

I. AN OVERVIEW

1. INTRODUCTION

The Department of Scientific and Industrial Research (DSIR), one of the departments of the Ministry of Science and Technology, was set up through a Presidential Notification, dated 4th January, 1985 (74/2/1/8 Cab.). The mandate of DSIR includes promotion of industrial research for indigenous technology promotion, development, utilization and transfer. Shri Prithviraj Chavan has taken over on 28th May, 2009 as the Hon'ble Minister of State (Independent Charge) of the Ministry of Science and Technology from Shri Kapil Sibal who was holding the charge until then as Union Minister. Shri Prithviraj Chavan on assuming the charge of Hon'ble Chief Minister of Maharashtra, Shri Kapil Sibal has been given additional charge of Union Ministry of Science & Technology with effect from 12th November 2010. Shri Pawan Kumar Bansal has assumed the charge as union minister of Parliamentary Affairs, Science and Technology and Earth Science on 19-01-2011 and Shri Ashwani Kumar has assumed as Minister of state of Parliamentary Affairs, Ministry of Science and Technology and Earth Science on 19-01-11.

The Allocation of Business for the Department is as follows:

- ◆ All matters concerning the Council of Scientific and Industrial Research.
- ◆ All matters relating to National Research Development Corporation.
- ◆ All matters relating to Central Electronics Limited.
- ◆ Registration and Recognition of R&D Units.

- ◆ Technical matters relating to UNCTAD and WIPO.
- ◆ National register for foreign collaborations.
- ◆ Matters relating to creation of a pool for temporary placement of Indian Scientists and Technologists.

The primary endeavour of DSIR is to promote R&D by the industries; support industrial units to develop state-of-the-art globally competitive technologies of high commercial potential; catalyze faster commercialization of laboratory-scale R&D; augment technology transfer capabilities; enhance the share of technology intensive exports in overall exports; strengthen industrial consultancy and establish a user-friendly information network to facilitate scientific and industrial research in the country. The DSIR has two public sector undertakings viz. National Research Development Corporation (NRDC) and Central Electronics Ltd (CEL) and two autonomous organizations viz. Council for Scientific and Industrial Research (CSIR) and Consultancy Development Centre (CDC). The Department also provides host facilities and assistance to Asian and Pacific Centre for Transfer of Technology (APCTT) as the focal point in the country.

2. TECHNOLOGY PROMOTION, DEVELOPMENT AND UTILIZATION SCHEME

The Technology Promotion, Development and Utilization (TPDU) Scheme is aimed at promoting technology development and industrial research in the country and encouraging its utilization by various sections of economy including industry, academic/research/scientific institutions and the

society at large. The components of the TPDU programme are:

- ◆ Industrial R&D Promotion Programme (IRDPP)
- ◆ Technology Development and Innovation Programme (TDIP)
 - Technology Development and Demonstration Programme (TDDP)
 - Technopreneur Promotion Programme (TePP)
- ◆ Technology Development Utilization Programme for Women (TDUPW)
- ◆ Information Technology and e-Governance (IT-eG)

2.1 Major Achievements

The major achievements of the various programmes of the Department during the period under report (from April to December 2010) are as under:

Industrial R&D Promotion Programme

DSIR is the nodal Department for granting recognition to in-house Research and Development centres of industry. As on 31st December, 2010, there were 1,376 in-house R&D centres with DSIR recognition. Of these centres, 167 incurred an annual expenditure of over ₹ 5 crores each and 346 incurred an annual expenditure in the range of ₹ 1 crore to ₹ 5 crores.

During the period under report, 178 in-house R&D centres were accorded fresh recognition and recognition of 433 centres were renewed.

Scientific research foundations in the areas of medicine; agriculture; natural and applied sciences; and social sciences seek DSIR approval as Scientific and Industrial Research Organisations (SIROs) under the programme granting recognition to SIROs. The registered SIROs are eligible for availing customs duty exemption on imports and central excise duty exemption on indigenous purchase of essential scientific and technical instruments, apparatus,

equipment (including computers), accessories, spare parts thereof and consumables, required for R&D activities. During the period under report, 22 SIROs have been accorded fresh recognition.

DSIR is the nodal Department for registration of public funded research institutions (PFRI), universities, IITs, IISc and NITs, for availing customs duty exemption and central excise duty exemptions under notifications 51/96-Customs and 10/97-Central Excise. During the period under report, 25 such institutions were newly registered with DSIR; and 76 institutions were granted renewal of registration.

Secretary, DSIR is designated as the Prescribed Authority under section 35(2AB) of Income-tax Act, 1961. Fresh approvals were accorded to 49 companies by the prescribed authority. Agreements of co-operation for R&D were also signed with these companies. The detailed R&D expenditure of the approved companies have also been examined by DSIR and 102 reports valued at Rs. 3461 crore have been forwarded to DGIT (E) in Form 3CL, as required under the IT Act.

Technology Development and Innovation Programme

The programme has two sub components:

- (i) Technology Development and Demonstration (TDDP) to support technology development efforts of industry R&D system and
- (ii) Technopreneur Promotion Programme (TePP) to nurture the innovative spirit of individuals.

The Technology Development and Demonstration Programme aims at catalyzing and supporting activities relating to technology absorption, adaptation and demonstration including capital goods development, involving industry and R&D organizations. Under the programme, research, development, design and engineering projects for absorption and up-gradation of imported technology, as well as development and demonstration of new and improved technologies are supported. While

the DSIR support is catalytic and partial, the bulk of the financial contribution in any project is from the industry.

The Department, under this programme, has so far supported about 220 R&D projects from 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 and others. Around 50 technologies developed under the programme have been commercialized or are under commercialization. During the period under report, more than 80 new proposals received against open advertisements in leading daily newspapers. Total 40 proposals were recommended through three Technical Advisory Committee meetings. 18 new proposals in the field of engineering, manufacturing, electronics, drugs, chemicals & fertilizers, etc. were awarded to different companies. DSIR has committed to support ₹ 165.65 Crores for these new 18 projects out of total project cost of ₹ 433.00 Crores.

Technology development projects have strengthened industry-institute linkages with more than 25 national research laboratories/institutions such as NAL, Bengaluru; NIIST, Thiruvananthapuram; IICT, Hyderabad; CIMFR, Dhanbad; IIP, Dehradun; C-DAC, Pune; Institute of Plasma Research, Ahmedabad; ER&DC, Thiruvananthapuram; Dalmia Centre for Biotechnology, Coimbatore and CMTI, Bengaluru. These have been collaborating with industry in the specific research, design, development and engineering (RDDE) projects having high techno-socio-commercial impact. The programme has hence been successful in synergizing the R&D efforts of industry and national research organizations.

The Technopreneur Promotion Programme (TePP) is India's largest network program supporting Individual innovators. The network spread out with 29 outreach centres and 100 innovation managers provides grants, pre-seed funds, technical guidance, incubation facilities and assistance. The support is provided in two distinct phases - *innovation*

incubation in first phase where maximum support is ₹ 15.00 lakh and towards *enterprise incubation* in second phase where the cap is ₹ 45.00 lakh. Since the time of inception, 466 innovations of individual innovators have been supported. Out of these, 370 were supported by DSIR (rest by TIFAC). Some of the successfully completed TePP projects during the year are Hi-fi...digitalized turning machine, Accurate level indicator, Hydraulic sun tracker, Development of PC based Oscilloscope, Multi-purpose mosquito trap, Areca nut tree climbing & harvesting robot, Voice Net, Track every coin, Instant Rasam Mix/Paste/Granules, Extra Air Power, Close circuit cooling tower, Power saver in Lathe Machine, Cardiac Analyser, Development of slide rule (ready reckoner), Snow-breeze - a people's Air-Conditioner, Cooled helmet for 2-wheeler rider, Light emitting POP tiles, An affordable augmentative & alternative communication device with dynamic message generation and speech synthesis for children with Cerebral Palsy, Dynamic multi focal spectacle frame, Herb-Med - herbal medicine for urological stones clearances, Auto-distractor (Phase-II), Cabinet of Personal Computer, Mosquito free healthy air, Improved machine human interface a replacement to mouse, Scientific evaluation of a herbal medicine for treatment of Asthma, Highly Flexible Stepper motor controlled diamond bruiting machine, Indigenous dialysis device refinement for commercialization and test marketing, Wireless threat assessment system, and so on.

International Cooperation

DSIR continues to play the role of being the focal point for the APCTT, an agency under United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) facilitating the establishment of networks of technology transfer inter-mediaries in the region to promote cross-border business cooperation among SMEs.

Other than the institutional support extended by the Government of India and other administrative support extended as per the host country agreement, DSIR has also extended support to APCTT to implement the project 'Promotion of National

Innovation Systems (NIS) in Countries of the Asia Pacific Region Phase I' and initiated to support the project, 'National Innovation System Phase II'. As part of the effort, the Centre has established an NIS Online Resource Centre.

The Renewable Energy Co-operation Network for Asia and the Pacific (RECAP) was developed by APCTT to promote renewable energy. APCTT engaged consultants from 12 countries and national focal points to prepare the country report and training materials etc. under this project. It has also organized two consultative workshops at Bangkok, Thailand. Sixth Technical Committee meeting was held on 22 – 23 November 2010 at Jakarta, Indonesia and Sixth session of Governing Council was held on 13th December 2010 at Bangkok, Thailand.

The Centre's technology transfer portal, www.technology4sme.net, served as an active platform for information exchange between APCTT, SMEs and business firms in the Asia-Pacific region. This website was also used by business firms in Europe, Latin America and the United States of America.

Technology Development Utilization Programme for Women

In pursuance of the recommendations of the Inter-Departmental Committee set up to consider issues regarding Gender Budgeting, the Department established a "Gender Budgeting Cell", initiated steps to enhance the share of women in respect of beneficiary oriented schemes, and designed a programme namely, Technology Development and Utilization Programme for Women (TDUPW) in 2005-06. The programme is aimed to meet specific needs of women and to enhance their contribution towards technology capability building. Department has supported several projects so far and eighteen projects have been completed. So far 21 proposals were supported and in the year upto 2010, 2 projects were supported.

Information Technology and e-Governance

Information Technology and e-Governance has

been initiated in the Department during the middle of the Tenth Plan by allocating a fixed percentage of the plan funds of the TPDU Scheme to create an IT environment in the Department in conformity with the National e-Governance Action Plan. IT Action Plan of DSIR was worked out in May 2003 and for its implementation, a separate IT Budget Head was created, which became operational in FY 2004-05.

Various applications like IntraDSIR, Instant Messaging System, Document Management Information System, Central Information System, Public Grievance Redress and Monitoring System, Procurement and Inventory Management system, Foreign Collaboration Approvals Information Management System, ExtraDSIR and Exchequer were operational during the period under report. IT-Security Policy has also been implemented in the department. Integrated Finance, DDO and Utilization Software (IFDUS) is being developed and preparation of bills for Grant-in-Aid is under testing. The preparation of bills for Salary, Contingency, TA/DA and LTC Advance and Other Advances is under development. A Composite Pay Roll System, developed in-house has been installed, configured and is under testing in the department for preparation of bills for salary, all advances, arrears and allowances. The system is used for calculation of Income Tax and preparation of Form 16 and e-TDS (quarterly and annually). The system also has an interface for sending transactions to the bank.

3. AUTONOMOUS INSTITUTIONS

3.1 Council of Scientific and Industrial Research (CSIR)

The Council of Scientific and Industrial Research (CSIR) is making wide ranging efforts to achieve a position of leadership at the cutting edge of R&D in the areas of aerospace; biological and chemical sciences and technology; electronics; sustainable energy; materials for futuristic applications as well as affordable healthcare. CSIR is also focusing on efforts for improvement in the quality of life of the underprivileged population through S&T interventions.

The following sections encapsulate CSIR's year long domain specific scientific and technical endeavours; policy and procedures frameworks and implementation thereof; human resource management and outreach activities, etc.

Set up as an autonomous, not-for-profit, publicly funded research organization, CSIR, through its network of 37 national laboratories and 39 extension centres has a Pan-India footprint. True to its mandate, it strives to promote, guide and co-ordinate scientific and industrial research in the country. It is also charged with the activities like collection and dissemination of information in regard not only to research and development but to industrial matters generally, setting up of new laboratories to pursue scientific industrial research, etc. It also contributes to capacity building efforts of other research institutions through award of fellowships (through conduct of National Eligibility Test) and publication of scholarly scientific journals.

During the year, CSIR refocused and reprioritized its R&D activities responding to the Government directions/policy changes. Towards that all the CSIR laboratories have been regrouped in six clusters, viz. Biological Sciences, Chemical Sciences, Engineering Sciences, Information Sciences, Physical Sciences and CSIR-800.

3.1.1 Significant Achievements of CSIR

CSIR's programmes aim at achieving set objectives in important S&T domains such as affordable healthcare, sustainable energy, technology for industrial competitiveness, S&T base for strategic sector, finding holistic solution for societal welfare through local relevance and innovation. The significant achievements of CSIR in some of the focused areas are summarized below:

Biological Sciences and Technology (Healthcare, Food & Nutrition and Agriculture & Floriculture)

- ◆ **Risorine:** Advancement in treatment of tuberculosis has been achieved through concerted efforts put in by IIM and M/s Cadila

Pharmaceuticals Ltd. through the launch of a novel combination named as "RISORINE" - developed for the first time in the World. Lead for this novel therapy is obtained from Ayurveda. Commercialization of Risorine reduces cost of Rifampicin - Isoniazide containing formulation by around 20 %.

- ◆ **Memory Sure:** Bacosides Enriched Standardised Extract of Bacopa - a single plant based unique natural memory enhancer formulation has been developed and patented. The product under the brand name - Memory Sure is being marketed by M/s Lumen Marketing Co. and M/s Zaar Distributors Pvt. Ltd.
- ◆ **Neutraceutical and dietary supplement for optimum bone health (Plant 1020F147):** A standardized fraction (Plant 1020F147) isolated from plant source, has been found to promote peak bone mass achievement and prevent bone loss in ovariectomized rats. The product is a neutraceutical and dietary supplement for optimum bone health, which would help alleviate the severity of osteoporosis later in life. The know-how for the plant 1020F147 has been licensed to M/s Natural Remedies Private Ltd., Bangalore for commercial exploitation.
- ◆ **Improved process for centchroman (a non-steroidal oral contraceptive):** An improved, economical, safe, environmental friendly process for production of DI-Centchroman was developed. The drawbacks of the earlier version of 'Saheli' have been eliminated. CDRI licensed the improved patented process of synthesis of ormeloxifene (Centchroman) to M/s Hindustan Lever Life Care Ltd., Thiruvananthapuram.
- ◆ **New generation clot specific protein:** IMTECH designed and developed a new generation clot specific protein that displays plasminogen activation property. The technology for this new drug molecule has been transferred to M/s Nostrum Pharmaceuticals, USA.

- ◆ **Caerulomycin A:** IMTECH developed a technology for Caerulomycin A, its proprietary derivatives and analogues ("Caerulomycin") for their novel indication of immuno-suppression - a discovery of immense importance in tissue transplantation like in kidney and heart. The technology has been licensed to M/s Nostrum Pharmaceuticals, USA.
- ◆ **Recombinant streptokinase:** The technology, developed by IMTECH, for the production of recombinant streptokinase produced from E.coli gives yield higher than that of conventional system. This technology would bring down the prices of clot busters significantly. M/s Shasun Drugs & Chemicals through M/s Lupin Pharmaceuticals and M/s Alembic Chemicals launched the product recently.
- ◆ **Natural agent for treatment of gastrointestinal toxicity:** CSIR's patented know-how on a natural agent for treatment of gastrointestinal toxicity associated symptom and ulcer. It has been licensed to M/s IPCA Laboratories Ltd., Mumbai.
- ◆ **MTB diagnostic kit:** CDRI developed PCR based MTB diagnostic kit and transferred to M/s Biotron Healthcare Ltd., Mumbai. The product has been commercialized under the trade name MycoView.
- ◆ **Medicinal plant based compounds:** Developed medicinal plant based new technologies for: Compound 99/411-an antimalarial drug, Bacopa extract-memory enhancer, CDR 134D & CDR 134F 194-antidiabetic compounds, 80/574 Asorvastatin formulation -lipid lowering. All of them licensed to industry.
- ◆ **Drosophila model for epilepsies:** Established Drosophila model for epilepsies - an alternate to rodent model. It provides a unique opportunity to dissect long-term plasticity relevant in epileptogenesis at cellular and molecular levels.
- ◆ **Release of new Medicinal & Aromatic Plant (MAP) varieties:** The following high oil yielding varieties of MAPs have been released for commercial cultivation:
 - **Chamomile var. "CIMAP SAMMOHAK":** It is a high blue oil yielding variety of Chamomile (*Chamomila recutita* (L.) Rauschert). This improved variety has shown dry flower yield of 7.53q/ha and dark blue oil yield of 6.63kg/ha. The dark blue oil was found to contain 12.98 % of the active ingredient Chemuzuline. This variety is suitable for North Indian Plains.
 - **Lemongrass var. "CIMAP SUWARNA":** It is high oil yielding variety of Lemongrass (*Cymbopogon khasianus*) suitable for growing under conditions of water stress. This variety is highly promising for fast growth, high herbage (50t/ha) and oil yield (200kg/ha) of better quality (citra 80%). The variety is suitable for rain-fed conditions/drought prone areas.
 - **Palmarosa var. "CIMAP HARSH":** It is high oil yielding variety of Palmarosa (*Cymbopogon martini* var. Motia). This variety has potential to produce an average herb yield of 30 t/ha and oil yield of 240kg/ha containing 89% geraniol. The variety has been developed by CIMAP through intensive composite breeding. It is suitable for North India (U.P, Bihar), M.P, Maharashtra and South India.
 - **Menthol Mint var. "CIMAP SARYU":** A high oil yielding variety of Menthol mint (*Mentha arvensis* L.). This variety was developed through intensive selection. It has potential to produce 2.74t/ha of herb containing 0.84-1.0% oil with an average oil yield of 265-290 kg/ha against 220- 230 kg/ha oil yield of well established mint variety-Koshi. The oil of CIMAP-Saryu contains 79-80% menthol.

- **Open Source Drug Discovery:** OSDD seeks to develop molecules for the treatment of tuberculosis in open source mode. It has received overwhelming response in terms of active participation from various institutions and scientific groups of India as well as from abroad. Presently there are more than 2000 contributors in the OSDD web portal which also include contributors from Berkeley, Harvard, IISc., AIIMS, IITs etc. The OSDD distributed virtual library has over 50 institutions and more than 2000 researchers as a part of this initiative.

Chemical Sciences & Technology (Energy, Chemicals & Petrochemicals, Leather, Water and Environment)

- ◆ **Process for recovery of lead from zinc plant residue:** A simple process for recovery of lead by leaching and cementation process which can be easily refined to obtain pure lead has been developed. It is expected not only to ensure sustainability of the various secondary zinc plants but is also environment friendly. The process has been transferred to the M/s Chakradhar Chemicals Pvt. Ltd.
- ◆ **Flotation column for the beneficiation of sillimanite from beach sands at IREL, Chavara:** An innovative technology using mode of bubble generation/air sparging system for floating column for the beneficiation of sillimanite from beach sands has been developed. The unit with a capacity of 150 tons/day has been installed at M/s Indian Rare Earths Ltd., Chavara, Kerala which resulted in increase in productivity by about 40%, with 15% savings in energy.
- ◆ **Innovative technology for upgrading fuel oil components into premium refinery products:** A novel technology has been developed based on concept of combining two apparently distinct and unrelated disciplines viz. 'solvent extraction' and 'catalytic cracking'. This novel approach provides a unique solution for producing additional quantity of de-aromatized feed (raffinate) for secondary conversion unit i.e. FCC, which otherwise would have been wasted by being blended into fuel oil pool. The technology is licensed to M/s Hindustan Petroleum Corporation Ltd.
- ◆ **Wind turbine:** A 500 kW wind turbine has successfully been designed, developed and installed at Sangeeth Wind Farm. The wind turbine was designed in such a way that costly yaw control and pitch control system are not required.
- ◆ **Sulphate of potash (SOP) plant:** CSMCRI patented and transferred technology for production of sulphur of potash from sulphate rich bittern to M/s Archean Group of Companies, Chennai. 60,000 acre of land has been allotted to the company in the Greater Rann of Kutch to establish a 100,000 TPA sulphate of potash (SOP) plant, integrated with MgO production.
- ◆ **PDA technology:** An improved process for Propane deasphalting (PDA) technology, used for the up-gradation of PDA plant of HPCL, Mumbai. The current development would make the plant highly energy efficient.
- ◆ **High grade industrial salt:** During the year 16,000 tons of high grade industrial salt [Ca, 0.03-0.05%; Mg, 0.04-0.07%; SO₄ -2 0.16-0.25%; Fe, 25-50 ppm] was manufactured based on CSMCRI's patented know how and marketed to leading chlor-alkali and soda ash industries in Gujarat.
- ◆ **Process for 1,1,1,2-Tetrafluoroethane (HFC-134a):** Developed a process for 1,1,1,2-Tetrafluoroethane (HFC-134a) a high temperature refrigerant for domestic refrigeration and automobile air conditioners, and licensed to M/s Navin Fluorine Industries Ltd., Mumbai.

Physical and Engineering Sciences (Earth Systems Sciences, Engineering & Infrastructure, Mining, Mineral & Materials and Strategic Sector & Aerospace)

- ◆ **Wankel Engine - Powered Unmanned Air Vehicle (UAV):** CSIR-NAL in partnership with DRDO (VRDE, ADE) has designed and developed first Indigenous Wankel Engine - Powered Unmanned Air Vehicle (UAV) 'NISHANT' which performed its maiden flight during the year at Kolar, Karnataka. The critical core engine, including the special cylinder composite nickel-silicon carbide anti-wear coating and the special aluminum castings, was designed and developed by CSIR.
- ◆ **Plastic waste sorting machine:** Near Infra Red (NIR) spectroscopy based plastic waste sorting system has been developed. The system can cater to plastic waste containing six types of materials namely, polyethylene, poly ethylene teraphthalate, poly propylene, poly vinyl chloride, high density polyethylene and poly styrene. The technology has been transferred to M/s Dintis Technologies Pvt. Ltd., Bangalore for commercialization.
- ◆ **Carbon fibre technology:** The carbon fibre technology developed by CSIR has been licensed to M/s Kemrock, who would utilize the know-how to meet the national needs first and then for exports. This assumes importance as this material is banned for supply to India. This will be a beginning towards indigenization of this vital raw material on a large scale, these fibres being used for indigenous modern aircraft manufacture.
- ◆ **Deployment of mousche using shape memory alloys:** Carbon fibre reinforced polymer (CFRP) Mousche to withstand the full load test have been fabricated. The fore plane or Mousche is an additional aerodynamic control surface. It is attached to the fore body of the Naval version of Light Combat Aircraft (LCA). The Mousche is deployed during landing to improve the landing characteristics of the aircraft using Shape Memory Alloy (SMA).
- ◆ **Mobile Teleclock:** CSIR developed an innovative system for transmission of digital time data via mobile network. It receives time

data through a general packet radio system (GPRS) modem to access the wireless mobile telephone network. It has an in-built clock run by a crystal oscillator.

- **Work related to Common Wealth Games Village:** Delhi Development Authority (DDA) reposed their faith & confidence in CSIR by entrusting a prestigious assignment for quality assurance of the proposed construction of Commonwealth Games Village for the Commonwealth Games to be held in Delhi in the year 2010.
- **Highwall Mining in India:** Highwall mining is a new technology which can extend the life of opencast mines without disturbing the surface dwellings, and maintain economy and productivity. This technology is in use in United States and Australia but yet to be introduced in Indian coalfields, CSIR is instrumental in adapting this new technology for Indian geomining conditions by providing scientific extraction design for the first two highwall Mining sites at Ramagundem Opencast Project-II of M/s Singareni Collieries Company Ltd. (SCCL) and Quarry SEB and AB, West Bokaro of M/s Tata Steel Ltd. (TSL).

CSIR-800

- ◆ **Novel Varieties of Ashwagandha:** A novel variety of Ashwagandha (*Withania somnifera*) with a high root yield (dry weight) ~ 15 q/ha has been developed under CSIR NMITLI programme. The ashwagandha contains molecules pharmacologically established as anti-inflammatory, anti stroke and anti arthritis. The new variety was released to farmers by Hon'ble Minister for S&T and VP, CSIR.
- ◆ **Stevioside from *Stevia rebaudiana*:** An economically viable, green technology for the production of stevioside from *Stevia rebaudiana* has been developed by CSIR which is currently grown in 1010 hectares and an annual

production of 50500 quintals. The new process technology has helped in increase in production and quality. The current revenue is ₹ 66 crore per year and involves around 8 lakh mandays per year.

- ◆ **Muga Heal:** Bio-formulation "Muga Heal" developed by CSIR was released to farmers of Assam. This can be used against Flatcheric disease of Muga silkworm and also enhance the silk fibre.
- ◆ **BLI-ARUN - a new strain of Lemon grass:** CSIR has developed BLI-ARUN - a new strain of Lemon grass. The package and practice for cultivation and distillation of oil had been released to four parties in Itanagar, Arunachal Pradesh.
- ◆ **Satawar (*Asparagus racemosus*):** A high yielding variety of Satawar (*Asparagus racemosus*) with high root yield and high saponin content named CIM-Shakti has been developed by CSIR. This finds its applications in herbal drugs and would help farmers to increase their earnings.
- ◆ **Terafil water filters:** To provide potable water to the masses, CSIR has developed Terafil water filters with food grade plastic containers, over 50,000 water filters have been distributed and sold through various government agencies and NGO's. Likewise, another product - the NEERI-Zar' developed by CSIR is a water purification system suitable for potable water supply particularly under emergency situation like floods. 100 units of NEERI-Zar were successfully deployed during cyclone Aila affected areas during June, 2009.
- ◆ **Studies on Seaweeds diversity:** For the first time ever in India, the diversity and distribution of Seaweeds of India containing 198 species of marine macroalgae representing all three major groups of Chlorophyta, Phaeophyta and Rhodophyta collected from Gujarat coast has been carried by CSIR. The findings have been brought out in a publication form by Springer which provide most reliable baseline data on

seaweed biodiversity for monitoring and evaluating the impact of any coastal developmental activities aimed at long term economic gains or environmental changes as a result of global warming and climate change.

Traditional Knowledge Digital Library (TKDL)

CSIR has played a major role in protecting the traditional knowledge of the country, through unique programme on Traditional Knowledge Protection, in which CSIR has digitized the archives of Indian Traditional Knowledge by creating a Traditional Knowledge Digital Library (TKDL). The TKDL contains information in 5 international languages, i.e. English, Japanese, Spanish, French and German in 30 million pages concerning 2.0 lakh Medicinal Formulations in Ayurveda, Unani and Siddha. Through the TKDL Access agreement concluded with European Patent Office (34 Member States), examiners can utilize TKDL for search and examination but cannot make any Third Party disclosure.

Intellectual Property

CSIR has always maintained its leadership position in the country in securing protection for the intellectual property generated by its scientific workforce. During the year it published around 4000 research papers in SCI journals. During the period April to December (as on 29th December, 2010), It has filed 95 patents in India and 103 patents abroad whereas it has been granted 207 patents in India and 173 patents abroad. CSIR could also file 24 copyright applications during the same period. At present CSIR holds an impressive patent portfolio (patents in-force) of 2253 patents in India and 3062 patents abroad. CSIR Laboratories contributed to produce over 450 Ph.D. students in various disciplines.

3.2 Consultancy Development Centre (CDC)

The Consultancy Development Centre (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

CDC was approved as an Autonomous institution of DSIR in December 2004. The Centre is managed and guided by a Governing Council headed by Secretary, DSIR. The Governing Council consists of representatives of government, industry and academia. The activities of CDC pertain to educational programmes in consultancy management, competency enhancement through training and skill building programmes, development of young professionals and women who opt for consulting as a career option and studies/projects relating to development of the consultancy profession.

During the period under report, specific programmes/activities in line with the following thrust areas decided by the Governing Council of CDC were drawn up for implementation.

- ◆ Development of Education and Capacity Building for Competency Enhancement of Consultancy Skills in the Country and Asia Pacific Region
- ◆ Consultancy Support for Projects/Activities for Developmental Programmes including North East and J&K
- ◆ Projects/Activities for Priority Sectors including SMEs
- ◆ Projects/Activities for Development of Consultancy

For carrying out specific projects/ activities in line with the above thrust areas, a plan budget of Rs. 450 lakh has been allocated to CDC. Based on the recommendations of the Project Advisory Committee constituted for the purpose, specific projects/ activities/ schemes were framed for implementation during the year.

All the programmes/ activities/ schemes are in line with the mandate of development and promotion of consultancy capabilities in the country. The expected outcome/ benefits of the activities would include.

- ◆ Development of Professionals/experts
- ◆ Creating a large pool of trained manpower/work force in consulting
- ◆ Facilitating career options in consulting

- ◆ Awareness and exposure/benefits on use of consultancy services amongst various stakeholders including government
- ◆ Creation of a knowledge centre on Consulting
- ◆ Enhancing quality in consulting
- ◆ Development and promotion of consultancy as a profession

4. PUBLIC SECTOR ENTERPRISES

4.1 National Research Development Corporation (NRDC)

The Corporation was established in 1953 by the Government of India, with a primary objective to act as a catalyst to promote, develop and commercialize the technologies / know how / inventions /patents/processes emanating from various national R&D institutions. The other major areas of activities of NRDC include facilitation of trade and business in science and technology in India and abroad, encouragement and advancement of research, propagation of inventions and innovations enabling the growth of Indian technologies and provide business benefits to techno-entrepreneurs through its IPR assistance.

In this endeavor the operations of the Company encompasses two major roles, viz., Promotional and Commercial. In its promotional role, well assisted by DSIR through generous funds, Corporation has undertaken two major programs viz. Invention Promotion Program and Technology Promotion Program. In its commercial role the company over the years has taken up activities pertaining to its area of expertise that is technology transfer.

In pursuance of its corporate goals, NRDC has forged strong links with and between the scientific and industrial community in India and abroad. The Corporation has formal arrangements with many of the major R&D organizations/ universities in the country for the commercialization of know-how developed in their laboratories. To create awareness on the range of technologies and services that is available from India, NRDC participates in exhibitions, seminars, workshops and entrepreneurship development programs in India as well as abroad.

NRDC also endeavors to leverage technology and narrow the technology divide between rural and urban India and enable common people to reap the benefits of technological development.

India has an extensive network of R&D institutions, mostly Government supported. These institutions cover virtually every branch of research and different aspects of technology. The institutions in this network are the primary source of NRDC's portfolio of marketable technologies. Prominent among these are :

1. National R&D Organizations
2. R&D institutions and laboratories under the various Ministries and Departments of the Government of India.
3. Industry Association/Research Institutions
4. Academic Institutions
5. Public Sector Organizations
6. Privately owned Research Institutions/ Organizations

NRDC also acts on behalf of large organisations who develop technologies in their R&D laboratories but chose to license them out for commercialization & hence assign them to NRDC.

NRDC Facts

- ◆ NRDC has licensed the indigenous technology to over 4600 entrepreneurs since its inception.
- ◆ NRDC has a database of over 2000 technologies
- ◆ Strong network to collect royalties
- ◆ Registered under Section 25 of Companies Act

Apart from carrying out the technology oriented entrepreneurial activity, the Corporation is also dedicated with equal zeal for carrying out its promotional activities. The major promotional activities undertaken by the Corporation are :-

- ◆ Giving awards to meritorious inventors - To promote the spirit of inventivity amongst scientists, inventors, students etc.
- ◆ Providing both technical and financial assistance for patent searching & filing patent - To protect inventions of individual inventors.
- ◆ Conduct patent seminars throughout India for

creating awareness regarding protection of inventions

- ◆ Participate in the equity through Angel funding to promote new ventures
- ◆ Bringing out scientific magazine Awishkar (monthly) in Hindi - to create general awareness of National Science & Technology heritage in the country by targeting individual inventors, innovators, industrial entrepreneurs etc.
- ◆ Provide Techno-commercial support to promising inventions and incentives to the Scientists.
- ◆ Development and promotion of rural and household technologies - To help several thousands of rural masses to generate employment and establishment of their business activities.
- ◆ Technical upgradation of select Rural Clusters
- ◆ Dissemination of information on the technologies.
- ◆ Organizing training programs on technology development and commercialization.
- ◆ Development of important technologies under Priority Projects - The Corporation identifies those technologies for development, which are of National importance and can have potential for export to the developed as well as developing countries.

As a result of these promotional activities, several new technologies have been developed, promoted and have achieved commercial success. This has resulted in nurturing our knowledge base & setting up industry based on the knowledge.

In addition to the various promotional activities stated above, the Corporation also undertakes commercial activities which are as under:

- ◆ Licence indigenous technologies to industry
- ◆ Intellectual Property Rights (IPR) Consultancy to R&D institutes/industries
- ◆ Export of Indian Technologies / know-how
- ◆ Participate in equity to facilitate formation of new ventures - Angel funding
- ◆ Execute turnkey projects abroad based on indigenous technologies

- ◆ Bringing together various R&D Institutions, industry in India through various get-togethers organized across the country
- ◆ Technology Evaluation
- ◆ International Patent Search
- ◆ Intellectual Property Rights Protection
- ◆ Conducting Market Surveys
- ◆ Preparation of Feasibility/Project Reports
- ◆ Identifying competent industrial clients
- ◆ Negotiating fair and equitable technology transfer agreements
- ◆ Syndicating Technology Development Funds
- ◆ Collection of Royalties
- ◆ Taking care of Legal aspects

4.2 Central Electronics Limited (CEL)

Central Electronics Limited (CEL) has been the pioneer in India in Solar Photovoltaics, Railway Signaling and Safety Equipment and Strategic

Electronics (PCM and Piezo ceramics). CEL has upgraded and up-scaled its Solar Photovoltaics operations from 2 MW to 10 MW during 2006-07 and has modern state of the art solar cell process technology to meet domestic and international competition. CEL has successfully developed Digital Axle Counters and 40 Detection Points Multi Section Digital Axle Counters conforming to European Standard CENELEC SIL-4 for Indian railways.

CEL has achieved the production and turnover of ₹ 123.54 crores and ₹ 114.52 crores respectively, during the year 2009-10 and earned gross margin of ₹ 9.02 crores. The Company has continued to perform profitably for the fourth successive year in spite of stiff competition and recession in the global market.

Further, CEL is diversifying in other areas of operations to achieve higher projected turnover in the next 2-3 years.