakhs out of a total Project outlay of Rs. 97.8 lakhs. The plant has been commissioned and difference types of bricks are being produced in the automatic plant. The testing of the end products is in progress. The project is nearing completion.

2.1.30 M/s. Maini Materials Movements (P) Ltd., Bangalore

The Project by M/s. Maini Materials Movements (P) Ltd., Bangalore on 'Research, Development, Design and Engineering of World Class In-plant Material Handling Equipment for Global Market' has been supported by DSIR with a financial support of Rs. 55 lakhs out of a total Project outlay of Rs. 144 lakhs. 12 prototypes of various in-plant material handling materials as per Euro norms have been developed and demonstrated. The project is likely to be completed.

2.1.31 M/s. PMT Machine Tool Automatics Ltd., Pune

The Project by M/s. PMT Machine Tool, Automatics Ltd., on 'FI6(T) Internal Grinding Machine With 4 Turrets' has been supported by DSIR with a financial support of Rs. 46 lakhs out of a total Project outlay of Rs. 148 lakhs. The prototype machine has been developed and field trails at users place have been completed. The project is nearing completion.

2.1.32 M/s. WEBEL Electronics Ltd., Kolkata

The Project by M/s. WEBEL Electronics Ltd. on 'Development of Computerised Braille Transcription Systems for automatic and speeded transcription of English and Vernacular texts' has been supported by DSIR with a financial support of Rs. 16 lakhs out of a total Project outlay of Rs. 32 lakhs. The project is nearing completion.

PROJECTS UNDER PROGRESS

2.1.33 M/s. ACE Designers Pvt. Ltd., Bangalore

The Project by M/s. ACE Designers Pvt. Ltd., Bangalore on 'Development of P.C. based CNC Machining system' has been supported by DSIR with a financial support of Rs. 35 lakhs out of a total Project outlay of Rs. 99.13 lakhs. The PC based CNC system has been fitted on the lathe machine and trials are being carried out. The project is under progress.

2.1.34 M/s. ARDEE Business Services Pvt. Ltd., Vishakhapatnam

The Project by M/s. ARDEE business Services Pvt. Ltd., Vishakhapatnam, on 'RAMDARS-Coal dry Beneficial system' has been supported by DSIR with a financial support of Rs. 70 lakhs out of a total Project outlay of Rs. 147.3 lakhs. The project is under progress.

2.1.35 M/s. Ashok Leyland Ltd., Chennai and Electronics Research Development Centre of India, Thiruvananthapuram

The joint project of M/s.Ashok Leyland Ltd., Chennai and Electronics Research Development Centre of India, Thiruvananthapuram for 'Development of Hybrid Electric Vehicle With Vector Controlled Induction Motor for Propulsion' has been supported by DSIR with a financial support of Rs. 45 lakhs out of a total Project outlay of Rs. 134 lakhs. First prototype has been developed and the project is under progress.

2.1.36 M/s. ATCO Industries Ltd., Pune

The Project by M/s. ATCO Industries Ltd., on 'Technology Development of Microbalance of 200gm Capacity With 1.0 mg Accuracy and High Dynamic Range' has been supported by DSIR with a financial support of Rs. 28.5 lakhs out of a total Project outlay of Rs. 76.3 lakhs. The prototype has been developed and is under testing at NPL, New Dehli. The project is under progress.

2.1.37 M/s. ATCO Industries Ltd.,Pune

The Project by M/s. ATCO Industries Ltd., on 'Development of Load cells' has been supported by DSIR with a financial support of Rs. 68 lakhs out of a total Project outlay of Rs. 149 lakhs. The prototypes of different types of load cells have been developed and are under testing. The project is under progress.

2.1.38 M/s. Autopal Industries Ltd., Jaipur

The Project by M/s. Autopal Industries Ltd., Jaipur, on 'Development of Metal Halide Lamps Including ARC Tube And Electronic Control Gear'

has been supported by DSIR with a financial support of Rs. 50 lakhs out of a total Project outlay of Rs. 145 lakhs. Development of the ARC tube has already been achieved under the project. The project is progressing satisfactorily.

2.1.39 M/s. Bharat Earth Movers Ltd., Bangalore

The Project by M/s. Bharat Earth Movers Ltd., Bangalore on 'Development of Cast Crank Shafts' has been supported by DSIR with a financial support of Rs. 27 lakhs out of a total Project outlay of Rs. 67 lakhs. The prototype of the S.G. Iron CrankShaft fitted in an Engine has completed all tests satisfactorily. The prototype of Austermpered Ductile Iron (ADI) Crankshaft is undergoing testing. The project is under progress.

2.1.40 M/s. Bharat Earth Movers Ltd., Bangalore and Electronics Research & Development Centre (ER&DC), Thiruvananthapuram

The Project by M/s. Bharat Earth Movers Ltd., Bangalore and ER&DC, Thiruvananthapuram, on 'Development of Unified Electronic Controller for Off-Highway Dump Trucks' has been supported by DSIR with a financial support of Rs. 16.5 lakhs out of a total Project outlay of Rs. 33.6 lakhs. Prototype has been developed and the project is under progress.

2.1.41 M/s. Bharat Heavy Electricals Ltd., Bangalore

The Project by M/s. Bharat Heavy Electrical Ltd., Bangalore on 'Development of ASIC Based Energy Meter' has been supported by DSIR with a financial support of Rs. 23 lakhs out of a total Project outlay of Rs. 46 lakhs. The project is under progress.

2.1.42 M/s. Bharat Pumps And Compressors Ltd., Allahabad

The Project by M/s. Bharat Pumps And Compressors Ltd., on 'Development of Twin Casing Fly Ash Slurry Pump' has been supported by DSIR with a financial support of Rs. 25 lakhs out of a total Project outlay of Rs. 60 lakhs. The material specimens have been sent to IIT, Delhi for testing and design has been frozen. The project is under progress.

2.1.43 M/s. BILT Chemicals Ltd., Secunderabad

The project by M/s. BILT Chemicals Ltd., Secunderabad on "Development of Technology for Tetra Bromo Bisphenol-A (TBBA) on a Pilot Plant level" has been supported by DSIR with a financial support of Rs.350 lakhs out of a project outlay of Rs.1447 lakhs. A Pilot Plant has been set up at Ankleshwar based on the technology developed In-house. The product TBBA is a fire redundant chemical and has considerable potential abroad and in the country. The project is in progress.

2.1.44 M/s. Canpex India, Pune

The Project by M/s. Canpex India, Pune on 'Setting Up of Pilot Plant For Production of 1T/day High Purity (72-80%) Calcium Cyanamide' has been supported by DSIR with a financial support of Rs. 35 lakhs out of a total Project outlay of Rs. 120.74 lakhs. The project is under progress.

2.1.45 M/s. Castron Technologies Ltd., Calcutta

The Project by M/s. Castron Technologies Ltd., Calcutta in collaboration with Central Fuel Research Institute on "Development of Indigenous Technology for Phenanthrene and 9:10 Phenanthrenequinone" has been supported by DSIR with a financial support of Rs.35 lakhs out of total project outlay of Rs.77 lakhs. The downstream processing plant is under erection and shall be soon operational. The Pilot Plant involves oxidation with Anthracene and fine tuning of the process. The process of upgradation of Phenanthrene (60%) to around (70%) by chemical method has been developed in the lab and the pilot plant equipment are under erection. The product has very good demand potential. The project is in progress.

2.1.46 M/s. Central Electronics Ltd, Sahibabad

The Project by M/s. Central Electronics Ltd., Sahibabad on 'Development of Digital Axle Counter' has been supported by DSIR with a financial support of Rs. 70 lakhs out of a total Project outlay of Rs. 146 lakhs. The 2 x 2 laboratory scale digital axle counter has been fabricated and tested. The prototype of 2 x 2 and 2 x 3 digital axle counter are under development stage. The project is under progress.

2.1.47 M/s. Farcom Cable Systems (P) Ltd., Bangalore

The Project by M/s. Farcom Cable Systems (P) Ltd., Bangalore on 'Development of Flame Retardant Low Smoke Material For Wires and Cables for Shorting Applications' has been supported by DSIR with a financial support of Rs. 50 lakhs out of a total Project outlay of Rs. 104.5 lakhs. The project is under progress.

2.1.48 M/s. Fluidtherm Technology Pvt. Ltd., Chennai

The Project by M/s Fluidtherm Technology Pvt. Ltd., Chennai on 'Developing a Novel Heat Treatment Furnace' has been supported by DSIR with a financial support of Rs. 50 lakhs out of a total Project outlay of Rs. 149.3 lakhs. The project is under progress.

2.1.49 M/s. General Exports & Credits Ltd., New Delhi and M/s. Dalmiya Centre for Biotechnology (DCBT), Coimbatore

The Project by M/s. General Exports & Credits, New Delhi, in collaboration with M/s. Dalmiya Centre for Biotechnology, Coimbatore, and Indian Institute of Chemical Technology, Hyderabad, on 'Development of Azadirachtin-A Technical from Neem Seeds Kernels and its Formulations' has been supported by DSIR with a financial support of Rs. 65 lakhs out of a total Project outlay of Rs. 248.97 lakhs. The project is for setting up of a pilot plant in which 300 kg/day neem seeds kernels will be processed to produce 100 gm. Azadirachtin A of 60 70% purity per day in District Hardoi (Uttar Pradesh) based on lab scale technology developed by DCBT. IICT, Hyderabad has been entrusted with the task of designing and engineering of the pilot plant and has submitted the drawing and design package to GCEL. National lab such as IARI centres will carry out field trials of pesticides.

2.1.50 M/s. IBP Co. Ltd., Gurgaon

The Project by M/s. IBP, Gurgaon (with the assistance of CMRI, Dhanbad) on 'Development of Heat Resistant Explosives' has been supported by DSIR with a financial support of Rs. 18.5 lakhs out of a total Project outlay of Rs. 65.4 lakhs. Field trial of Heat Resistant Explosive has been completed at 80°C and 100°C. Further trials at 100°C are being carried out. The project is under progress.

2.1.51 M/s. Indchem Research And Development Laboratory (IRDL), Chennai, and M/s. Semiconductor Complex Ltd. (SCL), Chandigarh

The joint project by M/s. IRDL, Chennai, and M/s. SCL, Chandigarh, on 'Development of MPEG-2 Decorder' has been supported by DSIR with a financial support of Rs. 70 lakhs out of a total Project outlay of Rs. 185 lakhs. The project is under progress.

2.1.52 M/s. Indus Natural Products Pvt. Ltd., Pune, and National Chemical Laboratory, Pune

Joint project of M/s Indus Natural Products Pvt. Ltd., Pune and National Chemical Laboratory, Pune is for `Development of Technology for L(+) Tartaric Acid, and Salts or Derivatives thereof, Pectin and Fruit Sugar from the Fruit of Tamarind' with DSIR support of Rs. 16.5 lakhs out of total project cost of Rs. 33.00 lakhs. Most common fruit from which tartaric acid is produced worldwide is grape, whereas in the present project tartaric acid is proposed to be manufactured from a totally new raw material tamarind. The process has been developed by National Chemical Laboratory, Pune and has been scaled up to a pilot plant scale of 350 kg. raw material per batch basis by M/s Indus Natural Products Pvt. Ltd., Pune. Pilot plant trials on batch of 50 kg and 100 Kg. tamarind have been completed.

2.1.53 M/s. Instrument Research Associates Pvt. Ltd, Bangalore

The Project by M/s.Instrument Research Associates Pvt., Ltd, Bangalore, on 'Design and Development of prototype making of CNC controlled plastics Switch board panel maker' has been supported by DSIR with a financial support of Rs. 8 lakhs out of a total Project outlay of Rs. 21.5 lakhs. Design of this machine has been completed and being vetted by CMTI. This machine is likely to create a new demand in the area of building and housing construction. The project is under progress.

2.1.54 M/s. JSL Industries Ltd., Vadodara and Electrical Research and Development Association, Vadodara

The Project by M/s. JSL, Vadodara, in collaboration with Electrical Research and Development Association (ERDA), Vadodara on 'Upgradation of Air Circuit Breaker' has been supported by DSIR with a financial support of Rs. 13.75 lakhs out of a total Project outlay of Rs. 34 lakhs. The project is under execution and prototypes with 50 KV Short Circuit rating have been successfully developed and tested. The project is progressing satisfactorily.

2.1.55 M/s. Karnataka Hybrid Microdevices, Bangalore

The Project by M/s. Karnataka Hybrid Microdevices, Bangalore on 'Innovative

Microelectronic Packaging Technology for Automobile under Hood Applications' has been supported by DSIR with a financial support of Rs. 38 lakhs out of a total Project outlay of Rs. 101 lakhs. The project is under progress.

2.1.56 M/s. Khandelwal Laboratories Ltd., Mumbai

The Project by M/s. Khandelwal Laboratories Ltd., Mumbai, on 'Enzymes for Bleaching and Softening' has been supported by DSIR with a financial support of about Rs. **1.00** lakh out of a total Project outlay of about Rs. **2.00** lakhs. The project is under progress.

2.1.57 M/s. Maharashtra State Seeds Corporation Ltd., Akola

The Project by M/s. Maharashtra State Seeds Corporation Ltd. on 'Development and Testing of Mini Dry HCl Gas cotton seed delinting plant.' has been supported by DSIR with a financial support of Rs. 31 lakhs out of a total Project outla·· of Rs. 93 lakhs. The project is under progress.

2.1.58 M/s. Mecpro Heavy Engg. Ltd., Ludhiana

The Project by M/s.Mecpro Heavy Engg. Ltd., on 'Efficient Extraction plant' has been supported by DSIR with a financial support of Rs. 35 lakhs out of a total Project outlay of Rs. 95 lakhs. The prototypes of equipments have been developed and have been installed in the plant. The performance trials in the plant are in progress. The project is under progress.

2.1.59 M/s. NATCO Pharma Ltd., Secunderabad

The Project by M/s. NATCO Pharma Ltd., Secunderabad in collaboration with Indian Institute of Chemical Technology (IICT), Hyderabad on "Development of Pilot Level Anaerobic Reactor Pharmaceutical Waste" has been supported by DSIR with a financial support of Rs.30 lakhs out of total project outlay of Rs.98 lakhs. Lab work, the basic process design of the Pilot Plant and detailed engineering design have been completed. Efforts are on to setup a Pilot Plant at M/s. NATCO Pharma assisted by IICT. The project, which is enviro-friendly, is in progress.

2.1.60 M/s. National Aluminium Company Ltd., (NALCO), Bhubaneswar

The Project by NALCO, Bhubaneswar on 'Recovery of Gallium from Sodium Aluminate Liquor' has been supported by DSIR with a financial support of Rs. 217 lakhs out of a total Project outlay of Rs. 1277 lakhs. The project involves setting up and operating a pilot plant to recover 1T/annum of 5N purity gallium from spent sodium aluminate liquor through mercury amalgamation route developed by CECRI, Karaikudi. The project is under progress.

2.1.61 M/s. National Research Development Corporation (NRDC), New Delhi and M/s. Aesthetic Technologies, Kolkata

The joint project by M/s. National Research Development Corporation and M/s. Aesthetic Techno-logies on 'Interactive Multimedia for IPR Training' has been supported by DSIR with a financial support of Rs. 20 lakhs out of a total Project outlay of Rs. 40 lakhs. The project is under progress.

2.1.62 M/s. P S G Industrial Institute, Coimbatore

The Project by M/s. PSG Industrial Institute, Coimbatore, on 'Development of Frequency Converter/Controller and High Frequency Submersible Motor Pump Sets For Irrigation' has been supported by DSIR with a financial support of Rs. 6 lakhs out of a total Project outlay of Rs. 13 lakhs. The motor for this pump has been specifically designed, fabricated and tested at full load. The controller has been designed and under development. The design of the pump has been frozen and development activities are in progress. This pump can reduce the number of stages from 10 to 1 for the same head, discharge and power. This project is likely to create a good demand in the agricultural sector. The project is under progress.

2.1.63 M/s. Parag Fans and Cooling Systems Ltd.,

The Project by M/s. Parag Fans and Cooling Systems Ltd., on 'Development Of Energy Efficient Fan System' has been supported by DSIR with a financial support of Rs. 28 lakhs out of a total Project outlay of Rs. 72 lakhs. The prototype fans of 1400 and 1600 mm sizes have been designed and fabricated using the FRP. Both the fans have been tested on the conventional fan systems. The FRP fan system for both the fans are in design and fabrication stages. These FRP fan systems can save the energy by 15 to 20 % over the conventional fans. This project is likely to create a replacement as well as new demand in the textile industry. The project is under progress.

2.1.64 M/s. Pennwalt India Ltd, Mumbai

The Project by M/s. Pennwalt India Ltd., Mumbai on "Coating of Chemical Process Equipment with Fluoropolymers and other High Performance Powders" has been supported by DSIR with a financial support of Rs.20 lakhs out of a total project outlay of Rs.67.05 lakhs. The company has undertaken the coating trials of the fluoropolymers. The technical specifications for the equipment to be fabricated are being finalised. The project is in progress.

2.1.65 M/s. Praj Industries Ltd., Pune

The Project by M/s Praj Industries Ltd., Pune on 'Development and Demonstration of BIOMAC - Mechanised Accelerated Biocomposting Technology' for treating, at pilot plant level, distillery effluents and for producing bio-compost material, has been supported by DSIR with a financial support of Rs. 49 lakhs out of a total Project outlay of Rs. 117 lakhs. The pilot plant has been commissioned and performance trials are in progress.

2.1.66 M/s. SBEM Pvt. Ltd., Pune

The Project by M/s. SBEM Pvt. Ltd., Pune for 'Indigenous Development of RADAR Level Gauging Systems' has been supported by DSIR with a financial support of Rs. 16.49 lakhs out of a total Project outlay of Rs. 34.62 lakhs. The project is under progress.

2.1.67 M/s. S M Creative Electronics Ltd., Gurgaon

The Project by M/s. SM Creative Electronics Ltd., Gurgaon on 'Development of Miniature DC/DC Convertor for Line Cards' has been supported by DSIR with a financial support of Rs. 10 lakhs out of a total Project outlay of Rs. 28.6 lakhs. The project is under progress.

2.1.68 M/s. Sankar Sealing Systems (P) Ltd., Chennai

The Project by M/s. Sankar Sealing Systems (P) Ltd., Chennai, on 'Development and Indigenising of Asbestos Free Cylinder Head Gaskets for TATA Indica Diesel Cars' has been supported by DSIR with a financial support of Rs. 27 lakhs out of a total Project outlay of Rs. 69.7 lakhs. The project is under progress.

2.1.69 M/s. Semiconductor Complex Ltd. (Scl), Chandigarh and M/s. Bharati Telecom Ltd. (BTL), New Delhi

The Project by M/s. SCL, Chandigarh and M/s. BTL, New Delhi, on 'Development of Technology For Production of Single Chip Telephone ICs and Telephone Instruments Based on Single Chip Telephone ICs' has been supported by DSIR with a financial support of Rs. 35 lakhs out of a total Project outlay of Rs. 89 lakhs. The project is under progress.

2.1.70 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh and Centre For Development of Advanced Computing (C-DAC), Pune

The joint project of M/s SCL, Chandigarh and C-DAC, Pune is for development of ASIC (Application Specific Integrated Circuit) for Indian languages computing system GIST II and the related card involving DSIR support of Rs. 30 lakhs out of total project cost of Rs. 50 lakhs. The ASIC is under fabrication. The project is under progress.

2.1.71 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh and Electronic Research & Development Centre (ER&DC), Thiruvananthapuram

The joint project by M/s. S C L, Chandigarh and ER&DC, Thiruvananthapuram, on 'Development of ASIC for STD-PCO Machine' has been supported by DSIR with a financial support of Rs. 32.5 lakhs out of a total Project outlay of Rs. 99.64 lakhs. The project has resulted in successful development and demonstration of FPGA (Field Programmable Gate Array) based STD-PCO machine. Technology Transfer activities have also been initiated by ER&DC. The project is under progress.

2.1.72 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh and M/s. S M Electronics & Services Ltd., New Delhi

The Project by M/s.SCL Chandigarh and M/s. *SMES Ltd., New Delhi, on 'Development of* Bilingual Pager based on ASIC' has been supported by DSIR with a financial support of Rs. 40 lakhs out of a total Project outlay of Rs. 94.9 lakhs. The project is under progress.

2.1.73 M/s. Semiconductor Complex Ltd. (SCL), Chandigarh and M/s. Shree Pacetronix Ltd., Indore

The Project by M/s. SCL, Chandigarh and M/s. Shree Pacetronix Ltd., Indore, on 'Design & Development of Indigenous Pacemaker Based on Single Chip and The Programming Unit' has been supported by DSIR with a financial support of Rs. 40 lakhs out of a total Project outlay of Rs. 90 lakhs. The project is under progress.

2.1.74 M/s. Shyam Telecom Ltd., Gurgaon

The Project by M/s. Shyam Telecom Ltd., on 'Design and Development of Remote Energy Metering System (REMS)' has been supported by DSIR with a financial support of Rs. 54 lakhs out of a total Project outlay of Rs. 147.8 lakhs. The project is under progress.

2.1.75 M/s. Southern Petrochemical Industries Corporation Ltd., (SPIC), Chennai and Indian Institute of Chemical Technology (IICT), Hyderabad

The joint project by M/s. SPIC, Chennai, and IICT, Hyderabad on 'Development of Process of manufacture of Pyrazinamide' has been supported by DSIR with a financial support of Rs. 219.5 lakhs out of a total Project outlay of Rs. 520 lakhs. The project is under progress.

2.1.76 M/s. TCM Ltd., Bangalore

The Project by M/s. TCM Ltd., Bangalore on "Development of Carnon-di-oxide Route for the Manufacture of Barium Carbonate" has been supported by DSIR with a financial support of Rs.30 lakhs out of a total project outlay of Rs.140 lakhs. Based on the use of lecofines with Barytes in the continuous rotary kiln. The flue gases from the rotary kiln have been treated and the carbon dioxide obtained has been successfully employed for precipitation of barium sulphide to get barium carbonate. The project is in progress.

2.1.77 M/s. Tamilnadu Petroproducts Ltd., Chennai and Indian Institute of Petroleum (IIP), Dehradun

The Project by M/s. Tamilnadu Petroproducts Ltd., Chennai, in collaboration with IIP, Dehradun, on 'Manufacture of Long chain (C10-C14) Alcohols by oxidation of N-Paraffin in the production of Linear Alkyl Benzene(LAB)' has been supported by DSIR with a financial support of Rs. 55 lakhs out of a total Project outlay of Rs. 134 lakhs. 40-45% conversion of N-paraffins into secondary alcohols, per pass, at a selectivity of about 95% has already been achieved in the project through the use of novel catalysts and the work at IIP, Dehradun has resulted in 6 patent applications. The work at IIP, Dehradun, is completed.

2.1.78 M/s. Tamilnadu Zari Ltd., Kancheepuram

The Project by M/s. Tamil Nadu Zari Ltd. on 'Establishment of a Technology Demonstration Facility for Super Fine Wire Drawing of Silver Alloy for ZARI Application' has been supported by DSIR with a financial support of Rs. 19 lakhs out of a total Project outlay of Rs. 69.96 lakhs. The project is under progress.

2.1.79 M/s. Targof Pure Drugs Ltd., Hyderabad

The Project by M/s. Targof Pure Drugs Ltd., Hyderabad on 'Development of Synthetic Route for Manufacture of Binapthyl Crown Ether' has been supported by DSIR with a financial support of Rs. 40 lakhs out of a total Project outlay of Rs. 133.5 lakhs. The project is under progress.

2.1.80 M/s. Turbotech Precision Engineering Pvt. Ltd., Bangalore, National Aerospace Laboratories, Bangalore and M/s. Shakthi Sugars, Erode

The joint project being executed by M/s. Turbotech Precision Engineering Pvt. Ltd., Bangalore in collaboration with NAL, Bangalore and M/s. Shakthi Sugars, Erode is for the development of low cost gas turbine (LCGT) generator set of 500 KW power class, with multi fuel capability (biogas, piped natural gas and diesel fuel) involving DSIR support of Rs. 87.37 lakhs out of total project of Rs.361 lakhs. The prototype of Low-cost Gas Turbine System has undergone no-load test successfully. The LCGT system is under testing at full load at TurboTech's Turbine Testing Centre, Nelamangla. The project is under progress.

2.1.81 M/s. United Telecoms Ltd., Bangalore

The Project by M/s. United Telecoms Ltd., Bangalore. on 'Design & Dev. Of ADSL (Asymmetric Digital Subscriber Line)' has been supported by DSIR with a financial support of Rs. 55

lakhs out of a total Project outlay of Rs. 127 lakhs. The project is under progress.

2.1.82 M/s. Zen Technologies Ltd., Secunderabad

The Project by M/s. Zen Technologies Ltd., Secunderabad on 'Interactive Small Arms Training Software - Intensive Computer Based Training Aid Meant to Help Trainees Perfect Advanced Marksmanship Skills Including Skills Based on Judgement and Reflex' has been supported by DSIR with a financial support of Rs. 60 lakhs out of a total Project outlay of Rs. 138.7 lakhs. The project is progressing satisfactorily.

2.1.83 M/s. ARDEE Business Services Pvt. Ltd., *Visakhapatnam*

The project of M/s. ARDEE Business Services Pvt. Ltd. on "Development of four channel RAMDARS system" has been supported by DSIR with a financial support of Rs. 70 lakhs out of total project cost of Rs. 147.30 lakhs. The project is progressing satisfactorily.

3. CUSTOMS DUTY EXEMPTION FOR GOVERNMENT FUNDED R&D PROJECTS

In pursuance to Customs Notification No.50/96 Customs dated July 23, 1996 for Customs Duty Exemption on components, consumables, equipments etc. used in R&D projects supported by Government, 22 Essentiality Certificates for nearly Rs.84 lakhs worth of components and consumables under 7 technology development projects supported under "Programme Aimed at Technological Self Reliances" scheme of DSIR have been issued.

4. TECHNOPRENEUR PROMOTION PROGRAMME (TePP)

The Ministry of Science & Technology has launched a novel programme known as "Technoprencur Promotion Programme (TePP)" jointly operated by Department of Scientific & Industrial Research (DSIR) and Department of Science & Technology (DST) to tap the vast innovative potential of the citizens of India. TEPP is a crucible to promote individual innovators to become technology-based entrepreneurs (Techno-preneurs). Any Indian citizen having an original idea/ invention/know-how can apply under this programme. During the year 15 projects have been considered for support under the programme so far.

A number of product prototypes/models developed with financial support under TePP were displayed in a 5-day exhibition under the theme of "AGROVISION 2001" organised during the 88th session of 'Indian Science Congress-2001' held at Indian Agricultural Research Institute (IARI), PUSA Campus, New Delhi (3-7 January, 2001) in an exclusively created pavilion viz. "INNOVATIVE INDIA" under the broad theme "MIND to MARKET". The basic aim of the exhibition was to - diffuse and disseminate various information regarding the activities of TePP and PATSER among concerned scientific groups & masses.

The Innovative products displayed under TePP during the exhibition viz. Tiltable bullock cart, Cost effective polythene bag filling device-Kittanal, Innovative Cotton Stripper, Fire fighting "ROBOT", Cattle Driven Pump, Disk-brakes for Rickshaws & Bicycles, Natural- Vegetable dyes, Hydrogen-oxygen gas Welding Machine, Furniture using waste tyres etc. were some of the innovations which received the attention of visitors. This exhibition also included poster demonstration of PATSER projects for products/process such as 6-Hi Cold Rolling Mills; Deep hole site mixing slurry explosives; 70T Dumpers, 400 HP Wheel Dozers, 10T excavators, transmission controllers for off highway dump trucks; Green ginger processing for manufacture of ginger oil; Computerised braille transcription system; Low cost gas turbine; Efficient solvent extraction technology; Moisture meter for road constructions etc.

A large number of visitors including Scientists, Technocrats, Professors, Teachers, representatives of corporate houses, Students, Farmers visited the Innovative India pavilion during the said exhibition.

5. EXPECTED OUTPUTS AND BENEFITS

The completed technology development projects supported under PATSER Scheme have resulted in significant technological and commercial returns to the industries concerned such as cost reduction, higher quality, improved products and processes as well as foreign exchange savings, while building up the R&D capabilities of the industrial units. The on going projects are expected to result in high commercial / societal impact and will lead to commercialisation and utilisation of `state of the art' technologies. There have been useful interactions and linkages with other concerned Government departments, National Research Organisations and users during evaluation, approval and implementation of various projects supported under PATSER scheme.

V. SCHEME TO ENHANCE THE EFFICACY OF TRANSFER OF TECHNOLOGY (SEETOT)

The "Scheme to Enhance the Efficacy of Transfer of Technology (SEETOT)" covers the following programmes :

A) National Register of Foreign Collaborations and Technology Management (NRFC & TM)

B) Transfer and Trading in Technology (TATT)

C) Promotion and Support to Consultancy Services (PSCS) which also includes the Consultancy Development Centre (CDC)

Activities and achievements of each of the above programmes are presented here.

V(A). NATIONAL REGISTER OF FOREIGN COLLABORATIONS (NRFC) AND TECHNOLOGY MANAGEMENT(TM)

1. PREAMBLE

The "National Register of Foreign Collaborations and Technology Management" (NRFC & TM), which is an ongoing Plan Scheme, continued its operations during the year 2000-2001. It has completed a number of programmes that were targeted for the year.

2. OBJECTIVES AND ACTIVITIES

The main objective of the Scheme is to facilitate efficient acquisition and management of technology in the country. The following major activities are carried out under NRFC & TM:

- Compilation and analysis of data on approved foreign collaborations.
- Undertake studies in select areas.
- Provide assistance in the effective transfer of technology process and efficient management of technology.
- Co-ordinate with Ministries and other organisations.
- Organise interaction & awareness programmes on technology related issues.

Activities undertaken, under the NRFC & TM scheme can be put into following broad categories :

- Compilation and analysis of data on foreign collaborations approved
- Studies on technology development and management
- Studies on managing technology at enterprise level (case studies)
- Training, Awareness programmes and Interaction meets for enhancing technology management capabilities.
- Networking
- Enriching resource base

The importance of technology management is increasingly being realised by industry, R&D organisations and others. Considering the need for enhancement of awareness of the subject, knowledge and skills in this area, the DSIR has initiated a number of multifaceted programmes and activities on the subject. The programmes and activities cover organisation of awareness programmes, undertaking studies, undertaking research reports, organising training programmes etc. These are taken up in close association with industry, R&D organisations, institutes of management & technology, consultancy organisations, government departments and others.

3. COMPILATION AND ANALYSIS OF FOREIGN COLLABORATIONS APPROVALS

In-house compilation of primary data on Foreign Collaborations approved was continued during the year. The compilation for the year 1999 was brought out. It contained information such as names of Indian companies, the names of foreign collaborators, products covered under the collaborations, duration, nature etc. The compilation for the year 2000 is in progress.

4. STUDIES ON TECHNOLOGY DEVELOPMENT AND MANAGEMENT

A) In India, certain States occupy pre-dominant position in terms of production of electronics items.

The contribution from Eastern and North Eastern Region happens to be nominal (around 3.22% only) of the total production of electronic items the country. Thus a study on "The Status and Prospects of Electronics Industry in Eastern and North Eastern States" has been taken up. This study is being conducted through West Bengal Consultancy Organisation Ltd., Calcutta. The main objective of the study is to analyse the present and future prospects of electronics industry in the region, identify the constraints if any, assess the growth opportunities in major product groups, identify sources of technology and also the development efforts required. The study would also contain project profiles, including investment range on the identified opportunities for the ready guidance of prospective entrepreneurs. The study has been finalised. The major findings of the study are discussed below :

The prevalent growth and development in electronics industry in the Eastern part (comprising of states namely Bihar including Jharkhand, Orissa and West Bengal) is relatively smaller as compared to that achieved by the Northern and Southern States of the country. The uneven growth pattern owes to manifold reasons, inclusive of geographical location, infrastructure constraints and varying degrees of regional/state level initiatives. North Eastern Region fraught with many limitation and consequently electronics industry has not much developed in this part.

On present reckoning, there are 692 electronic manufacturing units in Eastern and North Eastern Region. Most of the units 97% are concentrated in Eastern Region, i.e, in the States of Bihar including Jharkhand, Orissa and West Bengal. In North-Eastern Region, Nagaland, Arunachal Pradesh and Mizsoram have no electronic manufacturing unit. In terms of electronic production, the contribution from the North Eastern States also happens to be very little.

Inspite of overall gloomy situation, in electronics sector, in Eastern and North-Eastern Region, the silver lining owes to the existence of the IT sector. While West Bengal and Orissa have already moved ahead in this sector, some of the North Eastern States like Tripura and Assam also followed the suit. The situation appears to be encouraging with noticeable initiative taken by the Ministry of Information Technology, Govt. of India to implement a major project for connecting all the blocks in seven North Eastern States and Sikkim through Computer Information Centres shortly.

Manufacture of electronics items in India has undergone a sea change over the past few years. The emphasis is on indiginisation that has led to efficiency which has narrowed down the technology gap in manufacturing and today the indigenous products are more closer to the international standards than ever before. To develop the technology in all the segments of electronics in India, a number of technology missions have been undertaken to develop technologies needed for the country in association with technical institutions like IIT, Kanpur; IIT, Chennai; IIT, Kharagpur and various other development agencies like ER&DC, SCL, Chandigarh, ECIL, Hyderabad etc. In IT and allied service sector however India has made tremendous progress although little progress has been made in the hardware sector. Technology development in North-Eastern India has lacked behind than that prevalent in other parts of the country. However in IT and allied services the technology and skill developed is more of less at par with the technology in other parts of the country.

Present estimated market size of black and white & CTV and radio in Eastern and North-Eastern Region is around 20-21% of all India production. The production of consumer electronic items in this region (Eastern & North-Eastern Region), however is insignificant and most of the items are imported from the other regions. Local brand of this region like Webel Nicco in West Bengal, AMTRON in Assam and MONITORN in Manipur have lost their initial market share to the major international brands.

The penetration of computers in this region is around 0.1-0.15% of the total population at present. The computer population in the region is estimated at 2.5 – 3.8 lakhs nos. which is about 10-15% of all India population of computers. Due to government initiative, the personal computer penetration rate is likely to be around 1% by 2000 and 1.5% by 2005. The estimated PC population during the corresponding period is likely to about 27 lakhs and 28.3 lakhs respectively. Keeping pace with the increasing computer population, the market size of computer peripherals is also likely to increase from Rs. 986.45 crores at present (1999) to Rs. 1054 crores by 2005.

The market size of process control equipment in this region is only about 17% of all India production. Recent investment in power and petrochemicals sector may accelerate the growth of industrial electronics and process control equipment.

Total market size of software has been estimated at around 8% of all India market. The region accounts for about 5% share of all India software export market. It appears that there is more competition in the software market than that of Remote Processing activities, which require less investment but generate more employment. Government of West Bengal, Orissa, Assam and Tripura have taken initiatives for development of IT and IT enabled services in the respective states by way of formulating their respective IT policy and creating STPs and other infrastructure facilities including cyber connectivity in the state. This is expected to bear fruits in near future.

The study report also provides 20 project profiles in the field of Electronics which are considered suitable for the North Eastern Region. These include, Software Technology Park (STP), Call Center, Software Development Center, Cyber Cafe etc.

B) A Study on "Valuation of Intellectual Property Rights" has been taken up. This has been carried out by Waterfalls Institute of Technology Transfer, New Delhi. The objective of the study is to bring out the available techniques for valuation of IPR in different environments. It is also to present indicators relating to IPR as an aid in various stages in technology management including technology sources, technology assessment, technology selection and others, drawn from actual cases taken from global information networks. The study has been completed. Salient features are :

- It has brought out available techniques for the valuation of intellectual property which are concurrently in use in many agencies where primary function is to value such assets. Some of the methods are being Cost based, Market based and Income based.
- Patent related valuation indices and economic models valuing innovation are also included.
- There is no unique method suitable for all situations

Some of the highlights of the report are :-

I. Intellectual property is an advance indicator of some of the events that follow. The difficulty in assessing intellectual property arises from the fact that its value is not based upon what happened yesterday or what is happening today. It depends upon what in fact is, will generate in the next few years and what investments are required in this process to maximise those returns. While a universal search is on and no definite thumb rule formally has become available that can apply across a wide front, recent efforts have shown that the number of patents, the impact factors on those patents, the science linkage it will have, and the technology cycle time involved, would all influence the technological strength of a company.

II. The technological competitiveness of an organisation can be judged from such an assessed number representing the technological strength. However, at certain times this number representing the technological strength could be considerably influenced by the technology strategy of the company. The competitiveness of the organisation thus could perhaps be judged only over a few years.

III. While some uncertainties of this nature are pointed out in major areas relating to technology collaborations, perhaps one useful index could be based upon the technological strength of a company. The desirability of a collaboration, if possible with a company whose technological strength is higher than that of another would perhaps be a useful starting point. However, it would not be correct that, the lower strength at a given time is an undesirable entity for collaboration. Factors which are favorable for acquisition of technology could also be judged from the relative patent score card parameters.

IV. Obviously, the position for determining the desirability of investment in new area of research have more risks than in conventional technological domains. Biotechnological firms, firms specialising in semiconductor material as well as telecommunication sector give broad indication of the present technological strength of such companies.

V. The problems could often come when offers of technology are from companies whose technological strength has not yet been assessed as may particularly happen with companies which are established very recently. The risks to be assigned in such collaborations and investments will naturally be high but at the same time when successful they could turn out to be very profitable investment options.

VI. A search into the balance sheet of a company and determining whether intangible assets are properly reflected could also be a useful indictor. However, this has to be used with caution since there are examples in which high profile companies with high investments in advertising can perhaps try to be equally competitive to those with impressive R&D backing with large intellectual property assets.

Compilation of current cases in Trade Secrets has been completed. This was assigned to Waterfalls Institute of Technology Transfer, New Delhi. It has given 101 case decisions selected in various counts of law on different aspects of trade secret protection. The report addresses some of the emerging issues in the field of trade secret. The cases are grouped into eleven subjects :

- What can be a trade secret,
- What is not a trade secret,
- Measure to ensure security,
- Misappropriation,
- Restrains and covenants,
- Inevitable disclosure,
- Injunction,
- Damages,
- Jurisdiction,
- Liability,
- Other – legal aspects.

The report could be a useful guide in the context of new development in the domain of trade secrets and in dealing with the emerging issues in our situation.

C) During the various programmes taken up by the Department, it has been observed that many a time, industrial units particularly those in the small and medium sectors, entrepreneurs, consultants and even R&D organisations wish to seek assistance, to solve a specific production problem, product upgradation or even for development of a new product or a process. But the information as to the institutions where R&D facilities are available, subjectwise, and who are willing to offer their services, is generally not available at one place. Once this is available, they could approach them for solutions to specific technical problems or for sponsoring research or for training or for other assistance. To facilitate this, a compilation of R&D Capabilities Available in Select Institutions in India has been brought out.

The information is based on replies received from various laboratories of Council of Scientific and Industrial Research (CSIR), Defence Research and Development Organisation (DRDO), Indian Agricultural Research Institute (IARI), Indian Space Research Organisation (ISRO), Department of Atomic Energy (DAE), Indian Council for Medical Research (ICMR), Scientific and Industrial Research Organisations (SIROs) and In-house R&D Units. These organisations were requested to indicate their areas of expertise, where they were willing to offer their services to other organisations. This publication covers around 250 institutes/organisations with around 1400 Science/Technology fields/groups. It may however be noted, that the publication does not contain information in respect of all the R&D institutes in the country since only those who have replied, are included. It also does not reflect the entire capabilities of a responding institution, as only those areas where the institute is willing to provide assistance have been presented.

D) The state of Madhya Pradesh is bestowed with huge forest wealth. In order to collect an actual account of this wealth which could be harvested for value added products by infusion of technology, a study on "The Status of Minor Forest Produce (MFP) Based Industries in the State of Madhya Pradesh" has been taken up. The study is being conducted through the Madhya Pradesh Consultancy Organisation Ltd., Bhopal. The major objective of the study is to gather information and analyse the occurrence and availability of commercially important MFP in each agro climatic zone of the State of Madhya Pradesh. It will analyse the present methods of collection, grading, pricing and marketing mechanisms for the MFP and suggest how to improve the effectiveness and identify commercially viable enterprises based on available MFP. It would also assess the export and indigenous market potential for MFP based products, identify suitable technologies for manufacturing MFP based products and assess the viability of commercial plantation of MFP species found suitable for commercial exploitation. The report would also identify potential project opportunities together with sources of appropriate technology, for ready guidance of prospective entrepreneurs. The study is being finalised.

E) North Eastern Region of the country has a rich wealth of aromatic and medicinal plants, a study on "The Essential and Medicinal Plant Species in the North Eastern Region – Their present Status and Strategy for Development," has been taken up. This

study is being conducted through the North Eastern Industrial and Technical Consultancy Organisation (NEITCO) Guwahati. The basic objective of the study is to collect information on essential and medicinal plant species, their present status with regard to their availability, production, commercial utilization etc. The study would cover identification and systemization of plants with potential medicinal and biocidal value, listing their uses, estimation of the available quantity, their commercial utilization, estimation of the present level of technology being utilized for preparation of medicines from the herbs or plants and sources of improved technologies and equipment, both indigenous and imported. The study would also suggest strategies for utilization of plant species for commercial purposes and for the economic benefit of the region as a whole. The study is being finalised.

F) A study on the status of technology management education in India has been taken up. This has been entrusted to Educational Consultants India Ltd., NOIDA. The objective of the study is to carry out a comprehensive analysis of the status of education in technology management related subjects, in India. The study proposes to cover the technology management courses conducted in the various educational institutes, covering both technical and management streams, as well as in the training institutes set up by the industry. The study is in progress.

G) A study on the status of technology management education in select countries has also been taken up. This study has been entrusted to Indian Institute of Technology Delhi. The objective of the study is to analyse the status of education in technology management related subjects, in select countries. The study would inter-alia highlight the status of technology management education in the industrially advanced countries and some of the new industrializing countries. The countries that are proposed to be covered include USA, Japan, Germany and some select European countries, Israel, China and one south-East Asian Country. The study has been initiated.

H) A study on Technology Audit in select small and medium enterprises by TA Pai Management Institute is in progress. The objective of the study is to assess the present status of product/process technology in select sectors. Based on the assessment, factors inhibiting technology development, identification of key areas requiring innovation efforts would be dealt with.

5. STUDIES ON MANAGING TECHNOLOGY AT ENTERPRISES LEVEL (CASE STUDIES)

Case studies analysing the way, technology is managed in corporate settings in our context are very important inputs. Two studies were completed during the year. These studies have covered several aspects, such as devising a strategy for developing corporate plans for technology, its suitable integration with the business plan, R&D management, organisational structures, factors responsible for technological growth in the organisations, make or buy decisions on technology, methodologies for induction and implementation of new technologies etc. Such case studies have provided useful inputs to decision makers and reseachers, apart from being very useful pedagocical tools for academicians and trainers in management and technical institutes, including those of industry, and others.

6. TRAINING AND ORIENTATION PROGRAMMES

The need for training in various facets of technology and knowledge management is being increasingly realised by industry, R&D organisations and institutes of technology and management. A number of such programmes were organised. The Core Group (composition of the Group etc. has been specified in para 7) had also suggested organisation of such programmes particularly in the Regional Engineering Colleges. The basic objectives of these programes is to interact and provide useful inputs to R&D personnel, managers in industry, faculty and researchers in educational institutes. Various subjects such as technology strategy, R&D management, technology pricing, intellectual property rights and others are covered. During the year, the following Orientation programmes on technology management issues were held.

- For Regional Engineering Colleges at Calicut, Rourkela, Bhopal, Jaipur and Nagpur.
- For PSG Institute of Management.
- For Vellore Engineering College.

A programe was held on Learning Materials for Technology Management Education in association with IIT, Bombay.

A programe on R&D Management was organised in association with IIM, Calcutta.

Three Programmes were organised particularly for Small and Medium Enterprises, one at Dharwad in association with KCTU and Centre for Entrepreneurship Development of Karnataka, the second at Shimoga in association with KCTU and District Industries Center and the third at Hubli in association with KCTU & North Karnataka Small Scale Industries Association.

A programme on Intellectual Property Rights (IPR) in software, Web development and electronic commerce was held in association with the Administrative Staff College of India. A programme on IPR in knowledge economy was organised in association with IIT, Bombay.

Useful inputs were provided to the Expert Group in its meeting organised by APCTT and DST in connection with preparing a Training Manual on Technology Management. Experts from the Division designed and assisted APCTT in organising & conducting an intensive Workshop on Technology Acquisition at Hanoi, Vietnam.

The Division rendered assistance to IIT, Delhi in respect of a module on "Technology Transfer" which is a part of their MBA Course with Technology Management as the core subject. The module has been structured and relevant topics identified. A few sessions were also taken as Guest faculty. The Division is providing technical assistance to University of Roorkee in Technology Management capsule in their MBA Programme. It also assisted in organising a Programme on Knowledge Management at the University.

7. NETWORKING

With the objective of widening and strengthening the impact of its efforts in the field of technology management, the Division has networked with a number of organisations. The following are mentioned, in particular :

Realizing the need for sustained joint efforts to enhance awareness of Technology Management issues and promote effective utilization of technology management methods, bring about better industry institute inter - linkages through a networking of the industrial needs with academic and R&D inputs, a Core Group has been set up in which industry, academia, Department of Education and the AICTE are closely involved together with the DSIR.

The main objective of the Group is to suggest strategies for enhancing the knowledge in, and skills in the practice of, Technology Management in educational and industrial systems; to meet the emerging needs of industry, R&D organisations and others in this discipline. Some of the suggestions made by the Group are under implementation.

The Division has entered into a Memorandum of Understanding (MOU) with IIT, Bombay in the area of Technology Management. A number of activities are covered. They include, modules and sessions on technology management, cases studies, newsletter, focussed research studies and others. Action on some of these activities is underway.

A Center for Technology Management (a knowledge center) is being set up by the PSG Institute of Management, Coimbatore, in association with the Division. It has multifarious activities, such as organizing interaction meets and short term courses, undertaking surveys/studies and others. An Advisory Committee is guiding its activities.

The Division has also close linkages with IIT, Delhi on various aspects of Technology Management. Efforts in building Industry - Institute linkages in association with Bangalore University are being made.

Keeping is view the importance of technology management to small and medium entrepreneurs a number of activities are centered towards meeting their needs in this area. A number of collaborative programmes have been taken up in association with the Karnataka Council for Technological Upgradation (KCTU) which is a joint venture between the Central Government, the State Government of Karnataka, Small Industry Associations and others. The Division has entered into a Memorandum of Understanding with them. It has a number of activities such as cluster studies, newsletter, information exchange and others.

8. RESOURCE BASE

Efforts have been made to further enhance the resource base in the field of technology management. A few of these are :

- Manuals on a few key issues in Technology Management

- Case studies
- Documented talks delivered under the DSIR's Distinguished Technologists lecture.
- Bibliographies on various issues in Technology Management
- Background material prepared for various programmes

The Division has assisted a number of academic institutes in establishing courses on Technology Management related subjects by provided useful inputs, material and guidance to suit their own specific requirements.

9. INDUSTRIAL TECHNOLOGY

The industrial technology activities have historically been dealt by DSIR wherein proposals received from Secretariat for Industrial Approvals (SIA) for grant of Letter of Intent (LOI) and / or Foreign Collaborations (FC) with or without import of capital goods, extension of Foreign Collaboration by Indian entrepreneurs, foreign entrepreneurs / organisations, from Non-Resident Indians (NRIs) and those willing to set up 100% Export Oriented Units (EOU). During the post-liberalisation period, this is continued based on proposals received. The following are the broad highlights:-

A. Industrial Licensing

About 260 proposals for grant of Letter of Intent / Carry-on-Business, Extension of Letter of Intent etc. were received during the year. 15 meetings of Licensing Committee were held by SIA during 2000.

B. Meetings Concerning Foreign Collaborations and Others

The department received around 150 proposals from Secretariat for Industrial Approvals. These excluded such proposals involving foreign investment, which were directly considered by the Foreign Investment Promotion Board. During the year, the Department participated in the 15 meetings of the Project Approval Board and 11 meetings of the Board of Approvals for 100% Export Oriented Units held by SIA.

V(B). TRANSFER AND TRADING IN TECHNOLOGY (TATT)

1. OBJECTIVES

The TATT scheme mainly aims to promote technology intensive exports including export of technologies, projects and services. The measures adopted include:

- Supporting studies aimed at documentation and analysis of India's technology export capabilities in select sectors, technological requirements of other countries, technology export related policies and associated IPR issues, etc.
- Publicity and dissemination of Indian technological capabilities through workshops, trade fairs, delegations and video films;
- Supporting demonstration of exportable technologies overseas as well as within India;
- Supporting Small and Medium Enterprises (SMEs) for value addition and export production;
- Facilitating linkages between R&D institutions and industry in hi-tech areas for technology exports.

2. ACTIVITIES

The TATT scheme became operational during the year 1986-87 through a cell set-up in DSIR for this purpose. A number of programmes and projects aimed towards its objectives were completed during the 7th Five Year Plan. A re-organisation of schemes took place at the beginning of 8th Five Year Plan, when TATT scheme became a part of SEETOT programme and the Technical Advisory Committee was reconstituted. The thrust of the projects during 1985-1992 has been towards documenting our technological expertise and capabilities, preparation of technology profiles of select developing countries, and enhancing export efforts in the area of technology transfer through seminars/workshops, and video films. The focus during the 8th five year plan was intended to be generally towards commercialization of exportable technologies through setting up demonstration plants and export market development. Other activities undertaken related to compilation of data on technology exports and promotion of export of technology intensive services. However, DSIR did not receive many proposals from the industry or R&D institutions for demonstration plants. Since beginning of 9th plan period, programmes have been evolved mainly to project our technology related capabilities. These included compilation and dissemination of technology export related publications and encouraging exporting organisations including R&D institutions to participate in international trade fairs in India and abroad. A Technical Advisory Committee was reconstituted during 1997-98 to guide and advise as regards the implementation of the scheme. Six meetings of the Technical Advisory Committee have been held till December 2000. Details of some of the projects/activities completed or in progress during the year under report are given below:

2.1 Publication on Technology Exports and Exportable Technologies.

The publication contains information on technologies actually exported as well as technologies having potential for exports. The publication analyzes the data on technology exports and exportable technologies and highlights export trends in terms of sectors, destinations etc. Besides containing details such as brief company profile, details of exportable technologies available with the company, preferred mode of technology transfer, preferred export destinations etc, there is a separate section giving details of technologies actually exported. The publication serves as a ready source of reference to foreign customers who are looking for technology business partners from India. The target audience for the publication includes foreign embassies/missions in India, Indian embassies/ missions abroad, foreign business delegations visiting India and Indian delegations going abroad, exporting organisations and consultancy companies. The publication is being brought out annually, in association with Indian Institute of Foreign Trade, New Delhi. Publication containing information and data of about 120 technology intensive organisations pertaining to the year 1998-99 was brought out during the year.

2.2 Newsletter on Technology Exports

A quarterly Newsletter on Technology Exports, initiated during the year 1998-99 was continued. The Newsletter is being compiled by IIFT under the guidance of Editorial Board, comprising of representatives from DSIR, IIFT, Exim Bank, Ministry of External Affairs, ITPO and Waterfalls Institute of Technology Transfer. The Newsletter includes a lead article and details on technology export related policies, global technology and India's technology developments, joint-ventures, India's achievements in technology exports, technology offers and requests etc. The Newsletter has been greatly appreciated by industry, embassies/missions and other export promotion councils.

2.3 Technology Exports Pavilion and HERBO: 2000 Exhibition at India International Trade Fair, New Delhi, Nov 14-27, 2000

The objective of setting up a Technology Exports Pavilion was to promote display and dissemination of information related to technological capabilities, products and technologies of companies and organisations including R&D laboratories, product design institutes and academic institutions. The Technology Exports Pavilion was setup jointly by Department of Scientific and Industrial Research (DSIR) and India Trade Promotion Organisation (ITPO) for the fourth time in succession since 1997. The space in the Technology Exports Pavilion was offered free (cost shared equally by DSIR & ITPO) to the organisations engaged in technology intensive business, thereby encouraging them to exhibit their technology export capabilities. A space of 500 sqr. mtrs. was reserved in Pragati Maidan for the Technology Exports Pavilion. Concurrently with the Technology Exports Pavilion, the HERBO: 2000 Exhibition was organized by M/s Herbal Bio-Med Foundation, New Delhi.

Around 40 organisations, both from public and private sectors including national R&D laboratories participated in the Technology Exports Pavilion. These included Central Pulp & Paper Research Institute, Central Electronics Limited, Centre for Development of Advanced Computing (C-DAC), Central Drug Research Institute, National Botanical Research Institute, HEG Limited, All India Herbal Ayurvedic Research Association, Central Ground Water Board, National Research Development Corporation, Mecpro Heavy Engineering Ltd., National Council for Cement and Building Materials and Shriram Institute for Industrial Research. The participating organisations in the Pavilion displayed their technological capabilities through models, prototypes, interactive computer based displays, charts, machinery/product samples, etc. Central Ground Water Board was awarded the silver medal and National Research Development Corporation received a special commendation prize from ITPO for participation in the Technology Exports Pavilion.

Around 20 companies and research organisations participated in the HERBO:2000 Exhibition which displayed their products and services in the areas of herbs and medicinal plants and alternative systems of medicine. The participating companies included Colgate Palmolive India Ltd., Dabur, Ayush Herbals, Gurukul Kangri Pharmacy, Indian Herbs Research & Supply Company, Central Council for Research in Unani and Central Council for Research in Ayurveda & Siddha.

The Technology Exports Pavilion & HERBO:2000 Exhibition helped in promoting one-to-one interactions and business negotiations between the participating organisations displaying their technology intensive products, technologies, machinery, services, etc. and potential customers of Indian technology and services. These interactions, including interaction between R&D system and industry, generated many business enquires, besides creating awareness about our technological capabilities.

2.4 *Seminar on Herbal Products and* Technologies, November 17-19, 2000, Pragati Maidan, New Delhi

The Seminar was organised by M/s Herbal Bio-Med Foundation, New Delhi with the technical, administrative and financial support from DSIR and ITPO. The Seminar programme included sessions on Medicinal Plants & Herbs, Role of NGOs, R&D & Government Organisations in Awareness Creation, Health Care, Standardization of Drugs based on Alternative Systems of Medicines, Intellectual Property Right Issues, Health Foods and Biotechnology. The programme also included three workshops on Cardiology, Diabetes and Joints Pain. Main recommendations of the Seminar were: growers of herbs must be given hands-on training; industry should contribute funds for cultivation of herbs and medicinal plants; interaction between old ayurvedic practitioners in remote areas of the country and new practitioners, including those practising abroad should be encouraged; the conferences of this nature

must involve cultivators of herbs and other people at the working level; and such conferences should be organized in regions where herbs and medicinal plants are grown.

2.5 Technology Export Development Organisation

The main objective of the Technology Export Development Organisation (TEDO) - a Cell jointly setup by DSIR and CII, is to promote and support technology and technology intensive exports through collaborative efforts of government, industry, research & academic institutions, financial institutions and other export promotion agencies. The first Advisory Committee meeting of TEDO was held under the chairmanship of Secretary, DSIR and the second was planned. Several Executive Committee meetings were held to plan the focus areas and activities of TEDO. It was decided that TEDO would initially focus on four areas, namely Agro/Food Processing, Light Engineering, Indian Systems of Medicine and Homeopathy and Chemicals and Pharmaceuticals. The nature of activities planned include studies, training/awareness programmes, missions, fairs and seminars, technology demonstrations, etc. During the first year of TEDO operations: a brochure on TEDO was printed; four reports on Alternative Systems of Medicine, viz. Ayurveda and Siddha, Homeopathy, Unani and Yoga & Naturopathy have been prepared; a seminar to disseminate the findings of the report was planned in March 2001; and a website was designed for wider dissemination of technology based information.

2.6 Seminar on Industrial Products Design – New Delhi, April 12-13, 2000

The Confederation of Indian Industry (CII), New Delhi was provided a token support for preparation of the documentation pack in connection with the Seminar on Industrial Products Design. Product design and development is assuming greater importance for Indian companies to maintain their competitiveness, as more and more foreign companies are establishing business in India. Product design is particularly relevant for areas such as industrial products & components, capital goods and consumables. The main objective of the seminar was to provide a forum to the Indian Industry to focus its attention on key issues connected with management of product design and development and derive new initiatives to achieve their business goals. The seminar facilitated interaction of industry with national and overseas experts in the area. It also encouraged Indian companies to setup design centres for development of product design capabilities, which may in turn enhance their competitiveness and export potential.

2.7 Indian Industrial Products & Technology Exposition (INDIATECH-2000)– Cairo, Egypt, September 23-26, 2000

The above Expo was organised by Engineering Exports Promotion Council (EEPC) with the support of DSIR and other organisations. DSIR supported the participation of 3 CSIR laboratories (NCL, IICT and CDRI) in the above Exposition by offering them free space. A Theme Technology Pavilion was also setup under the auspices National Research Development Corporation. Ministry of Commerce and Embassy of India at Cairo actively coordinated the organisation of the event. The objective of DSIR support for the participation of national laboratories from the CSIR system in the Exposition was to provide an opportunity for interactions between R&D and industry of both the countries. The exposition was visited by over 5000 visitors and reported to have generated US $ 2 million worth of export orders and US $ 40 million worth of business and trade enquiries. One company dealing in ceiling fans claimed to have received enquiries worth US $ 300 million. In the overall context, while the exposition proved to be fairly successful in terms of business generation, it also provided useful tips to the organizers for future. The Expo was an endeavor to create awareness about Indian capabilities in the North African region in view of the potential and significance of trade and cooperation in technology intensive projects, products and services.

2.8 Newsletter on IPR for Industry

Waterfalls Institute of Technology Transfer (WITT), New Delhi has been commissioned to bring out 24 monthly Newsletters: "IPR for Industry", focusing on 6 areas viz. leather, sports goods, foundry, knocked down furniture, machine tools and locks. The objective of these newsletters is to create awareness about Intellectual Property Rights among technology based Small and Medium Enterprises. It is hoped that the newsletter would help SMEs in taking advantage of the latest technological trends contained in patents, designs, etc. for improving their technological capabilities and enhancing their export production. The newsletters are being published since June 2000 and have already covered all the six areas.

It is also proposed to organise workshops to assess the impact of the newsletter and to sensitize and obtain feedback from user SMEs as regards their specific IPR related requirements.

2.9 Exportable Technologies from Small and Medium Enterprises of Maharashtra

Maharashtra Industrial & Technical Consultancy Organisation Ltd. (MITCON), Pune has been entrusted to prepare 20 comprehensive profiles of exportable technologies in the 3 chosen sectors, viz. food processing, light engineering & electrical and chemicals & pharmaceuticals from SMEs in the State of Maharashtra. The profiles would cover information on techno-commercial details of the technology, details of the organisations offering the technology, illustrating their competence and details of the foreign markets for the technology. Preparation of profiles was in progress. MITCON was in the process of collecting information from around 40 units through a questionnaire and field visits.

2.10 *International Workshop on Sustainable* Strategy for Promoting Export Competitiveness of Knitwear Industry – Tirupur, August 23-25, 2000

The above Workshop was organised by Infrastructure Leasing & Financial Services (IL&FS) and other agencies under the aegis of CSIR's GOI-UNDP Umbrella Programme at Tirupur. DSIR provided technical support and also participated in the Workshop. The Workshop was attended by around 60 participants from select international organisations, government agencies, research associations, NGOs and knitwear units operating in Tirupur. The Workshop highlighted the emerging challenges before the Indian textile and garment industry, in particular the knitwear industry, in the post 2005 period when the MFA quotas under the WTO would be phased out. The importance of environment friendly technologies and processes and the need for integrating these in the overall business strategy rather than just reacting to the regulatory pressure was emphasized. Promotion of the "Tirupur" brand of garments in the global market was voiced by one and all. Efficient utilization of the Technology Upgradation Fund to meet the emerging challenges was recommended. It came out that there is an urgent need to upgrade the existing laboratories for testing and certification of textile products & processes and also, to setup new laboratories equipped with ultra-modern facilities. It was reported that upgradation of about 48 laboratories has been done and 7 new laboratories have been setup. The Commonwealth Science Council (London) representative presented details of a database prepared by them viz. Cleaner Operations and Manufacturing for Productivity and Resource Enhancement (COMPARE), used for benchmarking the operating units on the basis of their performance. The Commonwealth Knowledge Network was also discussed, used by the operating units to source raw materials, machinery, etc. and to find solutions to their problems.

2.11 Miscellaneous

Interactions were continued and strengthened with technology related organisations and advisory services were rendered as required. During the year the technology related exports have increased in absolute terms as well as a percentage of the total exports.

The following technical papers were prepared and presented during the conferences.

- "Technological Innovation and R&D In Infrastructure Sector" – prepared for Technical Session on "R&D and Related Export Potential" during NAFEN's XIV International Conference & Exhibition - INFRATECH 2000, December 5, 2000 New Delhi.

- "Sustainable Urban Development Through R&D and Technological Capability Building" – prepared for Technical Session on "Urban Development" during NAFEN's XIV International Conference & Exhibition - INFRATECH 2000, December 6, 2000 New Delhi

3. TECHNICAL ADVISORY COMMITTEE

Fifth and sixth meetings of the Technical Advisory Committee for the TATT and the Consultancy Schemes of DSIR were held during the year. The Technical Advisory Committee noted the progress of work under the two schemes and advised on the proposals received for support as well as future activities. Projects, studies and other activities recommended by the Technical Advisory Committee were taken up for implementation.

V(C). PROMOTION AND SUPPORT TO CONSULTANCY SERVICES

1. OBJECTIVES

The objectives of the Scheme include:

- To promote and strengthen consultancy capabilities for both domestic and export markets.
- Support to Consultancy Development Centre (CDC) and other promotional organisations related to consultancy.
- Human Resource Development including fellowships to bright and promising engineers as apprentices with eminent consultancy organistions, arrange training etc.
- Support R&D efforts of consultancy organisations and commercialisation of indigenous technologies.
- Organise Seminars, Workshops, etc. and document consultancy capabilities.
- Create awareness among users of consultancy.

2. ACTIVITIES

Some of the programmes/activities carried out during the year till December, 1998, are briefly indicated below:

Some of the programmes/activities carried out during the year till January 2001, are briefly indicated below:

(a) Documentation of Consultancy Capabilities and Experience

36 reports on consultancy capabilities in specific industrial sectors as well as at state level have been printed so far under the scheme. These reports have been widely disseminated.

In addition to above, the following studies were at various stages of implementation/ consideration.

(i) Study on Status of consultancy services in India

Precise information is not readily available on the overall consultancy capability scenario in the country To fill this gap, this study was taken up with the objective to compile information/data about the credentials and achievements of consultants including their profiles, through Consultancy Development Centre (CDC), New Delhi. The study is completed. CDC involved Tata Consultancy Services and Consulting Engineers Association of India (CEAI) for carrying out the study. The final report is printed and disseminated through CDC.

(ii) Study on policies and incentives available to consultants in other countries.

With a view to have insights of various policies and incentives available to consultants in other countries for the promotion and development of consultancy profession, a study was commissioned to Consulting Engineers Association of India (CEAI). The study is completed. The report gives information of 46 developed and developing countries on various aspects related to policies and incentives available to consultants in these countries. The final report is printed and disseminated through CDC.

(iii) Study on role of Consultants in R&D and Innovation

With a view to enhance the interactions of R&D laboratories in CSIR system with consultants and widely disseminate their technological and consultancy capabilities to industry, this study is commissioned at NISTADS and is also to explore nature and extent of involvement of external consultants in R&D and Innovation activities of CSIR labs. It examines potential of R&D through consultancy for consultancy development in R&D organisations. The study in nutshell covers – specific technical areas, nature of services provided, Intellectual property generated, period of consultancy, Amount involved, Nature of clients, Export of R&D services, R&D collaborations and future prospects, etc. Information on issues related to the involvement of consultants in R&D and Innovations have been collected through a structured questionnaire as well as from field visits. The data

have been analysed and report prepared. The study has been completed and will be evaluated for finalisation of the report.

(b) Promotion of Design Engineering Service Centres and Consultancy Clinics

Though India has developed considerable consultancy capabilities in several areas, consultants need to develop design and engineering capabilities in specific industrial sectors, particularly in the context of globalization, and thus become more competitive. These capabilities would also be useful in commercialising and marketing of indigenous technologies. Also, consultants and consultancy services need to be utilised optimally not only by big and medium industries, but by the small-scale industries as well. Keeping these objectives in view DSIR has evolved programmes for promotion of Design and Engineering facilities in specific sectors, such as food processing, textile etc. and Consultancy Clinics to support SMEs particularly those located in clusters. The following centres/clinics have been supported/under consideration.

(i) Food Processing Technologies and Services Centre at Kanpur

Keeping in view the large concentration of food grain production and food processing industries particularly the SMEs in the state of Uttar Pradesh, this centre is set up by U.P. Industrial Consultants Ltd., (UPICO), a technical and commercial consultancy organisation of U.P. State and Financial organisation, and CFTRI jointly to help the food processing industries in the North-Western region of the country. The centre is functional at Kanpur and is rendering services to the existing entrepreneurs or the new ones desiring to set up food related industries, on payment basis. Some revenues have also been generated by UPICO through the services of the Centre. UPICO-CFTRI have carried out in-depth survey related to potential and availability of raw material for Food Processing Industry in the state of Uttar Pradesh. This report is printed and is widely disseminated. The pre-operative phase of the project is completed and support for post-operative phase for 3 years was being examined for consideration.

(ii) Consultancy Clinic for Textile Industry at Bhilwara

With a view to provide doorstep professional services for textile industry in particular and other industries in general, this consultancy clinic is set up by Rajasthan Consultancy Organisation Ltd. (RAJCON) at Bhilwara. The clinic started operations, and clients started availing the services of the clinic. However, the progress slowed down due to management problems at RAJCON. DSIR reviewed the project and it was decided to utilise services of Institute for Labour Development (ILD), Jaipur which is also an IFCI supported organisation for developing skills and provide consultancy in the textile sector. The long term and short term plan is being prepared by ILD and RAJCON.

(iii) Consultancy Clinic for Lime Kiln Industry at Katni

With a view to provide doorstep professional services for lime kiln industry in particular and other industries in general, this consultancy clinic is set up by Madhya Pradesh Consultancy Organisation Ltd. (MPCON) at Katni. The clinic has started operations. Awareness campaigns have been started for clients for availing services of the clinic.

(iv) Other Proposals

Similar proposals from other organisations such as Andhra Pradesh Industrial and Technical Consultancy Organisation Ltd. (APITCO), etc. were under active consideration for consultancy clinics for different SME clusters.

(c) Institutional Programme Support

DSIR has been supporting capital and recurring needs of Consultancy Development Centre (CDC) set up to promote consultancy and implement programmes towards strengthening our consultancy capabilities.

3. REPORTS/PUBLICATIONS/PAPERS

A number of technical papers/reports relating to technology & consultancy, including the following were prepared and presented in various technical fora.

- A paper on "Status and Development of Consultancy Services in India" for TCDPAP International Workshop on "Technical Consultancy Services: Strategies for Globalisation" held in Kuala Lumpur, Malaysia – April 2000.

- A paper on "Prospects for Consultancy Exports in the Knowledge Economy" for Fourth National Consultancy Congress on

"Consultancy in the Knowledge Economy: Prospects and Profits" organised by CDC at New Delhi - January 2001.

- A report on "Status of Technology Incubation Systems for Promoting Hi-tech Enterprises in Developing Countries" as a study assignment from ESCAP.

4. ADVISORY SERVICES

Advisory services were made available to various consultancy related organisations, Departments and Organisations in relation to their programmes and activities. Following are examples of participation.

4.1 Committees

i) Governing Council, Executive Committee, Membership Committee, Awards Committee for Excellence in consultancy, Review and Technical Committees of 4th National Consultancy Congress of CDC, Bye-laws and CDPA committees of CDC.

ii) Consultancy Committee of FIEO

iii) Boards of Directors of U.P. Industrial Consultants Ltd., Kanpur and Rajasthan Consultancy Organisation Ltd., Jaipur.

iv) Board of Governors of NICMAR, Bombay.

v) Governing Council of CEAI.

4.2 Seminars/Workshops/Meetings

i) Technical and organising committees for Fourth National Consultancy Congress organised by CDC at New Delhi in January 2001.

ii) Various Committees of IIFT and IGNOU, New Delhi.

iii) ESCAP seminar on "Technology Incubators" held at Seoul, Korea – August 2000.

iv) National Seminar on "Food Processing Policy" organised by Department of Food Processing Industry – September 2000.

v) International Conference on "FIDIC Global Contracts for Construction Projects", 20-21 January, 2001, New Delhi.

5. CONSULTANCY DEVELOPMENT CENTRE (CDC)

5.1 Background

CDC came into being as a registered society in January 1986, and is functioning from its office at India Habitat Centre Complex since May 1994. The centre is managed and guided by a governing Body consisting of representatives of consultancy organisations, R&D institutions, Government Departments, academic institutions, public sector units etc. CDC had a membership of 234 as on 31-3-2000, representing various types of consultancy organisations and individuals connected with the consultancy. The CDC has concentrated mainly on development of human resources, providing computerised data/information services, and strengthening of technological and managerial consultancy capabilities through a scheme known as "Consultancy Development, Promotion and Assistance (CDPA)" Scheme. CDC is providing consultancy/training in ISO-9000 and 14000 Quality Management Systems, and has been awarded certificate for ISO-9002 by a Norwegian Company.

5.2 DSIR Support

An amount of Rs.74 Lakhs was provided as grant during 1999-2000, and a release of Rs.62.5 Lakhs was under consideration during 2000-01. The capital assets at CDC include computer systems with peripherals and accessories as well as some software. This facility is used for collection, analysis and dissemination of data, for training of engineering graduates and for small consultants. It is estimated that these investments have resulted in useful activities for nurturing consultants and users of consultancy for better returns on investments and enhanced earnings of foreign exchange directly and indirectly, besides several other qualitative advantages bringing long term benefits to the country. The centre is equipped with Library facilities for consultants.

A committee was constituted by DSIR to review and formulate the MOA, Bye-laws & Rules etc. of CDC, under the chairmanship of Shri S.B. Krishnan, the Secretary, TDB. The committee has submitted its report to DSIR which is under consideration.

5.3 Technical Consultancy Development Programme for Asia and Pacific (TCDPAP)

In order to enhance technological and managerial capabilities as well as the export capabilities of consultants, interactions with international organisations – such as World .Bank, Asian Development Bank, African Development Bank, International Trade Centre (ITC), UNIDO, ESCAP, APCTT, have been developed and programmes have been arranged for consultants at national and international levels which have proved to be useful to promote consultancy business. CDC has been identified to be a nodal agency for Technical Consultancy Development Programme for Asia and the Pacific (TCDPAP) by ESCAP. CDC was again nominated to function as secretariat for TCDPAP upto 2000 AD during its Second Meeting of Advisory/Promotional Committee. The first General Council meeting of TCDPAP held in October 1997 in Dhaka recommended that TCDPAP should be developed as an independent UN identity. The Second General Council Meeting of TCDPAP was held in Kuala Lumpur, Malaysia during April 2000 in which CDC has been retained as secretariat for TCDPAP for another 4 years w.e.f. September 1, 2000.

5.4 Activities

Some of the salient features of the activities carried out by CDC during 2000 are as under:

5.4.1 ISO Certification for CDC

Surveillance audit for renewal of ISO Certification for CDC was carried out by M/s Det Norske Veritas (DNV) on 10th August, 1999. It was found that the Centre confirmed to the requirements of ISO Standards and was recommended for renewal of certificate for a period of one year. Further renewal was not considered necessary and hence no renewal for ISO Certification was taken till January 2001.

5.4.2 MOU for ISO-14000 Certification

CDC entered into a Memorandum of Understanding with Anglo American Environment Quality and Safety Certification Services Ltd. (AAEQS) in 1998 for a period of 2 years for Conducting Advanced Lead Auditors Course and Internal Auditors Course in ISO-14000 for CDC becoming a Certifying Agency in the area. Also, another MOU was signed between CDA and NQA Quality System Ltd. (NQAQSR) for ISO-9000 Consultancy. This MOU is expired and further MOU is not signed.

5.4.3 Training

- During the year, CDC organised 4 short term specially structured training programmes on ISO-9000 Quality Management Systems and ISO-14000 Environmental Management System for consultants and small industries managers, to train them in design, development and implementation of ISO-9000 and ISO14000 systems.

- Several amendments and modifications were made in the syllabus of MS Consultancy Management Programme being organised in collaboration with BITS, Pilani. Advertisement was released for admission to the 5th batch of MS Programme which commenced in January 2001.

5.4.4 Consultancy in ISO-9000 QMS

During the year, CDC completed four ISO-9000 Facilitation Projects of Gammon India Ltd., Intercontinental Consultants and Technocrats Pvt. Ltd., Singhania and Partners and International Print-O-Pac Ltd., and projects of five organisations such as Central Road Research Institute, Uttar Pradesh Industrial Consultancy Organisation Ltd., National Institute of Training for Highway Engineers, U.P. State Bridge Corporation Ltd. and Delhi Development Authority were under execution. for getting them ISO-9000 Certification and bring improvements in their functional areas and a professional fee of Rs. 7.81 lakhs was received by CDC by March 2000 for these projects.

5.4.5 Study Assignments

- The centre completed a report on Consultancy Services in India, on behalf of DSIR. The final report was printed.

- A study commissioned by DSIR on Technology Status and Prospects of Bio-Degradable Plastics in India was under progress.

- A project assigned by DSIR on Development of TQM Web site was under progress.

5.4.6 Database and Information Services

The database of Consultants and Consultancy Organisations was augmented during the year. About 1400 profiles of Consultants/ Consultancy Organisations were updated on a regular basis. A National Directory of Consultancy Services – 2000 was prepared and printed.

5.4.7 Developmental Services

Contact/Interaction Programmes

- A two-day interaction meet on Consultancy Opportunities and Emerging Issues in Biotechnology was organised. Besides, till January 2001, nine monthly meets on various aspects of consultancy were also organised.
- During the year, CDC had close interactions with the Technical Consultancy Organisations (TCOs).
- The centre continued with the scheme for R&D experts as Associates, to utilise their expertise in various developmental activities useful to consultants.
- The centre continued the scheme for business developments for consultants through a fortnightly bulletin on business opportunities, which gives information on project opportunities likely to emerge in India and in global markets for consultants and professionals.

Fourth National Consultancy Congress

The above Congress was held on 15-16 January, 2001 at New Delhi, with its theme as "Consultancy in the Knowledge Economy: Prospects and Profits". The Congress was attended by about 300 Indian and foreign consultants, exporters, policy makers, industry representatives, R&D personnel, and others relevant to consultancy. Four National Awards for excellence in consultancy were given away in this Congress. Also, MS Degree Certificates were given to the pass out candidates for the year 2000 in the valedictory session on 15.1.01.

Rating/Grading of Consultants

A committee was constituted (under the Chairmanship of Shri S.P. Agarwal, Scientist-G, DSIR) for finalisation of criteria and methodology to be adopted for Rating/Grading of Consultants. Two meetings of the committee were held during the years 1998 to 2000. Substantial work was done by the Task Force in this regard and a scheme is likely to be evolved next year.

Scheme for Skill Upgradation of Consultants

Application of one consultant for financial assistance to attend training programmes under the skill upgradation scheme were approved during the year.

5.4.8 International Cooperation

The second General Council Meeting of TCDPAP was organised in Kuala Lumpur, Malaysia during April 2000 in which CDC was retained as secretariat for a further period of four years w.e.f. September 1, 2000. The office bearers of the General Council and Executive Committee were re-elected to continue office for another term with the exception that representatives from Indonesia, Iran and Korea were replaced by those from Nepal, Philippines, Vietnam in the Executive Committee. This meeting was followed by a three-day workshop on Strategies for Globalisation. 33 papers were presented during this workshop.

5.4.9 Publications/Brochures of CDC

- The seventh issue of Newsletter "TCDPAP Focus" was brought out during April, 2000.
- Proceedings of the Interaction Meet on "Opportunities in Food Processing Industries in the Next Millennium" were brought out and circulated during July, 2000.
- Proceedings of the Interaction Meet on "Business Opportunities in Energy Management in Industrial Sectors" were brought out and circulated during August, 2000.
- Three issues of Quarterly Newsletter "Consultancy Vision" was brought out. 2300 copies of the same were disseminated.

Brochure on MS (Post Graduate) in Consultancy Management Training Programme

The brochure gives objectives, scope, implementation modalities and guidelines for the

programme. The same has been widely disseminated to Consultants, academia and others.

Brochure on "Technical Consultancy Development Programme for Asia and Pacific (TCDPAP)"

The brochure gives information about the initiation and establishment of TCDPAP. It further highlights how consultants can avail facilities under this programme.

National Directory of Consultants 2000 was printed. This Directory contains profiles of 166 member consultants of CDC.

5.5 Revenue

CDC has made serious efforts to generate revenues on its own. It has earned a revenue of about Rs.88.43 lakhs during the year 1999-2000 from services rendered to various agencies, membership fees etc.

VI. LINKAGES WITH INTERNATIONAL ORGANISATIONS

During the year, the Department continued to participate in the activities of various international organisations such as UNCTAD, WIPO, UNIDO, ESCAP and APCTT at various levels and fora on issues related to Technology Development and Technology Transfer in co-ordination with other concerned Ministries.

APCTT and ESCAP

The matters pertaining to the Asian and Pacific Centre for Transfer of Technology (APCTT) under ESCAP were dealt with in co-operation with the Ministry of Commerce. The Department of Scientific and Industrial Research continued to play the role of focal point for the APCTT. DSIR helped in preparing a brief covering technological issues for the use of Indian delegation to the 56th Annual Session of ESCAP held in June 2000 at Bangkok.

Shri K.V. Srinivasan, Adviser, DSIR participated in the Sixteenth Technical Advisory Committee meeting of APCTT held during 27-28 November-2000 and the Fifteenth Session of the Governing Board of APCTT held during 29-30 November 2000 in Bali, Indonesia. These meetings were attended by participants from China, Indonesia, Islamic Republic of Iran, Republic of Korea, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and others.

Institutional support worth US $ 100,000 in Indian Rupees was provided to the Centre.

Senior officers of the department also participated in various workshops/seminars conducted by the APCTT during the year.

VII. NATIONAL INFORMATION SYSTEM FOR SCIENCE & TECHNOLOGY

1. INTRODUCTION

The increasing role of science and technology in the economic and social development of the country has generated a pressing demand for faster technology transfer to the industries. Apart from providing access to the information generated within the country, an information system is required to draw from the externally generated information to support internal efforts on research and development. Information centres serving the needs of different industries and R & D units, are therefore required to be coordinated and organized into an integrated system to avoid a haphazard growth and duplication of activities and to conform to national and international standards.

The National Information System for Science & Technology (NISSAT) commenced its operations in 1977 with the objectives of organizing information support facilities for a customer base largely dominated by people engaged in research and academics. In tune with the changing global scenario and in pursuance of the national efforts in liberalization and globalization of the economy, NISSAT reoriented its programme activities continually in order to be useful to a wider base of clientele in diverse subjects. Besides establishing the internal linkages between the information industry, its promoters and users, NISSAT has been making efforts to establish a bridge between information resource developers and users in India and other countries.

2. THE BROAD OBJECTIVES

The broad objectives of NISSAT are:

- Development of national information services
- Promotion of existing information systems & services
- Introduction of modern information handling tools & techniques
- Promotion of international cooperation in information
- Development of indigenous products & services
- Organization of skill development programmes

2.1 Subject Coverage

The NISSAT programme has the mandate to cover the entire spectrum of science and technology. However, during the process of programme implementation, special care is taken not to dwell upon subjects already being handled by other national programme like the BTIS, ENVIS or an agency like the ICAR. NISSAT solicits the views of other programmes/agencies, which are responsible for a subject under the allocation of their business. NISSAT requests for the expert views of institutions/individuals working on a given subject or its allied areas when required. As a proactive and progressive step, NISSAT has taken the onus on itself to strengthen the library movement in the country through the introduction of modern information technology, tools and techniques.

As the boundaries between science and technology, social sciences, arts and humanities are fast disappearing, emphasis on activities on one area cannot subsist without the support of the other. Therefore, in due course, NISSAT would need to adopt the non-S&T subjects as well. Already, NISSAT does not differentiate between the S&T and non-S&T areas in the implementation of the library networks and manpower development programmes.

The main functions under the NISSAT scheme are the following:

i) Strengthening of information services through Information Centres in Science and Technology, Value Added Patent Information Services, National Access Centres to International Database Services, CDROM Database facilities etc.

ii) Development of an Indian S&T Webserver (Vigyan) covering a variety of Indian S&T information and establishment of an Internet School.

iii) Development of sector specific websites like Indian Tea, Indian Ocean Data, Indian Food & Technology, Indian IPR Law, IPR on Biotechnology etc.

iv) Promotion of Information resource sharing in Science and Technology through city-based library and information networks with emphasis on web-based information content development.

v) Development of skills in entire gamut of library and information activities and promotion of development of indigenous database activities.

vi) Implementation of National Plan of action on Scientometrics/Bibliometrics and conduct of a series of R&D studies.

vii) Distribution and technical backup services on internationally developed software CDS/ISIS, MINISIS and IDAMS and development and promotion of CDS/ISIS based co-products like SANJAY.

viii) Coordination of international activities in collaboration with UNESCO and ASTINFO.

ix) Development of Information Market - marketing of information, revenue generation, Industry-User Interaction etc. and publication of the NISSAT Newsletter 'Information Today & Tomorrow'.

3. NISSAT CENTRES

3.1 National Information Centres

A sectoral information centre is established on a product, discipline or a mission. Sectoral Centres provide bibliographic as well as factual and numeric information to meet the various information needs of academicians, scientists, technologists, entrepreneurs, management executives and decision makers.

The Sectoral Centres are usually built around the existing information resources and facilities. They maintain extensive collections of published and unpublished documents in the from of books, periodicals, R&D reports, technical reports, standards, patents and trade literature in their subject areas.

A list of the NISSAT initiated National Information Centres in different Sectors is provided in the **Table 1.**

NISSAT supported sectoral information centres are well equipped with modern information technologies. The mode of E-mail and Internet connectivity vary from one centre to another, but it is usually a combination of VSNL, ERNET and NICNET facilities. Given the high costs of leased lines, the centres are forced to use dial-up facilities. Only NICHEM, NICFOS, NICMAS have 64 Kbps lines through radio modems or VSATs. Besides providing documents and preparing bibliographies on request, they offer selective dissemination of information (SDI), current awareness services (CAS), reprographic & micrographic services, industrial and technical enquiry services, technical translation and similar access-delivery services. Some of the sectoral centres bring out serial publications, digests, indexing & abstracting materials and news highlights. Apart from publishing these in print form, the information is more often computerized.

3.2 NACIDs : National Access Centres to International Database Services

NISSAT established nine NACIDS facilities in Ahmedabad, Bangalore, Calcutta, Chennai, Delhi, Hyderabad, Mumbai, Pune, and Thiruvananthapuram for providing online facility to access international database services. The NACIDS provides search services from Dialog and STN databases. The centres are gaining popularity in spite of the fact that the users have to pay the full cost of a search. All the centres are now already established and are absorbed by the parent institutions. Knowing the success of exisiting centes, one more centre at Guwahati is established.

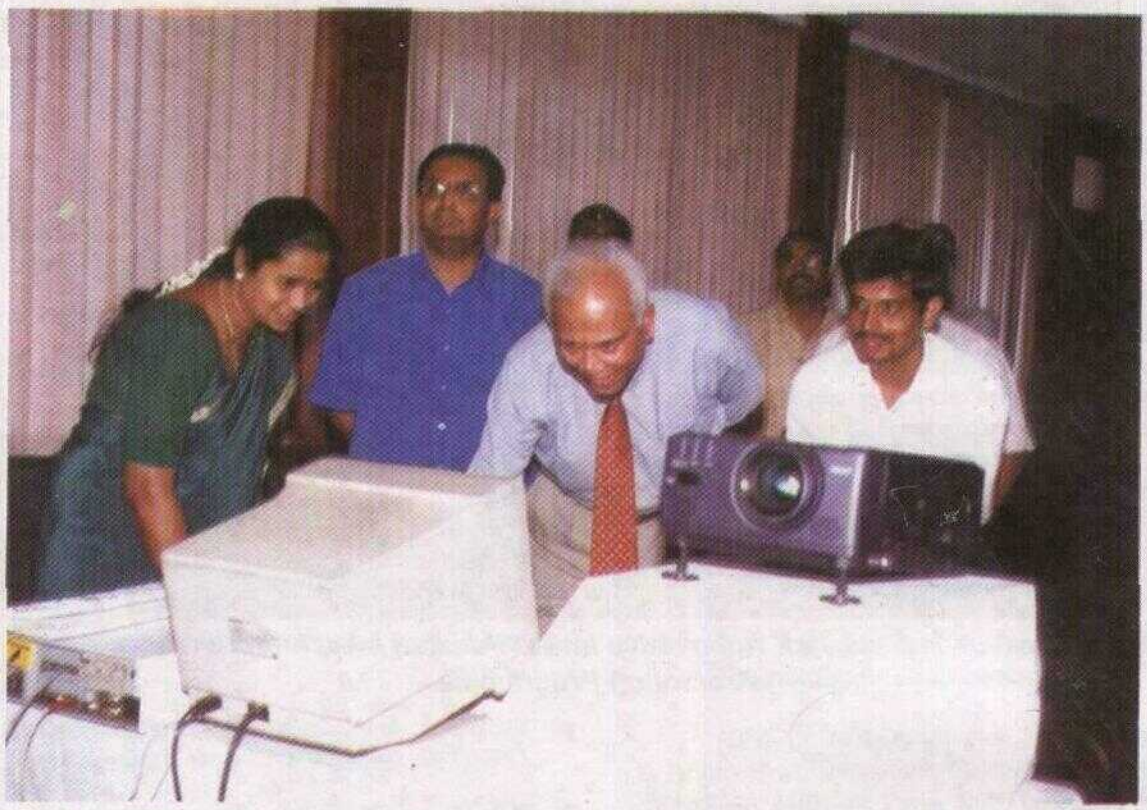
3.3 VAPIS : Value-Added Patent Information Systems

With the changing economic scenario in the country and the impending IPR regime, it is imperative to strengthen the patents information activities in India. The fierce competition faced by Indian industries, the necessity of the awareness of competitions innovations and the availability of foreign technology has made the patent information vital for the industry.

Considering the expert manpower available in the National R&D systems and the increasing need from industries for technical information, NISSAT established Value Added Patent Information System

IV.6 A view of "Innovative India" Pavilion – Technopreneur Promotion Programme

IV.7 A view of "Innovative India" Pavilion – PATSER Stalls



VII.1 The website for Intellectual Property Law, inaugurated at Bangalore by the Secretary, DSIR & DG, CSIR

VIII.A.1 Shri N.K. Sharma, MD, NRDC showing Rice Husk Particle Board sample to Hon'ble Dr. M.M. Joshi, Minister for S&T

Table 1. The NISSAT Sectoral Information Centres

NO.	SUBJECT AREA	ACRONYM	HOST INSTITUTION
1	Food Technology	NICFOS	Central Food Technological Research Institute, Mysore
2	Machine Tools Production and Engineering	NICMAP	Central Manufacturing Technology Institute, Bangalore
3	Textiles & Allied Subjects	NICTAS	Ahmedabad Textile Industry's Research Association, Ahmedabad
4	Chemicals & Allied Industries	NICHEM	National Chemical Laboratory, Pune
5	Management Sciences	NICMAN	Indian Institute of Management, Ahmedabad
6	Marine & Aquatic Sciences	NICMAS	National Institute of Oceanography, Goa
7	Publications on CD-ROMs	NCDROM	Foundation for Innovation and Technology Transfer, ITT, Delhi
8	Tea Manufacturing & Marketing	NICMAT	Tea Board, Kolkata
9	Drugs and Pharmaceuticals*	NICDAP	Central Drug Research Institute, Lucknow
10	Leather Technology*	NICLAI	Central Leather Research Institute, Chennai
11	Advanced Ceramics*	NICAC	Central Glass & Ceramics Research Institute, Kolkata
12	Bibliometrics*	NCB	Indian National Scientific Documentation Centre, New Delhi
13	Crystallography*	NICRYS	University of Madras, Chennai
14	CD-ROM*	NICDROM	National Aerospace Laboratory, Bangalore

* NISSAT financial support to the centres at serial no. 9 to 14 has since been withdrawn.

(VAPIS) at National Chemical Laboratory, Pune on Chemical Sector and Central Manufacturing Technology Institute at Bangalore on Engineering sector to offer specialized value added information services. The services are based on databases pertaining to US, Europe, World, Japan and other patents available on CDROM. Separate subset of the database on Chemicals is located at NCL, Pune and on Engineering in CMTI, Bangalore. Recently, VAPIS centre on Biotechnology is established at CCMB, Hyderabad.

The main objective of the centre is to take advantage of the expertise available with the host institutions to add value to patent information and offer such services to industry. The addition of value to patent information is made by analysing contents of the patents. Value addition to patent information involved understanding the contents of patents, and adding to them details of technology options, technology gaps and other items of crucial information.

4. INTERNET BASED ACTIVITIES

4.1 Web Servers

NISSAT has moved a step ahead by establishing websites/servers. The details are given at Table 2.

Table 2: NISSAT Supported Webservers/Websites

Subject	Host Institution	URL
Vigyan – Indian S&T	IISc., Bangalore	*203.200.16.99*
Intellectual Property Rights	National Law School of India University, Bangalore	*www.iprlawindia.org*
Indian Tea	Tea Board, Kolkata	*www.indiantea.org*
Indian Ocean Server	NIO, Goa	*www.indian-ocean.org*
MYLIBNET	CFTRI, Mysore	*www.mylibnet.org*

The focus on Indian S&T Webserver is to create an Internet Website for S&T and to use the facilities to operate an Internet training school. The Internet School will be used to train a multitude of users for effective use of Internet and trainers to act as web publishers and web administrators. The broad categories of information that would be hosted on the website would include, Policy and plan document, Institutional details, S&T projects, annual reports of S&T departments, expert manpower, Directory type of information, Forth coming conferences and events, Selected newsletters and journals of various S&T organizations, S&T news weekly etc.

Various Content Development projects like library materials module, extramural research, expert manpower, electronic theses and dissertations, etc are undertaken in coordination with various agencies for hosting on Vigyan Server.

NISSAT has collaborated with the National Law School of India University, Bangalore in setting up a national website for Intellectual Property Law.

The website for Intellectual Property Law, inaugurated on 22nd October 2000 by the Secretary, DSIR & DG, CSIR, is a comprehensive site for issues in intellectual property rights in India. The site would provide information on

- Indian law including revisions on patents, copyright, trademarks and designs, integrated circuits etc.
- Implications of new developments on database treaty, bio-diversity convention, product patent regime, TRIPS and Indian obligations etc.
- Resume of legal cases in Indian courts
- Panel of IPR Attorneys, firms and individuals.

The site would contain judicial decisions of Indian and foreign courts (along with relevant head notes) and a number of well-researched, innovative articles, highlighting recent trends and developments in intellectual property. The site hosts information on International conventions and in due course would provide texts of the Acts relating to all the areas of intellectual property: patents, trademarks, copyright, designs, trade secrets, integrated circuits, biodiversity, plants and seeds, microorganisms.

The site would also provide a showcase for events, seminars, job opportunities, available career and education choices, online help and archives of press releases.

The Indian Tea website will contain information on tea producers directory, tea exporters directory, overseas tea importers, tea statistics, tea economics, tea business and trade, tea research, machinery used in tea industry, info on tea cultivation and tea manufacture etc.

5. INFORMATION RESOURCE SHARING

With a mandate to facilitate provision of broad based information services in the country, NISSAT has taken initiatives for promoting resource sharing activities through Library Networks. These initiatives are aimed at ensuring better utilization of S&T information resources, minimization of functional load of information centres and encouragement of motivational factors to a large extend by better means of communication.

NISSAT strives further to develop self-sustaining information systems. With this end in view, NISSAT goes to the extent of setting up general infrastructural facilities like network service centres including hardware, software, manpower, organizational requirements and communication facilities. The participating institutions in a network have to arrange for their own terminal hardware,

software, manpower and to take the responsibility of database development. Of course, NISSAT extends support for training, and common facilities like development of standards, preparation of union catalogues, data conversion and so on. Table 3 provides a list of Network Hosts and network services management bodies.

Table 3. NISSAT Sponsored Metropolitan Information/Library Networks

Network	Host Site	Management
ADINET	INFLIBNET, Gujarat Univ. Campus, Ahmedabad	Society drawing support from INFLIBNET
CALIBNET	Regional Computer Centre, Jadavpur Univ. Campus, Kotkatta	Society
MYLIBNET	CFTRI, Mysore	Institutional Project
PUNENET	Bio-Informatics Centre, Pune Univ., C-DAC and NCL, Pune	Institutional Project

Network services centres provide Online and CD-ROM based search services. The PUNENET and MYLIBNET maintain their websites at *http://www.punenet.ernet.in* and *http://www.mylibnet.org* respectively.

6. INFORMATION TECHNOLOGY APPLICATIONS

The demand for use of computers ranges from automation of routine management functions in libraries to information retrieval or analysis of global databases. Since the inception, NISSAT had accorded a high priority to all aspects of computer based bibliographic information processing. As a part of the programme, NISSAT acquired proven software packages like **CDS/ISIS** for bibliographic information processing & retrieval and **IDAMS** for statistical data processing. NISSAT subsequently obtained the official rights for distribution of the two packages in India from UNESCO.

As on date, there are about *1729* installations of CDS/ISIS and 53 installations of IDAMS in India. The implementation of CDS/ISIS is monitored regularly through exchange of information, user's group meetings (eight such meetings have been held so far) and periodic surveys.

SANJAY is a package developed by NISSAT in collaboration with DESIDOC to help the libraries and information centres in India to improve their housekeeping and service functions through automation. The package is totally menu driven and can be used even by non-professionals. The package was released for marketing in September 1995, and till now it has an installation base of 60 sites. The development of SANJAY under windows environment with LAN support is under progress.

NISSAT has entered into an agreement with the MINISIS Resource Centre at the SNDT Women's University for marketing of the package and applications development.

7. DEVELOPMENT OF SKILLS IN INFORMATION SCIENCE AND TECHNOLOGY

Existing library and information science courses cannot keep pace with the rapid developments in the information field; there is a need to supplement these with continuing education programme at various levels. In view of the situation, NISSAT encourages and supports a variety of manpower development programmes which cover topics such as CDS/ISIS, WINISIS, Internet and Web Designing, TQM in Library Services, Patent Information for R&D and Industry, ISO 9000 Quality Management System, etc. Seventeen courses were organized during the current year.

8. RESEARCH & DEVELOPMENT AND SURVEY STUDIES

8.1 Scientometrics & Informetrics in India

In consultation with and active participation of the subject specialists, the NISSAT has formulated a plan of action for scientometric and informetric studies in India. As a first step in the implementation of a programme of coordinated research, NISSAT has completed eight projects on *National Mapping of Science* using CA,

Compendex, Inspec, SCI, Medline plus, BIOSIS, EMBASE, Georef, CAB, AGRICOLA, ISA databases. The executive summaries of these studies are hosted on Vigyan Server. The updation of the aforesaid studies has been taken as per details given in Table 4.

Table 4 : Project Areas under National Mapping of Science

Project Area	PI Institution
Agricultural Sciences	M.S.Swaminathan Foundation , Chennai
Biological Sciences	M.S.Swaminathan Foundation , Chennai
Mathematical Sciences	M.S.Swaminathan Foundation , Chennai
Geo-Sciences	Regional Research Laboratory, *Bhubaneswar*
Medical Science	Indian Council of Medical Research, New Delhi
Physics	National Physical Laboratory, New Delhi
Science & Technology	National Institute for Science, Technology, Development Studies, New Delhi

These studies attempt to map the Indian effort in science through analysis of Indian contributions to the scientific literature as covered in CD-ROM databases.

NISSAT also promotes and supports research and development and survey studies. The list of such projects/efforts during the year of report is given in Table 5.

9. DATABASE DEVELOPMENT ACTIVITIES

In pursuance of its thrust on contents development, NISSAT encourages indigenous database development activities. Besides library catalogues, union catalogues and lists, the activity could be on subjects in which a global database does not exist, or on subjects in which Indian elements are not properly represented. Table 6 indicates various projects supported by NISSAT during the period of support.

Table 5: Studies / Surveys supported by NISSAT

Activity	PI Institution
Indicators of Competence in Industrial Innovation	NISTADS, New Delhi
Database and Annual Publication on Bibliometric Indicators of Indian Science	NISTADS, New Delhi
Holistic improvement of leather workers through information support in selected villages in Tamil Nadu	CLRI, Madras
Assessment of Information Needs of Small and Medium Enterprises in Madhya Pradesh	MPCON, Bhopal
Vidyanidhi (Electronic Theses and Dissertations)	University of Mysore, Mysore

10. INTERNATIONAL ACTIVITIES

The activities of ASTINFO/UNESCO (Regional Network for the Exchange of Information and Experiences in Asia and the Pacific/UNESCO) are closely coordinated with those of NISSAT. The NISSAT Advisory Committee also functions as the *National Advisory Committee of UNISIST and the* National Advisory Group for ASTINFO. Besides, NISSAT has been included in the Advisory Group to guide preparation of the World Information and Communication Report 1999 prepared by UNESCO.

UNESCO also awarded to NISSAT a project on "Virtual Learning Community Facilities using 3-D Virtual Reality". This project is being executed in *collaboration with the Indian Institute of Science*, Bangalore.

NISSAT official was also invited to deliberate on "Knowledge Management" in Ulaan Baatar / Terelj in a UNESCO Regional meeting and on "Information Content Development" in Tokyo.

Table 6: Indigenous Database activities supported by NISSAT

Database Activity	PI Institution
Database of Indian Chemical & Pharmaceutical Industries	NICCHEM, NCL
Directory of manufacture of various kinds of Ferrous and Non-Ferrous and Special Castings	IIF, New Delhi
Bibliographical database of Indian Scientists	JNU, New Delhi
Indian Sugar Industry	VDIS, Pune
Directory of Libraries and Information Centres in Gujarat	GGSS, Ahmedabad
Database on Indian Website Using MINISIS	SNDTWU, Mumbai
Virus and Virology	NIV, Pune
Rosters of Experts and Resource Organizations for Rural Technology	RCIATM, Allahabad
Database on Silkworms	MKU, Madurai
Directory of Database on Agrochemicals Industry Sector	CCMB, Hyderabad

11. INFORMATION TODAY & TOMORROW (ITT)

Under the banner of ITT, two specific activities are undertaken.

- NISSAT organizes a national meet of information industry, promoters and users, every year. ITT2000 was held during November 22-24, 2000 at the National Aerospace Laboratories, Bangalore with a focused theme on Knowledge Management. Apart from serving as a technology watch, this meet also generates several recommendations, ideas and projects to support. The three-day event had an inaugural function, seven technical sessions consisting of 30 paper presentations, a panel discussion on Cyber Laws, three commercial presentations and an Info Quiz. The meet was well attended by information professionals, people from IT industry, and scientists from various national laboratories, representatives from other information systems, and also participants from international agencies.

- NISSAT has been bringing out its *NISSAT Newsletter* -- a quarterly newsletter since the beginning of the programme. Over the years, the format has undergone several revisions in keeping with the changing information scenario. Now, the contents include information on new tools and techniques, events concluded and announcements, interesting Internet sites, new database products and services. With a change in the title, *Information Today & Tomorrow (ITT)*, the quarterly periodical is distributed free to 5000 individuals and institutions. The Internet Edition of ITT, available at *http://itt.nissat.tripod.com*, comes out much before the publication of its print version. One can also browse through the back issues from 1995 onwards.

VIII. PUBLIC SECTOR ENTERPRISES

VIII(A). NATIONAL RESEARCH DEVELOPMENT CORPORATION (NRDC)

1. INTRODUCTION

National Research Development Corporation (NRDC) is the principal organisation established by the Government to act as a link between scientific laboratories and industrial establishments for transferring technologies. It is a unique organisation in that it is the only public enterprise wholly dedicated to transfer of technologies from R&D laboratories to industry. What is more, its operations cover the entire spectrum of industrial technologies ranging from chemicals to metallurgy, mechanical engineering, electrical engineer, electronics, biotechnology etc.

During the year 1999-2000, the Corporation continued to face the challenges of marketing indigenously developed technologies under the liberalized industrial regime with confidence. The Corporation has recorded significant improvement in performance in all most all areas of operations, including profitability. The Corporation has earned Lumpsum Premia and Royalties amounting to Rs.197.18 lakhs as compared to Rs. 172.71 lakhs during the previous year.

2. PROFIT

The Corporation's endeavour in improving its image and relations with the industry, rational pricing of technology and optimising expenditure has helped to increase its Gross Profit to Rs 51.97 Lakhs, during 1999-2000 as compared to Rs 45.96 lakhs during the last year 1998-99.

The gross income of the Corporation from all sources, including premia and royalties, but excluding grants-in-aid, was Rs. 385.77 lakhs as compared to Rs. 284.70 lakhs in the previous year.

The Department of Public Enterprises has given the 'Very Good' rating to your Corporation for its MOU performance during the last year (1998-99).

3. PROCESSES ASSIGNED AND LICENCE AGREEMENTS CONCLUDED

The Corporation continued its efforts to identify new technology resources by nurturing long term relationships with R&D Organizations as well as Universities/Technical Institutes in India and abroad. The Corporation signed MOU's with new organisations in the year viz. Research Development Centre for Iron and Steel, Steel Authority of India Ltd., Ranchi and Krishi Tantra Sanstha, Pune for assignment of technologies. The number of processes assigned to the Corporation for commercialisation was 25 as compared to 42 in the previous year. Some of the commercially important processes assigned to the Corporation during the year were:

- A Process for Making Bio-fertilizer in Liquid form for Foliar Application using Non-symbiotic nitrogen fixers and by converting them in dormant form
- A Process for making Phosphate solubilising Bio-fertilizer in liquid form using phosphate solubilising micro-organisms and converting them into dormant form
- A Technology for the production of controlled release formulation of an insect growth regulator for mosquito larval control
- Laser based thickness measurement system for plates for online application
- A Napi Monitor System
- Ayurvedic Formulation for Treating Leukaemia
- Thio Glycolic Acid from Mono-chloroacetic Acid
- Aliphatic Xanthates from Alcohols and Carbon Disulfide

VIII.A.2 *Shri N.K. Sharma, MD, NRDC presenting a cheque to Dr. R.A. Mashelkar, DG, CSIR and Secretary, DSIR for Premia & Royalty collected on CSIR processes*

VIII.A.3 *Shri N.K. Sharma, MD, NRDC signing licence agreement for commercialisation of Plasticisation for making Bentwood Components*

VIII.A.4 *Signing of agreement between TDB and Twenty First Century Battery Limited, Chandigarh for Lithium-Lithium Ion Battery Project*

VIII.A.5 Hon'ble Minister for Science & Technology and HRD, Dr. Murli Manohar Joshi presenting Award for the development of a bio-inoculant

VIII.A.6 Korean Ambassador Mr. Pak Myong Gu operating the Pedal Operated Rice Mill – an awarded invention

VIII.A.7 Hon'ble Chief Minister Shri Chandra Babu Naidu taking keen interest in the activities of NRDC

- Catalyst grade Vanadium Pentoxide and its deposition on catalyst carriers from red mud to final stage
- Manganese dioxide of gama structure (CMD)
- Carbon monoxide eliminator
- Herbal Pesticide

4. MAJOR TECHNOLOGIES LICENSED

Due to aggressive marketing of technologies, the Corporation was able to sign 39 licence agreements during the year as compared to 27 agreements signed in the previous year. Some of the major technologies licensed by the Corporation during the year were:

- Infectious Bovine Rhinotracheitis (IBR) Vaccine
- Preparation of Katha from Uncaria Gambier
- Glycol Based Antifreeze Coolant
- Test Kit for Microbiological Quality of Drinking Water
- 20 HP Tractors
- Digital Sensing and Analysis of Bio-signals for Medical Data Base Management System
- Anti Corrosive Treatment for Steel Reinforced Rods
- Small Capacity Rice Husk Fired Water Tube FBC Boilers
- Resham Jyothi (A Silkworm Bed Disinfectant)
- Manufacture of Sacrificial Anodes, Magnesium Alloy and Zinc Alloy Anodes for Cathodic Protection
- A technique for wood plasticisation for making Bent wood

5. TECHNOLOGY DEVELOPMENT PROJECTS

The Corporation has been promoting and financing in collaboration with industry/R&D institutes, technology development projects for setting up pilot/semi commercial/demonstration plants. The Progress on the major technology development projects is given below

5.1 On-Going Projects:

5.1.1 Thrombinase- a blood clot dissolving agent

Thrombinase, a novel blood clot dissolving agent has been isolated, identified and purified for the first time from a Bacillus species at the Vector Control Research Centre, Pondicherry. The Corporation in collaboration with Malladi Research Centre, Madras has been carrying out joint development work for further development of Thrombinase at a cost of Rs.80 lakhs. A sum of Rs.18.94 lakhs each towards the Corporation's share of grant and loan has already been released. The Corporation has filed patent applications for the process in India, USA, EPO (Germany, Switzerland, Belgium and UK) and patents in USA & UK have already been granted. The physico-chemical studies, stability studies and animal toxicological studies have been completed. The Research Centre is now working on invivo activity studies for determination of half life, comparable data for streptokinase and thrombinase and repeated systemic administration of thrombinase to determine basic data as lead for human trials. The Corporation has also initiated negotiations with a major Japanese Company for licensing of the Know how and Patent Rights.

5.1.2 Lithium-Lithium Ion Battery Project

The manufacture of Lithium-Lithium Ion Battery is a multi-agency-funded developmental project of M/s Twenty First Century Battery Limited, Chandigarh costing around Rs.27 crores based on the patented know-how of M/s. Telcordia Technology Inc., a subsidiary of Bellcore Laboratories, USA. The Lithium-Lithium Ion Batteries have many applications in Cellphones, automobiles, photo voltaics, etc. Keeping in view the vast potential of this battery technology, the Corporation has signed an investment agreement with M/s. Twenty First Century Battery Limited for participation in its equity to the extent of Rs.50.00 lakhs out of which Rs. 25 lakhs was released in March, 2000.

5.1.3 Technology Information related Portal – TECHNAHOO.COM

The Corporation being a premier Institute involved in technology transfer, desires to move in and fill up the gap by setting up a technology

information related portal which shall provide complete information related to the technologies required by industry and particularly to the small & medium entrepreneurs. This shall be first international portal of its kind covering the various aspects of technology related information needs of the industry, R&D Institutes, Researchers, etc.

Broadly, the information shall cover :

- Indigenous & foreign technologies available for licensing
- Intellectual Property Rights (IPR)
- Certification/testing Organisations
- R&D Awards Information
- Technology Funding Agencies
- Technical barriers to Trade
- R & D Institutes/Universities
- Individual Experts
- Short term Training Programmes leading to technology transfer

It is proposed to set up independent sub portals on each of the above mentioned information categories and to integrate them through the base portal "Technahoo.com". Besides this portal shall also provide a E-mail, free web pages, techno watch, job watch, event watch, tech chat sites, etc.

The Corporation later proposes to set up a joint venture Company with a competent information technology organisation as partner who would be responsible for running the company and would also financially contribute towards the equity of the new company to the extent of 51%.

5.1.4 Interactive Multimedia Training Package on Intellectual Property Rights

In order to provide an effective tool for training on IPR for the benefit of industry, R&D institutes, Government Departments, Educational Institutes, Patent Attorneys/Judiciary, Individuals etc., the Corporation has taken up a project to develop an Interactive Multimedia Training Package on IPR in collaboration with M/s. Aesthetic Technologies, Calcutta. The estimated cost of the project is Rs. 40 lakhs wherein the Corporation is investing Rs. 8 lakhs and Aesthetic Technologies is investing Rs. 12 lakhs. The remaining Rs.20 lakhs is being provided by the Department of Scientific & Industrial Research (DSIR), the Administrative Ministry of the Corporation as grant under its PATSER scheme for the project. The Interactive Multimedia IPR Training Package would be the first step in establishing an IPR Consultancy Division in the Corporation.

6. PROJECTS SUPPORTED BY THE DEPARMTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH (DSIR)

DSIR has been supporting technology development projects under its "Programme Aimed at Technological Self Reliance (PATSER)" involving industry, research institutes and consultants. The Corporation has been identified as the agency to manage all maters connected with the intellectual property rights generated in these projects, as also to collect the royalty revenues accruing from the utilisation of the technology by the collaborating Company and also from third party licensing. A few of the major projects undertaken during the year under PATSER are:

- Development of Metal Halide Lamps including Arc Tube & Electronic Control Gear with M/s AUTOPAL Industries Ltd.
- Development SAARC Pagers with M/s S.M. Elect. Services
- Development of State-of-the-Art Machining Centre with M/s H.M.T., Bangalore
- Development Interactive Voice Response Systems with M/s Innovative Communication systems Pvt.Ltd.

7. MARKET SURVEYS

Market surveys not only make the technology to be licensed more complete and credible, but also help in assessing the realistic price at which the technology can be licensed. With this object in view, the Corporation continued to carry out market surveys on commercially important technologies through professional market survey agencies for the purpose. During the year, market survey reports on the following items were completed:

- Neem Based Pesticide Formulations

- Phorate Formulations
- MF Battery – Lead Acid Maintenance Free Battery
- Metalware Coating by Silicon Dioxide Film
- Pregnancy Detection Kit
- Katha from Uncaria Gambier
- Metal Matix Composites
- Natural Dyes from Indian Plants
- Fluidised Abrasive Polishing Machine
- Oxygen Scavanger
- Nano Crystalline Alumina Powder
- Calorising of Steel

8. INVENTION PROMOTION PROGRAMME

The Corporation continued to promote and encourage inventive talent amongst scientists, engineers, industrial workers and students by awarding prizes for meritorious inventions and providing financial assistance for fabricating prototypes, setting up pilot plants to prove such inventions.

During the year, the Corporation received 64 proposals for prize awards and 7 proposals for providing financial assistance. The Corporation announced on Technology Day 1999 i.e. 11th May, 1999 cash awards amounting to Rs.3.80 lakhs for 7 inventions.

World Intellectual Property Organisation (WIPO) Gold Medals have also been awarded to 2 inventions viz. Process for Preparation of Alumina Hydrate of Superior Purity and Fineness and process for Preparation of Low Soda, High Alpha, Pure Alumina and Sketching device for Tactile Graphics through Thread Delivery over Hook & Loop Surface – An Education Aid for Blind Children that is suitable for developing countries.

Some of the meritorious inventions recognised through awards during the year were:

- Bio-Inoculant in Liquid form with Plurality of Strains used as Liquid Fertiliser and Bio-Foliar Sprays for Augmentation of Crop Yield
- Development of Cheap and Suitable Fire Protective Coating Materials for Preventing Spontaneous Heating in open cast mines
- Combustible Cartridge Cases for Tank Gun Ammunition
- Vijetha – A Silkworm Body and Rearing Agent Seat Disinfectant
- Reducing the Period of Retting of Coconut Husk and Upgrading the Quality of Unretted Green Husk Coir fibre by Treatment with Bacterial Cultures
- Pedal Operated Rice Mill

8.1 Patent Assistance

Consequent to the globalisation of economy, Intellectual Property Rights have gained significant importance and have become the foremost concern specially for the scientific community and Indian industry. The Corporation is putting more emphasis on providing technical, legal and financial assistance to inventors in drawing up patent specifications, processing their patent applications etc. During the year, the Corporation received 69 applications from individual inventors for such assistance. Assistance was granted to 30 inventors based on the patentability of the inventions involved and 68 patent applications were also filed on behalf of different R&D organisations.

9. DEVELOPMENT & PROMOTION OF RURAL TECHNOLOGY

The programme aimed at the application of S&T for improving the standard of living of our rural people by increasing employment potential through the development and application of appropriate rural technologies utilising local resources. The programme is aimed at bringing the key elements of the innovation chain e.g. development on a carefully selected basis, of new and innovative technologies for use in rural areas, demonstrating them under actual field conditions and stimulating interest through publications and mass media etc. for propagation of the technology. This is being done in association with the local voluntary groups, Govt. agencies, R&D Institutions which are engaged in rural development.

The Corporation continued the programme of Development and Promotion of Rural Technology through undertaking development projects and operating RTDT Centres as given below :

i. **Demonstration cum Training cum Replication unit based on Heavy Clay based Pottery.**

The Corporation has provided financial assistance for setting up a pottery unit in the premises of Yusuf Meherally Centre at Tara, Dist. Ahmednagar, Maharashtra.

ii. **Setting up of Demonstration cum Training Centre in Backward and Tribal areas of Madhya Pradesh.**

A Task Force, with the Corporation as a Member, has been set up by the Govt. of Madhya Pradesh to explore the possibility for setting up 2-3 Rural Technology cum Demonstration centre in Backward and Tribal areas of Madhya Pradesh, with special emphasis on exploiting the technologies suitable for Tamarind & Aromatic and Medical Plants.

10. TECHNOLOGY AND PROJECT EXPORT

The Indian technologies are appropriate to the needs of many other developing countries. The Corporation, therefore, considers it an important part of its charter to seek out and seize opportunities in those countries for technology and project exports. Towards this end, several delegations from other developing countries were received by the Corporation during the year. Visits to industries of their interest for establishment in their own countries based on technology offers made by the Corporation, were also arranged.

The export performance during the year 1999-2000 has improved as compared to previous year. After protracted negotiations an agreement for setting up two Science & Technology Entrepreneurs Parks (STEPs) in Egypt at a total value of US$ 462,990, has been signed with the Social Fund for Development (SFD), Egypt.

The Corporation also signed an agreement with M/s. Dikron Pharma, Inc, USA for licensing of the Knowhow for Bio-active compound from fenugreek (Methi), Garlic, Banyan bark for lowering of cholesterol and blood glucose.

The Corporation has also signed a Memorandum of Agreement with M/s Industrial Promotion Services (IPS), Abidjan, Cote D'Ivoire for carrying out a survey on the technologies developed in Indian Research Institute on the technologies related to Cotton Farming, Processing and By-product Utilisation.

Foreign Exchange Earnings

The foreign exchange earnings of the Corporation amounted to Rs. 47.00 lakhs in 1999-2000 as compared to Rs.0.25 lakhs during the previous year.

11. PUBLICATIONS

An important activity of the Corporation is to disseminate information on new processes to industry, entrepreneurs and the general public for the promotion and commercialisation of technologies. One of the means of doing so is through publications of various types. During the year, the Corporation continued to bring out the following regular magazines and publications:

- Awishkar – (Monthly in Hindi)
- Invention Intelligence – (Bi-monthly in English)
- NRDC at Your Service

12. SALE OF DSIR PUBLICATIONS

The Department of Scientific & Industrial Research has entrusted NRDC with the marketing and sale of their publications on Technology Status Studies/Tech.Evaluation Studies/Project Profiles/ Consultancy and other Studies and Handbook of foreign Collaboration Approvals (1981-90). During the year, the Corporation sold 31 reports valued at Rs. 0.11 lakhs.

13. EXHIBITIONS AND PUBLICITY

Participation in exhibitions, seminars, workshops, entrepreneurship development programmes etc. are of vital importance for the creation of awareness about the role of the Corporation in technology transfer. The Corporation participated in exhibitions, seminars and get-

togethers organised by various agencies as detailed below:

- Expert Meet on Commercialisation of R&D and Technology Development, Bangladesh (April 99)
- Hospi Medica, New Delhi (15-18 Sept. 1999)
- CECRI-CII Summit Techtron 99, Karaikudi (30-31 July, 1999)
- Instt. Industry Interaction Meet, Roorkee(9th October, 1999)
- Technology Summit & Technology Platform, Hyderabad(28-29 Oct. 1999)
- Inbuilt 1999, Chandigarh(29-31 Oct., 1999)
- India-Sri Lanka Joint Business Council, Bangalore(9-10 Nov., 1999)
- IITF, New Delhi(14-27 Nov. 1999)
- In-house R&D in Industry, New Delhi(25-26 Nov. 1999)
- Indian Science & Technology into the next Millennium, Pune(3-7 Jan. 2000)
- Componex Electronic India 2000, Bangalore (29-31 Jan. 2000)
- Swadeshi Vigyan Mela, New Delhi (2-6 Feb., 2000)
- Biotechnology India, 2000 (16-18 Feb., 2000)
- WISITEX 2000, New Delhi (1-4 March, 2000)

14. IMPLEMENTATION OF OFFICIAL LANGUAGE

The Corporation continued making efforts to implement the provisions of the Official Language Act and Rules framed there under to ensure the continued use of Rajbhasha in its day to day working. Significant progress has been made in the field of corespondence noting and drafting in Hindi. The Annual Report of the Corporation is being published in diglot form in both Hindi & English since 1986-87. The Corporation also publishes a popular science and technology monthly magazine in Hindi, entitled Awishkar. To popularise the use of Hindi in day-to-day work, the Corporation celebrated the `Hindi Pakhwara' from Sept. 14 - 29, 1999. During the Pakhwara different competitions like Hindi Essay writing, Hindi noting and drafting, Hindi typing, Short speech and Hindi Poetry were organised. Under the Hindi Incentive Scheme, Certificates and Cash Awards were also given to selected staff members for their use of Hindi in official work. To promote Rajbhasha "The Comprehensive Glossary of Administrative Terms (Eng-Hindi)" was distributed among the employees.

VIII(B). CENTRAL ELECTRONICS LIMITED (CEL)

1. INTRODUCTION

Central Electronics Limited (CEL) holds a unique position among the family of Public Sector Enterprises in Electronics, with its emphasis on indigenous technology inducted both from its in-house development and the national laboratories. Activities of CEL are focused on three areas:

i) Solar Photovoltaic cells, modules and systems for a variety of rural and industrial applications

ii) Selected Electronic Systems for Railway Safety and Signaling, Impressed Current Cathodic Protection of oil and gas pipelines, Communication, specially VSAT

iii) Selected Electronic Components - Professional Soft Ferrites, Electronic Ceramics, Piezo Electric Elements and Microwave Components

2. PERFORMANCE IN 1999-2000

2.1 Operating Results

Production, sales and profit/loss achieved during the year as compared to the previous year are given below:

(Rs. in crores)

	1998-99	1999-2000
Production	44.67	53.27
Sales	51.13	55.41
Profit/Loss	(-) 5.96	(-) 3.74

Operating results for the year 1999-2000 showed marked improvement over the previous year and the company has been able to close the financial year with lower losses that too despite of lower prices realization particularly in the solar photovoltaic products where prices dropped by as much as 15-25%.

The company could reduce the inventory as on 31.3.2000 by Rs.4.07 crores.

2.2 Exports

2.2.1 Solar Photovoltaics Group

Export of SPV products worth Rs. 163 lakhs was achieved which included electrification of two villages in Namibia. The company has drawn-up action plan to aggressively promote export of solar photovoltaic products at internationally competitive prices using website and through participation in trade fairs and exhibitions.

2.2.2 Components Group

The Components Group for the fourth consecutive year has successfully exported PZT components worth Rs. 133 lakhs to France.

3. OTHER HIGHLIGHTS OF 1999-2000

3.1 Quality and Computer Literacy

During the year under review all the three business groups were brought under the ISO-9002 quality coverage. Computer literacy to enhance the quality of the work and quality of operations in all areas has been given a new thrust through "Computer Stations" accessible to all employees of the company. Under the computer literacy scheme, employees are encouraged to use computers and also learn about technology and business practices through Internet.

3.2 Disinvestment Commission Recommendation

Disinvestment Commission in its study of the company had submitted a report in the year 1998 and recommended substantial down-sizing through an attractive Voluntary Retirement Scheme and allowing the company further two years for determining financial viability. Recommendations made by the Disinvestment Commission specified that the company can continue in Public Sector if it is commercially viable. No new Voluntary Retirement Scheme (VRS) could be offered during the year under review since no funds were sanctioned by the Government. However, employees were encouraged to proceed on long leave, on deputation etc. which was availed by seven employees. The employees strength including those on long leave/deputation as on 31.3.2000, was 842.

3.3 Future Strategy

To remain competitive and retain leadership position, the company has taken a number of steps. Some them are as follows:

VIII.B.1 ***SPV Water Pumping System by CEL in a village in Punjab***

VIII.B.2 ***SPV Powered Lighting of Medical Centre by CEL in Village Spitzskoppe in Namibia***

VIII.B.3 ***SPV Powered Domestic & Street Lighting Systems by CEL in Village Spitzkoppe in Namibia***

VIII.B.4 ***SPV Powered Domestic Lighting Systems by CEL in a village Spitzkoppe in Namibia***

i) The company has entered into a strategic alliance with Solid State Physics Laboratory of MoD for the manufacture of cadmium zinc telluride (CZT) substrates, a key material in Defence applications. This alliance has not only facilitated deployment of the manpower but will also generate substantial revenue in the years to come.

ii) The company has also signed an MOU with "Mining and Chemical Combine" (MCC) of Russia for setting-up a joint venture for manufacturing of monocrystalline silicon wafers in India. Subject to commercial viability, such an operation will guarantee availability of silicon in India which is the basic raw material for solar photovoltaic and micro electronic industries. The MOU has been drawn up under the Indo-Russian Long Term Projects (ILTP) of the Ministry of Science & Technology.

iii) Visualising early phasing out of analog axle counters in Indian Railways, the Company has taken-up development of digital axle counter which will be much superior to its analog version, both in features and fail safe operation.

iv) Towards export initiative, the company has put up a 'Solar Operated Railway Level Crossing Warning System (SOLAGARD)' for demonstration. Several countries, including Sri Lanka, have shown active interest in this product.

v) The company has identified solar powered water pumping systems as a key business activity. During the year, it has supplied highest number of such systems under the programme of the Ministry of Non-Conventional Energy Sources.

4. TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

The company has been a pioneer in the development and absorption of indigenous technologies. In this regard, notable achievements during the year are as follows:

i) With the support from DSIR under its PATSER Scheme, the company took up upgradation of technology for the production of monocrystalline silicon solar cells in association with Inter-University Micro Electronics Center (IMEC), Belgium. The process technology acquired from IMEC has been successfully absorbed, adopted and converted into commercial production. The company happens to be the first and the only one company to manufacture, on a commercial scale, solar cells using IMEC technology and achieve cell efficiency in excess of 14-14.5%.

ii) Improved "electroless copper plating process" has been developed by the company in association with National Aerospace Laboratory (NAL), Bangalore and inducted in the pilot production of ultra high efficiency burried contact type silicon solar cells. The new process enhances throughput by reducing cycle time of copper deposition to half.

iii) Developed and standardized 99% alumina ceramics decomposition process, thus acquiring the status as the only company in India with technology and production capabilities for such high purity alumina ceramic components for application in Missile parts, Plasma torches etc.

iv) Carried out upgradation of PZT material exhibiting superior piezo properties for application in underwater transducer arrays for sea-mapping.

v) The company has also successfully absorbed another technology through DLRL which is for production of spiral antenna upto 18 GHz frequency. It is used in Electronic Warfare (EW) system for project SANGRAHA.

vi) The company has invested over Rs. 300 lakhs, towards upscaling and upgrading the plant for soft ferrites. The company has also invested Rs. 294 lakhs for modernizing and optimising the solar photovoltaic cells and modules plant.

5. FOREIGN EXCHANGE RECEIPTS AND OUTGO

During the year 1999-2000, the company has spent Rs.435 lakhs in foreign exchange as against Rs.788 lakhs in the previous year towards the purchase of capital equipment, raw materials and components and travel etc.

The company earned foreign exchange of Rs. 42 lakhs as against Rs.195 lakhs in the previous year from export of its products.

6. ENERGY CONSERVATION

The company being an electronic industry, its operations are not energy intensive. Therefore, the requirement to furnish information on conservation of energy/energy consumption under rule 2(A) of Companies (Disclosure of Particulars in the Report of Board of Directors) Rules 1988 is not applicable to the Company.

7. PARTICULARS OF EMPLOYEES

In accordance with the Companies (particulars of employees) Rules 1975 read with Sub-Section 2-A of Section 217 of the Companies Act, 1956 as amended in 1988, none of the employees of the Company either employed throughout the year or employed for a part of the year under review was in receipt of remuneration more than that minimum prescribed in the Rules.

8. IMPLEMENTATION OF HINDI, INDUSTRIAL RELATIONS AND HUMAN RELATIONS

The company had fairly cordial industrial relations during the year as a result of the management's continuous dialogue with the recognised Workers Union and with the Executives Association.

In order to ensure the use of Hindi, the employees continued to be trained in Prabodh, Praveen, Pragya Hindi courses, Hindi type-writing and Hindi Computer. Hindi Swarana Jayanti Varsh was organised from 14.9.1999 to 14.9.2000. Further Hindi week was organised on 14.9.1999 to 20.9.1999. Various short time training programmes were conducted for workers as well as for officers during the year.

9. WELFARE OF RESERVED CATEGORIES

All Government directives relating to the Reserved Categories such as Scheduled Castes, Scheduled Tribes, the Physically Handicapped, Ex-Servicemen etc. continued to be implemented during the year.

IX. ADMINISTRATION

1. ADMINISTRATION

The Department of Scientific & Industrial Research was created through a Presidential Notification of January 1985. The Administrative functions of recruitment of personnel, provision of general facilities, redressal of grievances of employees, parliament work and use of Hindi and house keeping jobs except related to cash section are being performed by the Departement of Scientific and Industrial Research. Activities related to promotions of scientific staff and officers (under the flexible complementing scheme) are also looked after by the Department.

The department is also facing a further need for office space. A sum of Rs.3.00 crores has been provided during the 9th Five Year Plan towards creation of support infrastructure, building etc. for the DSIR (other than CSIR) and a programme towards provision of the same is under progress.

2. PROMOTION OF HINDI

DSIR made the following efforts for the use and promotion of Hindi in the official work and implementation of official language policy of the Government:

a) The meetings of the Official Language Implementation Committee were held regularly in DSIR.

b) The Quarterly Progress Report regarding use of Hindi in the Department was sent to the Department of official Language regularly and in time.

c) Under Hindi Teaching Scheme, non-Hindi knowing employees of the Department were nominated for Prabodh, Praveen and Pragya courses.

d) From 1st to 14th September 2000 combined Hindi Pakhwara was observed by the Department of Scientific and Industrial Research and Department of Science and Technology at Technology Bhavan. To promote the use of Hindi in the official work, essay, noting and drafting, debate, painting and quiz competitions were organised in the Department during this period and winning officials of the Department were given prizes.

e) CDC was inspected to assess the progressive use of Hindi.

f) A Hindi workshop was organised during January 2001.

The staff strength in the different groups in the Department of Scientific & Industrial Research (other than CSIR & PSUs) as on 1.1.2001 is given below:

	No. of Employees			
	Gen.	SC	ST	Total
Group A (Gazetted)	32	6	1	39
Group B (Gazetted)	5	-	-	5
Group B (Non-Gazetted)	8	3	-	11
Group C (Non-Gazetted)	15	7	3	25
Group D (Non-Gazetted)	4	3	4	11

ANNEXURES

ANNEXURE-II.1

LIST OF CSIR ESTABLISHMENTS

1. Central Building Research Institute (CBRI), Roorkee
2. Centre For Biochemical Technology (CBT), Delhi
3. Centre for Cellular and Molecular Biology (CCMB), Hyderabad
4. Central Drug Research Institute (CDRI), Lucknow
5. Central Electrochemical Research Institute (CECRI), Karaikudi
6. Central Electronics Engineering Research Institute (CEERI), Pilani
7. Central Fuel Research Institute (CFRI), Dhanbad
8. Central Food Technological Research Institute (CFTRI), Mysore
9. Central Glass and Ceramic Research Institute (CGCRI), Calcutta
10. Central Institute of Medicinal & Aromatic Plants (CIMAP), Lucknow
11. Central Leather Research Institute (CLRI), Chennai
12. Central Mechanical Engineering Research Institute (CMERI), Durgapur
13. Central Mining Research Institute (CMRI), Dhanbad
14. Central Road Research Institute (CRRI), New Delhi
15. Central Scientific Instruments Organisation (CSIO), Chandigarh
16. CSIR Centre for Mathematical Modelling & Computer Simulation (C-MMACS), Bangalore
17. Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar
18. Institute of Himalayan Bioresource Technology (IHBT), Palampur
19. Indian Institute of Chemical Biology (IICB), Calcutta
20. Indian Institute of Chemical Technology (IICT), Hyderabad
21. Indian Institute of Petroleum (IIP), Dehradun
22. Institute of Microbial Technology (IMT), Chandigarh
23. Indian National Scientific Documentation Centre (INSDOC), New Delhi
24. Industrial Toxicology Research Centre (ITRC), Lucknow

25. National Aerospace Laboratories (NAL), Bangalore
26. National Botanical Research Institute (NBRI), Lucknow
27. National Chemical Laboratory (NCL), Pune
28. National Environmental Engineering Resarch Institute (NEERI), Nagpur
29. National Geophysical Research Institute (NGRI), Hyderabad
30. National Institute of Oceanography (NIO), Goa
31. National Institute of Science Communication (NISCOM), New Delhi
32. National Institute of Science Technology and Development Studies (NISTADS), New Delhi
33. National Metallurgical Laboratory (NML), Jamshedpur
34. National Physical Laboratory (NPL), New Delhi
35. Regional Research Laboratory (RRL, BHO), Bhopal
36. Regional Research Laboratory (RRL, BHU), Bhubaneshwar
37. Regional Research Laboratory (RRL, JM), Jammu
38. Regional Research Laboratory (RRL,JOR), Jorhat
39. Regional Research Laboratory (RRL, TVM), Thiruvananthapuram
40. Structural Engineering Research Centre (SERC-G), Ghaziabad
41. Structural Engineering Research Centre (SERC-C) Chennai

ANNEXURE III.A.1

STATEMENT ON RECOGNITION OF IN-HOUSE R&D UNITS

Month	Year	Receipts	Cumulative Receipts	Pendency Disposal	Cumulative Disposal	Cumulative pendency at the end of the month
December	1999	6	-	-	-	27
January	2000	13	40	7	7	33
February	2000	7	47	6	13	34
March	2000	7	54	12	25	29
April	2000	4	58	6	31	27
May	2000	14	72	18	49	23
June	2000	13	85	9	58	27
July	2000	16	101	11	69	32
August	2000	10	111	13	82	29
September	2000	8	119	5	87	32
October	2000	9	128	4	91	37
November	2000	9	137	7	98	39
December	2000	18	155	11	109	46

ANNEXURE III.A.2

STATEMENT ON RENEWAL OF RECOGNITION OF IN-HOUSE R&D UNITS WHOSE RECOGNITION WAS VALID UP TO 31-3-2000

Month	Year	Receipts	Cumulative Receipts	Renewal Applications processed	Cumulative Renewals Processed	Cumulative Pendency at the end of the month
December	1999	77	77	-	-	77
January	2000	209	286	-	-	286
February	2000	55	341	83	83	258
March	2000	29	370	83	166	204
April	2000	21	391	58	224	167
May	2000	25	416	-	224	192
June	2000	3	419	119	343	76
July	2000	24	443	36	379	64
August	2000	12	455	12	391	64
September	2000	2	457	66	457	-
October	2000	-	457	-	457	-
November	2000	-	457	-	457	-
December	2000	-	457	-	457	-
Total			**457**		**457**	

ANNEXURE III.A.3

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE MORE THAN Rs. 500 LAKHS

Sl. No.	Name of the firm	R&D Expenditure (Rs. in Lakhs)
1	Aptech Limited	557
2	Asea Brown Boveri Ltd.	1516
3	Ashok Leyland Ltd.	1165
4	Asian Paints (India) Ltd.	550
5	Associated Cement Companies Ltd.	609
6	Aurobindo Pharma Ltd.	1475
7	Bajaj Tempo Ltd.	1066
8	Bharat Earth Movers Ltd.	1194
9	Bharat Electronics Ltd.	6610
10	Bharat Heavy Electricals Ltd.	5274
11	B P L Limited	2249
12	Cadila Pharmaceutical Ltd.	505
13	Cadila Healthcare Ltd.	1259
14	Central Mine Planning & Design Inst. Ltd.	2037
15	CMC Limited	1097
16	Cipla Limited	1630
17	Crompton Greaves Ltd.	2174
18	Cummins India Ltd.	1044
19	Eicher Ltd.	2220
20	Electronics Corporation of India Ltd.	909
21	Gharda Chemicals Ltd.	663
22	Gujarat State Fertilizers Company Ltd.	549
23	GEC Alsthom India Ltd.	564
24	HMT Limited	541
25	Hindustan Aeronautics Ltd.	14635
26	Hindustan Lever Ltd.	3731
27	Hoechst Marion Roussal Ltd.	1169
28	IPCA Lab. Ltd.	644
29	Indian Aluminium Company Ltd.	1189
30	Indian Oil Corporation Ltd.	7716
31	Indian Petrochemicals Corporation Ltd	1005
32	Indian Telephone Industries Ltd.	3860
33	Kinetic Engineering Ltd.	506
34	Lakshmi Machine Works Ltd.	1187
35	Larsen & Toubro Limited	1771
36	Lupin Lab Ltd.	932
37	MRF Limited	1145
38	Mahindra & Mahindra Ltd.	4135
39	Maruti Udyog Ltd.	972
40	Motor Industries Co. Ltd.	1559
41	Natco Fine Pharmaceuticals Pvt. Ltd.	506

Sl. No.	Name of the firm	R&D Expenditure (Rs. in Lakhs)
42	National Organic Chemical Industries Ltd.	711
43	National Telecom of India Ltd.	641
44	Novartis Enterprises Ltd.	500
45	Oil & Natural Gas Corporation Ltd.	7116
46	Oil India Limited	1043
47	The Projects & Development India Ltd.	650
48	Rallis India Ltd.	872
49	Ramco Industries Ltd.	3009
50	Ranbaxy Laboratories Ltd.	5339
51	Reliance Industries Ltd.	7509
52	Steel Authority of India Ltd.	4832
53	TISCO	1350
54	Tata Engineering & Locomotive Co. Ltd.	7530
55	Tata Hydro-Electric Power Supply Co. Ltd.,	759
56	The Tata Iron & Steel Co. Ltd.,	6452
57	The United Phosphorous Ltd.	650
58	Tractors & Farm Equipment Ltd.	680
59	Torrent Pharmaceuticals Ltd.	2582
60	Venco Research & Breeding Farm Ltd.	658
61	Venkateshwara Hatcheries Ltd.	1178
62	Whirlpool Of India Ltd.	934
63	Widia (India) Ltd.	530
64	Wipro Limited (formerly Wipro Infotech Ltd.)	805
65	Wockhardt Limited	1561

ANNEXURE III.A.4

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE IN THE RANGE OF Rs. 100 LAKHS TO Rs. 500 LAKHS

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
1	ARM Limited	228
2	Aerospace System Ltd.	315
3	Alembic Chemical Works Co. Ltd.	254
4	Alkali Metals Ltd.	178
5	Altos India Ltd.	187
6	Amalgam Leather Pvt. Ltd.	283
7	Amara Raja Batteries Ltd.	208
8	Amrutanjan Ltd.	189
9	The Apex Electricals Ltd.	152
10	Apollo Tyres Ltd.	262
11	Applied Electro Magnetics Pvt. Ltd.	118
12	Arvind Mills Ltd.,	101
13	The Astra-IDL Limited	281
14	Audio India Ltd.	108
15	Atul Limited,	465
16	Autometer Secheron Limited	130
17	The Avasarala Tungsten Ltd.	144
18	BASF India Ltd.	130
19	BPL Engineering Ltd.	125
20	BPL Limited	315
21	BPL Sanyo Utilities and Appliances Ltd.	288
22	BPL Telecom Ltd.	315
23	Ballarpur Industries Ltd.	111
24	Balmer Lawrie & Company Ltd.	203
25	Baroda Rayon Corporation Ltd.,	174
26	The Bata India Ltd.	190
27	Berger Paints India Ltd.	130
28	Bharat Biotech International Ltd.	114
29	Bharat Dynamics Ltd.	283
30	Bharat Heavy Plate & Vessels Ltd.	141
31	Bicycle & Sewing Machine R&D Centre	136
32	Biological E. Ltd.	140
33	Brakes India Ltd.	360
34	Britannia Industries Ltd.	179
35	Bush Boake Allen (India) Ltd.	311
36	Camphor & Allied Products Ltd.	174
37	Carborundum Universal Ltd.	141
38	Castrol India Ltd.	128
39	Century Textiles & Industries Ltd.,	105
40	Central Electronics Ltd.	277
41	Cheminor Drugs Ltd.	246

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
42	Clariant (India) Ltd.	255
43	Coates of India Ltd.	347
44	Cochin Refineries Ltd.	211
45	Colour-Chem Limited	376
46	Core Healthcare Ltd.	143
47	Cyanamid Agro Limited, Mumbai	150
48	DCM Shriram Consolidated Ltd.	128
49	DCM Shriram Industries Ltd.	237
50	DE-NOCIL Crop Protection Ltd.	216
51	DGP Hinoday Industries Ltd.	190
52	DGP Windsor India Ltd.	112
53	Dai-ichi Karkaria Ltd.	355
54	Dhampur Sugar Mills Ltd.,	175
55	The Dharamsi Morarji Chemical Co. Ltd.,	138
56	The Divi's Laboratories Ltd.	199
57	Dr. Reddy's Laboratories Ltd.	233
58	Dynamatic Technologies Ltd.	161
59	Dunlop India Ltd.	284
60	E.I.D. Parry (India) Ltd.	363
61	Eicher Limited	133
62	Eicher Motors Ltd.	192
63	Electronic Research Ltd.	105
64	Elgi Tyre & Thread Ltd.	285
65	Elin Electronics Ltd.	128
66	Engineers India Ltd.	356
67	Excel Industries Ltd.	353
68	FDC Limited	142
69	FGP Limited	142
70	Foseco India Ltd.	242
71	Fujitsu ICIM Ltd.	101
72	Gammon India Limited	128
73	Garware Polyester Ltd.	167
74	German Remedies Ltd.	106
75	GEIL Projects & Services (India) Ltd.	210
76	Glaxo India Ltd.	315
77	Global Bulk Drugs & Fine Chemicals Ltd.	450
78	Godrej Soaps Ltd.	267
79	Goodlass Nerolac Paints Ltd.	491
80	Gujarat Communications & Electronics Ltd.	335
81	HCL Infosystems Ltd.	427
82	Haryana State Electronics Development Corpn. Ltd.	191
83	Hawkins Cookers Ltd.	100
84	Heinz India Pvt. Ltd.	217
85	Herdillia Chemicals Ltd.	101
86	Hindustan Antibiotics Ltd.	252
87	Hindustan Cables Ltd.	178

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
88	Hindustan Copper Ltd.	155
89	Hindustan Motors Ltd.	327
90	Hindustan Petroleum Corporation Ltd.	286
91	Hindustan Photo Films Manufacturing Co. Ltd.	127
92	Hindustan Telecommunication Ltd.	160
93	Hindustan Zinc Ltd.	379
94	Hyderabad Industries Ltd.	149
95	IBP Company Ltd.	198
96	ICI India Ltd.	316
97	IDL Industries Ltd.	202
98	IPCA Laboratories Ltd.	318
99	ITC Limited	398
100	ITC Zeneca Ltd.	100
101	India Glycols Ltd.	192
102	India Nippon Electricals Ltd.	133
103	India Pistons Ltd.	103
104	India Satcom Ltd.	111
105	Indian Drugs & Pharmaceuticals Ltd.	243
106	Indian Dyestuff Industries Ltd.	211
107	Ion Exchange (India) Ltd.	149
108	J.K. Drugs & Pharmaceuticals Ltd.	206
109	J.K. Industries Ltd.	299
110	Jaysynth Dyechem Ltd.	273
111	Jindal Strips Ltd.	190
112	Jindal Steel Power Ltd.	188
113	Johnson & Johnson Ltd.	165
114	Jyoti Limited	312
115	Jyoti Ceramic Industries Pvt. Limited	139
116	Keggfarms Pvt. Ltd.	138
117	Khandelwal Laboratories Ltd.	101
118	Kirloskar Brothers Ltd.	171
119	Kirloskar Copeland Ltd.	203
120	Kirloskar Electric Co. Ltd.	125
121	Kirloskar Oil Engines Ltd.	183
122	Knoll Pharmaceuticals Ltd.	345
123	Krishna Maruti Ltd.	247
124	L&T-McNeil Ltd.	117
125	L&T Komatsu Ltd.	138
126	LML Limited	366
127	Lakhanpal National Ltd.	181
128	Lubrizol India Ltd.	388
129	Lucas-TVS Ltd.	218
130	Lyka Labs Limited	123
131	MAX-GB Limited	190
132	Madras Refineries Ltd.	232
133	Mafatlal Industries Ltd.	268

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
134	The Maharashtra Hybrid Seeds Company Ltd.	240
135	Manali Petrochemical Ltd.	156
136	Medicorp Technology India Ltd.	152
137	Merind Limited	368
138	Midas Communication Technology Pvt. Ltd.	159
139	Minda Industries Ltd.	172
140	Mirc Electronics Ltd.	406
141	Modi Rubber Ltd.	247
142	Modipon Limited	274
143	Monica Electronics Ltd.	177
144	Mysore Kirloskar Ltd.,	263
145	The NRC Ltd.	197
146	National Mineral Development Corporation Ltd.	472
147	National Aluminium company Ltd.	267
148	Neyveli Lignite Corporation Ltd.	362
149	Onward Technologies Ltd.	231
150	Otis Elevator Co. (India) Ltd.	123
151	Parke-Davis (India) Ltd.	53
152	Pfizer Limited	20
153	Philips India Ltd.	95
154	Pidilite Industries Ltd.	10
155	Premier Automobiles Ltd.	76
156	Premier Instruments & Controls Ltd.	435
157	Proagro Seed Company Ltd.	185
158	Procter & Gamble India Ltd.	400
159	Punjab Communications Ltd.	189
160	Punjab Tractors Ltd.	383
161	RPG Life Sciences Ltd.	178
162	Rane Brake Linings Ltd.	122
163	Rashtriya Chemicals & Fertilizers Ltd.	103
164	Renewable Energy Systems Pvt. Ltd.	128
165	Resonance Laboratories Pvt. Ltd.	130
166	Rhone-Poulenc (India) Ltd.	142
167	S.H. Kelkar & Company Ltd.	118
168	SOL Pharmaceuticals Ltd.	205
169	Sami Chemicals & Extracts Ltd.	245
170	Samtel Color Ltd.	115
171	Sandvik Asia Ltd.	201
172	Saraswati Industrial Syndicate Ltd.,	263
173	The Scooters India Ltd.	252
174	Sealol Hindustan Ltd.	115
175	Searle (India) Ltd.	260
176	Secure Meters Ltd.	163
177	Seagram Manufacturing Pvt. Ltd.	196
178	Semiconductor Complex Ltd.	304
179	Shantha Biotechnics Pvt. Ltd.	148

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
180	Shyam Telecom Ltd.	356
181	Shasun Chemicals and Drugs Ltd.	234
182	Sieflex Robotics Co.	101
183	Simpson & Co. Ltd.	108
184	Siel Compressor Ltd.	100
185	*Smithkline Beecham Pharmaceuticals (India)Ltd.*	207
186	Southern Petrochemical Industries Corpn. Ltd.	400
187	Spaco Carburettors (India) Ltd.	132
188	Sudarshan Chemical Industries Ltd.	318
189	Sun Pharmaceutical Industries Ltd.	390
190	Sundaram Brake Linings Ltd.	163
191	Sundaram Clayton Ltd.	444
192	TVS-Suzuki Limited	247
193	Tamilnadu Petroproducts Ltd.	241
194	Tata Elxsi (India) Ltd.	145
195	Tata Sons Ltd.	357
196	Tata Tea Ltd.	291
197	Tata Refractories Ltd.	241
198	Technicom Systems (India) Pvt. Ltd.	125
199	Thermax Limited	338
200	Tide Water Oil Co. (India) Ltd.	130
201	Tube Products of India (A unit of Tube Investment of India Ltd.)	196
202	Travancore-Cochin Chemicals Ltd.,	105
203	The Unichem Laboratories Ltd.	170
204	United Catalysts India Ltd.	167
205	United Phosphorous Ltd.	125
206	United Telecoms Ltd.	207
207	Uptron India Ltd.	110
208	Vam Organic Chemicals Ltd.	256
209	Vatanu-Cool Rotary Vanes Ltd.	178
210	VIP Industries Ltd.	138
211	Vera Laboratories Ltd.	118
212	Vitara Chemicals Ltd.	188
213	Voltas Limited	135
214	Webel Telecommunication Industries Ltd.	107
215	Wheels India Ltd.	212
216	Wipro GE Medical Systems Ltd.	100
217	Wipro Limited	297
218	Zen Technologies Ltd.	231

ANNEXURE – III.B.1

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS APPROVED DURING JANUARY 2000 TO DECEMBER 2000

AGRICULTURAL, MEDICAL AND NATURAL & APPLLIED SCIENCES

Sl. No.	Name of the Organisation	Approval Valid upto
1	Sri Aurobindo Anusilan Society, Suri, West Bengal	31.3.2002
2	Society for Applied studies, Calcutta	31.3.2002
3	National Brian Research Centre, New Delhi	31.3.2002
4	Saveetha Medical and Educational Trust, Erode	31.3.2002
5	Hastimal Sancheti Memorial trust, Poona	31.3.2002
6	Seth G.S. Medical College, Mumbai	31.3.2003
7	Centre for research on Nutrition Support Systems, New Delhi	31.3.2002
8	International Institute of Ayurveda of Arya Vaidyan Rama Varier Educational Foundation of Ayurveda , Coimbatore	31.3.2003
9	MGM's Medical College, Navi Mumbai	31.3.2002
10	RGCF Poona Hospital and Research Centre, Poona	31.3.2002
11	Ila Devi Cataract and IOL research Centre, Ahmedabad	31.3.2002
12	Kerala State Science and Technology Museum, Thiruvananthapuram	31.3.2002
13	Matrivani Institute of Experimental Research and Education, Calcutta	31.3.2002
14	Centre for Science and Environment, New Delhi	31.3.2002
15	Agency for Non Conventional Energy and Rural Technology (ANERT), Thiruvananthapuram	31.3.2002
16	Punjab State Council for Science & Technology, Chandigarh	31.3.2002
17	Inter University Consortium for Department of Atomic Energy, Indore	31.3.2002
18	Bakul Finechem Research Centre, Mumbai	31.3.2002
19	Indian Institute of Information Technology, Bangalore	31.3.2002
20	Centre for Wind Energy Technology (C-WET), Chennai	31.3.2003
21	National Centre for Antarctic and Ocean Research, Goa	31.3.2003
22	Institute of Wetland Management and Ecological Design, Calcutta	31.3.2003
23	ICICI Knowledge Park, Hyderabad	31.3.2003
24	Indo-US Science and Technology Forum, New Delhi	31.3.2003
25	National Accreditation Board for Testing & Calibration Laboratories, New Delhi	31.3.2003
26	Foundation for Revitalisation of Local Health & Traditions (FRLHT), Bangalore	31.3.2003
27	Indian Society of Genetics and Plant Breeding, New Delhi	31.3.2003
28	The South Indian Sugarcane and Sugar Technologist's Association, Chennai	31.3.2003
29	Tea Board, Calcutta	31.3.2003

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS APPROVED DURING JANUARY 2000 TO DECEMBER 2000

SOCIAL SCIENCES

Sl. No.	Name of the Organisation	Approval *Valid upto*
1	FICCI Socio-Economic Development Foundation, New Delhi	31.3.2002
2	National Centre for the Performing Arts, Mumbai	31.3.2002
3	TALEEM Research Foundation, Ahmedabad	31.3.2001
4	Kripa Foundation, Mumbai	31.3.2002

CERTIFICATES FOR CLAIMING ACCELERATED DEPRECIATION ALLOWANCE ISSUED BY DSIR UNDER RULE 5(2) OF I.T. RULES VIDE NOTIFICATION NO.133/342/86-TPL DATED 1.4.1988

Sl. No	Name of the Company	Source of know-how/ Technology	Item of Manufacture	Investment Certified (Rs in Lakhs)
1	Vantech Industries Limited, Hyderabad	IICT, Hyderabad	Monocrotophos	69.46
2	ECIL, Hyderabad	In-house	Electronics Products	46.06
3	Transmetal, Vadodara	EXCEL Industries Ltd., Mumbai	Sodium salt of Trichloro Pyridionol (NaTcP)	488.68
4	Bharat Electronics Ltd., Bangalore	In-house	Electronic Equipment	1649.23
5	Sun Pharmaceutical Industries Ltd., Baroda	In-house	Bulk drugs	494.90

ABBREVIATIONS USED

ACC	Associated Cement Company
ACE	Association of Consulting Engineers
APCTT	Asian and Pacific Centre for Transfer of Technology
BEL	Bharat Electronics Limited
BHEL	Bharat Heavy Electricals Limited
CBDT	Central Board of Direct Taxes
CDC	Consultancy Development Centre
CEL	Central Electronics Limited
CMPDIL	Central Mine Planning & Design Institute Limited
CSIR	Council of Scientific and Industrial Research
DSIR	Department of Scientific and Industrial Research
ECIL	Electronics Corporation of India Limited
ERDA	Electrical Research and Development Association
ESCAP	Economic and Social Commission for Asia and the Pacific
GSI	Geological Survey of India
HMT	Hindustan Machine Tools
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICSSR	Indian Council of Social Science Research
IIFT	Indian Institute of Foreign Trade
IPCL	Indian Petrochemical Corporation Limited
ISRO	Indian Space Research Organisation
ITI	Indian Telephone Industries
MIT	Ministry of Information Technology
NCAER	National Council of Applied Economic Research
NICMAR	National Institute of Construction Management and Research
NIDC	National Industrial Development Corporation
NISSAT	National Information System for Science and Technology
NRDC	National Research Development Corporation
ODS	Ozone Depleting Substances
PATSER	Programme Aimed at Technological Self Reliance
TePP	Technopreneur Promotion Programme
RDI	Research and Development by Industry
SEETOT	Scheme to Enhance the Efficacy of Transfer of Technology
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation
WIPO	World Intellectual Property Organisation