

I. AN OVERVIEW

1. INTRODUCTION

The Department of Scientific and Industrial Research (DSIR) is a part of the Ministry of Science and Technology, which was announced through a Presidential Notification, dated January 4, 1985 (74/2/1/8 Cab.). The Department of Scientific and Industrial Research (DSIR) has a mandate to carry out the activities relating to indigenous technology promotion, development, utilization and transfer. Dr. Murli Manohar Joshi, Union Minister for Ministry of Human Resource Development and Ministry of Science and Technology has been the Minister in-charge of the Department during 2003-04. Shri Bachi Singh Rawat has been the Minister of State for Ministry of Science and Technology during 2003-04.

The primary endeavour of DSIR is to promote R&D by the industries, support a larger cross section of small and medium industrial units to develop state-of-the art globally competitive technologies of high commercial potential, catalyze faster commercialization of lab-scale R&D, enhance the share of technology intensive exports in overall exports, strengthen industrial consultancy & technology management capabilities and establish user friendly information network to facilitate scientific and industrial research in the country. It also provides a link between scientific laboratories and industrial establishments for transfer of technologies through National Research Development Corporation (NRDC) and facilitates investment in R&D through Central Electronics Limited (CEL).

The above objectives are sought to be achieved through the following during Tenth Plan.

- a) Technology Promotion, Development and Utilization (TPDU) Programmes
- b) National Research Development Corporation (NRDC)
- c) Central Electronics Limited (CEL)
- d) Council of Scientific & Industrial Research (CSIR)

2. TECHNOLOGY PROMOTION, DEVELOPMENT AND UTILIZATION (TPDU) PROGRAMME

The scheme "Technology Promotion, Development and Utilization (TPDU) Programmes" has been formulated by merging following Ninth Plan schemes as per the recommendation of the Planning Commission under zero based budgeting exercise.

- ☞ *Research & Development by Industry (RDI)*
- ☞ *Programme Aimed at Technological Self-Reliance (PATSER)*
- ☞ *Scheme to Enhance the Efficacy of Transfer of Technology (SEETOT)*
- ☞ *APCTT*

Programmes and activities under the scheme are centered on promoting industrial R&D, development and commercialization of technologies, acquisition, management and export of technologies, promotion of

consultancy capabilities, etc. The specific components of the scheme are:

- ☞ Industrial R&D Promotion Programme
- ☞ Technology Development and Innovation Programme
- ☞ Technology Management Programme
- ☞ International Technology Transfer Programme
- ☞ Consultancy Promotion Programme
- ☞ Industrial R&D and Technology Information Facilitation Programme

2.1 Major Achievements

Industrial R&D Promotion Programme

DSIR is the nodal department for granting recognition to in-house Research and Development centres. As on December 31, 2003, there were 1180 in-house R&D units with valid DSIR recognition. Of these units 117 in-house R&D centres incurred an annual expenditure of over Rs.5 crores each and 217 in-house R&D units incurred an annual expenditure in the range of Rs. 1 crore to Rs. 5 crores. During the year 2003, 83 in-house R&D centres were accorded fresh recognition and 444 in-house R&D units were accorded renewal of recognition.

During the year 2003, 17th National Conference on in-house R&D in industry was organised; DSIR National Awards were presented to 8 industrial units. A publication on “Outstanding in-house R&D Achievements (2003)” and 4 issues of “In-house R&D in Industry Update” were brought out.

Scientific research foundations in the areas of medical, agriculture, natural and applied sciences and social sciences seek DSIR approval as Scientific and Industrial Research Organisations (SIROs) under the DSIR scheme

of granting recognition to SIROs. The approved SIROs are eligible for availing customs duty exemption and excise duty exemption on imports and indigenous purchase respectively, of essential scientific and technical instruments, apparatus, equipment (including computers), accessories, spare parts thereof and consumables, required for research and development activities.

During the year 2003, 26 new SIROs have been accorded DSIR recognition. 4 certificates for accelerated depreciation allowance on plant and machinery set up, based on indigenous technology involving an investment of Rs. 1547.82 lakhs, 622 essentiality certificates for claiming custom duty exemptions on imports amounting to Rs. 3500 lakhs and 87 essentiality certificates for claiming excise duty exemptions on indigenous purchase amounting to Rs. 127 lakhs were issued by DSIR.

DSIR is nodal department for registration of public funded research institutions, universities, IITs, IISc., RECs, for availing Customs Duty Exemption and Central Excise Duty Exemptions under notifications 51/96-Customs and 10/97-Central Excise. During the year, 24 such institutions were registered with DSIR; and 15 institutions were granted renewal of registration.

Secretary, DSIR, who is designated as the Prescribed Authority under section 35(2AB) of Income-tax Act, 1961, approved in-house R&D centres of 22 companies. Agreements of co-operation for research and development were signed with these companies. R&D expenditure of 32 companies were reported to DG, IT (E) in Form 3CL.

Technology Development and Innovation Programme

The programme has two components viz Technology Development and Demonstration Programme to support technology development

efforts of industry-R&D system and Technopreneur Promotion Programme (TePP) to nurture the innovative spirit of individuals.

The component scheme on ***Technology Development and Demonstration*** 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 Scheme, 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 have been supported. While DSIR support has been catalytic and partial, bulk of the financial contribution in any project has been from the industry.

The Department under this programme has so far supported about 155 R&D projects of Industrial units. These projects cover products and processes in various important industries such as metallurgy, electrical, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives. 66 projects have been completed so far since inception of the scheme, further development activities in case of 10 projects have been completed pending receipt of project completion reports. Out of the completed projects, 25 technologies/ prototypes have been commercialized. There are 24 companies paying royalty / lump-sum as per the terms of agreement.

Technology Development projects have strengthened the linkages with more than 25 national research laboratories/ institutions such as NAL, Bangalore; RRL, Trivandrum; IICT, Hyderabad; CMRI, Dhanbad; IIP, Dehradun; C-DAC, Pune; NML, Madras; Institute of Plasma Research, Ahmedabad; ER&DC, Trivandrum; Dalmia Centre for Biotechnology,

Coimbatore; CMTI, Bangalore; which have been collaborating with industry in the specific research, design, development and engineering (RDDE) projects of high techno-socio-commercial impact. The Scheme has been found successful in synergising the R&D efforts of industry and national research organizations.

Under “Technopreneur Promotion Programme (TePP)” jointly operated by DSIR and DST aims to tap the vast innovative potential of the citizens of India. The activities under TePP include providing financial support to individual innovators having original ideas and convert them into working models, prototypes etc. So far, 98 projects have been supported under TePP jointly by DSIR & TIFAC of DST. Products such as (i) cost effective polythene bag filling device (Kittanal); (ii) small 5 litre capacity sprayer (Kushal); (iii) tiltable innovative bullock cart; (iv) innovative cotton stripper; (v) motorcycle driven sprayer, (vi) diagonal inverter for operation microscope; (vii) bullock operated generator; (viii) U.V. trans-illuminator, (ix) cattle driven pump; (x) Thermocombs – an energy efficient generator etc. have been developed by individual innovators and introduced commercially. Individual innovators who could be supported under TePP also include farmers, artisans etc. A number of novel products with commercial potential are under development.

Technology Management Programme

The Technology Management Programme includes activities related with National Register of Foreign Collaborations & Technology Management. A report on the compilation of primary data on foreign collaborations for the year 2001 was brought out. Computerization of data collected on foreign collaborations for 2002 has been completed. During the year, several analytical, technology status and development studies including those on Aromatic and

Medicinal Plant species in the State of Sikkim, Assessment of Forest Wealth based Industries of Maharashtra and Goa, Technology Audit in a fertilizer industry unit, Technology status of Guar Gum based industries and on the Status of electronic industries cluster of Karnataka have been completed. Studies and cases on technology and innovation management that have been completed include those on Management of Innovation in small and medium enterprises, case studies of a Pharmaceutical Company and of a manufacturing organization in the engineering sector. Studies on Women Representation in Corporate R&D, Development of a Model for Evaluation of Innovations in SMEs and others are in progress. Studies - including analytical, status, as well as research based ones, on emerging aspects of technology and innovation management - have been taken up on need basis. With a view to strengthen networking and enhance technology management capabilities in industry including small and medium enterprises, academic institutes, state level enterprises and consultancy / research organizations; a number of activities have been taken up. MOUs have been signed with Osmania University and Madhya Pradesh Council for Science and Technology. Various programmes have been envisaged in collaboration with industry and industry associations, State level technical consultancy organizations, CSIR and other research institutions, academic institutes including IIMs & IITs. Programmes covering various aspects of Technology Management, Intellectual Property and Knowledge Management are being organized on need basis. These programmes include training of trainers as well. Few of these are especially designed to meet the requirements of small and medium enterprises. Efforts to disseminate important findings and information of relevance to the subject have been intensified.

International Technology Transfer Programme

Major activities carried out under this program include: bringing out of a Publication on “Technology Exports & Exportable Technologies for the year 2000-2002”; releasing of four quarterly issues of a Newsletter on “Technology Exports”; organisation of a “Technology Trade Pavilion” at India International Trade Fair (IITF) - 2003, Pragati Maidan, New Delhi; support to the activities of Technology Export Development Organisation (TEDO); support to a Centre for International Trade in Technology at IIFT; conducting a research study on impact of FDI on export competitiveness of our technology based industries; setting up of a Technology Trade Facilitation Centre at National Research Development Corporation; organisation of Awareness-cum-Training Programme on Competitive Advantage through Designs; and a project on ‘Exportable Technologies from SMEs in the Delhi Region’.

All these efforts seem to have catalyzed the technology intensive and high value added exports. The percentage of such exports, in the overall exports, has steadily increased over the years. A large segment of exporting community has been sensitized towards high value added exports.

Consultancy Promotion Programme

The programme relating to promotion and support to consultancy services essentially aims to strengthen our consultancy capabilities for domestic and export markets. During the period under report, the Food Processing Technologies and Services Centre at Kanpur, and Consultancy Clinic for Lime Kiln Industry at Katni primarily to help small and medium industries were continued its operation. Due to some problems at RAJCON, the Consultancy Clinic for Textile Industry at Bhilwara could not be reactivated

and was closed.

Besides, (i) a Study on Consultancy Needs for Improving Performance/ Upgradation of Textile Mills in UP was completed through UPICO (ii) a Draft report of the study on consultancy Capabilities for Small Hydro Power Development in India through IIT Roorkee was received. (iii) A National Workshop on Consultancy Capabilities in Textile Industry in India was organized at Kanpur. Institutional and programme support to Consultancy Development Centre (CDC) was provided. Also, technical inputs/support was provided to Consultancy Engineers Association of India (CEAI) and other consultancy promotion organizations.

CDC was promoted in January 1986 as a non-profit society, primarily with a view to implementing some of the programmes of DSIR. CDC is implementing a programme "Consultancy Development, Promotion & Assistance (CDPA)", maintains a computerized database of consultants, organizes training courses particularly on ISO-9001/2000 and ISO-14000 and Human Resources development Programmes for promoting consultancy, conducts consultancy related programmes sponsored by other agencies. DSIR provides recurring and non-recurring support to CDC. First Annual National Consultancy Congress was conceptualized and organized on January 15, 2003, the foundation day of CDC and National Awards for Excellence in Consultancy were given away. 6th National Consultancy Congress on "Global Partnering in Consultancy" has been organized during January, 15-16 2003. To enhance technological and managerial capabilities of consultants as well as export capabilities, interactions with international organizations such as World Bank, APCTT, ITC and ESCAP were organized by CDC. The 7th batch of the trainees of the post graduate degree (MS) programme in Consultancy Management in association with

BITS, Pilani, continued. Several Interactions Meets and Training Programmes in various areas including ISO-9001/2000 & ISO-14000 systems were organized by CDC.

The Fourth Meeting of Executive Committee of TCDPAP was held in Bali, Indonesia during September 2003. CDC continued as secretariat for a further period of 4 years w.e.f. September 1, 2000. CDC has earned revenues of Rs. 105.14 lakhs during the year 2002-03 as against Rs.74.32 lakhs during the year 2001-02.

3. COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)

Council of Scientific & Industrial Research, a premier autonomous R&D organization with its 38 laboratories and 47 regional centers, has completed 60 years of its existence. Nourished, fostered and supported by the successive governments, since its inception, CSIR is now recognized internationally as an institution which is moving speedily towards achieving global excellence without diluting local relevance. In India, it symbolizes a culture that links science with society through technology and industrial manufacture. Man of Vision and Values have shown path and built CSIR to its present strength, ethos and culture.

CSIR has celebrated its Diamond Jubilee Year from September 2002 to September 2003. The year-long Diamond Jubilee Celebrations were held at all the constituents of CSIR. During the year, CSIR has also taken new initiatives such as creating a CSIR Diamond Jubilee Technology Award of Rs.10 lakh; Diamond Jubilee Innovation Award for school children; CSIR Diamond Jubilee Research Intern Awards; establishing Institute of Genomic and Integrative Biology by changing the mandate of Centre for Biochemical Technology, Delhi. A series of seminars, symposia, workshops, open house meetings, scientific lectures and bringing out scientific publications, reports, articles,

souvenirs etc. were organized to focus about CSIR's services to the nation and its contribution to science, society and economy. An exhibition of sixty most outstanding developments was organized and taken to 50 places all over the country.

As the nation's strongest holder of intellectual property rights, CSIR leads the way for protecting traditional knowledge strength while adding to the new IPR capital. CSIR was ranked the first amongst major PCT applicants from developing countries. CSIR has also continued to promote excellence in science and is the only S&T organization which had nurtured and supported human tech from 16 to 65 years of age through numerous schemes on human resource for scientific research.

3.1 Significant Developments

Creating massive knowledge networks

A key feature of CSIR's performance was the creation of major and innovative knowledge networks across and beyond CSIR laboratories. Not too long ago, most CSIR laboratories had acted as single units with several laboratory based programmes. CSIR's massive network on 'bioactive molecules', launched three years ago began the process of leveraging the benefit of networking by bringing together 20 CSIR laboratories and several other institutions. This philosophy was carried forward with vigour. Most of the programmes for the Tenth Plan now have been formulated with networking of resources and capabilities as the major component.

Contributing to Indian industry

CSIR continued to provide a strong support to Indian industry. The major achievements included successful commercialization of process for conversion of Naphtha to Gas and Gasoline (NTGG); catalyst for speciality

polymeric materials based on zirconium tetrachloride; lacidipine process; methane sulphonic acid process; Precipitated Calcium Carbonate (PCC), etc.

Catalyzing civil aviation industry: SARAS roll out

CSIR has been rendering yeoman service to the Indian aerospace sector. Its contributions and excellence are acknowledged not only nationally but internationally as well. The light transport aircraft programme achieved a significant milestone on 4th February 2003 when its first prototype of SARAS rolled out. The prototype was named VT-XSD - SD in honour of Dr. Satish Dhawan, a doyen of aerospace and former Chairman of National Aerospace Laboratories (NAL) Research Council at whose instance NAL's Civil Aviation activities were initiated. Major testing activities have been completed for SARAS in preparation of the first flight. It needs to be emphasized that the first journey that began with a Light Combat Research Aircraft in the National Aerospace Laboratories, was taken forward to the series of HANSA aircrafts, resulting finally into an all composite aircraft HANSA-3, that was test certified in 2001, and is productionised and taken to Indian skies already.

National Policy Setting: CSIR's inputs

CSIR had privilege to contribute to framing of two important policies during the year, namely auto fuel policy and policy on drug regulatory issues and spurious/substandard drugs. The committees for the purpose were chaired by DG, CSIR. For these two domains of national importance, the knowledgebase available in CSIR system, was of substantial help in examining highly technical and complex issues and providing need based solutions. The auto fuel policy took a holistic view of the diverse aspects of emissions, auto technologies and auto fuel quality on one hand and social costs,

security of fuel supply and absorptive capacity on the other. The policy tried to provide a practical and balanced approach to meeting of these challenges. Likewise, the policy on drug regulatory issues and spurious drugs too, provided far sighted directions to bring diverse systems in the domain up to international standards. It dealt with the regulatory issues of products of ISM, therapeutic foods and dietary supplements, medical devices, diagnostics etc. It also addressed the issues of clinical research, an emerging opportunity for India.

Traditional knowledge: efforts for protection and value addition

CSIR lead the Team India initiative for setting up the first ever Traditional Knowledge Digital Library (TKDL). The TKDL would provide a search interface to retrieval of traditional knowledge information on international patent classification (IPC) and keywords in multiple languages. At global level it would act as a bridge between ‘Sanskrit Slokas’ and a patent examiner.

CSIR’s programme on discovery, development & commercialisation of new bioactives and traditional preparations completed its first phase. It has 52 leads under various stages of development, for diverse diseases namely cancer, ulcer, tuberculosis, immunomodulation, parkinsonism etc. The programme now has under its network 20 CSIR laboratories, 12 universities and 3 systems of Indian system of medicine i.e. Ayurveda, Siddha and Unani. The effort now is focussed towards filing new chemical entities, which will lead to entirely new and novel therapeutics.

Science & Technology for the Society

As a socially conscious organization, CSIR continued its efforts to provide the S&T needed for the masses. During the year it adopted villages to promote employment generation on

one hand and developed diverse technologies to add to quality of life on the other hand. These technologies include: ceramic membrane based removal of arsenic and iron from contaminated ground water; pesticide removal unit for producing potable water free from organic pollutants; lead-free Jaipur blue pottery; setting up of Reverse Osmosis (RO) based desalination plants in villages; marine sanitation device for “Kettuvallom” etc. In an unique endeavour, CSIR catalyzed commercial cultivation of geranium in Uttaranchal through community participation. In this end to end mission farmers have been trained not only for cultivation of geranium but also for extraction of oil and making value added products.

Renaming of Centre for Biochemical Technology (CBT)

Centre for Biochemical Technology became a full fledged research centre of CSIR on 1st April, 1993 after sixteen years of its inception in 1977 as an affiliated Centre. From 1997 onwards there was a change of direction in CBT, which raised its ambition. The center added a major network activity on “Functional genomics” realizing that human and other genome sequencing, will transform biology and medicine forever and will open up a new chapter for biochemical technology as it enters the “Genome era”. CBT charted a new path, which completely changed its trajectory. Its activities were thus directed towards multidisciplinary research in the areas of genomics, molecular medicine, bioinformatics and environmental biotechnology of high scientific impact, leading to technology development and services relevant to society. The centre has created a large network involving many clinicians from various hospitals & medicinal institutions. CBT thus rapidly got transformed from a small laboratory working in narrow areas of biochemical research to a largely networked laboratory. This was achieved by utilizing the existing scientific strength of CBT and introducing two new areas

“Molecular human Genetics’ and Genome Information”.

The Performance Appraisal Board (PAB) of CBT recognized that CBT was emerging as a distinctive Institute with its new R&D programmes viz., comparative genomics, proteome analysis, in-silico drug target discovery, and novel screens for drug target development. In view of aforesaid, PAB recommended a change in the name of the centre to reflect its new mandate closely. In view of the suggestion given by the PAB, the emerging scenario and also looking at the future of the biomedical research, an appropriate name of the CBT was recommended by the Research Council of CBT as Institute of Genomics & Integrative Biology (IGIB). The change in name was agreed to. This name would not only reflect the present position and the new content of R&D but also will give focus to diverse activities.

New Millennium Indian Technology Leadership Initiative (NMITLI)

NMITLI continued its efforts with the thrust to harness national potential in Science and Technology to realize the vision of a resurgent India by partnering with Indian industry to achieve global leadership position in select niche areas. Concerted efforts were made to synergise the best competencies of publicly funded R&D institutions, academia and private industry. In a short span of less than three years, 25 path setting technology projects have been crafted with an enviable network of industry, academia and publicly funded R&D. These involve partnership of over 50 industries and 150 R&D institutions. During the year, eleven new projects were launched. These included 5 industry initiated and 6 nationally evolved projects in which 27 research institutions and 14 industrial firms were participating.

The significant achievements include: identification for the first time, of contrasting

chemo types from over hundred accession of *Withania somnifera* collected from across the country; launching of a next generation bioinformatics software, “Bio-Suite” which is a comprehensive, portable, modular and scalable software having more features than any existing commercial product; a new pharmacophore is being developed towards IND filing under the project on “Latent M. tuberculosis: new targets, drug delivery system, bioenhancers and therapeutics”; identification of potential leads for ambient preservation of hide and for dehairing of goat skin - these leads are being further pursued to develop a chemical free environmental friendly technology for leather processing; development of a high performing catalyst for desulphurising diesel from 2500 ppm to <50 ppm - the catalyst is now scheduled for testing at a plant scale; designing and fabrication of a new Liquid Crystal Display device for flat Panel Display System with two orders of magnitude faster switching time, a higher contrast ratio, symmetric and wide viewing angle; and development of a novel process for (S) 3-hydroxy- γ -butyrolactone - a versatile intermediate using maltose and maltodextrin, as raw materials.

4. PUBLIC ENTERPRISES

4.1 National Research Development Corporation (NRDC)

Corporation with its sustained, hard and dedicated endeavour continued to achieve satisfactory overall performance and earned profits. The Corporation earned lumpsum premia and royalty of Rs. 308.89 lakhs from licensing and commercialisation of indigenous technologies as compared to Rs. 273.65 lakhs in the previous year. The gross profit of the Corporation was Rs. 12.62 lakhs as compared to Rs. 33.51 lakhs in the previous year. The Department of Public Enterprises has given the ‘VERY GOOD’ rating to the Corporation for its MOU performance during the last year (2001-2002).

The Corporation entered into Memorandum of Understanding with several new organisations including AIIMS, New Delhi, NDRI, Karnal, CCSHAU, Hissar, NII, New Delhi, NBRI, Lucknow and SASMIRA, Mumbai for assignment of technologies developed by them resulting assignment of 71 new processes for commercialisation as compared to 27 processes assigned in the previous year.

The Corporation signed 29 licence agreements during the year as compared to 30 agreements signed in the previous year. Some of the major technologies licensed by the Corporation during the year were: Nutan Himveer Bukhari, Instant Gel, Cocolawn- a Readymade Lawn, Resham Keet Oushadh, Platinized Titanium Anodes, Resorcinol, Drivers' Reflexes Testing System, etc. The Corporation also rendered its services to M/s Ethiopian Maize Agro Industrial Share Company (EMAISC), Addis Ababa for supply of Pharmaceutical books at a value of US \$ 3915.

The Corporation provided cash awards amounting to Rs.2.55 lakhs (Rupees two lakhs fifty five thousand only) for six inventions and one WIPO Gold Medal on the occasion of Technology Day i.e. 11th May 2002.

4.2 Central Electronics Limited (CEL)

The Company is the nation's pioneer and largest manufacturer of Solar Photovoltaic products and is among the top few producers of crystalline

silicon solar cells/modules in the world. It is the only indigenous manufacturer of strategic item Phased Control Module (PCM) which is a building block for phased array radar. The Company also has a leading position in the area of Railway Electronics and Cathodic Protection Systems.

During 2003-04, CEL's production was Rs. 67 crores and sales Rs. 64 crores. The focus of the company in 2003-04 has been in the areas of Solar Photovoltaics and Strategic Electronics. Some of the significant activities of 2003-04 were as follows:

CEL developed Building Integrated Photovoltaic (BIPV) Modules. For these modules, an order for a SPV power plant was received from Punjab Energy Development Agency, Chandigarh. It has been executed. The company also carried out SPV electrification of two remote villages in Nepal. A visit to Afghanistan was made and discussions initiated regarding SPV electrification of 'Teachers Training Centres'.

In the field of Electronic Systems, the company manufactured and supplied 700 nos. of analog axle counters and 200 nos. of digital axle counters.

In the field of Strategic Electronics, the company obtained orders for 12,000 numbers of PCMs and one IFF System.