

## IIC. TECHNOLOGY MANAGEMENT PROGRAMME

### 1. OBJECTIVES

The major objective of the Technology Management Programme is to provide the required technological inputs and support mechanisms for efficient transfer and management of technology.

The process of liberalization and subsequent globalization has changed the climate for innovation in the country. Technological prowess is alone not sufficient to combat challenges effectively in the current competitive scenario; rather the ability to manage these skills is also equally important. Technology Management is the key to performance in every sphere of activity in this milieu. Specific programmes targeted towards enhancing technology management capability in industry, R&D institutions, academic institutes and other establishments have been initiated. This is helping in the promotion and effective utilization of emerging technology management methodologies, and in bringing about better industry-institute inter-linkages through a networking of industrial needs with academic and R&D inputs.

### 2. ACTIVITIES

The activities undertaken have been primed to enhance knowledge and skills in the efficient management and transfer of technology. Multi pronged measures have been initiated to generate a knowledge base in technology issues, to facilitate awareness building and provide training and capability enhancement.

These include:

☞ Providing assistance in efficient transfer of technology, through information in respect of foreign collaborations approved and

analysis of such approvals as well as focused studies;

☞ Enhancing knowledge base in respect of technologies specific to the nation, including rural based technologies and region/sector specific technologies by undertaking analytical studies, technology status and development studies

☞ Providing information to industry, Government departments and researchers through targeted research studies and policy research

☞ Promoting industry-institute interaction by setting up resource centers on technology management in appropriate locations

☞ Enhancing academic interest and contribution through active collaborations and memorandums of understanding with academic institutes

☞ Initiating State level agencies and research organizations to take up activities in the realm of Technology Management

☞ Information dissemination on Technology Management related aspects through newsletters, portals, manuals, and other forms

☞ Promoting an understanding of Technology Management in the Indian scenario through case studies of manufacturing and research organizations in the country, distinguished technologists lecture series etc, and

☞ Promoting an understanding of technology management, its need and importance in the current competitive environment through

awareness programmes, focused training, seminars and management development programmes, and guidance to trainers on specific technology management issues.

### **3. WORK COMPLETED / UNDERTAKEN DURING THE YEAR**

During the year, in addition to a number of on-going activities, a few more need based programmes and activities have been taken up.

#### **3.1 Compilation and analysis of data on approved foreign collaborations**

The compilation of foreign collaborations approved during the year, which is being brought out regularly for quite some years, was continued this year too. These publications provide information relating to the names and addresses of the Indian and foreign collaborators and the specific terms of collaboration. The report includes an analysis of the data compiled.

The publication is much sought after as an authentic record of foreign collaborations approvals in the country. Compilation for the year 2003 is in progress.

#### **3.2 Analytical, Technology Status and Development Studies**

Identification of technology gaps of existing industries in respect of important products and processes is a need that has to be continually addressed. There are many region specific resources in different States in the country that have spawned industries, which benefit through such research and analysis. There are also a number of areas where there is need for indigenous development of technology and for value addition; including rural based technologies; in respect of which information collection and analysis is required. Industry, policy makers, academic and research institutes need to be made aware of areas of their concern relating to these technologies in which effective

action can be taken to mitigate problems and enhance efficiency.

Studies have been taken up to address these; covering status of technology in the country, international trends, gaps in technology, research facilities and other such information; in respect of specific identified products, processes. The details of such studies undertaken are listed below:

#### ***Study on technology status of Aromatic and Medicinal Plant Species in the State of Sikkim***

The above study assigned to the North Eastern Industrial and Technical Consultancy Organisation Ltd (NEITCO), Guwahati has been completed. The work involved identification of various plant species having commercial importance and analysis of the status of industries based on these plant species in the State.

Sikkim has a vast reserve of medicinal and aromatic plants species and a rich culture of folk medicine. Most of these plants are collected from the wild and only a few of the species are under commercial cultivation. The study has identified several species of plants having major potential. In order to give a fillip to this sector it is suggested that strategies need to be formulated around the following aspects: Cultivation, Propagation, Conservation and Harvesting; Processing/Manufacturing and Marketing; Database, Inventory and Documentation; Research & Development; Awareness Programmes and Community participation.

Although there are over 50 species which have good prospects, only 12 species which have high demand from the pharmaceutical sector may be initially identified for commercial cultivation. These are:

☛ Atees: *Aconitum heterophyllum* Wall.

- ☞ Chirata: Swertia chirata Buch – Ham.
- ☞ Indian Berberry: Berberis aristata DC
- ☞ Jatamansi: Nardostachys jatamansi DC.
- ☞ Kokum: Garcinia indica Linn.
- ☞ Kuth: Saussurea castus c.B. Clork (S.lappa)
- ☞ Kutki: Picrorhiza Kurooa Aut. Non. Royle
- ☞ Sarpagandha: Rauvolfia serpentina Benth. Ex Kurz
- ☞ Vatsnabh (Bikh) Aconitum ferox Wall. (A. Chasmanthum)
- ☞ Dioscorea: Dioscorea composita
- ☞ Homa cherri: Phodophylum hexandrum
- ☞ Mangan: Panax pseudoginseng Wall

Thrust should be given in the area of research and development and training of personnel connected to this sector, so as to optimally utilize the resources. The study has also provided indicative project profiles in the areas of ayurvedic formulations and preparations, herbals cosmetics, citronella oil, lemon grass oil, cinnamon leaf oil and others.

***Study on the status of Assessment of Forest Wealth based Industry of Maharashtra and Goa for Technological Upgradation and Value Addition***

The study assigned to MITCON Consultancy Services, Pune has been completed. The work involved survey of commercially available Minor Forest Produce (MFP) in the States of Maharashtra and Goa and analysis of the status of industries based on these produce. The broad findings are given below:

There are around 750 industrial units in the states of Maharashtra and Goa which are engaged in the manufacturing of MFP based

value added products. Out of these, around 70% are dealing with herbal drugs and medicines and are mostly located around Mumbai, Nagpur, Pune, Nashik, Jalgaon and Aurangabad. There are also units engaged in the manufacturing of food pulp and puree, herbal extracts, essential oils and cosmetics. Most of these units based on simple technologies and not capital intensive.

Substantial R&D work is carried out by various research organizations in respect of products based on MFPs. Many of such technologies are available from CSIR laboratories.

The study report also contains indicative project profiles for the benefit of entrepreneurs. Project profiles on natural dyes; pulp of unripe and ripe fruits of Bael, Bilwa and other fruits; sisal juice and products; extraction of various plants/herbs and others; have been covered in the report.

***Technology status study on Guar based industries in the country***

The status study had been entrusted to UP Industrial Consultants Limited (UPICO), Kanpur. The study involved analysis of production and distribution of guar sources, performance assessment of guar based industries in the country, scope for expansion/diversification and exports and assessment of gaps of technology in use. The study has been completed and a synopsis of the study is given below:

India is a world leader in Guar production, which is primarily concentrated in the states Gujarat, Rajasthan, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh and Orissa. The annual production of Guar during the last 3 years ranged from 11,00,000 MT to 12,87,000 MT. Around 90% of the total produce of Guar is used in the production of guar gum and rest is used as cattle feed. The by product of guar processing is guar meal; a rich source of protein that is used for cattle and poultry feeding.

Commercially important derivatives of guar gum are: Hydroxy Alkylated Guar gum, Carboxy Methylated Guar gum, Oxidized Guar gum, Cationic derivatives of Guar gum, Sulphated Guar gum, Guar gum formate, Guar gum acryl amide, Boraecrosslinked Guar gum, Reticulated Guar gum, Carboxy methyl hydroxy propyl guar gum and Depolymerised Guar gum.

Guar gum can be used for a variety of industrial uses in oil well drilling, textile printing, paper explosive, mining, pharmaceuticals and others. Indian industries are manufacturing either Guar gum split or Guar gum powder. There are more than 110 Guar gum split plants with a total installed capacity of more than 6 lakh tonnes per annum, fitted with indigenous plant machinery.

The present level of knowledge of farmers and use of inputs like high yielding varieties of seed, rhizobium culture, weedicides, pesticides and fertilizers being poor, there is an urgent need to educate farmers. Training programmes should be organised in selected villages having higher production by using the resources of ICAR, State Universities and other institutions. Demonstration farms should also be organised. Concerted efforts in the area of agricultural research for guar i.e. plant breeding and agronomical practices should be undertaken, in close interaction with the industry. Also, efforts towards development of new equipment and machinery for processing of guar and testing the quality of raw material and finished products are required.

The study report also provides indicative project profiles on Guar gum derivatives, guar gum powder, hydroxy-propyl guar gum and others for the benefit of entrepreneurs.

#### ***Study on 'Electronic Industries Cluster of Karnataka'***

The study taken up in association with Karnataka Council for Technological

Upgradation (KCTU), Bangalore has been finalized.

Rapid technological developments in electronics have spurred industry development in many parts of the country. In and around Bangalore, a large number of electronic industry units dealing with telecommunication products, consumer electronic products and industrial and strategic electronic products have come up. The economic liberalization process and rise of Information Technology has affected the Electronics Industry drastically. Two specific sectors, which have growth potential, have been taken up for the purpose of this study. Technology gaps in respect of the identified sectors have been brought out. In addition, specific measures to boost these sectors have been suggested.

#### ***Study on potential of Handloom and Spice Processing Industry with special focus on technology in the North East***

The study is being conducted by the NEITCO, Guwahati. The main objective of the study is to find out the interventions required for introduction of appropriate technology, equipment and upgradation of skills which will enable the products produced in the region to get wider market acceptance at competitive prices; and thus develop and upgrade the socio-economic scenario of the region through generation of employment and income. The study would involve survey of the existing units, identification of concentrated areas of the skills involved, size of the units, their technical, financial and economic status, present market coverage, product pricing, marketing channel, willingness for expansion, modernization and diversification, constraints, assistance required; availability of raw materials etc. The study is in progress.

***Study on status of technology in selected Cottage and Tiny Industries of Madhya Pradesh and Chhattisgarh***

The study has been assigned to MP Consultancy Organization Limited (MPCON), Bhopal. The objective of the proposed study is to select about 3200 cottage and tiny units in two industry groups in selected districts of Madhya Pradesh and Chhattisgarh to assess: the present status of technology in existing cottage and tiny industries; the need for technology upgradation in existing cottage and tiny industries; the present potential for productivity enhancement and value addition; the present export potential of the products produced and the present status of import substitution. The study is in progress.

***Study on 'Technology interventions required for Minor Forest Produce in Andhra Pradesh'***

The study has been taken up in association with APITCO, Hyderabad. The proposed objective of the study is to cover 35 varieties of Minor Forest Produces (MFPs) in the 54 forest divisions in Andhra Pradesh. It would inter-alia: collect data on products and prices for the last 3 years offered by different buyers from secondary sources, evaluate present procedure adapted from collection to marketing, estimate wastage and financial loss for each of the 35 MFPs, evaluate the present process of marketing and identify quality requirements for enhanced market in both domestic as well as export segments, identify improved methodology for better processing disseminate the findings in each of the forest divisions and also bring out relevant project profiles. The study is in progress.

***Study on 'Technological Interventions in manufacture of ethyl alcohol from grains in Maharashtra'***

The study has been entrusted to MITCON, Pune. The objective of this study is to assess the

technological aspects of manufacturing Ethyl Alcohol from Grains and its industrial potential in Maharashtra. The grains to be focused would be sorghum and maize. The technological interventions required in processing and evaluating the strengths and weaknesses of existing technologies are inter-alia proposed to be covered in the report. The study is in progress.

***Study on 'Potential of Minor Forest Produce Based industries in Uttaranchal and Uttar Pradesh'***

The study has been assigned to UPICO, Kanpur. The study proposes to assess the availability of minor forest produce materials and the potential of setting up industries using such materials as input. It is also proposed that the area would be surveyed, materials identified, sources of technologies ascertained and project profiles of commercially viable projects brought out. Area-wise specific development programmes for MFP based industries would also be suggested. The study is in progress.

**3.3 Studies on technology and innovation management issues**

Rapid paradigm shifts are taking place and new approaches; tools and techniques are available in technology and innovation management areas. Studies - in such emerging areas for harnessing value from knowledge leading to further knowledge creation, on technology transfer issues and technology upgradation measures, and in other technology areas - have been taken up. Specific studies for the benefit of small and medium enterprises, and identified sectors that offer opportunity for growth have also been taken up. These study reports are widely disseminated and have benefited industrial units, R&D organizations, academic

institutes, Government departments and others. The details are summarized below:

### *Study on Management of innovation in SMEs*

The study entrusted to T. A. Pai Management Institute (TAPMI), Manipal has been completed. The major objective of the study was to investigate the process of technological and managerial innovations in companies in the small and medium sector operating in select industries.

The study has brought out that technological innovation is invariably supported by managerial efforts in synergizing available resources and converting skills and knowledge into new products and processes. Managerial innovations deal with new ways of operations with regard to systems and procedures. Technological innovation, which is generally understood to deal with technical aspects of organizational activities are facilitated by the managerial innovations resulting in building of innovation capabilities. Innovations are influenced by both internal and external organizational factors. Internal factors include inter departmental co-ordination, communication system, organizational structure covering aspects like size, hierarchy of relationships, roles played in different layers and leadership style. Such factors are understood to be the influencers that regulate the manner in which innovation capabilities in a company are acquired, developed and built.

As regards the connection between technological innovation and business strategy, the report brings out that perhaps appropriate innovations contribute to building fundamental competitive advantage in an organization. Specific mapping of innovations has enabled a better understanding of the degree of alignment between technology strategy and business strategy. It is possible to apply this concept of technology strategy and gain insight into the kind of capabilities an organization is building

up and identify innovations critical to its future. It is crucial for the organization to realize this and apply these principles continually.

Another gleaning from the study is that knowledge management is a process involving people and that human resource management is, therefore, subsumed within knowledge management. The reward system, direct conscious efforts made by the leader, thrust of the leader's vision, the shaping of organization culture are all closely linked to the learning process within an organization. Such organizational learning is key to the acquisition and innovation capabilities of an organization. Such innovation capabilities constitute of two levels of functional capabilities that deal with specific skill sets and knowledge and integrative capabilities that merges and synergizes the functional capabilities with other organizational resources. The effectiveness of problem solving is one measure of the process of learning and acquisition capabilities. The efficiency of continuous improvement activities is another measure. Again the kind of leadership, organizational culture, vision and human resource management practices are the major influences.

The study brings out that integrative capability seems to be directly related to the size of the organization. As organizations grow, they seem to learn to acquire the capability to link the various critical activities involved in innovation. The study also brings out that the process of management of knowledge and learning is similar across the organizations studied. So also, the organizations exhibit variation in their adoption of product vs process centric innovations, revealing a significant characteristic of the technology strategy. Besides, the choice of the market segment served seems to influence the technology strategy of the organizations. In other words, the choice of OEM or mass market or industry

or retail market seems to be a major influence. Importantly, the study highlights that the technology strategy, which also implies the nature of technological capabilities sought to be built, is not automatically aligned with the business strategy of an organization at any point of time.

#### ***Study on ‘Innovation in Infrastructure Sector in India’***

The study has been assigned to XLRI, Jamshedpur. The objective is to study innovation aspects of the infrastructure sector, assess the extent of innovation achieved and the contribution to national development. Measures taken up by concerned agencies to enhance the ‘innovativeness’ of the infrastructure sector are to be examined. The status of technology in use in traditional infrastructure sectors as well as emerging infrastructure sectors, gaps in technology in comparison with the state of art in use elsewhere, and analyzing the role of innovation in these sectors, giving adequate coverage to specific technological dimensions associated with each sector; are among the issues that are being covered. The study is in progress.

#### ***Study on ‘Management of Technology in the Automotive sector’***

The study has been assigned to Management Development Institute (MDI), Gurgaon. The main objective is to study aspects related to management of technology in the automotive sector that is having immense potential to grow and develop further in the country, create a dedicated research team to this end and suggest measures for furthering innovations in this vibrant sector. Case studies would be generated focusing on a number of technology management issues handled in the sector that would be studied at depth. The study is in progress.

#### ***Study on ‘Evaluating the Application of Technology Management Assessment Procedure (TMAP)’***

The study has been entrusted to MPCON, Bhopal. The main objective of the proposed project is to evaluate the application of Technology Management Assessment Procedure (TMAP) in the Foreign Collaboration proposals approved and implemented in Madhya Pradesh during the last seven years. Issues, proposed to be covered in respect of the cases, are: Identification, Selection, Acquisition, Assimilation and Exploitation of technology as well as Protection of knowledge and expertise. The study is in progress.

#### ***Study on ‘Technology Management practices in companies related to technology transfer’***

The study has been assigned to Consultancy Development Centre (CDC), New Delhi. The objective of the study is to study the correlation between the success of companies who were involved in technology transfer and the various attributes of technology management. Five large successful companies that have had experience of technology transfer and have also managed the transferred technology successfully, are proposed to be studied. Suggestions and recommendations from the experience of these successful companies would be brought out to help other companies handle such issues well. The study is in progress.

### **3.4 Targeted research studies on specific issues in technology transfer, technology and innovation management**

Research is paramount to developing an objective understanding of a situation demanding focused direction. There is thus immense need for serious research and study of several aspects concerned with management of technology in different sectors that are important for the economic uplift of the nation. Such research efforts not only result in

comprehensive information and data collection of a specific nature but also enable analytical decision making. With this in view, some more need based research studies were undertaken during the year.

***Development of a Model of Evaluation for Innovations in SMEs***

The study has been taken up in association with IISc Bangalore. The objective of the study is to develop a model for evaluation of innovation in select technology based small and medium enterprises. These SMEs would be drawn from amongst select sectors. The study, while investigating the status of innovation in entrepreneurial firms, proposes to highlight the nature of innovation and strategy being followed. It would also provide a model that firms could use in analyzing their own innovation process and develop a long term innovation strategy. The study would identify variables that facilitate innovation in a small technology based Indian entrepreneurial organization and to develop a model that measures innovative pursuit. The study is in progress.

***Study on 'Influences of Integration of Technological Strategies with Business Strategies of Large Public Sector Organizations and their Small and Medium Scale Suppliers'***

The study has been taken up in association with Birla Institute of Technology (BIT), Ranchi. The objective would be to study the influence of technology change on a large-scale organization and its impact on the technology capabilities of its vendor/ancillaries. The study would focus on a large public sector organization. The specific impact on technology strategies and strategic vision as well as the spin of effects on its vendors and ancillaries would be analyzed. The study is in progress.

***Study on 'Women Representation in Corporate R&D'***

The study had been assigned to IIM Calcutta. The objective is to examine the determinants of women leadership in various corporate companies. Both socio-cultural factors relating to women leadership in Science and Technology areas, as well as linkages between the national culture and organizational processes and practices would be analyzed. Reasons for slow growth of women professionals in research and development fields, factors relating to organizational culture and leadership that influence performance of women, specific gaps in corporate industries as well as strengths and failings of women employed in these industries are among the issues that would be covered. The study is in progress.

***Study on 'An empirical analysis of the status of collaborative R&D in India'***

The study has been taken up in association with IIM Indore. The main objective of the study is to understand the perception of Indian industries related to collaborative R&D, identify the factors that impede Indian industry to carry out collaborative R&D, estimate the impact intensity of these factors on the probability of adopting collaborative R&D and bring out the difference across industries or technologies. The study is in progress.

***Study on 'Managing strategic transformation of high-tech firms in India'***

The study has been entrusted to IIM Calcutta. The study proposes to research into the process of strategic transformation by companies that wish to move up the value chain, in the case of two specific industries viz. pharmaceutical and information technology. The proposed methodology is to first conduct a pilot study of two companies, one in each industry, followed by a workshop to define and focus the future research strategy and work plan, then study



eight companies, four from each industry sector before drawing out specific conclusions in a final report. The study is in progress.

### ***Study on 'Building technological capabilities through strategic development of industrial clusters'***

The study has been taken up in association with IIM Ahmedabad. The proposal aims to broadly study the mechanisms that firms use to learn from each other in order to enhance their technological capabilities and consequently their competitiveness and identify what allows clusters to achieve this objective. Sample surveys and case studies are to be used to lead to quantitative assessment and specific understanding. About 75 firms in three clusters are to be covered. A report analyzing the nature, extent and characteristics of technology building in three chosen sectors through industrial clustering and emerging strategic needs would be brought out. The study is in progress.

### **3.5 Case Studies covering Technology Management aspects**

Case studies bring out how technology has been managed in corporate as well as in R&D organizational settings. The objective is broadly to generate learning from best practices. Such studies are important for pedagogic use as there is paucity of relevant case material based in the Indian situation. These case studies also provide useful information to consultants and executives from industry. A number of case studies relating to Indian manufacturing and research organizations have hence been taken up, brief details of which follow:

#### ***Case Study of a Pharmaceutical Company***

The case study assigned to ASCI Hyderabad, has been completed. In the current competitive environment global pharmaceutical companies are continuously employing a number of strategies to remain competitive. These include

intensive drug discovery supported by combinatorial chemistry, consolidation through mergers and acquisitions, strategic alliances and resource pooling, switching over to biotechnology based drugs instead of chemistry based drugs, utilizing traditional knowledge for identification of biologically active molecules, establishment of brands, globalization of research, increased adoption of high through put screening and intensive patenting of active molecules. Mergers facilitate companies to have a sharper market focus and enhance resource availability for new product development. Alliances also facilitate the fusion of two distinct competencies, namely bio-chemical process development and bio-medicinal chemistry, both of which are required for development of bio-technology based drugs. In view of the innovative nature of the industry and the patent regime becoming tighter, a company needs to employ a combination of these strategies in order to remain competitive.

The case study highlights the importance of a shared vision to achieve success. Research in the company studied has three areas of focus namely, development of drugs for generic markets, new drug development and new drug delivery systems. The importance of studying generic market is because many valuable drugs would be going out of patent protection in the next few years, leaving open a very large market. The cost of new drug development could be lower if carried out in India effectively. Achieving this cost effectiveness would require focused capabilities.

Globalization of operations helps a company in a number of ways, as brought out by the case study. It helps the Indian company learn about global markets and learn about competitive practices. This facilitates the acquisition of new capabilities. It also helps the company in deriving economies of scale. It also helps the company to diversify and expand its product portfolio and thus minimize risks. Acquisition of companies aids in leveraging competencies,

brands, manufacturing assets and sales force; depending upon the specific capabilities of the company being acquired. The company can thus not only enter new market segments and increase its export but also improve its competitiveness and source bulk drugs through internal procurement. One useful strategy is perhaps to operate each of the individual units as separate profit centres. This would ensure that the acquisition process does not adversely affect the managerial culture.

The case study clearly brings out the importance of openness, achievement orientation, positive attitude and non-bureaucratic style in the organizational culture. Leadership also plays a pivotal role, the case study clearly brings out. The leader can catalyze the evaluation of a company by providing vision. Globalization, alliances, innovation and acquisition are all important to performance. Globalization also leads to a change in managerial culture and brings about professionalization of management. This in turn leads to several positive outcomes, inclusive of changing to an innovation culture from that of imitation, benchmarking against global competitors, becoming more quality and cost conscious and improving competence regulatory practices.

### ***Technology Audit in a fertilizer industry based unit***

The Case Study taken up by TAPMI Manipal has been completed. A technology audit provides for a dynamic perspective and evaluation of the technological and organizational strengths and weaknesses; and identification of specific technological potential. An understanding of the innovation process resulting in enhanced operating capabilities is the end result.

The fertilizer industry in India was first established in 1906 and has since been growing from an annual capacity of 6 thousand metric tones to 17.5 million metric tones till 2003.

There are 59 large fertilizer plants manufacturing a wide range of nitrogenous, phosphatic and complex fertilizers, 23 of which are in the public sector; apart from around 70 medium and smaller sized units also in operation. The fertilizer industry in India has been continuously upgrading its technology, revamping its plant and machinery to suit different feedstock and produce a wide range of products. There has been a shift towards using cleaner technology resulting in pollution reduction.

The company studied had been beset with several operating and management related problems, and made a phenomenal comeback in recent years. The study revealed that the critical factors affecting its performance related to power supply, plant and machinery failure, process water, labour unrest and paucity of funds among others. An in-house technical services cell has been set for undertaking pilot plant studies, project planning, design and implementation; and the company has been keeping track of the latest technological process developments.

Despite suffering from setbacks during the project formulation state and a protracted project implementation period, the company managed to start performing as a result of its technology focus. Several steps were initiated. Indigenization of spare parts and machinery resulted in reduced inventory levels. Major R&D activities were initiated in areas related to energy and power consumption and efficient use of feedstock. The feasibility of changing over to LNG as feedstock, instead of naphtha, is being examined. A plan for diversification to utilize the excess ammonia capacity for a new plant was successfully commissioned. A major reason for project delay was the decision to use a new process technology for manufacture of DAP, that had not been tested commercially elsewhere. Being the first commercial plant of a new process technology the exercise was unsuccessful and had to be replaced with

conventional technology, which was implemented free of cost by the supplier, notwithstanding the losses accumulated on account of delay in implementation etc. There have been continual efforts to revamp and replace critical plant machinery and spares right from the initial years. But more recently technical and pilot studies involving licensors and technical consultants have resulted in rehabilitation plans being systematically drawn up. All these measures have resulted in the company's turn-round and profit is being generated over the last 4 years. Technology has hence played a major role in achieving increased production, better capacity utilization, on-stream efficiency, reduced energy consumption, optimization of raw-materials viz. reduced ammonia usage and reduced utilities consumption by way of steam and power. A strong knowledge base, abetted by the effective linkages between technology and functional areas, has been a major contributory factor towards attainment of profitable operations.

***Case study of a manufacturing organization in the engineering sector.***

The case study assigned to ASCI Hyderabad, has been completed. The gist of the study follows.

The company has established itself as a quality manufacturer, and quality, taken in its wider sense, means far more than mere conformity to product specifications. The company constantly strives to achieve excellence in all areas of performance. Quality is sustainable at the company as it is process driven. Apart from its focus on quality, the company has also cultivated excellence in Total Preventive Maintenance. The company is hence able to maintain profitability. The company is among the earliest of engineering companies to establish external manufacturing linkages by setting up a manufacturing base in China.

The company's process driven quality approach enabled it to enter into strategic alliance with one of the world's leading automotive manufacturers. Apart from enabling exports of specific products, the alliance aided the company in finding new markets, and customers; to use quality as an entry point in other markets; and to find and improve markets for its other products.

The organization proposes to use strategic acquisitions and diversifications into new product areas as drivers for growth in the future. Importantly, the company has a shared vision to become a global supplier for automobile components of value to its customers. This has been possible because it has leveraged its technological capabilities for creating business value in an industry that is intensely competitive. It has hence successfully positioned itself as a vibrant, dynamic, customer oriented and truly global company only on the basis of its technological capability.

The stress on quality and ISO 9000 certification has provided the company an opportunity to enter the burgeoning information technology business. The company has ventured into development of software products for knowledge integrated quality management. The company has hence been able to spur software exports too.

The company has successfully integrated its technology and business strategies through a host of measures:

- ☞ Creating a global reputation as a quality supplier
- ☞ Ensuring it remains a quality and cost leader through use of total preventive maintenance
- ☞ Sustaining the quality, productivity, and excellence through continuous monitoring and implementation of technology assimilation initiatives

☞ Assessing the systems and performance benchmarks to become a global supplier of automobile aggregates.

In conclusion, strong leadership, shared vision, commitment and involvement of managers at various levels have been the major factors that have helped the company in initiating change and in devising suitable strategies, leading to successful diversification and globalization.

Three more case studies of manufacturing organizations in different sectors are in progress.

### **3.6 Collaborative work with Academic Institutes on Technology Management.**

There have been intensified efforts to interact with academic institutes, especially those concerned with technical and management education, in order to give the necessary thrust to formal education in technology management aspects. Measures to develop sufficient teaching material based in the Indian setting, develop a base of pedagogic aids and teaching tools and to enable appropriate understanding of the issues concerned is a continuous thrust of these collaborative activities. The importance for need-based modules on issues related to technology management has been sensitized in many institutes across the country, apart from forging an active collaboration with some of them. A summary of these collaborative efforts is given below:

#### ***Collaboration with School of Management, IIT Bombay***

Work taken up in association with School of Management, IIT Bombay entered its second phase. Outputs generated during the first phase were much appreciated by the many users from industry, academic institutions, Government agencies, consultancy and research organizations. Several need based activities

have been taken up in the second phase. These include, organization of a management development programme, bringing out of newsletters, development of a portal, organization of a national seminar, and conduct of case studies.

#### ***Collaboration with Administrative Staff College of India, Hyderabad (ASCI)***

The collaboration forged with the Administrative Staff College of India, Hyderabad has been very fruitful and has yielded a number of useful outputs that have been very well appreciated. Some of the major activities taken up under this collaboration include preparation of case studies of research and manufacturing organizations, organization of focused training programmes, organization of lectures by distinguished technologists, policy research studies, pedagogic aids such as bibliographies etc.

#### ***Collaboration with IIMs***

Collaborations have been forged with several IIMs to propagate an understanding of technology management related issues. During the year, activities inclusive of projects on technology and innovation management and focused research studies on several emerging aspects have been undertaken in association with IIM Ahmedabad, IIM Calcutta and IIM Indore.

#### ***Collaboration with IIT Madras***

The development of an electronic newsletter has been taken up in association with IIT Madras. The objective of the Newsletter is to enhance technological creativity and interest in technology development among various target groups. The newsletter would feature information on various technologies, case studies, and technology morphologies; and provide basic foundation in various aspects of technology management.

### ***Collaboration with other leading academic institutes***

Work has been taken up in association with several leading institutes on different aspects of technology management. Other institutes in association with which work is on-going during the year include IISc Bangalore, XLRI Jamshedpur, Birla Institute of Technology Ranchi, Management Development Institute Gurgaon, T A Pai Management Institute Manipal, PSG Institute of Management Coimbatore, Osmania University Hyderabad and others. In addition, the collaboration with IIT Delhi and IIT Roorkee on dissemination of technology management aspects was continued.

### **3.7 Collaborations with State level, research and other agencies on Technology Management**

Interaction with State level bodies and research institutions with the objective of initiating activities in the realm of Technology Management has been a major thrust of the Division. During the year, interaction with several State level bodies across the country continued with increased vigour, apart from continued collaboration with research institutions.

#### ***Interaction with Madhya Pradesh Council of Science & Technology***

The first phase of collaboration with the Madhya Pradesh Council of Science & Technology in the form of a memorandum of understanding has been signed during the year. Several activities aimed at fostering an understanding of technology management issues are being undertaken.

#### ***Interaction with Karnataka Council for Technological Upgradation (KCTU)***

Work undertaken in association with the Karnataka Council for Technological

Upgradation, Bangalore was continued. Cluster level case studies, focused training programmes, information dissemination of technology management aspects specific to the region and bringing out newsletters are among the activities taken up. The outputs generated and the training programmes conducted, including those for training of trainers, have been found to be extremely useful.

#### ***Interaction with State level Technical Consultancy Agencies***

Work has been taken up in association with several of the State level Technical Consultancy Agencies to undertake specific region based studies on technology status and development. These include MPCON Bhopal, APITCO Hyderabad, MITCON Pune, NEITCO Guwahati, UPICO Kanpur, MITCON Pune and CDC New Delhi

#### ***Collaborative activities in association with research organizations***

Over the years, activities have been undertaken in association with CSIR laboratories and other research organizations on different technology management related issues. During the year, work taken up in association with Waterfalls Institute of Technology Transfer (WITT), New Delhi was continued.

### **3.8 Industry-institute networking**

There is a need for the creation of centers or forums in different parts of the country where there is access to information on technology management aspects that are specific interest to the region of concern, expertise to advise and provide guidance on issues concerned with technology management, and generate long-term as well as short-term solutions. Two resource centers have been set up at regional levels in selected industry clusters across the country. The basic objective of these centers is to continually nurture technology development,

innovation and growth by focusing on relevant TM issues and networking with national / international organizations depending upon the specific interventions required.

### ***Center for Technology Management at Coimbatore***

A Centre for Technology Management has been established at PSG Institute of Management, Coimbatore. The objective of the Centre is mainly to act as a resource base for Technology Management related activities for furthering knowledge in this field. The Centre provides information on an on-going basis in respect of local-specific technology related issues relating to the area. An industry focus has been selected for the purpose so that close linkages between industry, technical, management and research organizations can be forged effectively.

A number of activities are being taken up at the Centre which include: counseling and training for development of human resources for implementation of TM programmes; studies focusing on specific industry related issues; providing services and guidance to small and medium enterprises in business innovation and TM; conducting seminars and workshops to enable interaction between different interest groups; enhancing technology management capabilities in select SME clusters; introduction of TM related modules at the post graduate level at the institute to enable fresh students imbibe essential aspects of TM so that they are better equipped to cope up with the competitive situation they would face; publications on different TM aspects for increased knowledge sharing and others. The programme is into its second phase.

### ***Technology Management Center at Bhopal***

Under a Memorandum of Understanding (MOU) with the Madhya Pradesh Council for Science and Technology Bhopal, a number of activities related to technology management

have been initiated and a Technology Management Center has been started. The programme is currently in its first phase. The activities include specific region need-based study reports, bringing out a periodic publication, the organization of training programmes and workshops on specific Technology Management related issues and awareness generation programmes.

### **3.9 Information dissemination**

In the current era of globalisation, it is evident an important edge can be attained by managing the entire process of research and technology development in an optimum manner. It is also required to foster ideas relating to technology management in young minds, so that there is yearning to learn more about these aspects. To facilitate these, the Division has used different mechanisms for information dissemination on relevant aspects.

Newsletters, Manuals, Paper contests on specific technology related issues, Compilations of articles on these aspects and Audio-visual aids are among the various mechanisms that are being actively utilized for the purpose. Efforts to effectively put the world wide web to use for this purpose have also been made.

#### ***Newsletters***

During the year, newsletters on specific technology management aspects in association with IIT Bombay, PSGIM Coimbatore, KCTU Bangalore and WITT New Delhi have been brought out.

#### ***Other publications for information dissemination***

In addition, electronic newsletters and other interactive media are under development in association with IIT Madras, ASCI Hyderabad, IIT Bombay and other organizations.

### ***Students' Paper contest***

A paper contest was organized at IIT Roorkee and best articles presented at the contest were awarded.

### ***Technical contributions and presentations***

During the year, contributions to prestigious national and international publications, including Current Science and Technovation were made. A number of technical presentations on varied technology issues were also made at different forums inclusive of the IITs, NITs, IIMs, CII, CSIR laboratories etc.

### **3.10 Training / Interaction meets / Seminars / Management Development Programmes**

Issues concerned with innovation and technology management in an organization are very many. Technology strategy, R&D management, Knowledge management, acquisition and transfer of technology, comprising some of the major aspects involved, are each very complex issues. Each is suited to an organization's needs and each is again a process the organization has to necessarily handle in a recurrent manner in order to be relevant in the current competitive scenario. The Division has been taking steps to inculcate skills to manage these processes efficiently, thus effectively enabling an organization - decide about making or buying, opt what to develop and what to procure, select appropriate technology, absorb imported technology, develop new product/process, transfer and commercialize technology etc. Specific training programmes, seminars, intensive workshops and interaction meets organized for the purpose have benefited industry executives, trainers in educational institutes and in the field, researchers, entrepreneurs, consultants and students.

Lectures by distinguished personalities that bring out experiences of distinguished

technologists / scientists / managers as to how they managed technology in their organizations have been another effective mechanism used to provide food for thought on issues concerned with management of technology.

Programmes organized during the year include the following:

- ☞ An intensive Management Development Programme on 'R&D Management' was organized in association with IIT Bombay.
- ☞ Dr J J Irani, former Managing Director of Tata Steel Jamshedpur, had delivered a lecture under the Distinguished Technologists Lecture series at Hyderabad.
- ☞ A Management Development Programme on 'R&D Management', for the benefit of industry professionals, was organized in association with IIM Calcutta.
- ☞ A National Seminar on 'Management of Global Product Development Projects' was organized at Mumbai in collaboration with the School of Management, IIT Bombay.
- ☞ A programme was organized at Indore in association with MP Council of S&T and Indo-European Chambers of Commerce.
- ☞ A number of short term courses and programmes on varied technology management issues were organized by the Center for Technology Management at Coimbatore.
- ☞ A programme was organized at Bhopal in association with MP Council of S&T and Small Scale Industries Association of Bhopal.
- ☞ A programme was organized at Mysore in association with CII Mysore and KCTU Bangalore.