ANNUAL REPORT
1999-2000

Department of Scientific and Industrial Research
Ministry of Science & Technology
New Delhi-110 016

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Text

I(A). AN OVERVIEW

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

During 1999-2000 the Minister In-charge is Dr. Murli Manohar Joshi, Union Minister for Ministry of Human Resource Development and Ministry of Science and Technology. Shri B.S. Rawat is the Minister of State for the Ministry of Science and Technology.

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

1.3 Council of Scientific and Industrial Research

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

As CSIR reorients itself to be market driven and move on the path of self-financing, its performance would be conditioned by the performance of the Indian industry and economy. Thus the rate of External Cash Flow (ECF) generation from contract R&D and consultancy came down from 15 to 10%, the actual going ECF going up from Rs. 190 crore to Rs. 209 crore. The contribution to creation of new knowledge was satisfactory, patent filings increased significantly, rising from 71 to 91 in the year for foreign patents and from 209 to 264 for Indian patents. The quality of papers contributed also showed a healthy upward trend although the number remained nearly static. CSIR's all round performance during the year was satisfactory. Most significant among its activities has been the winning initiative for revocation of US patent on turmeric, which besides confirming CSIR's pioneering efforts to successfully safeguard traditional Indian knowledge, created an unprecedented positive public goodwill for the CSIR. More importantly this success had some far-reaching effects viz.: it demonstrated that CSIR and other Indian institutions were acquiring capabilities to fight the complex techno-legal issues of IPR, both defensively and aggressively, to meet the challenges under the WTO regime; it showed the importance of appropriate documentation and public availability of records of traditional knowledge base in a systematic manner, which can be provided as evidence of prior knowledge; it reassured the Indian people of the fair and transparent operations of the IPR system.

Some of the recent achievements of CSIR covering a wide spectrum are as follows:

The significant scientific achievements are:

In the field of Aerospace Science & Technology: hypersonic flow computations for a space vehicle; **in the field of Biological Sciences and Technology:** abnormalities in q arm of Y chromosome, anti-oxidant effects of tea in cataract retardation, microbial resistance to plant antibiotics, nuclear organelle genome interaction, importance of control strains in gene disruption studies, construction of a combined genetic and physical map of *V.cholerae* 0139 genome, lipoprotein (a) – a potential marker of coronary heart disease and atherosclerosis, bioenhancers for some commonly used antibiotics, bioremediation of hydrocarbon of contaminated soil – role of bacterial diversity and microbial inocula; **in the field of Chemical Sciences and Technology:** Dipolar cycloaddition reactions, Solid phase chemistry for organic reactions, Pressure swing adsorbent; **in the field of Earth & Physical Sciences and Technology:** Studies in Koyna Seismic Zone, Structure across Narmada-Son Lineament Zone, Upper ocean thermal structure, Ridge Research Programme, Signal duration and local Richter

magnitudes; **in the field of Engineering Sciences & Technology:** New approaches for the study of non-linear oscillators, Neural network based analysis of building structures; **in the field of Food Science & Technology:** Adsorption studies of selected traditional foods of India; **in the field of Information Science & Technology:** Study of non-linear metallurgical system from I/O patterns using artificial neural network, Simulation of non-newtonian polymeric fluid flow; **in the field of Material Science & Technology:** Barium titanate particles of tailored shape; **in the field of Societal Science & Technology:** Ethno-botanical investigations on Kangra valley, Study by NISTADS to analyse India's Scientific system from the Indus Valley Civilization to the colonial era and present, Studies on the rural unorganized industrial sector.

The significant technological achievements are:

In the field of Aerospace Science & Technology: Flight test for full type certification of second prototype of HANSA (VT-XBL) with a Rotax 914-F3 engine, System design of Light Transport Aircraft – SARAS completed, Exhaust volute for Kaveri gas turbine (marine version); **in the field of Biological Sciences and Technology:** preparation of high loading supports for large scale synthesis of oligonucleotides and oligonucleotide library work, Novel cationic amphiphiles as transfection agents, Long acting biodegradable delivery system for erythromycin, Early flowering of bird of paradise, High yielding varieties of Java citronella viz. Jal Pallavi and Manjari, Alkaloid free non-narcotic opium poppy, Herbal formulations for use as healthcare products, safe domestic insecticides etc. viz. Long burning herbal sticks, Crack cream, Liquid dentifrice, Herbal tooth powder, Scented insect repellent lotion, Edible dyes extracted, Pulse grain protectant, Improved technology for fresh ginger processing, Fly Ash – soil amendment; **in the field of Chemical Sciences and Technology:** Synthesis of Zeolite-X, Novel catalyst for dehydrogenation reactions, Nitration of organics, Catalyst-free esterification/ trans-esterification; **in the field of Earth & Physical Sciences and Technology:** Mapping of gas hydrates, Pillar extraction by bulk filling, Improved steel cog; **in the field of Engineering Sciences & Technology:** Electromechanical actuator, Integrated optical receiver module, Mechanized production of fly ash bricks, Modelling and assessment of strength of existing building under seismic excitation, Soil nailing technique for stabilization of slope, Oil field effluent treatment plant, Non-recovery type coke ovens for production of soft coke, Automation of Jacquard cards for handloom weavers, Mechanization of coffee plantations, Calendar Sealing Machine; **in the field of Food Science & Technology:** Nutrition supplements for school children, Low cost dhal analogue, Food grade lecithin; **in the field of Information Science & Technology:** Software for functional genomics, CD-ROM databases on Indian Science Abstracts (ISA) 1990-1998 and Directory of Research and Industrial Institution in SAARC Region, Computer aided estimates for construction industry, Software for digitization, Research journals; **in the field of Material Science & Technology:** Magnetic sensor for material characterization, Carbon fibre reinforced composite rings for polio calipers, Superconducting magnet for NMR spectrometer, Ceramic glazing from drum filter cake; **in the field of Societal Science & Technology:** Productivity enhancement and quality improvement of rural pottery, Performance enhancement of Gur (Jaggery) plants in rural areas, Technology upgradation of Kewda processing, Low-cost apricot oil extraction machines, Candleless terracotta water filter.

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

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

a) In-house R&D in industry.

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

c) Fiscal Incentives for Scientific Research.

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

a) Development of new or improved technologies.

b) Development of special/custom built capital Goods.

c) Absorption and Adaptation of imported technology.

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

e) Technopreneur Promotion Programme.

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

a) National Register of Foreign Collaborations (NRFC).

b) Industrial Technology

c) Transfer and Trading in Technology (TATT).

d) Promotion and Support to Consultancy Services (PSCS) which also include the Consultancy Development Centre (CDC).

IV. **Linkages with International Organizations**

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

VI. **Public Enterprises viz.**

a) National Research Development Corporation (NRDC).

b) Central Electronics Limited (CEL).

1.5 Research and Development by Industry (RDI)

DSIR is the nodal department for granting recognition to in-house Research and Development centres; there were 1207 units having valid recognition as on 31 December 1999. 60 in-house R&D centres incurred an annual expenditure of over Rs.5 crores and 202 in-house R&D units incurred an annual expenditure in the range of Rs. 1 crore to Rs. 5 crores. During the year, 61 in-house R&D centres were accorded fresh recognition and 230 centres were accorded renewal of recognition. During the year 1999, Thirteenth National Conference on in-house R&D in industry was organised; DSIR National Awards were presented to 6 industrial units. An exhibition was also held along with the Thirteenth National conference depicting the successful stories of the developments made by 21 in-house R&D centres. A publication on "Outstanding in-house R&D Achievements (1999)" and 4 issues of "In-house R&D in Industry Update" were brought out.

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

During the year, 26 new SIROs have been accorded DSIR recognition. 10 certificates for accelerated depreciation allowance on plant and machinery set up based on indigenous technology involving Rs. 9615 lakhs, 9 certificates for import of capital equipment and consumables/materials for R&D projects supported by DSIR, 850 essentiality certificates for claiming customs duty exemption amounting Rs. 33 crores, 81 essentiality certificates for claiming excise duty exemptions amounting Rs. 95.98 lakhs were issued by DSIR.

DSIR is nodal department for registration of Public funded research institutions/universities/ IITs / IISc., Bangalore/RECs other than a hospital for availing Customs Duty Exemption and Central Excise Duty Exemptions. During the year, 60 such institutions were registered with DSIR.

1.6 Programme Aimed at Technological Self Reliance (PATSER)

Under the "Programme Aimed at Technological Self Reliance" (PATSER) the Department has so far supported nearly 100 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. The projects in progress include those of M/s. Webel Electronics Ltd., Calcutta for development of Computerised Braille Transcription System; M/s. SPIC & IICT, Hyderabad for development of Catalytic Route for Production of Pyrazinamide; M/s. MECON and M/s. Hero Cycles Ltd, for development of 6-Hi Cold Rolling Mill; M/s. HMT for development of State-of-the-Art CNC Machining Centre; M/s. NALCO for development of special Aluminas & Hydrates; M/s. HZL and CSIR for setting up a pilot plant for Nickel Recovery from Chromite overburden; M/s Turbotech Precision Engineering Pvt. Ltd. (TPEL) and National Aerospace Laboratories (NAL), Bangalore for the development of low cost gas turbine (LCGT)

generator set of 500 KW power class, with multi-fuel capability (biogas, piped natural gas and diesel fuel); M/s Bharat Earth Movers Ltd.(BEML), Bangalore for the design and development of 460 HP Wheel Dozer; M/s ACE Designers Ltd. And CMTI, Bangalore for development of PC Based CNC System.

The completed technology development projects supported under PATSER Scheme have resulted in significant technological and commercial returns to the industries concerned such as cost reduction, higher quality, improved products and processes as well as foreign exchange savings, while building up the R&D capabilities of the industrial units. The on-going projects are expected to result in high commercial / societal impact and will lead to commercialisation and utilisation of 'state-of-the-art' technologies.

The Ministry of Science & Technology has launched a novel programme known as "Technopreneur Promotion Programme" (TePP) jointly operated by Department of Scientific & Industrial Research (DSIR) and Department of Science & Technology (DST) to tap the vast innovative potential of the citizens of India. TePP will be a crucible to promote individual innovators to become technology based entrepreneurs (Technopreneurs). Any Indian citizen having an original idea/invention/know-how can apply under this programme. During the year 27 projects have been considered for support under the programme. Some more are in pipeline.

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

The Department continued its activities relating to the scheme on National Register of Foreign Collaborations & Technology Management (NRFC & TM). A compilation of primary data on FCs for the year 1998 was brought out. Computerisation of data collected on foreign collaborations for 1999 has been completed. During the year, studies on status of Minor Forest Product based Industries in the state of Madhya Pradesh, Status and Prospects of Electronics Industry in Eastern and North Eastern States and Essential and Medicinal Plant Species in the North Eastern Region – their status and strategy for development were in progress. A status study covering the performance of the DSIR national award winning technologies and companies was also completed. With a view to enhance capabilities in the area of Technology Management, a number of programmes have been initiated and are in progress. These include, studies on Intellectual Property Rights, case studies on Managing Technology at Enterprise level, Training and Awareness Programmes, Networking with various Institutions and Enhancing level, Training and Awareness Programmes, Networking with various Institutions and Enhancing the Resource Base etc. Interaction meets were organised covering inter-alia awareness programmes on Intellectual Property System, technology acquisition and other related issues.

Under the Scheme on Transfer and Trading in Technology, activities carried out include: setting up of a Technology Exports Pavilion at India International Trade Fair' 1999 (IITF'99), in Pragati Maidan, New Delhi; organisation of a "Seminar on Technologies from India"; release of 4 quarterly issues of a Newsletter on Technology Exports; printing of a Compendium on Technology Exports from India covering data on technologies and services exports during 1996-98; organisation of seminars on "Export potential of Indian technical know-how in construction industry of Kathmandu" and "Enhancing Export Competitiveness at Mumbai"; supporting participation of R&D laboratories in INDIATECH-2000 at Colombo, Sri Lanka; and setting up of a "Technology Exports Promotion Cell" in CII.

The scheme relating to promotion and support to consultancy services essentially aims to strengthen consultancy capabilities for domestic and export markets. During the period under review the main activities have been towards setting up of design and engineering service centre for Food Processing Industry at Kanpur and a Consultancy Clinic for Textile Industry at Bhilwara primarily to help small and medium industries. Besides, Studies on. (i) Status of Consultancy services in India, and (ii) Policies and Incentives for Consultants in various countries were carried out, and (iii) study on role of consultants in R&D and innovation was being carried out through NISTADS, institutional and programme support to Consultancy Development Centre (CDC) was provided.

CDC was promoted in January 1986 as a non-profit society, primarily with a view to implement some of the programmes of DSIR. CDC is implementing a programme on Consultancy Development, Promotion & Assistance (CDPA)

scheme, maintains a computerised database of consultants, organises training particularly on ISO-9000 and ISO-14000 and Human Resources development Programmes for promoting consultancy, conducts programmes sponsored by other agencies. DSIR is providing recurring and non-recurring support to CDC. First National Consultancy Congress was conceptualised and organised on 15th January 1998, the foundation day of CDC and National Awards for Excellence in Consultancy were given away.

1.8 Linkages with International Organizations

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

DSIR participated in the Fifteenth Technical Advisory Committee meeting of Asian Pacific Centre for Transfer of Technology (APCTT) and the Fourteenth session of the Governing Board of APCTT held in Kish Island, the Islamic Republic of Iran.

1.9 National Information System for Science & Technology (NISSAT)

National Information System for Science & Technology (NISSAT) promotes and supports the development of a compatible set of information systems on science and technology and inter-links these into a network to facilitate the effective transfer of latest information to users in all parts of the country.

NISSAT programme continued support to information centres to meet information needs of scientists, technologists and decision-makers. The activities of the NISSAT centres were augmented and their services and revenue generation improved. The NISSAT Access Centres on International Database Service-s continued services on full cost recovery basis. NISSAT's national collection centre for publications on CD-ROM databases on India and about India collects nationally produced documents on CD-ROM databases on India and about India. Four city-based library networks in Ahmedabad, Calcutta, Mysore and Pune continued their services and provide access to information resources in a city and also through Internet access. NISSAT so far established web sites/servers on Indian Ocean Server at NIO, Goa, MYLIBNET at CFTRI, Mysore, Indian Consultancy at CDC, New Delhi, Indian S&T at the IISc., Bangalore, website on NISSAT, Website on ISISCLEARING HOUSE, Website on Indian Tea and Website on India IPR law. Information Today & Tomorrow (ITT) containing information on new tools and techniques, events concluded and announcements, interesting Internet sites, new database products and services has been distributed free to 5000 individuals and institutions.

1.10 Public Enterprises

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

Some of the major technologies licensed by NRDC during 1998-99 include Bakery margarine, Glucose bio-sensor, Nano size stabilised zirconia production, Vanadium Penta-oxide, Spirulina algae, Preparation of Katha from Gambier, Defatting of groundnut without losing shape, 777 Oil for treatment of psoriasis, Test Kit for microbiological quality of drinking water, Bio-degradable plastics etc.

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

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

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

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

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

2. During the year 1999-2000, there was an all-round progress and growth in the activities under different programmes of DSIR

I(B). FINANCIAL SUMMARY

The financial summary giving the Actuals 1998-99,BE 1999-2000, RE 1999-2000 AND BE 2000-01 of Various Plan and Non-Plan schemes (Headwise/broad category wise) is as under:-

(Rs. in crores)

S.No.	Head of Development Projects	Actual Expenditure 1998-99			Budget Estimated 1999-2000			Revised Estimates 1999-2000			Budget Estimates 2000-01		
	Programmes/Schemes	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
1	Assistance to Council of Scientific & Industrial Research	201.100	509.310	710.410	265.000	529.160	794.160	250.000	548.740	798.740	299.350	612.140	911.490
2	Technology Promotion Development and Utilisation Scheme	13.890	0.070	13.960	15.900	0.080	15.980	14.100	0.070	14.170	15.900	0.090	15.990
3	Research and Development (APCTT & NISSAT)	1.850	0.000	1.850	2.400	0.000	2.400	2.400	0.000	2.400	2.550	0.000	2.550
4	Investment in Public Enterprises												
4.1	Central Electronics Limited	2.500	0.000	2.500	2.500	0.000	2.500	2.500	0.000	2.500	2.500	0.000	2.500
4.2	National Research Development Corporation	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250
5	Loans to Public Enterprises												
5.1	Central Electronics Limited	2.500	0.000	2.500	2.500	0.000	2.500	2.500	0.000	2.500	2.500	0.000	2.500
5.2	National Research Development Corporation	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250	0.250	0.000	0.250
6	Secretariat Economic Services	0.160	2.090	2.250	0.200	2.220	2.420	0.200	2.696	2.896	0.200	3.146	3.346
7	Administration and Infrastructure	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	1.000
8	Provision for NER & Sikkim	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	30.500	0.000	30.500
	Grand Total	**222.500**	**511.470**	**733.970**	**289.000**	**531.460**	**820.460**	**272.200**	**551.506**	**823.706**	**355.000**	**615.376**	**970.376**

II. COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH (CSIR)

1. INTRODUCTION

Council of Scientific & Industrial Research (CSIR) is a national R&D organisation providing scientific and industrial research of value for India's sustained growth, strategic needs and nurturing of national human resource in S&T. It has country-wide network of 40 Laboratories and 80 Field Centres (see list of establishments) undertaking fundamental and applied R&D in diverse areas of Science & Technology. Ninth Five Year Plan for the CSIR was formulated with an objective to provide scientific industrial R&D that maximises the economic, environmental and societal benefits for the people of India.

CSIR efforts to support and nurture the development of highly qualified R&D manpower at the national level through grant of Junior & Senior Research Fellowships and Research Associateships are widely acknowledged in the country. CSIR's programme to promote youth leadership in science (CPYLS) introduced this year to attract young school going talent to science has been universally acclaimed as a welcome step to avert the trend of bright school students opting for non-science subjects.

As a result of various initiatives taken by CSIR in the first two years of the Ninth Plan the total external cash-flow for the period 1997-99 from contract R&D and services from CSIR laboratories could reach Rs.412 crore, though short of the targets yet it was creditable! Indian patent filing of 310 achieved has far exceeded last years total figure of 264 and foreign patent filing already at the level of 105 (as against a target of 100). The impact factor per scientific paper contributed has shown a remarkable increase from 1.26 in 1996 to 1.51 in 1998! The industrial production based on CSIR knowledge-base has touched the figure of around Rs.4200 crore in 1998-99, which was about 10% above the figure of 1996-97.

2. SCIENTIFIC & TECHNOLOGICAL ACHIEVEMENTS

The S&T contributions from CSIR are of value to almost all socio-economic sectors. CSIR carries out R&D and provides S&T services of value not only to industry but also to other sectors of the economy e.g. agriculture, health, energy, rural development, transport & defence. CSIR's assistance to domestic industry is not only by way of relevant competitive technologies but also through search of raw materials and components, pollution control, productivity enhancement etc.

On the Technology Management front CSIR negotiated and tied up World wide marketing of IIP technology for Lube Oils by the giant multinational company Mobil Oil Corp., USA; in a similar fashion IIP tied up for marketing and providing technical support for Amoco's technology for Dimethyl ether a diesel substitute in India. CSIR through CDRI has tied up with Nova Nordisk for screening of molecules for therapeutic for diabetes and negotiated for a small share in the commercialising of proprietary novel molecule of Cytomed (CMI-977) as a drug – a historical first of its kind. Some of the other achievements are listed sector wise.

2.1 AEROSPACE SCIENCE & TECHNOLOGY

Scientific Achievements

2.1.1 Hypersonic flow computations for a space vehicle

NAL took up a DRDL sponsored project to compute hypersonic flow past complex re-entry payload configurations. The development of a multi-block Navier-Stokes grid with fin deflection (there are four fins located symmetrically around the body at the end of the payload) was one of the challenging tasks involved as the required number of grid points could be in millions. The computation of the flow field with such a large grid system on the existing computational platforms posed another challenge. A multi-block upwind RANS solver called MB-EURANIUM has been developed at NAL and successfully tested on a 2-block grid for an axisymmetric configuration at hypersonic Mach number. A multi-block N-S grid for a re-entry space vehicle payload with four fins has been generated employing the imported pre-processor GRIDGEN. The code MB-EURANIUM is being currently tested

on this grid for RANS computations at hypersonic speed.

Technological Achievements

2.1.2 HANSA

The second prototype of HANSA (VT-XBL) with a Rotax 914-F3 engine driven by a variable pitch propeller commenced its test flight programme during May 1998. DGCA granted provisional type certificate and the aircraft participated successfully in the flight demonstrations at the international air show, "Aero India" in Bangalore during December '1998. The aircraft is now going through flight test for full type certification. The first pre-production aircraft is getting ready to be delivered to one of the flying clubs through the DGCA. The productionizing effort at Taneja Aerospace and Aviation Ltd. is also progressing systematically.

2.1.3 Light Transport Aircraft : SARAS

HAL became a full-fledged partner of NAL in the LTA development programme and thus many divisions of HAL were involved in the design activity. A considerable amount of wind tunnel testing was carried out to generate aerodynamic data particularly at high Mach and Reynolds numbers for the SARAS aircraft. The results covered tests on 1/20 scale model in the NAL's 1.2m x 1.2m tunnel, 1/9 scale model in the TsAGI T-106 tunnel and 1/6 scale model in the IISc low speed tunnel. The detailed design of the SARAS airframe was nearing completion. While the design and the drawings of the empenage have been completed, those for the wing and fuselage were under progress. All the parts of horizontal stabiliser have been manufactured. The assembly jig has been set up and referenced at Taneja Aerospace and Aviation Ltd. The design of system test rigs has been taken up. The assembly of the horizontal tail was to commence early in 1999-2000. The system design of all the major systems has been completed and procurement actions initiated.

2.1.4 Exhaust volute for Kaveri gas turbine (marine version)

Under a programme sponsored by the Gas Turbine Research Establishment (GTRE) for the marinisation of the Kaveri engine, NAL has developed the technology for high performance, compact exhaust volutes. Developmental testing of scaled models of the exhaust volutes have been carried out in specially set-up water flow visualisation and airflow rigs. A computational study of this complex flow has also been taken up using a general purpose CFD code PHOENICS. A novel vortex controlled exhaust volute has been successfully developed with the overall total pressure losses within the limits specified by GTRE.

Service

2.1.5 Revamping, reinstallation and computerisation of VSSC's vertical autoclave

VSSC uses an autoclave for the fabrication of advanced composite parts for various aerospace applications. VSSC recognising NALs ability to indigenously design and develop state of the art autoclaves, requested NAL to revamp, reinstall and computerise their vertical autoclave supplied by M/s Reaves Ltd., UK about 10 years ago. NAL undertook the project at a cost of about Rs.90 lakhs with a time frame of one year. The scope of the project included the design, development, reinstallation, integration, commissioning, testing, training and maintaining the system for one year. The project has been successfully completed and the system was handed over to VSSC for user trial in March 1999.

2.1.6 Re-engineering the GCM weather prediction code

A General Circulation Model (GCM) used for numerical weather prediction is among the most complex computer codes from the viewpoint of mathematics as well as software engineering. NAL in association with the Centre for Atmospheric and Oceanic Sciences, Indian Institute of Science completed a major exercise to reengineer the GCM T-80 code, provided to NAL by National Centre for Medium Range Weather Forecasting (NCMRWF). The objectives of the re-engineering project were to: (a) make the code transparent and easy to comprehend and modify and; (b) remove the limitations of coding practices due to Fortran 77 by rewriting in Fortran 90. As a result of this effort, the rewritten code reduced from 40,000 lines to 18,000 lines. The implications of this re-engineering effort are very significant: (a) modified code is completely portable across platforms (without requiring any platform-specific changes); (b) code can be run on a Pentium PC, making it possible for almost any college or university to offer training in numerical weather modelling; and (c) a powerful research tool now available for weather forecasting, climate modelling and simulation and even for 'hands-on' classroom teaching.

2.1.7 National Trisonic Aerodynamic Facilities (NTAF)

The focus of activity in NTAF included the attenuation of flow unsteadiness in the 1.2 m wind tunnel, which involved a major shutdown of the facility, installation of noise attenuation module, re-calibration and re-installation of various control systems. Following completion of modifications and re-commissioning of the PC based control system of the wind tunnel, the tests were being repeated to assess the changes in the flow quality. The improved free-stream quality in the 1.2 m wind tunnel at supersonic Mach numbers were now comparable with the best wind tunnels elsewhere. A total of 819 blow-downs were conducted in the 1.2 m wind tunnel during the period.

2.1.8 Cooled turbine cascade testing

NAL has signed a MOU with United Technologies, USA for testing high Mach number cooled gas turbine blade profiles in the Transonic Cascade Tunnel. Under this project it was proposed to obtain aerodynamic performance data without and with coolant flow, simulating actual density ratio.

2.1.9 Sun shield panels of INSAT 2E

NAL made and delivered to ISRO sunshield panels for INSAT 2E. The satellite has been successfully launched with these panels integrated into it. The INSAT pictures received from 2E showed the excellent performance of the sunshield panels.

2.1.10 Wind studies in North East

MNES enlisted NAL's help in locating windy areas in the states of Assam, Meghalaya, Sikkim and Tripura. A few areas identified by NAL have given some very interesting results namely Assam, generally known for heavy rainfall and low wind conditions, has some possible pockets where wind could be higher than anticipated.

Human Resource Development

2.1.11 FRP Moulding

The Composite Products Development and Applications Centre (COMPAC) set up with USAID funding at NAL organised the sixth FRP moulding training programme for 20 SC/ST participants. So far 140 participants have been trained under this programme.

2.1.12 Training in diverse aerospace science & engineering

During the period, 51 diploma trainees (40 are still continuing), 122 graduate trainees (98 continuing) and 13 postgraduate trainees (7 continuing) were inducted for training in diverse fields of aerospace science and engineering. About 175 batches of mostly engineering and MCA students (165 batches continuing) undertook their project work required for the award of a degree and included 425 outstation (202 continuing) project trainees.

2.2 BIOLOGICAL SCIENCES & TEHNOLOGY

Scientific Achievements

2.2.1 Abnormalities in q arm of Y chromosome

CCMB has reported a case wherein the p arm of Y chromosome is normal, but its q arm has two abnormalities, namely deletion of the entire heterochromatin and duplication of q euchromatin. Studies indicate that, these two events leading to chromosomal abnormalities in the q arm, would have happened simultaneously involving a paracentric inversion, sometime during the early spermatogenesis of the father of the proband. Paternity of the child was confirmed by using Y chromosome specific STRs. Considering, the fact that, duplication of the Yq euchromatin was neutral leading to normal male phenotype, suggests that ambiguous genitalia and un-descended testes in this case might be due to deletion of the heterochromatic region of the Y chromosome. Further studies on the above hypothesis are in progress.

2.2.2 Antioxidant effects of tea in cataract retardation

The green and black tea polyphenol extracts have been studied at CCMB for their antioxidative properties and for their ability to help relieve the oxidative stress in the eye lens. It is seen that these substances can quench reactive oxygen species, prevent the oxidative cross-linking of lest proteins and inhibit DNA strand breaks in whole cells. Rats in which cataract was induced by selenite administration of tea extracts led to retardation of the progression of lens opacity indicating the potential anti-cataract effects of tea.

2.2.3 Microbial resistance to plant antibiotics

Studies on the response of the cellular slime mould *Dictyostelium discoideum* to isoflavonoid phytoalexins have led scientists at CCMB to propose a novel plant-microbe interaction with leguminous plants. The plant uses isoflavonoid compounds to manipulate the foraging behaviour of cellular slime mould amoebae so as to get rid of potentially pathogenic rhizosphere bacteria from the vicinity of root lesions.

2.2.4 Nuclear organelle genome interaction

All biological activity in plants generally result from the interaction of the organelle genome, viz. mitochondria and chloroplast. Based on the RAPD analyses of the mitochondrial genome together with nuclear genome, NBRI has developed a tool for categorising and identifying various male sterile, maintainer fertile and restorer lines. It can provide a very sensitive and powerful method which could be used by plant breeders. After sequencing entire genome of chloroplast, selective sequences can be utilised for making vectors for chloroplast transformation.

2.2.5 Importance of control strains in gene disruption studies

Targeted deletion of genes is a routinely used tool to study the biological role of genes in yeast and other microbes. In such deletions, another gene, usually one that obviates the need for a nutrient, is used to mark the deleted genes, and also to identify strains deleted for such genes. IMT has shown that such selectable marker genes themselves could influence the results if appropriate control strains are not used. It is expected that the outcome will serve as a warning to yeast researchers to use appropriate control strains in gene disruption studies, and thereby forestall misleading results (and publications).

2.2.6 Construction of a combined genetic and physical map of *V.cholerae* O139 genome

For the first time in Indian Science a combined physical and genetic genome map of strain SG24 of *V. cholerae* O139 Bengal, a novel non-O1 epidemic strain has been constructed by IICB using three enzymes *Not I, Sfi I & Ceu I.* More than 80 cloned homologous and heterologous genes, including several operons, have been positioned on the physical map. Comparison of the O139 map with that of classical O1 strain 569B revealed considerable diversity in DNA restriction sites and several genetic markers are in different positions in the SG24 and 569B genomes. The chromosome of SG24 has been described as a single circular and the genome size is about 3.57 Mb.

2.2.7 Lipoprotein (a) - a potential marker of coronary heart disease and atherosclerosis

CDRI has established the clinical significance of serum lipoprotein Lp(a), a cholesterol rich protein, in determining the degree of risk of coronary heart disease (CHD). Serum Lp(a) concentration of 10 mg/dl or more has been demonstrated as a potential risk marker in the Indian population. The assay will be useful in diagnosis of human subjects at higher CHD risk.

2.2.8 Bio-enhancers for some commonly used antibiotics

CIMAP has identified two plant extracts CIM 154 and CIM 227 that could enhance the antibacterial potential of antibiotics such as rifampicin, tetracycline and ampicillin. The bacterial strains studied were *E.coli, Bacillus subtilis and Mycobacterium smegmatis.* Studies so far have shown that rifampicin caused 7 fold higher killing of *E.coli* cells when present along with plant extract CIM 227 while the extract itself did not possess any detectable antibacterial activity. Further studies are on to establish the various findings.

2.2.9 Bioremediation of hydrocarbon contaminated soil : role of bacterial diversity and microbial inocula

NEERI has taken up a DBT sponsored project that seeks to explore innovative isolation and culturing protocols in combination with molecular approaches to determine bacterial genotypic diversity at contaminated terrestrial sites for enhancing in situ activity as well as to generate "microbial inocula". A protocol was developed for extraction of microbial DNA from oil and grease saturated soil and fingerprinted for hydrocarbon contamination using GC-MS. In the first instance, the extracted DNA was used in polymerase chain reaction based assays using the widely distributed catabolic genes, the camphor monooxygenase, cam C gene and the naphthalene diooxygenase, nah Ac gene to demonstrate availability of the target specific DNA in a soil. The DNA extraction methodology was found to be applicable for soils contaminated with organochlorine pesticides, phthalate ester plasticizers and paints. The

studies conducted so far indicate that in addition to quick and specific determination of genotypes, the methodology developed can be used in the biotreatability studies for in situ bioremediation of hydrocarbon contaminated soils.

Technological Achievements

2.2.10 Preparation of high loading supports for large scale synthesis of oligonucleotides and oligonucleotide library work

High loading supports preparation is of immense importance for antisense oligonucleotide research, where relatively pure material are required but in large quantities. It is difficult to obtain high loading of leader nucleotides on high porosity supports, because of the smaller surface area available for functionalization. CBT has developed a simple protocol for the preparation of high loading supports for large scale synthesis of oligonucleotides employing commonly used polymer supports. Synthesis of oligonucleotides have been carried out and compared with the synthesis on normal pre-derivatised supports.

2.2.11 Novel cationic amphiphiles as transfection agents

Delivery of genes into cells has several applications including gene therapy. Lipid mediated transfection is a popular and convenient method among nonviral methods of transfection. CCMB, in collaboration with IICT, assessed several cationic lipids with novel chemistry for their transfection efficiency. Two compounds in specific combination with colipids were found to be very promising. The transfection efficiency of these compounds was more than Lipofectamine, a popular commercial agent. Since the molecules were designed keeping aspects of cell surface in consideration, these may be suitable to a variety of cell lines.

2.2.12 Long acting biodegradable delivery system for erythromycin

Erythromycin is bacteriostatic under the conditions of clinical use and is effective in the treatment of chronic lung, skin and other infections. Long acting system for erythromycin for control of chronic bacterial infections has been developed by CBT. Such systems are particularly useful in rural areas and in countries with poor hospital facilities.

2.2.13 Early flowering of bird of paradise

Bird of paradise has gained popularity among the variety of high value cut flowers, now in great demand all over the country. Normally the gestation period from germination to blooming is 5-6 years. IHBT by application of growth regulator, GA3 and kinetin has reduced the gestation period to two years and increased flower production by 400% involving a nominal incremental cost.

2.2.14 High yielding varieties of Java citronella

Java citronella (*Cymbopogon winterianus* Jowitt) is a major aromatic grass of immense importance for its essential oil used in pharmaceutical and cosmetic industries. CIMAP has released two new varieties of the herb for commercial cultivation, viz.:

- **Jal Pallavi** is a high yielding water tolerant variety and thus can sustain its high productivity under water stagnation conditions in perennial plantations;

- **Manjari** is a superior mutant variety, the oil of which has desirable features of low elemol (1.31%) and high citronellal content (43%).

2.2.15 Alkaloid free non-narcotic opium poppy

An opiumless and alkaloid free stable opium poppy *Papaver somniferum* variety christened Sujata has been developed by CIMAP. Sujata is patented in India and patent application in USA has been filed for it. Further, as var. Sujata does not produce latex (opium), it is quite safe to grow as "seed poppy" unlike the licenced/registered cultivated "opium poppy".

2.2.16 Herbal formulations

CIMAP has developed a number of herbal formulations for use as healthcare products, safe domestic insecticides etc. These are:

- **Long burning herbal sticks** for fragrance and mosquito repellence;
- **Crack cream** an efficacious herbal cream for mild and severe cracks on heels and hands;
- **Liquid dentifrice** for pain relief and freshness of oral cavity;

- **Herbal tooth powder** a synergistic mixture from plants (not exploited earlier for such uses) for bleeding swollen gums, toothache, yellowing/staining of teeth, loosening of teeth, foul odour of mouth and sensitivity to cold/hot water and food;

- **Scented insect repellent lotion** based on various essential oil ingredients and an emulsifier as a potent flying insect repellent agent;

- **Edible dyes extracted** from herbs as alternatives to synthetic dyes and;

- **Pulse grain protectant** an herbal combination which is effective against the prevailing strains of the pulse beetle.

2.2.17 Improved technology for fresh ginger processing

RRL, Trivandrum has developed a process for extraction of ginger oil directly from fresh ginger. Presently commercial scale production of ginger oil is from sun-dried ginger which has nearly 25-30% less volatile oil - the prime contributor for the characteristics fresh ginger flavour, which is lost during drying. Extraction of fresh ginger not only gives a higher oil yield but also an oil of superior quality besides dispensing with the time consuming drying process. Higher yield and premium quality products with fresh flavour make this process better as compared to dry ginger processing. A fresh ginger processing pilot plant of 10 tonnes/day capacity developed and designed by the laboratory is being erected in Manipur.

2.2.18 Fly Ash – soil amendment

CFRI has developed fly ash soil amendment technology which has been extensively demonstrated through field trials with varying proportions of fly ash under different agroclimatic conditions and soil types in different parts of the country for cultivation of various cereals, root, leguminous and vegetable crops. A substantial increase in crop yield (20-60%), early maturity of crops and improvement in physico-chemical properties of the soil without any adverse effect are the advantages. Furthermore less pest incidence and no carry over of trace/heavy metals/radioactivity from fly ash in soil, crop produce and ground water are seen. Also extensive R&D for bio-reclamation of abandoned ash pond, has made it productive and suitable for growing ornamental/fruit trees and agro-forestry via biotechnological methods.

Service

2.2.19 Mobile laboratory

A mobile laboratory (van) has been fabricated by IHBT with capabilities for oil extraction, tissue culture inoculation, performing routine chemical, pathological, physiological, biochemical and molecular biology work and technology transfer cum-demonstration through audio-video aids. Global positioning facilities to locate longitude & latitude of the location while moving to a new area have also been provided. Expeditions for bioprospection of biomolecules/essential oils/extremophiles genes and collection of ethno-botanical informations can be easily conducted with ease and efficiency using the IHBT mobile laboratory.

2.2.20 Health survey studies

ITRC in a study to assess the risk to women using biomass based domestic fuel e.g. fire wood, cow dung and the mixture of two, showed an overall prevalence of 35.3% and maximum prevalence of 42.8% of the respiratory symptoms in comparison to 10.7% incidence in those using LPG as cooking fuel. The major complaint was dry irritating cough associated with impaired pulmonary function.

Human Resource Development

2.2.21 Short-term training for students

CDRI imparted training to fifty students from universities and medical colleges in basic techniques of biochemistry, fermentation technology, microbiology, tissue culture and maintenance of analytical and biomedical instruments.

2.2.22 Vocational training

CBT trained 64 students from different universities/institutes during the summer training programme in biotechnology and related disciplines.

2.2.23 Training in biotechnology

CIMAP arranged a number of training programmes in biotechnology and related fields including a short-term training course for 40 students of Lucknow University on "Recent techniques in plant biotechnology".

2.2.24 Young scientist contact programme

NBRI trained, twenty nine young scientists of M.Sc. level from less endowed universities/colleges under the DST sponsored programme in September 1998.

2.3 CHEMICAL SCIENCES & TECHNOLOGY

Scientific Achievements

2.3.1 Dipolar cycloaddition reactions

Microwave energy has been used for the first time for the generation of 1, 3-dipole viz. nitrile oxide from the corresponding diaroylfuroxan and their subsequent cycloadditions with various dipolarophiles were performed in just one pot of a solvent free condition. The reaction proceeded efficiently, and good yields were obtained at ambient pressure within minutes time and in the absence of solvent. Based upon 1, 3 – dipolar cycloaddition strategy of azide to acetylenes, a simple and efficient method for the preparation of 1-allyl-6',1',2',3'-triazoloanalogues of HEPT and MKG 442 which are anti HIV reverse transcriptase inhibitor have been developed by RRL, Jt.

2.3.2 Solid phase chemistry for organic reactions

Solid phase chemistry is attaining increasing importance in medicinal chemistry for creating combinatorial libraries of pure chemical entities. Solid phase chemistry investigations on SN_2, cycloaddition, NO_2 reduction and halomercuration reactions and synthesis of aminoalcohols, tetrahydropyro-lidines, pyrazolopyridines and nitriles have been initiated at IICT.

2.3.3 Pressure swing adsorbent

Pressure swing adsorbent is an emerging technology for separation of syngas components marked by ease of separation and cost effectiveness. CFRI engaged in the development of a new and improved adsorbent material has tested three different carbon adsorbents which have shown a good selectivity and adsorption capacity towards CO. Experimental data also indicated high purity of CO & H_2 obtained.

Technological Achievements

2.3.4 Synthesis of Zeolite-X

Zeolite-X is widely used as molecular sieves for solvent purification, drying and adsorptive separation. A process for the synthesis of Zeolite-X has been developed by CSMCRI using sodium aluminate and sodium silicates, after studying the different reaction parameters. Also a route for synthesis of Zeolite-X using bauxite leached sodium aluminate has been developed.

2.3.5 Novel catalyst for dehydrogenation reactions

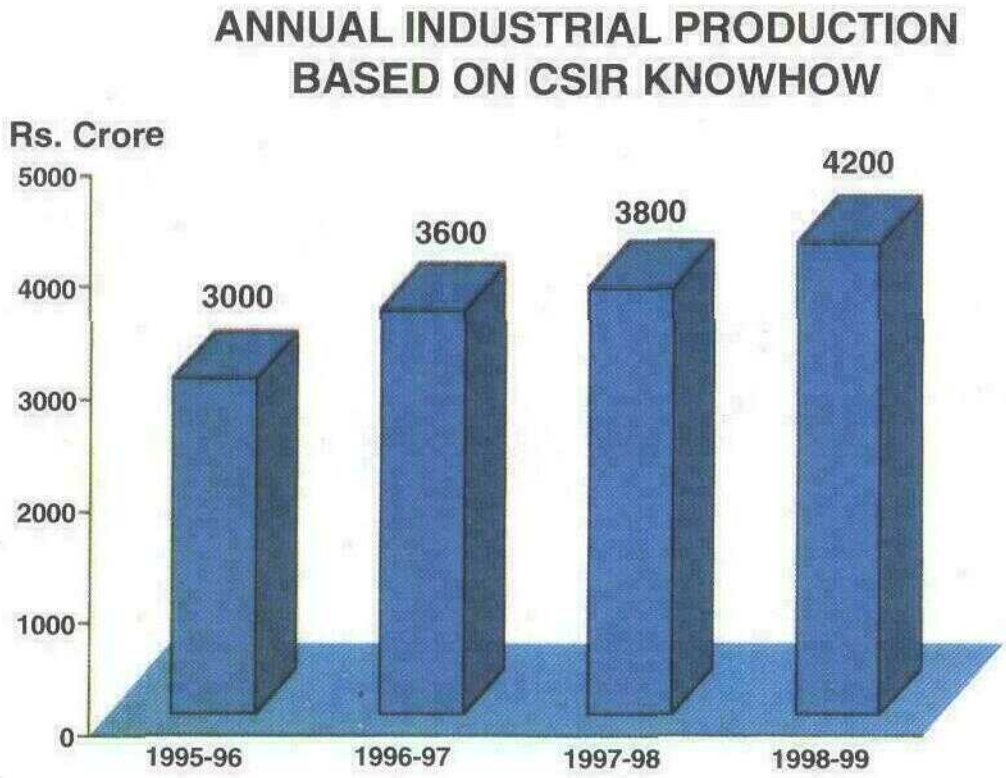
RRL, Jm. has developed a novel nickel based catalyst for vapour phase dehydrogenation of cyclic terpene ketones to thymol. The catalyst offers a specific conversion of cyclic ketones like menthone, isomenthone, piperitone and isopulegone into thymol in quantitative yields without side reaction.

2.3.6 Nitration of organics

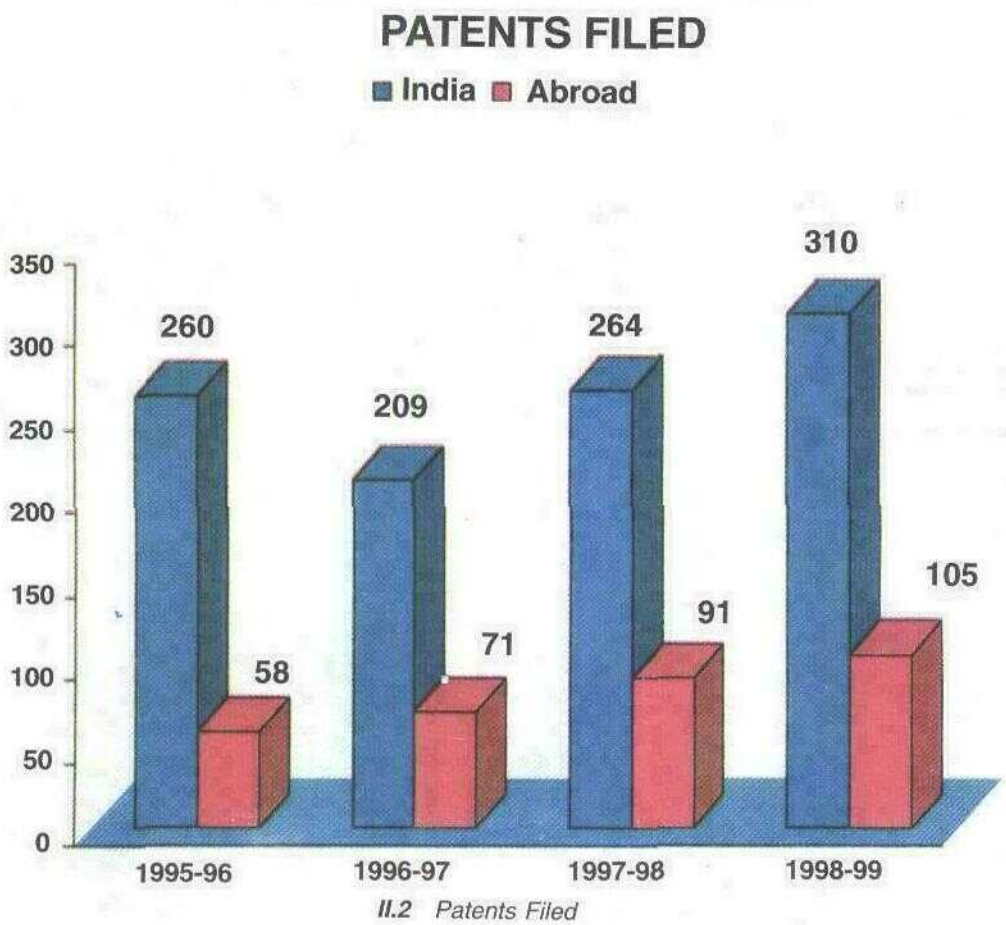
IICT has developed a novel process for nitration of aromatic compounds. The conventional nitration employs a nitrating mixture of nitric and sulphuric acids, whereas the new process employs reusable solid acid catalysts to totally dispense with sulphuric acid. The para selectivities of a variety of monosubstituted aromatics viz., chloro, bromo and iodo benzenes, toluene, cumene, anisole and allied chemicals have been enhanced in the range of 30 to 90%. The IICT technology, patented in US, European Union and India can be adopted for continuous processing in a tubular flow reactor.

2.3.7 Catalyst-free esterification/transesterification

A catalyst-free process has been developed by IICT for the esterification of carboxylic acids with alkanols. The development also enables simultaneous esterification and transesterification of fatty acids and triglycerides when present together. Conventionally, such mixtures are reacted in a two-step catalytic process wherein the fatty acids are first converted to esters by using an acidic catalyst followed by a transesterification step involving a basic catalyst.

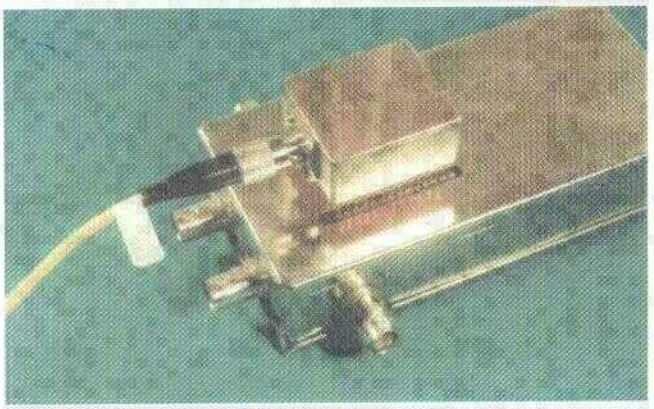


II.1 Annual Industrial Production based on CSIR know-how

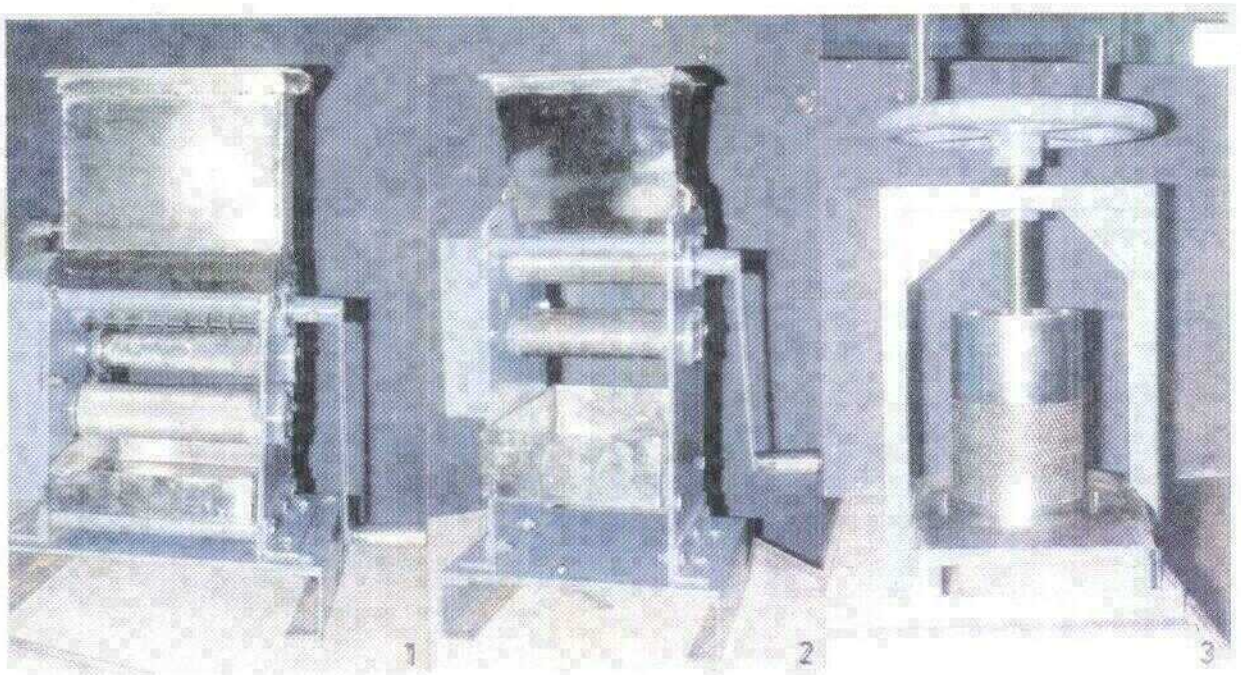


II.2 Patents Filed

II.3 *Opiumless Poppy developed by CIMAP*



II.4 *Integrated Optical Receiver Module developed by CEERI*



II.5 *Low cost hand operated apricot oil processing machines developed by RRL, Jammu*

Service

2.3.8 Commissioning lube extraction plant

A grass root lube oil base stock production plant based on technology developed by IIP in collaboration with EIL and MRL, Chennai using NMP was commissioned at Haldia refinery. The capacity of unit is 250,000 tonnes per annum.

Human Resource Development

2.3.9 Refresher courses in electrochemical areas

Courses were conducted in the field of Corrosion, Pollution control, Lead acid batteries, Industrial Metal finishing by CECRI for nearly 190 trainees

2.3.10 Technical training programme for petroleum personnel

Eleven training programmes on topics relating to refining technology application of fuels and lubricants and measurements of automotive emissions were conducted by IIP.

2.3.11 Workshop-cum-training on combinatorial synthesis

CSIR and International Centre for Science & High Technology (ICS), UNIDO organised an International Workshop on "Combinatorial Technologies – Awareness and Familiarisation for Decision-makers" a Training Programme on "Methodologies, Applications and Economics of Combinatorial Chemistry and Combinatorial Technologies" at IICT for 30 delegates.

2.4 EARTH & PHYSICAL SCIENCES AND TECHNOLOGY

Scientific Achievements

2.4.1 Studies in Koyna Seismic Zone

Three dimensional seismic models were generated by NGRI to decipher critical linkages between recurring seismicity and high velocity. Surface rupture zone of the region was defined through Helium surveys and westerly dip of Koyna fault was established.

2.4.2 Structure across Narmada-Son Lineament Zone

Geo-electric structure, based on the magnetotelluric studies in the zone conducted by NGRI could be related to the seismogenic fault believed to be associated with Jabalpur earthquake and also to the reactivation processes that the region has experienced. Seismic data suggests a high velocity (6.6-6.7 km/s) at depths of 1.5 km in parts of the Narmada zone and at 8-10 km depth outside this zone. A rheological model under the constraints provided by focal depth of the Jabalpur and Satpura earthquakes suggests relatively cold lithosphere for the central Indian shield.

2.4.3 Upper ocean thermal structure

Expendable bathythermograph (XBT) operations for studying upper ocean thermal structure were carried out by NIO along shipping lanes of: (a) Chennai-Andamans-Calcutta; (b) Chennai-Singapore and; (c) Mumbai –Port Louis routes as part of ocean observing systems. Thermal sections in the central Bay of Bengal (Chennai-Port Blair) prepared with XBT data of 1991-96 indicated significant inter-annual variability. Further, influence of 1992-93 *El Nino* event in the Pacific was noticeable in the central Bay as it reduced the sea surface temperatures. From these thermal sections, year to year variability in the location and strength of the Indian monsoon current was distinct. Both, up-welling close to Madras coast during summer monsoon and strength of western boundary current along the east coast of India, exhibited inter-annual variability.

2.4.4 Ridge Research Programme

This programme funded by the DOD and United States India Fund (USIF) includes the study of various aspects of the ridge system in the Indian Ocean to understand the mechanism responsible for present configuration and position of the landmasses and the oceans, and in identifying the possible hydro-thermal sites and axial sea-mount formation. Two areas were identified for investigation: one in the slow spreading Carlsberg ridge area (north of the equator) and the other along the intermediate spreading Central India Ridge (South of the equator). Studies indicate asymmetric spreading and second order discontinuity with morphological segmentation at 30-80 km. Magnetic anomalies up to 5 have also been observed.

2.4.5 Signal duration and local Richter magnitudes

A study on signal duration and local Richter magnitudes from the shallow earthquakes in North East India and its vicinity was undertaken by RRL, Jt. Over 210 shallow earthquakes in North East India and its neighbourhood during the period 1993-1997 were studied. The model derived would be useful to determine the duration magnitudes for the earthquakes in and around North East India on routine basis and also for knowing the signal duration attenuation characteristics.

Technological Achievements

2.4.6 Mapping of gas hydrates

The gas hydrates are widely considered as a promising alternate energy resource. NIO carried out special processing of about 5000 km of seismic data under a consultancy project awarded by the National Gas Hydrate Programme (NGHP). These data were further examined for locating the Bottom Simulating Reflections (BSR), which are considered to be the acoustic indicators for Gas Hydrate bearing zones within sediments. A map depicting the distribution of BSRs on the western continental margin of India has been prepared. The results of the study are expected to be helpful for planning exploration of gas hydrates on the continental margins of India.

2.4.7 Pillar extraction by bulk filling

A technology for delayed bulk filling of open slopes with high density cemented fill for the extraction of pillars was developed at CMRI under a grants-in-aid project of Ministry of Mines. Complete mill tailings could be used for back filling which was found to exhibit higher strength than conventional deslimed tailings fill. Cement requirement and mine de-watering cost are also reduced and productivity increased.

2.4.8 Improved steel cog

CMRI has developed an improved type of steel cog as an effective and economical support for underground mine roofs. With supporting area of 1 m^2 and load bearing capacity of 40 T this newly developed device has high potential to replace conventional wooden as well as cube-shaped box type steel cogs.

Service

2.4.9 Water resource augmentation

NGRI took up studies in water resources location and two important accomplishment during the year were :

- **Water harvesting** : twenty one well sites were identified for drilling in and around Dhankanal, Orissa. Fifteen sites were located for construction of water harvesting structures in Pakur district, Bihar;

- **Recharge studies:** on natural recharge for groundwater were completed in some watersheds of Rajahmundry and East Godavari districts of Andhra Pradesh. The total primary replenishable groundwater potential of East Godavari district was calculated as 813 million cubic meters for the rainfall of 850 mm during 1997 monsoon precipitation.

2.4.10 Gold Mineralisation Studies

NGRI undertook two important programmes on gold mineralisation namely:

- **In Madagaskar:** NGRI took up geophysical and geo-chemical studies on gold mineralisation in collaboration with the NMDC Ltd., in its first ever international venture. Geo-chemical reconnaissance work was carried out in a 220 sq km area in Beforana and 570 sq km on Vohilava provinces. Sample analysis has indicated gold values between 0.20 and 3.0 gm/tonne.

- **In Karnataka:** NGRI had suggested six sites for drilling based on the combined studies with Hutti Gold Mines Ltd. Out of these, two boreholes have been drilled. Core samples from these boreholes indicated a gold grade of 1.86 gm/tonne over a width of 5 m.

Human Resource Development

2.4.11 Short training programmes by CMRI

CMRI organised two 5-day courses on "Recent Developments in Explosives and Accessories – their Assured Safety, Quality and Cost-effectiveness" and "Pressure Balancing Technique, Cryogenic Technology and Multizonal ventilation System for Rapid Control of Fire and Improvement

of Environment and Safety in Mines". The courses were well attended by mining professionals.

2.4.12 Ocean information management

NIO organised a National Workshop on Ocean Information Management to create an awareness about state-of-art technology in ocean information science for better co-ordination and data and information management. Delegates from all over the country representing 25 organisations participated.

2.5 ENGINEERING SCIENCES & TECHNOLOGY

Scientific Achievements

2.5.1 New approaches for the study of non-linear oscillators

A novel semi-analytical integration scheme, called the phase space linearization method has been developed by CBRI to obtain stable and unstable periodic solutions of forced as well as unforced non-linear oscillators and also the damped separatrices. The method has been evaluated against periodic solutions of three oscillators, Ueda's, Duffing-Holmes' and Van der Pol's oscillators, obtained using fourth order Runge-Kutta method with sufficiently small time step. The separatrices obtained using the phase space linearization method were comparable with those obtained via the power series method as developed earlier.

2.5.2 Neural network based analysis of building structures

SERC, G has undertaken a project on application of Artificial Neural Networks (ANN) in the area of structural engineering. The focus is mainly on back propagation algorithm with supervised learning. ANN was developed to predict the central deflection of square grid structure. Subsequently the ANN was used in the Non Destructive Testing (NDT) of concrete structures using Hammer & USPV test result. The results predicted by the ANN were quite promising and show the potential of the ANN in solving problems of NDT of structure.

Technological Achievements

2.5.3 Electromechanical actuator

CEERI has developed a high performance electromechanical actuator system consisting of PWM amplifier and associate control electronics. Direct position sensing at the output with a rotary potentiometer has been used for compact size for the system.

2.5.4 Integrated optical receiver module

CEERI has developed a 24-pin hybrid Integrated Optical Receiver Module, for 155 Mbps data rate suited for SONET/SDH Compatible Optical Communication links.

2.5.5 Mechanised production of fly ash bricks

Production of clay fly ash bricks through de-airing extrusion and stabilised lime fly ash bricks through vibro-compaction has been achieved by CBRI. Small scale demonstrative trials have been conducted successfully. Such mechanised techniques enable setting up of the brick production facilities at or nearby thermal power plants.

2.5.6 Modelling and assessment of strength of existing building under seismic excitation

Windows based computer software WINFILL (Windows Based Infill Analysis Program) has been developed by SERC, M for the analysis and strength assessment of the plane frames with infill. Another software (SESTRA), for the strength and safety evaluation procedures, consists of a pre-processor with GUI in Visual C++ which has been developed to generate the plan and elevation of other building components and to take the inputs from the user through dialog boxes. The dead load, live load and storey weights with shear and bending capacity of the beams and columns are calculated by the program.

2.5.7 Soil nailing technique for stabilization of slope

CRRI has carried out a model study on soil nailing using dry sand and alluvial soil for stabilisation of steep soil slope which showed encouraging results for its implementation in the field. At the instance of DST field trials using soil nailing technique have been carried out on State Highway 45 near Rishikesh in UP. On the basis of stability analysis, the optimum length and spacing of nails have been determined.

2.5.8 Oil field effluent treatment plant

The effluent treatment plant at Lakwa oil field, set up by ONGC for treating oil field produced

water, generates huge amount of oil bearing sludge which is hazardous and not safe for disposal as such for land filing etc. RRL Jorhat has developed a technology for making common masonry bricks meeting ISI specifications.

2.5.9 Non-recovery type coke ovens for production of soft coke

CFRI has developed non-recovery type coke ovens to produce soft coke that dispense with the conventional burning of coal in open atmosphere. These ovens are energy efficient, environment friendly need low investment and can be set up as small scale industry in rural and backward areas as well. CFRI has licensed over 150 entrepreneurs to commercialise the know-how and more than 20 plants have been commissioned.

2.5.10 Automation of Jacquard cards for handloom weavers

India has a tradition for handloom fabrics, especially sarees of various types and unique designs. Handloom sarees are produced on Jacquard looms. Unique design motifs are woven by random selection of warp threads by means of punched 'Jacquard' cards. A traditional design for a saree generally needs 4000~5000 punched cards which are presently punched manually and take from 2 to 4 months for one design. CMERI has developed a computerised system for automatic production of Jacquard cards to reduce the time taken for production of such card decks and eliminate the drudgery of manual punching. Subsequently, a computerised method of digitising the design of the whole saree to generate digital data for automatic punching of the Jacquard cards was also developed. The development is expected to improve the economic status of the traditional handloom weavers.

2.5.11 Mechanisation of coffee plantations

At the instance of the Coffee Board, CMERI has developed mechanised implements for coffee plantations viz.,

- **Steam bark scrubber** for scrubbing the bark in coffee plantations for preventing pestilence.
- **Pit digger** for digging pits to the right specification (30cm. diameter and 30cm. depth.). The machine has its own petrol-run two stroke, two wheeler engine mounted on light-weight and robust aluminium channels with a pair of handlebars for performing the digging operation.
- **Raking machine** for uniform drying of the beans which are normally sun-dried and need repeated raking for uniform exposure to sun.
- **Mechanical weed remover** capable of removing weeds from about 2-3 cms. above the ground level, driven by a 35 cc petrol engine.

2.5.12 Calendar Sealing Machine

A novel calendar sealing machine has been developed by CMERI. It is expected to replace the conventional method of calendar binding and dispense with the metallic strips or spirals generally used for binding.

Service

2.5.13 Magnetic standards laboratory

A new magnetic standards laboratory has been established at NPL. This offers special facilities for AC measurements on soft magnetic materials viz. electrical steel strips as per IEC standards. It is possible to measure total core loss, peak values of magnetic induction and polarization, specific apparent power, peak values of magnetizing field etc.

2.5.14 Monitoring of quality of washed coal supplies

CFRI undertook the monitoring of 3.5 million tonnes of the quality of coal dispatched to SAIL steel plants from BCCL washeries.

2.5.15 Evaluation of deshaling plant of Northern Coalfields Ltd.

Washability characteristics and other relevant chemical parameters of three coals of Bina colliery linked to the Bina deshaling plant were determined by CFRI for purpose of performance evaluation of the process and also development of software for optimum yield predictions. The software developed enables the prediction of yield at selected ash content under variable proportions of known linked coals.

2.5.16 Bubble type dome units in concrete composites for roof structures

SERC, M developed bubble type dome units of 2.82 m radius in high performance fibre reinforced

concrete (HP-FRC) for the roof structure of the Parliament Library Building, New Delhi.

Human Resource Development

2.5.17 Training courses in instrumentation

CEERI conducted several training programmes in the design and application of high performance electronic instrumentation.

2.5.18 Skill development programmes for construction industry

CBRI conducted three training cum skill development programmes during the year for construction industry personnel where over 100 trainees from HUDCO, state housing boards etc. were trained.

2.5.19 International workshop-cum-training programme

CRRI organised the International Workshop-cum-Training Programme on "Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development" wherein 30 persons and experts from Sri Lanka, Iran, Bangladesh, Jordan, Austria, Turkey, Italy, Czech Republic, U.K., Nepal and India participated.

2.5.20 Training of highway engineers

CRRI conducted 10 training programmes for over 100 in-service highway engineers from the various organisations.

2.5.21 Training in ferrocement technology

A two day training programme on ferrocement technology, application and popularisation in North Eastern Region was organised by RRL, Jt.

2.5.22 Training course on quantitative methods in industrial pollution control

A 5-day training course for 30 scientists and engineers on "Quantitative methods in industrial pollution control" was organized by the IICT.

2.5.23 Certification of welders

RRL, Jt. conducted welder qualification certification for ONGC welders engaged in high pressure pipeline welding.

2.6 FOOD SCIENCE &TECHNOLOGY

Scientific Achievements

2.6.1 Adsorption studies of selected traditional foods of India

CFTRI has generated adsorption study based database on a number of food products which are useful for selection of suitable packaging material for the design of functional packages.

Technological Achievements

2.6.2 Nutrition supplements for school children

CFTRI has developed two nutrients enriched snacks namely nutro biscuits and suruchi meetha a burfi like product, both valuable as items for the mid-day meal schemes in schools. Nutro biscuits prepared from a blend of wheat flour and defatted soya flour have a protein content of 12-13%. To improve its nutritive value the biscuit has been fortified with thiamine, riboflavin, nicotinic acid, vitamin 'A' and vitamin 'D'. The novelty of suruchi meetha is that it is low cost as it is made from some of the food industry by-products. Ingredients used in the formulation are bio-technologically modified to improve the nutritional quality. It has 15% protein, 400k calories of energy/100 gm and is ready to eat. Technology has already been licensed for commercial production.

2.6.3 Low cost dhal analogue

A cheaper but highly nutritive substitute for common chick pea (arhar dal), in the form of instant sambar mix has been developed and introduced by CFTRI. The product has defatted soya flour as a major ingredient with other spices specially to suit the taste preference of the rural and urban poor. Production units of 500 Kg/day have been set up at 4 NGO centres and their personnel have been trained in all aspects of the technology.

2.6.4 Food grade lecithin

IICT has developed a simple and commercially viable process for the preparation of food grade lecithin from soybean oil gum and associated technologies for modified lecithins.

Service

2.6.5 Analysis and testing of samples

Analysis and testing of different products received from private and government organisations for physico-chemical attributes, nutritional quality, in addition to the specific analysis, were undertaken by CFTRI. Nearly 1400 samples from over 600 parties were analysed.

2.6.6 Analytical methods for chemical residues in fresh and processed foods

Efficient TLC and GC methods with high reliability and sensitivity have been developed by CFTRI for analysis of endosulfan, heptachlor, carbofuran, bendiocarp, benomyl and carbendazim, in addition to a novel diazatisation colorimetric method for estimation of 2-aminobenzimidazole.

2.

Human Resource Development

2.6.7 CFTRI conducted:

Masters degree in food technology: Fifty graduates from food science and agriculture took the course;

Certificate course in milling technology: The ten months course was taken by 18 graduates;

Short term courses: Nearly 400 participants from food industry took advanced level custom designed courses which covered all areas of interest to Food Processing Sector.

2.7 INFORMATION SCIENCE & TECHNOLOGY

Scientific Achievements

2.7.1 Study of non-linear metallurgical system from I/O patterns using artificial neural network

A robust multi-layer feed forward back propagation neural network (MBPN) architecture has been developed by NML and the algorithm has been implemented in a general purpose software package. The software has been successfully applied for modelling highly non-linear systems characterised, quite often, by imprecise and noisy data.

2.7.2 Simulation of non-newtonian polymeric fluid flow

Non-Newtonian viscoelastic fluids have a complex rheological behaviour. The objective of an investigation at C-MMACS has been to study the development of viscoelastic stresses near the entrance region, as the Weissenberg number was increased, to better understand the high Weissenberg number problem. A finite volume approach was adopted to discretise the governing equations on a computational grid, and the continuity equation treated by a pressure based method.

Technological Achievements

2.7.3 Software for functional genomics

CBT has developed a novel software to analyze peptides present in the whole genome. This software has been used for preliminary screening of antigenic epitopes in silico.

2.7.4 CD-ROM databases

INSDOC has produced the following databases in CDs:

Indian Science Abstracts (ISA) 1990-1998 :. a cumulative electronic searchable database of Indian Science Abstracts (ISA) comprising over 216 issues of ISA published over 9 years covering about two lakh abstracts and;

Directory of Research and Industrial Institution in SAARC Region : covers a database of 771 research institutions in Science & Technology in the SAARC.

2.7.5 Computer aided estimates for construction industry

CBRI has developed a software – BILDEST for giving priced bill of quantities, projecting the cost of building considering the building codes and application standards for residential buildings.

2.7.6 Software for digitisation

A software using "Autotrace and digitise" methodology was developed by NGRI for digitising the aeromagnetic data. This method is fast, user friendly and enhances the interpretation capability. The software was tested for generation of aeromagnetic images over parts of the Cuddapah Basin and adjoining areas.

2.7.7 Research Journals

NISCOM continued the timely publication of the thirteen research journals of international repute

covering the major science disciplines. The total number of papers published during the year in these journals were 1573 and the total number of pages printed were 8902. With a view to acquaint young research scientists with frontline research of contemporary relevance special issues brought were for:

Thrust Areas in Environment Engineering (Indian Journal of Engineering & Materials Sciences);

Recent Advances in Biological Oceanography *(Indian Journal of Marine Sciences)*;

Frontiers in Biotechnology (Journal of Scientific & Industrial Research);

Recent Trends in Science & Technology of Magnetic Fluids *(Indian Journal of Engineering & Materials Sciences)* and;

Management of Information technology – Organizations and Beyond *(Journal of Scientific & Industrial Research)*.

Service

2.7.8 Establishment of a rubber database system

Expertise of INSDOC was sought for preparing a feasibility study for establishment of Rubber Database System (RDS) at the Rubber Research Institute of India (RRII), Kottayam.

2.7.9 Database of SSI clusters in India

INSDOC has been assigned the task of creating a "Database of Exporting Small Scale Industries and SSI Clusters in India" by the Ministry of Industry, Govt. of India.

2.7.10 Computerized material database system

NML has developed menu-driven, interactive database of materials properties compositions and heat treatment to help designers narrow down the materials most appropriate for their specific application. The selection process allows defining and redefining the criteria for accepting and rejecting materials.

Human Resource Development

2.7.11 Training in information Science & Technology

INSDOC conducts three training programmes in the field of information science and technology viz.

Associateship in Information Science (AIS) : an advanced two year training course in documentation and reprography with special emphasis on information technology, information analysis and information systems.

Short-term training in Information Technology : in information handling and management techniques for professionals from various information systems/centres with particular emphasis in the areas of information technology and computer applications.

Attachment training programme : on-the-job training for persons requiring specialised training in the field of information science, information management, information technology and related activities was organised.

2.7.12 Course on science writing

NISCOM organised training programme on writing a scientific paper for fifteen research workers from Universities and CSIR laboratories.

2.7.13 Training on computer networking

A training programme on "Computer networking – Basic principles" for computer specialists was organized at IICT in May 1998.

2.8 MATERIAL SCIENCE & TECHNOLOGY

Scientific Achievements

2.8.1 Barium titanate particles of tailored shape

CGCRI has successfully used a sol-emulsion-gel method, starting from an organic solvent of low dielectric constant in the emulsion phase, an acetate-based barium titanate sol as the dispersed phase and a non-ionic surfactant in an invert emulsion system for obtaining tetragonal barium titanate particles of tailor-made shape. The change in shape of $BaTiO_3$ ceramic particles is easily controllable.

Technological Achievements

2.8.2 *Magnetic sensor for material characterisation*

NML has developed a sensor which could monitor ferromagnetic components. A nanocrystalline soft magnetic material, which has high non-linear characteristics, high permeability, high saturation induction and low magnetic Barkhausen noise, is used as a sensing element for as the sensor. It is able to detect the presence of 65 and higher martensite in a cold worked AISI 304 stainless steel.

2.8.3 Carbon fibre reinforced composite rings for polio calipers

The conventional calipers/crutches used by polio (poliomylites) patients for removal of deformities have stainless steel rings assembly using wires across the fractured/deformed areas. These are heavy, opaque to X-rays, amenable to plastic deformation at higher loads and for a single use only. A light weight substitute consisting of carbon fibre reinforced composites has been developed by NPL which has several advantages over the steel rings most important being nearly 75% reduction in weight of the rings which enables the patients to move freely and take to physiotherapy more easily. These are elastically rigid over the whole range of loads applied and avoids the plastic deformation exhibited by stainless steel rings. These are transparent to X-rays and thus allow better monitoring of the healing process. These rings are cost-effective and lend themselves to repeated use.

2.8.4 Super-conducting magnet for NMR spectrometer

NPL has developed a high homogeneity super-conducting magnet with super-conducting shims for radial and axial field corrections suitable for NMR spectrometer application. The cryostat housing this magnet has a hold time of 90 days for L-He.

2.8.5 Ceramic glazing from drum filter cake

A frit material using drum filter cake waste has been developed and used for glazing of ceramic wall tiles by RRL, Bho. The material has been characterised with regard to its lead complexing efficiency in terms of lead leachability test and other physico mechanical properties such as impact strength, water absorption etc. which are found to meet the BIS Standards.

Service

2.8.6 Synthesis of hexagonal boron nitride

CGCRI has set up a facility for the synthesis of hexagonal boron nitride based on the low temperature synthesis process developed earlier at the Institute. The facility has a capacity to produce 1.5 Kg of boron nitride powder per run amounting to production of 50 to 60 kg per year.

Human Resource Development

2.8.7 Training in skill-cum-technology up-gradation

NML conducted nine training programmes for skill-cum-technology up-gradation for the Small Scale Industries and Rural Artisans in Collaboration with SIDBI and concerned other local agencies, over 300 participants benefited.

2.8.8 International workshop on building ceramics from industrial wastes

RRL, Trivandrum organised an international workshop supported by the International Centre for Science and High Technology (a unit of UNIDO), Italy and co-sponsored by CSIR and BMTRC. The major solid industrial waste covered in the workshop were fly ash, chrome, tannery sludge, metallurgical and mineral industrial wastes. Thirty participants drawn from industry, R&D institutions and promotional agencies from India and abroad. Countries represented were Italy, Netherlands, USA, Philippines, Indonesia, Malaysia, China, Mangolia and India.

2.9 SOCIETAL SCIENCE & TECHNOLOGY

Scientific Achievements

2.9.1 Ethno-botanical investigations on Kangra valley

An ethno-botanical survey in the tribal tracts ranging from foothills to 4500 mt. of height in the Dhauladhar range inhabited by *Gaddi* tribes was carried out by NBRI. About 120 plants/ plant products used by the tribals for food, fiber, medicine, fodder, veterinary, medicinal oil, religious ceremony, etc. were collected, identified and documented.

2.9.2 Science and Technology in India

A study initiated by NISTADS analyses India's scientific system, from the Indus valleys civilization to the colonial era and present.

2.9.3 Studies on the rural unorganized industrial sector

A techno-economic study was carried out by NISTADS on the status of the artisans engaged in the manufacturing, repairing of agricultural and household tools and equipment and other products in the unorganized sector. The goal of the project sponsored by ICAR, seeks to highlight the ways in which the unorganized sector of artisans could be made aware of the wider economic prospects of their activities and how they could become an agent of overall change.

Technological Achievements

2.9.4 Productivity enhancement and quality improvement of rural pottery

Over 5500 potters' families of Sabarkantha and Kheda districts of Gujarat are actively engaged in producing pots and ceramic products using only traditional methods of production. Preliminary studies revealed the need for changing the body compositions. Improved body compositions were formulated based on the locally available clays. The new body mixes significantly improved the quality of the products with almost zero firing loss. CGCRI Naroda Centre constructed pit type and bottle type updraught kilns at the Rural Technology Institute, Gandhinagar and conducted a Workshop for transmitting the developments through demonstration to the potters.

2.9.5 Performance enhancement of Gur (Jaggery) plants in rural areas

IIP under took a study to improve the thermal performance of existing Gur Plants in and around Dehradun. A modified design for the furnace was evolved that gives saving in bagasse consumption of ~10%.

2.9.6 Technology upgradation of Kewda processing

An improved and energy efficient system for distillation of kewda flowers developed by RRL, Bhu. was field tested during the 1998 flowering season at Tulu, Ganjam District. The yields of essential oil enhanced by more than 20% with savings of fuel wood by at least 25%. The special feature of the improved distillation system is the jacketted still that can be mounted on a conventional or improved kiln or heated with steam.

2.9.7 Low-cost apricot oil extraction machines

Under a project funded by TMO&P, GOI, ten sets of appropriate, low cost apricot seed oil extraction machines comprising, apricot decorticator, kernel sorter, meal grinder and mechanical oil extractor, designed at RRL, Jm. were fabricated and distributed among the voluntary organisations in apricot growing areas of Uttarakhand in UP, Kinnaur in HP, Rajouri, Poonch and Leh (Ladakh) in J&K State.

Each set of the hand operated machines has a capacity to process 60 kg pits, so as to produce high value 7 kg oil per day. The working and maintenance of these machines have been demonstrated to 300 persons from the voluntary organizations and farmers in the apricot growing areas.

2.9.8 Candleless terracotta water filter

RRL, Bhubaneshwar has developed a candleless terracotta water filter "Terafil" made from pottery red clay, sand and saw dust mixture. The filter brings down the turbidity of water from 100 NTU to 0.5 to 2.0 NTU. The know how has been transferred to Orissa Renewable Energy Development Agency (OREDA) for propagation among rural masses. Council of S&T and Environment, Meghalaya has also evinced interest in obtaining the know-how.

Service

2.9.9 Extension of rose cultivation in the Northern India

The work of IHBT on Damask rose particularly the development of two varieties viz. Jwala and Himroz has triggered the development of the essential oil bearing plants in the northern region and a large number of farmers have been attracted from the hills as well as plains in procuring the planting materials and are also showing interest in processing technology. As a result of this development an additional 9000 quintals of fresh flowers were produced only by the state of Punjab and this has generated 1300 man months employment during this year. The farmers utilised the expertise of IHBT for increasing their production by ten-fold.

2.9.10 Training programme on floriculture

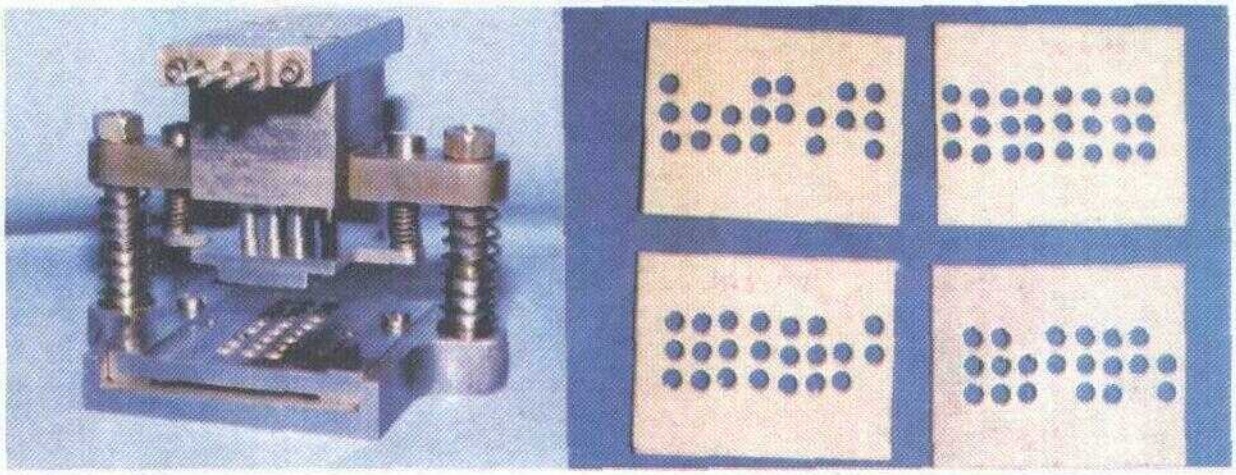
IHBT organised a short term training programme on "Commercial Floriculture" for flower growers of H.P.

2.9.11 Training in Jojoba & Jatropha cultivation

CSMCRI imparted training on Jojoba & Jatropha cultivation for seventy officers of the level of Deputy Director & Agricultural Officers of Gujarat State in two batches at Junagadh district. Another programme was conducted for 28 Extension Officers of Gujarat at Anand.

2.9.12 Training in sisal fibre articles making

RRL, Bho. organised training for backward tribal women in the preparation of handicrafts using sisal fibres. Fifty women of different villages participated in the comprehensive training programme.



II.6 *Autopunching Machine for punching of Jacquard Cards developed by CMERI*

III.A.1 *High Vacuum Fractionation unit of Deltamethric Acid Plant*

III.A.2 *100 KW Rice Husk Gasifier*

III.A.3 *Effluent Recycle Pilot Plant*

III.A.4 *Sensor Retraction/Hoisting and Servo System on Wheeled Vehicle*

III. RESEARCH AND DEVELOPMENT BY INDUSTRY (RDI)

The EFC Memorandum for the IX Plan (1997-2002) scheme "Research and Development by Industry" was approved in November, 1999 with an allocation of Rs.1.40 crores. The broad objectives of the scheme are to:

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

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

A) In-house R&D in Industry

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

C) Fiscal Incentives for Scientific Research

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

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

1. RECOGNITION OF IN-HOUSE R&D UNITS

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

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

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

The R&D activities are expected to be separate from routine activities of the firm such as production and quality control. The in-house R&D units should have at least some staff exclusively engaged in R&D headed by a full-time R&D manager who would have direct access to the Chief Executive or to the Board of Directors depending upon the size of the unit.

Number of in-house R&D units recognised by DSIR has increased steadily from about 100 in 1973 to about 275 by 1975, to over 700 by 1980, around 925 by 1985, over 1100 in 1990 over 1200 in 1995 and 1207 as on December 1999. Of these 1207 units, around 135 units are in public sector public sector, 35 in joint sector, and the remaining in private sector. A revised and updated 'Directory of Recognised in-house R&D Units' was brought out during November 1999.

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

During the year 1999 the Screening Committee met 12 times and considered 99 applications for recognition; 61 R&D units were granted recognition and 38 applications were rejected.

The pendency at the end of December 1999 was 27. A statement giving month-wise receipt, disposal and pendency of applications for recognition of R&D units is given at Annexure III.A.1.

62 In-house R&D units were visited till the end of December 1999 by expert teams for a first hand assessment of the R&D work, infrastructural facilities and other claims made by the in-house R&D units. Also, nearly 330 discussions/meetings were held with heads of in-house R&D units.

2. RENEWAL OF RECOGNITION

Recognition to R&D units is granted for a period ranging from 1 to 3 years. The R&D units are advised to apply for renewal of recognition well in advance (3 months) of the date of expiry of the recognition. Applications received for renewal of recognition are circulated to CSIR, NRDC and/or the concerned Administrative Department of Government of India for comments. The applications are examined in the Department taking into account the inputs received from other agencies for taking suitable decision on their renewal. During 1999, 271 in-house R&D units were due for renewal of recognition beyond 31 March 1999; of which 243 applications were received. Based on the evaluation of the performance of the R&D units, renewal of recognition was granted to 230 R&D units. Recognition granted to 13 Companies could not be renewed because their R&D performance was not up to the mark. A statement showing month-wise receipt, disposal and pendency of the cases of renewal of recognition of the R&D units is given at Annexure III.A.2.

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

The in-house R&D units are distributed throughout the country. There are around 200 units in the Northern Zone (Delhi, Haryana, Punjab, Uttar Pradesh, Jammu & Kashmir), around 100 units in Western Zone (Rajasthan and Gujarat), around 450 units in the Central Zone (Maharashtra, Madhya Pradesh and Orissa), around 350 units in the Southern Zone (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu) and around 100 units in the Eastern Zone covering Bihar, West Bengal, Assam and other north eastern states.

4. R&D EXPENDITURE

The expenditure incurred by in-house R&D units in industry has steadily increased. During 1980-81 it was of the order of Rs. 300 crores. In 1985-86, it was of the order of Rs. 500 crores. It is estimated that the present R&D expenditure of the 1207 recognised R&D units is of the order of Rs.2000 crores. The share of public and joint sector is about 35 % and that of private sectors about 65%. 60 in-house R&D units spend over Rs. 5 crore each on R&D, 202 in-house R&D units spend between Rs. 1 crore to Rs. 5 crore

each per annum on R&D. The lists of these R&D units are given in Annexures III.A.3 and III.A.4 respectively.

5. R&D INFRASTRUCTURE

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

6. R&D MANPOWER

There has been a steady increase in R&D manpower employed by the in-house R&D units. By 1975-76 about 12,000 R&D personnel were employed by recognised in-house units; by 1981-82 the figure was over 30,000. The present estimated manpower for the 1207 in-house R&D units is around 50,000 out of which around 17,500 R&D personnel are employed in public sector in- house R&D units and around 32,500 R&D personnel are employed in the private sector In- house R&D units. Of the total 50,000 R&D personnel, around 2700 are Ph.D's, 16,500 Post Graduates, 14,000 graduates and the rest are technicians and support staff.

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

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

Chemical and Allied industries	420
Electrical and Electronics industries	330
Mechanical Engineering industries	230
Process industries (Metallurgical, Refractories, Cement, Ceramics, Paper, Leather and others)	175
Agro and food processing industries and others	55

8. IN-HOUSE R&D UNITS: OUTPUT

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

Chemical and Allied Industries

- Development of an anti-malarial drug - "Arteether".
- Development of an anti TB drug based on locally available plant materials.
- Development of ayurvedic drugs such as swasamrutham, panamruthan, vaidyendra and ropini.
- Development of copper promoted high temperature carbon monoxide conversion catalyst for water gas shift reaction used for production of hydrogen.
- Development and commercialisation of drugs such as cetirizine, nemusulide, alpazolam, fluconazole and acyclovir.
- Development of process for beta-carotene by culturing algae called "Dunaliella Salina".
- Development of L-cysteine hydrochloride monohydrate from L-cystine by electrolytic reduction.
- Development of Etofenprox by an independent indigenous chemical technology.
- Development of an improved process for the manufacture of titanium dioxide pigment through chloride route process.
- Development of a medium durable general purpose grade high gloss pigment under trade name KEMOX RC802.
- Development of in the surface treatment of the emulsion grade pigment KEMOX RC 813.
- Development of highly durable zirconia coated automotive grade pigment being launched under trade name KEMOX RC 808.
- Development & commercialisation of naphtha steam pre-reforming catalysts.

Electrical and Electronic Industries

- Design and development of Raws -03 Radar, dual guidance unit, futuristic 3.8m vsat, antenna system, vehicle driving simulator.

- Development of LCD based cockpit display system for LCA.

- Development of IFF MK-X System for Russia, electronic board test software for Switzerland, digital microwave communication network for Kenya, night vision goggles for Israel and laser range finder for Sweden.

- Development of "Civil Twilight Switcher" and " Time of Day Power Scheduler".

- Development of ASIC based single phase digital electronic energy meter product and test & calibration system for EEM production.

- Design and development of sensor retraction & servo system.

- Development of remote controlled load management system for low tension side distribution automation.

- Development of visible CCD linear imager technology.

- Development of process technology for 1.2 um Low Voltage CMOS, 0.8 um CMOS process and1.2 um BHCMOS.

- Development of mine counter measurement system to detect mines in using technologies of data logging and geological information systems software.

- Design and development of PC-controlled double beam atomic absorption spectro-photometer.

- Development of all digital telephone answering machine.

- Design and development of computerised wheel aligner, digital level master, computerised wheel balancer, computerised engine analyser.

- Design and development of medium speed variable frequency (MSVF) elevator up to 1.75 m/s with serial communication with elevator car and hall fixtures.

- Design and development of emergency lowering device (ELD) for NH 300 hydraulic elevator.

Mechanical Engineering Industries

- Design and development of rice husk gasifier (100 kw) and wood gasifier for large kitchens.

- Design and development of Tata Indica Car.

- Development of orbital vane rotary compressor for air and gas compression, refrigeration, air conditioning and vacuum pump application.

- Commercialisation of ultra filtration hollow fibre membrane technology.

- Absorption and improvement of technology for in-plant material handling equipment and electric tow tractor.

- Development of personal monitor and portable monitors for detection of various toxic substances.

- Development of labyrinth, oil seals, thrust bearing and journal bearing for steam turbines and compressors.

- Development of medium and high frequency motorised spindle for machines tools.

- Development of oil/gas fired duct burner and low nox oil burner.

- Indigenous development of electro-gas welding machine.

- Development of thermo-coprocessor to recover low pressure flash steam.

- Design & development of test rigs for aerospace applications.

- Development of seamless rolled rings and main gear box,housing for Advanced Light Helicopter (ALH).

- Design and development of systems and accessories for ALH and LCA.

- Design and development of hydraulic pump & free gyro for strategic applications.

- Design and development of 6 Hi cold rolling mill.

- Design and development of Compaction of sprocket cam shaft (H - shape in cross-section) in single platen press.
- Design and development of constant velocity and double offset joint cages for Light Commercial Vehicles.
- Design and development of TVS-Spectra A 150 CC 4 Stroke 4 Gear Scooter.
- Design and development of 5 axis tool & cutter grinding machine, tungsten carbide rock roller bits for copper mines and design methodology tool using FEA technique for cold forging application.
- Design and development of high density coir pads, coir and jute composites.
- Design and development of CV inner races and bevel gears through closed die forging.
- Absorption of technology for the manufacture of centrifugal pump and fluid end expendables for triplex mud pumps used in oil field exploration.
- Development of razor blade stainless steel, Ni substituted austenitic stainless steel and stainless steel for railway wagons.

Processing Industries

- Development of 9Cr 1 Mo grade steel for nuclear power generators.
- Development of titanium alloy containing 6% Aluminum and 4% Vanadium in form of forged bars with improved microstructure.
- Development of stabilised Interstitial Free (IF) steels for super formability.
- Commercialisation of micro-alloyed steel for coach and wagon wheel.
- Process development for Electro-refining of crude gold and recovery of Palladium from spent Gold Electrolyte, Production of Alloy cast Iron Grinding Media From Granulated Slag.
- Development of liquid phase redox process for hydrogen sulphide removal and recovery of sulphur from sour gases.
- Development of stationary phase catalyst for nox abatement from thermal power plants and chemical process industries.
- Development of thermo-mechanically treated corrosion resistant rebars having improved pitting resistance, through cc- route.
- Development of Mullite refractory bricks.

Agro and Food Processing Industries

- Development of Carocan (carotenoids and micronutrients from carrot).
- Development of aromatic and non-aromatic rice hybrids.
- Breeding of Aglaonema and Hibiscus to evolve novelties.
- Development of Diagnostic Kit for Banana Mosaic Virus and improvement of banana cultivation suitable for processing and export.
- Standardisation of agro-techniques for high solid dehydration of onions for export.
- Development of production technology of mango varieties suitable for processing and export.
- Improvement of cultivation of high latex papaya cultivars.
- Development of de-oiling lecithin food grade and free flow lecithin powder.
- Moleculor genetic studies of rice genome.
- Development of variety of chicken for rearing outside cages in the country side.
- Tissue culture propagation of sugarcane.
- Molecular mapping of genes for resistance to bacterial leaf blight disease in rice.
- Development of hybrids for crops like cotton, chillies, brinjal, bajra, bhindi, sunflower, cabbage and cauliflower.

9. IMPORTS MADE BY R&D UNITS

The recognised in-house R&D units have imported a variety of equipment, raw materials and samples for their R&D activities. These include: NMR, GLC, IR, HPTLC, high speed centrifugal counter current and droplet counter current chromatographs, Beta Scope, Perkin-Elmer GC-FTIR system, FT-NMR spectrometer, inverted phase contrast fluorescence microscope, 4 channel 100 MHz Oscilloscope, Microsheen Digital Opacity eflectometer Colour image analysis system, Laser based particle size analyzer, digital distortion analyser, dielectric loss analyser, high performance liquid chromatograph, X-ray spectrophotometer, ASIC development system, CAD and Stereo Zoom Microscope, single beam UV-VIS-NIR fiber-optic spectrophoto-meter for absorbance, transmittance, reflectance, UV-VIS Dual Beam Spectrophotometer, cryptometer colour computer for colour matching, CO sensor and filter, frictional distillation unit total organic carbon analyser, heat transfer oil, anion and cation exchange membranes, crystalic baths, Rapid prototype machine, EDM, microprocessor based double ended inertial dynamometer, computer controlled eddy current dynamometer, CAD System logic analyser, fibre optics evaluation kit and intelligent universal programmer.

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

Bulk drugs manufactured through process know-how developed through in-house R&D are eligible for exemption from the price control under DPCO for a period of five years after their introduction in the market. New drugs developed for the first time in the world are eligible for exemption from price control under DPCO for a period of 10 years. The Department examines the requests of the in-house R&D Units for issuance of a certificate of indigenous technology development for seeking price control exemption. The examination is through detailed discussions, inputs and views of experts in the field of drug development and discovery, and visits by expert teams. Taking into account the various inputs and also considering the novelty and innovativeness of the process, the certificate of indigenous development of process know-how is issued for seeking price control exemption to deserving cases. One request for price control exemption for drugs based on indigenous technology was received during the year, which is under examination.

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

The Department provides assistance to recognised in-house R&D units in a number of ways, such as cases of industrial R&D units requiring remittance of foreign exchange for deputing experts to attend international symposia and seminars, exhibitions, trade fares, international R&D collaborations, engagement of foreign experts for R&D and for maintenance/ commissioning of imported R&D equipment requiring such expertise, allotment of special controlled materials for R&D, permission to export of specialised products reserved for small scale industries by medium scale industries for test marketing in other countries are examined for making suitable recommendations to concerned agencies.

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

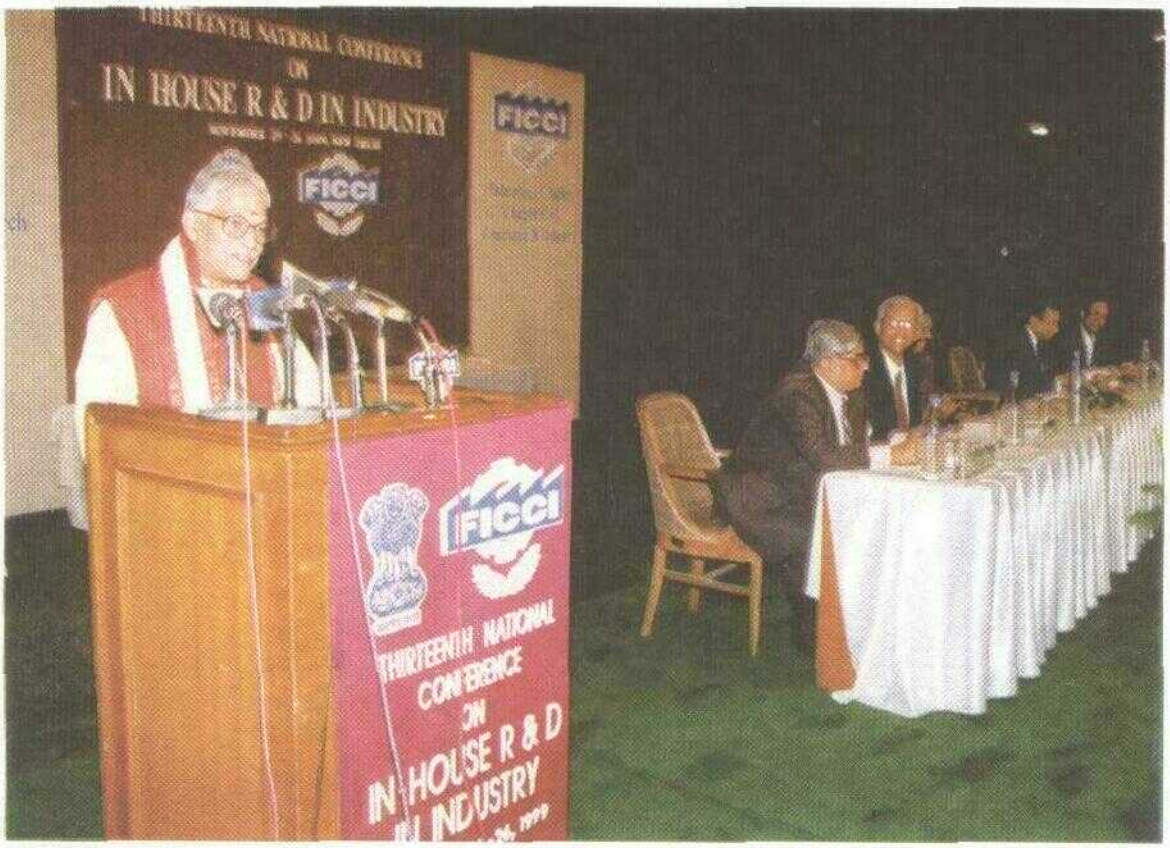
12. COMPUTERISATION OF DATA ON IN-HOUSE R&D UNITS

Names, addresses and also location of in-house R&D units as well as validity of recognition of the recognised in-house R&D units are computerised and updated. As on 31 December 1999, there were 1207 in-house R&D units recognised by DSIR.

13. CONFERENCE, AWARDS, EXHIBITION & PUBLICATIONS

a) 13th National Conference on in-house R&D in Industry:

Department of Scientific and Industrial Research (DSIR) organised the 13th National Conference on in-house R&D in Industry in association with the Federation of Indian Chambers of Commerce and Industry (FICCI) on 25-26 November 1999 in New Delhi. Attended by over 400 delegates from industry, national laboratories, IITs and universities, scientific and industrial research organisations (SIROs), consultancy organisations, government departments, the Conference was inaugurated by Dr. Murli Manohar Joshi, Union Minister for



III.A.5 *Dr. Murli Manohar Joshi, Union Minister for HRD and S&T addressing the delegates at the inaugural session*

III.A.6 *Dr. R.A. Mashelkar, Secretary, DSIR addressing the delegates at the inaugural session*

III.A.7 Dr. Murli Manohar Joshi, Union Minister (HRD and S&T), presenting the DSIR National Awards (1999)

III.A.8 Dr. M.S. Ahluwalia, Member, Planning Commission addressing the delegates at the valediciory session

HRD & S&T on 25 November 1999 in FICCI Golden Jubilee Auditorium. The Minister presented the 1999 DSIR National Awards for Outstanding in-house R&D Achievements to six industrial units. Shri B.S. Rawat, Minister of State (S&T) released the DSIR special publication" Outstanding in-house R&D Achievements - 1999 ".

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

In order to provide recognition to the efforts of the industry towards innovative research and technological development, the DSIR has instituted National Awards for R&D Efforts in Industry in 1987. These awards are in the form of shields made of sterling silver and are presented along with citations at the inaugural session of the Annual National Conference on in-house R&D in Industry. During 1988, National Awards were presented to 7 firms; in 1989 to 9 firms; in 1990 to 12 firms; in 1991 to 8 firms; in 1992 to 9 firms; in 1993 to 9 firms, in 1994 to 12 firms, in 1995 to 15 firms and in 1996 to 7 firms; in 1997 to 6 firms; in 1998 to 6 firms and in 1999 to 6 firms for Outstanding R&D Achievements.

Following is the list of the award winners in 1999 :

Chemical and Allied Industries:

Mitsu Industries Ltd., Vapi

Drugs and Pharmaceuticals Industries:

Bharat Biotech International Ltd., Hyderabad

Electronic Industries:

Manatec Automations Pvt. Ltd., Pondicherry

Mechanical Engineering Industries:

Tata Engineering and Locomotive Company Ltd., Mumbai

Renewable Energy Systems:

Associated Engineering Works, Tanuku (A.P)

Successful Commercialization of Public Funded R&D:

Themis Chemicals Ltd., Mumbai

c) Outstanding in-house R&D Achievements - 1999:

DSIR had brought out a publication " Outstanding in-house R&D Achievements (1988-1991)" during December 1991 , covering the award winning achievements of 36 companies. A second publication " Outstanding in-house R&D Achievements (1992 & 1993)" was brought out during November 1993, covering the award winning achievements of 18 companies. A third publication "Outstanding in-house R&D Achievements (1994 & 1995)" was brought out during November 1995, covering the award winning achievements of 27 companies. A fourth publication "Outstanding in-house R&D Achievements (1996)" was brought out in December 1996, covering the award winning achievements of 7 companies. A fifth publication "Outstanding in-house R&D Achievements (1997)" was brought out in October 1997, covering the award winning achievements of 6 companies. A sixth publication "Outstanding in-house R&D Achievements (1998)" was brought out in December 1998. The seventh publication" Outstanding in-house R&D Achievements (1999)", covering the award winning achievements of 6 companies, was released during the inaugural session of the 13th National Conference on in-house R&D in Industry on 25 November 1999.

d) Exhibition:

An exhibition was held at FICCI Auditorium Lawns along with the 13th National R&D Conference depicting the success stories of the co-operation between our public funded institutions /national laboratories and industries in development and commercialisation of new product and process. Dr.Murli Manohar Joshi, Union Minister for HRD and S&T inaugurated the exhibition. 21 industries participated in the exhibition which included TELCO, Mitsu Industries, Shyam Telecom, Bharat Biotech International and Ramco Systems. M/s Pan India Consultants, Gurgaon won the best exhibitor award.

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

As the number of in-house R&D Centres has increased while the activities of DSIR have also diversified significantly with respect to in-house R&D Units, it was felt appropriate to devise a quick communication system between DSIR and in-house R&D Units. Accordingly, the DSIR started bringing out a quarterly Information Update on In-house R&D in Industry on a regular basis since April 1988. The Information Update is intended to provide a fast communication link between DSIR, in-house R&D

Units and SIROs and serve to disseminate useful and important information relevant to R&D in Industry.

During 1999-2000, four issues of in-house R&D in Industry were brought out in April, July, October 1999 and January 2000. These have been widely disseminated to industry, SIRO, Government Departments, missions abroad and others and are well received.

III(B). SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS

1. INTRODUCTION

Scientific Research Associations, Institutions, Universities and Colleges which undertake research in the area of Medical, Agricultural, Natural and Applied Sciences and Social Sciences have been seeking approval under section 35 (1) (ii) or (iii) of the Income Tax Act, 1961 if they wish to obtain donations from industry or other sources. The organisations notified under the section obtain benefit to the effect that any sum obtained by them for research purposes is wholly exempted from the levy of Income-Tax. The donors who pay sums to such notified organisations were allowed deductions from their income to the extent of donations and for the financial year1999-2000, this has been raised to 125% of the donations given for scientific research.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The DSIR has brought out Guidelines for Recognition of Scientific and Industrial Research Organisations (SIROs), which gives procedural details and application proforma for seeking recognition under the SIRO Scheme. Functional Scientific and Industrial Research Organisations (SIROs) having broad based Governing Council, Research Advisory Committee, Research Personnel, Infrastructural facilities for research, well defined research programmes and clearly stated objectives of undertaking scientific research are considered eligible for recognition by DSIR.

Applications for seeking recognition under the SIRO scheme are considered in DSIR by an Inter Departmental Screening Committee with members from Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Indian Council of Social Sciences Research (ICSSR) and University Grants Commission. The recommendations of the Screening Committee are put up for approval of Secretary, DSIR.

During the period January 1999 to December 1999, the Screening Committee met 4 times and recommended 26 cases for recognition as Scientific and Industrial Research Organisations under 1988 Scheme of DSIR. Of these 26 cases, the concurrence of Secretary, DSIR for 7 cases was conveyed to the DG(ITE), Calcutta for notification u/s 35(1)(ii)/(iii) of IT Act, 1961 prior to the notification dated 25th June, 1999. These include 20 cases in the Natural & Applied, Agricultural and Medical Sciences; and 6 cases in the Social Sciences. List of these SIROs is furnished at Annexures III-B.1 and III-B.2.

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

At present there are 536 SIROs duly recognised by DSIR. Of these, 193 are in the area of Natural & Applied Sciences, 163 are in the area of Medical Sciences, 39 are in the area of Agricultural Sciences, 119 are in the area of Social Sciences and 22 are Universities/ Colleges. DSIR has brought out Directory of Recognised Scientific & Industrial Research Organisations in November, 1999.

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

III(C). FISCAL INCENTIVES FOR SCIENTIFIC RESEARCH

1. INTRODUCTION

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

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

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

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

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

During the year 1999, 10 certificates involving Rs. 9615 lakhs on cost of plant and machinery were issued by DSIR. Details of these cases are given at Annexure III.C.1.

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

The Union budget for 1996-97 introduced the provision of customs duty exemption on specific goods imported for use in R&D projects funded partly by any Department of the Central Government and undertaken by the company in their in-house R&D unit recognised by DSIR. A certificate from the Ministry or Department, as the case may be, funding the research project stating the essentiality of the item/s in each case at the time of importation would make the item/s eligible for duty free import for that R&D programme by the company. During the period January-December 1999, 9 certificates worth Rs. 18.5 lakhs for import of capital equipment and consumables/ materials for R&D projects supported by DSIR were issued.

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

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

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

During the year recommendations of Secretary were sent to DG (ITE) in the cases of five companies namely M/s Aqua Alloys Private Ltd., Shinoli, M/s Mytimasters Engineering Pvt. Ltd., Mumbai, M/s Chakolas Spinning and Wearing Mills Ltd., Kalamassery, M/s Sunshield Chemicals Pvt. Ltd., Mumbai and M/s Atlaz Technology Pvt. Ltd., Mumbai.

5. APPROVAL OF COMMERCIAL R&D COMPANIES

In order to promote research and development activities in the commercial research and development companies the Union Budget for 1996-97 has proposed to provide for a five-year tax holiday under section 80-1A of the Income Tax Act, to approved companies whose main objective is scientific and industrial research. This incentive is available to any company that has as its main objective, activities in the area of scientific and industrial research and development and which has been accorded approval by the Prescribed Authority. Secretary, Department of Scientific & Industrial Research is the Prescribed Authority for this purpose vide Gazette notification dated 26 December, 1996, issued by Deptt. of Revenue, Ministry of Finance.

The tax holiday is available to any company whether new or existing, which is accorded approval by the Prescribed Authority at any time before the first day of April 1998. The 100% deduction for a five-year period commences from the assessment year relevant to the previous year in which the approval by the Prescribed Authority is accorded to such a company.

The amendment has taken place from 1st April 1997 and will accordingly apply in relation to the assessment year 1997-98 and subsequent years.

The Department has approved one company whose request was under consideration as commercial R&D company during the year 1999-2000.

6. EXCISE DUTY WAIVER

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

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

7. CUSTOMS DUTY EXEMPTION TO RECOGNISED SIROs

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

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

During the year around 850 essentiality certificates were issued for claiming customs duty exemption on import of scientific equipment,

accessories and components, including consumable items. The value of scientific equipment instruments and the consumables was over Rs. 33 crores.

8. CENTRAL EXCISE DUTY EXEMPTION TO RECOGNISED SIROs

All Scientific and Industrial Research Organisations (SIROs) recognised by DSIR are eligible for Excise Duty Exemption on the purchase of scientific and technical instruments, apparatus, equipment (including computers); accessories and spare parts thereof and consumables; computer software, Compact Disc- Read Only Memory (CD-ROM), recorded magnetic tapes, micro films, microfiches; and prototypes for research and development activities and programmes.

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

During the year 1999, 81 essentiality certificates for a total amount of Rs. 95.98 Lakhs were issued for claiming Excise Duty Exemptions.

9. REGISTRATION OF PUBLIC FUNDED RESEARCH INSTITUTIONS AND OTHERS.

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

The procedure for registration of public funded research institutions, universities, IITs, IISc, Bangalore; Regional Engineering Colleges has been reviewed during the year and an inter-departmental Screening Committee chaired by a former Secretary of DSIR and having members from CSIR, ICAR, ICMR, UGC and DSIR has been constituted for recommending the registration. The Committee met 3 times during the year and considered about 75 applications from various public funded research institutions.

During the period 1 April 1999 - 31 December 1999, about 60 registration certificates were issued to such public funded research institutions universities, IITs, IISc, Bangalore, Regional Engineering Colleges for availing customs duty exemption on import of scientific equipment, spares and accessories, consumable items and Central Excise Duty exemption on indigenous purchases for Scientific Research Purposes. Apart from these 51 public funded research institutions which are already registered with DSIR for availing customs duty exemption were issued certificates of registration for availing central excise duty exemption on indigenous purchases.

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

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

operation in such research and development facility and for audit of the accounts maintained for that facility.

The provision was introduced for expenditure on R&D incurred up to 31st March 2000. The Ministry of Finance, Department of Revenue, Central Board of Direct Taxes, notified the provision vide Notification No S.O.259 (E) dated 27 March 1998. Financial Bill 1999 introduced in Lok Sabha on 27 February 1999 extended this provision till 31 March 2005. During the year guidelines for approval were finalised and about 30 applications were received. The Prescribed Authority has signed agreements for co-operation in such research and development facility with 9 companies.

IV. PROGRAMME AIMED AT TECHNOLOGICAL SELF RELIANCE (PATSER)

1 OBJECTIVES OF PATSER

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

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

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

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

2 ACTIVITIES

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

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

The Department provides on a selective basis partial financial support to research, development, design and engineering (RDDE) projects to be proposed by industry in the following areas:

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

b) Absorption and Upgradation of imported technology.

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

The Department under PATSER Scheme has so far supported about 100 R&D projects of Industrial units. These projects cover products and processes in various important industries such as metallurgy, electricals, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives.

During the year, a number of new R&D projects of industry were supported on partial financial support basis and the technology evaluation studies in the pipe line were in the process of being completed. The Department had invited, through advertisements in leading newspapers, project proposals for technology absorption, development and demonstration from industrial units whose in-house R and D Units are recognised by DSIR. Consequently, over 250 responses from industrial units seeking further details about the scheme, indicating their technology development projects were received by the Department. During the year, till December 1999, 35 projects were submitted for consideration of the Technical Advisory Committee to PATSER for partial financial support by DSIR. Some more projects are likely to be considered by TAC in the period January - March, 2000.

During the year till December, 1999, under "Technopreneur Promotion Programme" (TePP), which is jointly operated by DSIR under its PATSER Scheme and TIFAC of DST under its Home Grown Technology Programme to tap the vast innovative potential of the citizens of India, 27 projects were considered for support and some more are expected to be considered for support in the period January – March, 2000.

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

2.1.1. M/s. Central Electronics Ltd. (CEL), Sahibabad

The project for "Development and Evaluation of Plasma Etching and Edge Grinding System for Edge Separation" was undertaken by M/s CEL, Sahibabad, with DSIR financial support of Rs. 30 lakhs out of the total project cost of Rs. 130 lakhs. The project has been successfully completed.

2.1.2 M/s Semiconductor Complex Limited, (SCL), Chandigarh and Electronic Research & Development Centre, Thiruvananthapuram.

The joint project of M/s SCL and ER&DC is for development of ASIC for microprocessor based power controller involving DSIR support of Rs. 50.50

lakhs out of total project cost of Rs. 93 lakhs. The project has been successfully completed.

2.1.3 M/s Semiconductor Complex Limited, (SCL), Chandigarh and Electronic Research & Development Centre, Thiruvananthapuram.

The joint project of M/s SCL and ER&DC is for development of ASIC and the related STD PCO machine involving DSIR support of Rs. 18.00 lakhs out of total project cost of Rs. 65 lakhs. The project has resulted in successful development and demonstration of FPGA (Field Programmable Gate Array) based STD PCO machine. Technology Transfer activities have also been initiated by ER&DC.

2.1.4 M/s Central Electronics Ltd. (CEL), Sahibabad

M/s CEL has undertaken a project for "Upgradation of the Process Technology for the Production of Single Crystalline Silicon Solar Cells in the existing SPV Plant" with DSIR's support of Rs. 219 lakhs out of the total project cost of Rs.492 lakhs based on laboratory scale technology developed by Inter- University Micro Electronic Central (IMEC), Belgium. The project has been successfully completed.

2.1.5 M/s Innovation Communications Systems Pvt. Ltd. (ICS), Hyderabad

The project for "Development of Interactive Voice Response System with Multilingual Capability" was undertaken by M/s Innovation Communication with DSIR support of Rs. 7.00 lakhs out of total project cost of Rs. 23.80 lakhs. The project is completed.

2.1.6 M/s. Padmavathy Panel Boards Ltd., Bangalore

The project for upgradation of Rice Husk based plant and development of new variant of reinforced boards and particle board & fire check doors is being undertaken by M/s. Padmavathy Panel Boards Ltd., Bangalore in collaboration with NRDC, with DSIR support of Rs. 23.65 lakhs out of project cost of Rs.95.00 lakhs for one year duration. The upgraded Rick Husk Board plant of 2000 TPD has been commissioned and development of fire check doors and new variants of reinforced boards have been developed. The project has been successfully completed.

2.1.7 M/s. FACT, Cochin

The project for development of slow release fertilisers and their application on Paddy, Banana, sugar cane and Coconut crops is being undertaken by M/s FACT in association with Kerala Agricultural University, Coimbatore with a DSIR support of Rs. 12.00 lakhs out of a total project cost of Rs.46.00 lakhs. Initially six formulations of fertiliser were taken for field trials and in the subsequent crops based on the performance, two of them were short listed as final product. The use of slow release fertiliser has resulted in increase of yield by 9%, 13% and 15%in case of paddy, sugar cane and banana respectively. Similarly in the case of coconut crop, the bio-metric observations at different stages have shown higher growth rates. These formulations have also been tested in farmers' field for each crop. The project activities are completed.

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

The project by MIDHANI is for welding of Molybdenum wire to make 20 kg coil. A special welding machine has already been developed in the project for this purpose. Samples of welded wires have already been approved by user's both in India and abroad and more than 500 Kg of wires have already been produced and delivered. This project is completed.

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

MIDHANI has taken up a project to produce clean steel through filtration. Filters have been identified for the project and trials have been conducted on them. Trials have demonstrated the effectiveness of the filter in some type of steels. DSIR's support to the project is Rs. 37.00 lakhs out of a total project cost of Rs. 74.00 lakhs. Activities in the project are completed.

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

The project for production of wires with high surface finish has been taken up by MIDHANI with a DSIR support of Rs. 12 lakhs and project cost of Rs. 36 lakhs. Such wires find extensive use in spark plugs and electrostatic precipitators. Trial lots have

already been produced and supplied to MICO for spark plugs and to BHEL for electrostatic precipitators which have already been found to be of acceptable quality. Another improved lot has again been supplied to BHEL and is undergoing trials. Activities in the project have been completed.

2.1.11 M/s National Aluminium Company Limited (NALCO), Bhubaneswar

NALCO has taken up a project to develop technology for the production of Special Aluminas and Hydrates which are used in a variety of diverse applications such as grinding wheels, tooth paste, etc. DSIR has supported the project with a financial grant of Rs. 100 lakhs. Customer evaluation of the product is under progress. The project has been completed.

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

The joint project of M/s.SMES and CDAC is for development of Multilingual Pager involving DSIR support of Rs.36.00 lakhs out of total project cost of Rs.80.00 lakhs. Pagers for Hindi, Marathi, Bengali and Tamil are under evaluation. The Project is nearing completion.

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

Four projects for (a) Development of Site Mixed slurry (SMS) Explosives for deep bore-hole applications. (b) Adaptation and upgradation of Emulsion Explosive Technology (c) Development of Detonating Card for shaped charges used for perforation of wells in oil fields and (d) Development of Heat Resistant fields (with the assistance of CMRI, Dhanbad) were undertaken by M/s IBP, Gurgaon with DSIR support of Rs.41.50 lakhs out of total project cost of Rs. 137.00 lakhs. The project on Detonating Card for shaped charges and Site mixed slurry has been completed. The firm has filed an Indian patent on the Detonating card. The field trial on Emulsion Explosive is over and field trial of Heat Resistant Explosive has been completed at 80 ° C and 100° C. After the completion of these field trials the project on Heat Resistant Explosive will be completed.

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

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

2.1.15 M/s Semiconductor Complex Limited, (SCL), Chandigarh and C- DAC, Pune.

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

2.1.16 M/s Semiconductor Complex Limited, (SCL), Chandigarh and M/s Indchem Research and Development Laboratory (IRDL), Madras.

The project for the development of ASIC for MPEG-2 (Motion Picture Expert Group) Decoder was undertaken jointly by M/s SCL and IRDL with DSIR support of Rs. 70 lakhs out of the total project cost of Rs. 225 lakhs. FPGA version is under development.

2.1.17 M/s Semiconductor Complex Limited, (SCL), Chandigarh and Electronic Research & Development Centre, Thiruvananthapuram.

The joint project of M/s SCL and ER&DC is for development of MBA (Micro controller Based ASIC) for STD PCO machine involving DSIR support of Rs.14.50 lakhs out of total project cost of Rs.34.64 lakhs. The project is in progress.

2.1.18 M/s. Semiconductor Complex Ltd., Chandigarh and M/s.Bharti Telecom Ltd., New Delhi

The joint project of M/s.Semiconductor Complex Ltd., Chandigarh and M/s.Bharti Telecom Ltd., New Delhi is for development of Single Chip

Telephone ICs and Telephone instrument involving DSIR support of Rs.35.00 lakhs out of total project cost of Rs.89.00 lakhs. The project is in progress.

2.1.19 M/s. Semiconductor Complex Ltd., Chandigarh and Shree Pacetronix Ltd., Indore

The joint project of M/s.Semiconductor Complex Ltd., Chandigarh and Shree Pacetronix Ltd., Indore is for development of Pacemaker with ASIC involving DSIR support of Rs.40.00 lakhs out of total project cost of Rs.90.00 lakhs. The project is in progress.

2.1.20 M/s. Semiconductor Complex Ltd., Chandigarh and M/s.S.M.Electronics & Services Ltd., New Delhi

M/s. Semiconductor Complex Ltd., Chandigarh and M/s.S.M. Electronics & Services Ltd., New Delhi is for development of bilingual pager based on ASIC involving DSIR support of Rs.40.00 lakhs out of total project cost of Rs.95.00 lakhs. The project is in progress.

2.1.21 M/s. Bharat Earth Movers Ltd., Bangalore and Electronics Research Development Centre of India, Thiruvananthapuram

The joint project of M/s. Bharat Earth Movers Ltd., Bangalore and Electronics Research Development Centre of India, Thiruvananthapuram is for development of Unified Electronic Controller Off-Highway Dump Trucks involving DSIR support of Rs.16.50 lakhs out of total project cost of Rs.33.60 lakhs. The project is in progress.

2.1.22 M/s Bharat Earth Movers Ltd. (BEML), Bangalore

The project for development of Cast Crank Shaft used in their heavy duty engines was undertaken by M/s BEML with DSIR support of Rs.27.00 lakhs out of total project cost of Rs.65.00 lakhs. The prototype of the S.G. Iron CrankShaft has been developed and fitted in an Engine, which is under testing. The prototype of Austempered Ductile Iron (ADI) Crankshaft has been successfully developed and is undergoing testing. The project is in progress.

2.1.23 M/s Turbotech Precision Engineering Pvt. Ltd. (TPEL) and National Aerospace Laboratories (NAL), Bangalore

The joint project being executed by of M/s TPEL in collaboration with NAL, and Sakthi Sugars, Erode is for the development of low cost gas turbine (LCGT) generator set of 500 KW power class, with multi-fuel capability (biogas, piped natural gas and diesel fuel) involving DSIR support of Rs. 88 lakhs out of total project of Rs.351 lakhs.

The prototype of Low-cost Gas Turbine System has undergone no-load test successfully. The LCGT system is under testing at full load at Turbotech's Turbine Testing Centre, Neelamangla. The project is in progress.

2.1.24 M/s Central Electronics Ltd. (CEL), Sahibabad and Electronics Research & Development Centre (ER&DC), Thiruvananthapuram

The joint project of CEL and ER&DC is for "development and design of SPV Charger for Ni-Cd batteries using Smart charging technology" with DSIR's support of Rs. 24 lakhs (Phase I) out of the total project cost of Rs. 71.80 lakhs. The SPV chargers will find applications for charging the batteries of man-pack/portable Radio sets of the Military and Para-military forces. Improved version of the prototype has been developed and is being put for customer evaluation.

2.1.25 M/s Metallurgical & Engineering Consultants (I) Ltd.(MECON), Ranchi

M/s MECON (I) Ltd. has undertaken a project for development of Hydraulic AGC (Automatic Gauge Control) system with a DSIR support of Rs. 10 lakhs out of total project cost of Rs. 75 lakhs. The prototype has been developed.

2.1.26 M/s Triveni Structurals Ltd. (TSL), Naini

M/s TSL is undertaking a project for development of various types of 400 KV and 765 KV Self supporting and Guyed type transmission line towers, with a DSIR support of Rs20 lakhs out of the total project cost of Rs 86 lakhs. Structural Engineering Research Centre (SERC), Madras is assisting the firm in design and testing of the towers. One prototype of 400 KV guyed wire single circuit 0°-2° Transmission Tower has been developed and has successfully cleared the trials at SERC, Madras. Two more prototypes have been completed and tested.

2.1.27 Central Power Research Institute (CPRI), Bhopal and M/s G.K. Electricals, Bhopal

The joint project of CPRI and M/s G.K. Electricals, Bhopal is for development of 12 KV load

break switches for use in Electrical Sub-Stations involving a DSIR support of Rs.5.5 lakhs out of total project cost of Rs.50.00 lakhs. Second and third prototypes have been tested. Final prototype is under evaluation.

2.1.28 M/s JSL Industries Ltd., Vadodara

The project of M/s JSL Industries Ltd. Vadodara for upgradation of Air Circuit Breakers in collaboration with Electrical Research and Development Association (ERDA), Vadodara was approved during the year with a DSIR support of Rs. 13.75 lakhs out of total project cost of Rs. 34 lakhs. Prototypes with 50 KV Short Circuit rating were successfully developed and tested.

2.1.29 M/s INTRA Industries Pvt. Ltd., Pune

The project of M/s INTRA industries Pvt. Ltd., Pune for development of 14.5 KVA Inverter for Railways was approved during the year with a DSIR support of Rs. 21.80 lakhs out of total project cost of Rs. 62 lakhs. Prototype as per Revision 3 of RDSO specifications is ready.

2.1.30 Project of Autopal Industries Ltd., Jaipur

The project of M/s.Autopal Industries Ltd., Jaipur is for development of Metal Hallide Lamps and ARC Tube involving DSIR support of Rs.50.00 lakhs out of total project cost of Rs.145.00 lakhs. ARC Tube has been developed. The project is in progress.

2.1.31 M/s. Usha India Ltd., (Electronics Division), Faridabad

The project of M/s.Usha India Ltd., (Electronics Division), Faridabad is for development & optimization of process technology for high power converter grade Thyristors involving DSIR support of Rs.40.00 lakhs out of total project cost of Rs.147.00 lakhs. The project is in progress.

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

The joint project of M/s.Ashok Leyland Ltd., Chennai and Electronics Research Development Centre of India, Thiruvananthapuram is for development of Electric Hybrid Vehicle involving DSIR support of Rs.45.00 lakhs out of total project cost of Rs.134.00 lakhs. The project is in progress.

2.1.33 M/s.Minda Industries Ltd., Delhi

M/s.Minda Industries Ltd., Delhi is for development of electric auto switches using rapid Prototyping techniques involving DSIR support of Rs.25.00 lakhs out of total project cost of Rs.88.95 lakhs. The project is in progress.

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

The project for the development and demonstration of 5-axis CNC internal grinding machine has been undertaken by PMT Machine Tools Automatics Ltd., Pune with DSIR support of Rs. 46 lakhs out of total project cost of Rs.98 lakhs. The prototype machine has been developed and is under testing. The project is nearing completion.

2.1.35 M/s Praj Industries Ltd., Pune

The project for "development and demonstration of energy efficient drying system " has been undertaken by M/s Praj Industries Ltd., Pune with DSIR support of Rs. 24.00 lakhs out of the total project cost of Rs. 49.50 lakhs. The pilot plant of the ring dryer has been developed and various feed materials are under testing in the pilot plant to establish parameters for efficient ring dryer system. The project is nearing completion.

2.1.36 M/s. Praj Industries Ltd, Pune

The project for "Development of Mechanized Accelerated Bio-composting Technology (BIOMAC) at Pilot Plant level for treating distillery effluents and to produce bio-compost material" has been undertaken by M/s. Praj Industries Ltd., Pune with DSIR support of Rs. 49 lakhs out of total project cost of Rs. 117 lakhs. The project is in progress.

2.1.37 M/s. ATCO Industries Ltd., Mumbai

The project for "Technology development of micro-balance of 200 gm. Capacity with 1 mg. Accuracy" has been undertaken by M/s. ATCO Industries Ltd, Mumbai with DSIR support of Rs. 28.50 lakhs out of the total project cost of Rs. 76.30 lakhs. The project is in progress.

2.1.38 M/s. ATCO Industries Ltd., Mumbai

The project for "Technology Development of Load Cells" has been undertaken by M/s. ATCO Industries Ltd., Mumbai with DSIR support of Rs. 68

lakhs out of the total project cost of Rs. 149 lakhs. The project is in progress.

2.1.39 M/s Priya Bricks Pvt. Ltd., Calcutta

The project for the "development and demonstration of stiff extrusion technology for extruding solid perforated & hollow building blocks " has been undertaken by M/s Priya Bricks Pvt. Ltd. with DSIR support of Rs. 45.00 lakhs out of the total project cost of Rs. 97.80 lakhs. The plant has been erected and commissioned and is undergoing testing. The project is in progress.

2.1.40 M/s Tamilnadu Petroproducts Limited (TPL), Madras and Indian Institute of Petroleum (IIP), Dehradun.

The project for development of technology for Long chain (C10-C14) Alcohols by oxidation of n-Paraffin arising in the production of Linear Alkyl Benzene (LAB) with a DSIR support of Rs. 55 lakhs out of total project cost of Rs. 144 lakhs is being undertaken by M/s TPL, in collaboration with Indian Institute of Petroleum, Dehradun. Use of a novel catalysts system has given 40-45% conversion of n-paraffins into secondary alcohol, per pass, at a selectivity of about 95%. Work at IIP Dehradun is completed which has resulted in 6 patents.

2.1.41 M/s Delta Agro Chemicals Ltd., Serinarasannapalem, Krishna District, A.P.

The Project for the development of process for manufacture of furfural alcohol by hydrogenation of furfural is being undertaken by M/s. Delta Agro Chemicals Ltd., Serinarasannapalem, Krishna District (A.P.) with DSIR support of Rs. 18.5 lakhs out of a total project cost of Rs. 45.0 lakhs. The project is in progress.

2.1.42 M/s General Exports & Credits Ltd., New Delhi

The project for development and demonstration of Azadirachtin-A Technical from neem seeds kernels and its formulations is being undertaken by M/s. General Exports & Credits Ltd., New Delhi in collaboration with Dalmia Centre for Biotechnology(DCBT), Coimbatore and Indian Institute of Chemical Technology(IICT), Hyderabad, with DSIR support of Rs. 65.0 lakhs out of a total project cost of Rs. 248.97 lakhs. The project is for setting up of a pilot plant in which 300 kg/day neem seeds kernels will be processed to produce 100 gm. Azadirachtin-A of 60-70% purity per day in District Hardoi (Uttar Pradesh) based on lab scale technology developed by DCBT. IICT, Hyderabad has been entrusted with the task of designing and engineering of the pilot plant. National lab such as IARI centres will carry out field trials of pesticides. The project is in progress.

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

The project for "pre-pilot plant trials of slow release zinc polyphosphate fertilizer" was undertaken by Raman Centre for Applied and Interdisciplinary Sciences (RCAIS), Calcutta in collaboration of M/s National Fertilizers Ltd. (NFL), New Delhi, with DSIR support of Rs. 4.15 lakhs out of a total project cost of Rs. 8.9 lakhs. M/s. NFL has extended its support of Rs. 4.765 lakhs to RCAIS. DSIR had extended its support for upscaling and field testing of this fertiliser in the past which has been patented by Dr Chandrika Varadachari of RCAIS. The field trials of this fertiliser at three major national centres had shown encouraging results. The project is in progress.

2.1.44 M/s Hindustan Zinc Ltd. Udaipur, and CSIR

The project for "Setting up a Pilot-Demonstration Plant for Recovery of Nickel from Chromite Overburden" has been taken up by M/s Hindustan Zinc Ltd., Udaipur and CSIR, New Delhi with a project cost of Rs. 10 crores and DSIR support of Rs. 1 crore. The project is under progress.

2.1.45 M/s Dolphin Ind. Co-Op. Soc. Ltd., Vizianagaram

A project for 'Glazing of Terra-Cotta clay products" has been taken up by M/s Dolphin Ind. Co-Op. Soc. Ltd., Vizianagarm with a total project cost of Rs.55.33 lakhs and DSIR support of Rs. 27 lakhs. The project is under progress.

2.1.46 M/s National Aluminium Company Limited (NALCO), Bhubaneswar

NALCO has taken up a project to set up a plant for recovery of 1 T/annum of 5N purity Gallium from their sodium aluminate liquor. DSIR support to the project is Rs. 2.17 crores. The project is in progress.

2.1.47 MATA Foundation, Imphal and Regional Research Laboratory, Trivandrum

The Project of MATA Foundation, Imphal for the integrated pilot demonstration plant for ginger processing is being executed by RRL, Trivandrum on a turn key basis. The project involves DSIR support of Rs.60 lakhs out of a total project cost of Rs. 135.55 lakhs. Ministry of Food Processing Industries has also extended a support of Rs.42.32 lakhs towards this project. The project is nearing completion.

2.1.48 M/s S.B. Electro-Mechanicals, Pune

The Project of M/s. S.B. Electro-Mechanicals, Pune for indigenous development of Radar Level Gauging system has been approved for a DSIR support of Rs.16.49 lakhs out of a total project of Rs.34.62 lakhs. The project is in progress.

2.1.49 M/s Maharastra State Seeds Corporation Ltd., Akola in collaboration with NCL Pune.

The Project of M/s. Maharashtra State Seeds Corporation Ltd., Akola in collaboration with NCL, Pune for development and testing of mini dry HCl gas cotton seeds delinting plant (0.5 tph) has been approved for a DSIR support of Rs.33 lakhs in the total project cost of Rs.118 lakhs. The project is in progress.

2.1.50 M/s Encon Thermal Engineers and Indian Institute of Petroleum (IIP), Dehradun

The project of M/s Encon Thermal Engineers in collaboration with IIP, Dehradun, is for development of Natural Gas Fired Industrial Gas Burners having a capacity of 50 and 100 cu. m. of natural gas per hour and involves financial support from DSIR and M/s Gas Authority of India Ltd. (GAIL), New Delhi of Rs. 11 lakhs each out of a total project cost of Rs.30 lakhs. Three types of burners have been designed and fabricated. LPG Storage and handling facility has been set up for trials of burners. The project is in progress.

2.1.51 M/s HMT Ltd., Bangalore

The project for the development of CNC Machining Centre is being undertaken by HMT Ltd., Bangalore and Pinjore with the aim of bringing out a new generation machine tool comparable to international standard. The DSIR's support is Rs. 75 lakhs out of the total project outlay of Rs. 197 lakhs. The machine has been displayed at IMTEX-98. The metal cutting trials are in progress.

2.1.52 M/s ACE Designers Ltd. and CMTI, Bangalore

The joint project for the development of PC Based CNC System is being undertaken by M/s ACE Designers Ltd., Bangalore in collaboration with Central Manufacturing Technology Institute, Bangalore has been approved for a DSIR support of Rs. 35 lakhs, out of the total project cost of about Rs. 99 lakhs. The aim of the project is to develop a cost effective, advanced open architecture PC based CNC System for the machine tools. One PC Based CNC System has been interfaced with the lathe machine and its trial is in progress. The project is in progress.

2.1.53 M/s. Eelectronics Corporation of India Ltd., Hyderabad with Central Road Research Institute, New Delhi

The Project of M/s. Electronics Corporation of India Ltd., Hyderabad in collaboration with Central Road Research Institute, New Delhi for the development of Nuclear based moisture and density gauge has been approved for a DSIR support of Rs.19.5 lakhs in the total project cost of Rs.32.5 lakhs. The gauge has been developed and demonstrated and presently being used for the field trials. The project is in progress.

2.1.54 M/s. Bharat Pumps and Compressors Ltd., Allahabad with IIT, Delhi

The Project of M/s. Bharat Pumps and Compressors Ltd., Allahabad in collaboration with IIT, Delhi has been approved for the development of twin casing fly ash slurry pump has been approved for a DSIR support of Rs. 25.00 lakhs in the total project cost of Rs.60.00 lakhs. The project is in progress.

2.1.55 M/s Central Electronics Ltd. (CEL), Sahibabad and Centre for Development of Advanced Computing (C-DAC), Pune

The joint project of M/s CEL and C-DAC is for "Development of a Solid State Interlocking (SSI) System for Railways" has been approved for a DSIR support of Rs. 70.00 lakhs out of the total project cost of Rs. 95.00 lakhs. The project is in progress.

2.1.56 M/s. Karnataka Hybrid Microdevices Ltd., Bangalore

The Project of M/s. Karnataka Hybrid Microdevices Ltd., Bangalore for development of thick film hybrid micro electronic circuit technology for automobile under hood applications has been approved for a DSIR support of Rs.38 lakhs out of the total project cost of Rs.101 lakhs. The project is in progress.

2.1.57 M/s. Webel Mediatronics Ltd., Calcutta

The Project of M/s. Webel Mediatronics Ltd., Calcutta for development of computerised Braille transcription systems has been approved for a DSIR support of Rs.16 lakhs out of the total project cost of Rs.32 lakhs. The project is in progress.

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

The Project of M/s. MECON Ltd., Ranchi and Hero Cycles Ltd., Ludhiana for development of 6-Hi Cold Rolling Mill was undertaken with a aim to develop the new generation rolling mill and build up its design engineering capability. The DSIR support is Rs. 98 lakhs out of the total project cost of Rs. 1443 lakhs. The machine has been erected and commissioned at the Hero Cycle Complex, Ludhiana. Performance guarantee trials are in progress. The project is likely to be completed by April 2000.

2.1.59 M/s. Bharat Heavy Electricals Ltd. (EDN), Bangalore and M/s. Semiconductor Complex Ltd., Chandigarh

The Project of M/s. Bharat Heavy Electricals Ltd., (EDN), Bangalore and M/s. Semiconductor Complex Ltd., Chandigarh for development of 3 phase electronic energy meter and related ASIC is for a DSIR support of Rs.23 lakhs out of a total project cost of Rs.46 lakhs. The project is nearing completion.

2.1.60 Central Building Research Institute, Roorkee and Central Power Research Institute, Bangalore

Central Building Research Institute, Roorkee and Central Power Research Institute, Bangalore have been instituted 2 studies for gainful utilisation of marble slurry towards making tiles, bricks, distemper and cellular concrete (Rs.6.5 lakhs to CBRI) and low cost bricks deicing agent, Sox removing agent, ceramic tiles etc. (Rs.5 lakhs to CPRI). The studies are under progress.

2.1.61 Gujarat Narmada Valley Fertilisers Limited (GNFC), Bharuch, Gujarat and Engineers India Ltd., New Delhi

A project to develop the process for removal of Hydrogen sulphide and recovery of sulphur from sour gases was assigned to Gujarat Narmada Valley Fertilisers Limited (GNFC), Bharuch, Gujarat and Engineers India Ltd., New Delhi. The DSIR support for the project is Rs. 100 lakhs, out of total cost of project Rs. 207 lakhs. The catalyst for removal of Hydrogen sulphide and recovery of sulphur has been demonstrated at ONGC Complex at Hazira. The project is in progress.

2.1.62 ABR Organics Limited (ABROL), Hyderabad

The project for Technology upgradation of polyimide resins and their applications by M/s ABR Organics Limited (ABROL), Hyderabad has been taken up with DSIR support of Rs. 35 lakhs out of a total project cost of Rs. 150 lakhs. The project is in progress.

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

Southern Petrochemical Industries Corporation Ltd., Chennai, and Indian Institute of Chemical Technology Hyderabad have jointly undertaken a Project for development of Process for manufacture of Pyrazinamide using catalytic route. The project involves DSIR support of Rs. 195.00 lakhs in a total project cost of Rs. 466.00 lakhs. The project is in progress.

2.1.64 M/s TCM Ltd. (TCML), Bangalore

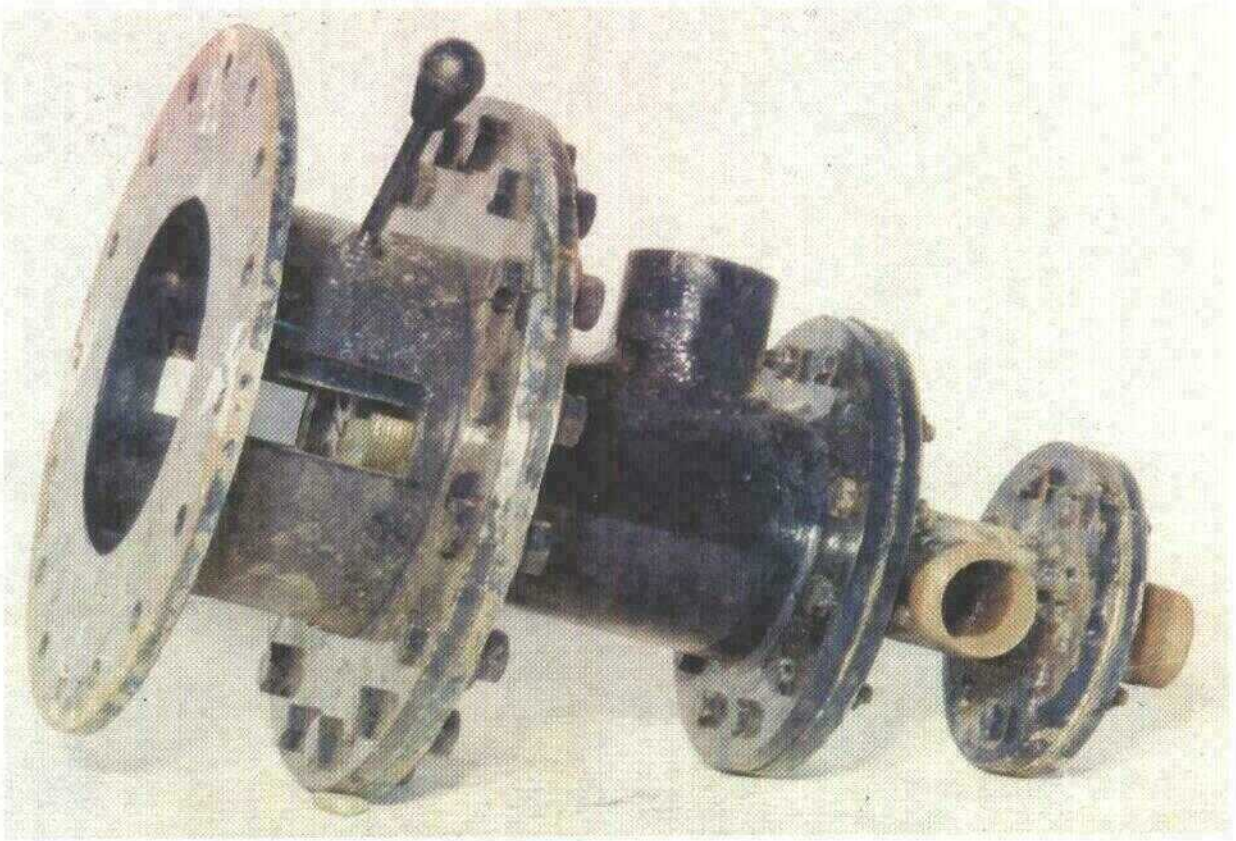
The project for development of Technology for production of different grades of Barium Carbonate (heavy/ light, powder/ granules) has been taken up with DSIR support of Rs.30 lakhs out of a total project cost of Rs.140 lakhs.

2.1.65 M/s Targof Pure Drugs Ltd., Hyderabad

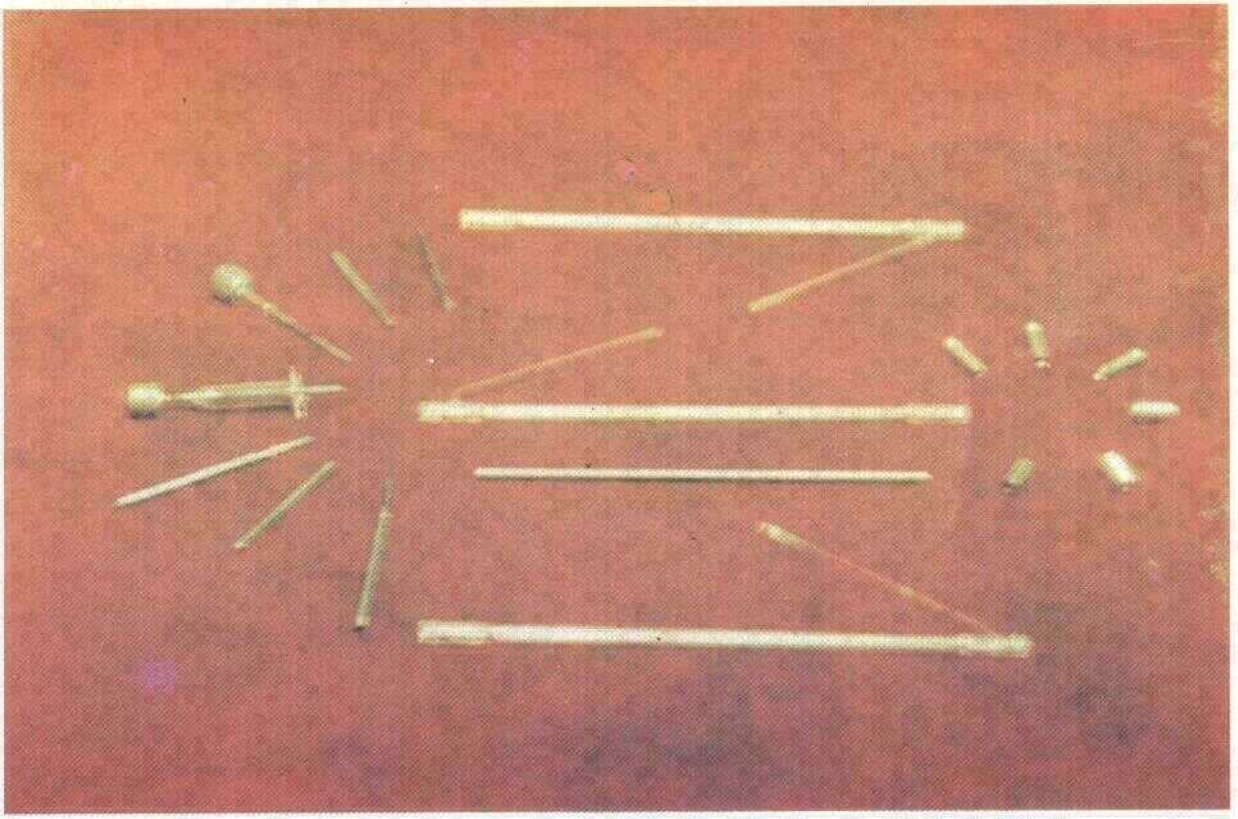
Targof Pure Drugs Ltd., Hyderabad have undertaken a Project for Development of Synthetic Route for manufacture of Bi-Naphthyl Crown Ethers.

IV.1 *Participation of DSIR in Indian Science Congress, 2000 at Pune*

IV.2 *A view of INNOVATIVE INDIA Pavilion during Indian Science Congress, 2000 at Pune*



IV.3 *Industrial Natural Gas Burner 100 m^3/hr (pre-mix type) being developed by IIP, Dehradun and M/s. Encon Thermal Engineers, Faridabad*



IV.4 *Xenon/Krypton Laser Pump Lamps developed by M/s. Litex Electricals (P) Ltd., Pune*

The project involves DSIR support of Rs. 40.00 lakhs in a total project cost of Rs. 133.50 lakhs. The project is in progress.

2.1.66 M/s. BILT Chemicals Ltd., Secunderabad

M/s. BILT Chemicals Ltd., Secunderabad have undertaken a project for development of Technology for Tetra Bromo Bisphenol-A (TBBA) on a pilot plant level. The project involves DSIR grant-in-aid of Rs.350 lakhs out of the total project cost of Rs.1436 lakhs. The project is in progress.

2.1.67 M/s. Pennwalt India Ltd., Mumbai

M/s. Penwalt India Ltd., have undertaken a project with the objective to develop a coating of fluoropolymers and other high performance powders through a chemical process. The DSIR support in the project is Rs.20 lakhs out of the total project cost of Rs.67 lakhs. The project has recently been commissioned and in progress.

3. CUSTOMS DUTY EXEMPTION CERTIFICATE

In pursuance to Customs Notification No.50/96-Customs dated July 23, 1996 for Customs Duty Exemption on components, consumables, equipment etc. used in R&D projects supported by Government, 11 Essentiality Certificates for nearly Rs.29 lakhs under 7 technology development projects supported under "Programme Aimed at Technological Self Reliances" scheme of DSIR have been issued.

4. TECHNOPRENEUR PROMOTION PROGRAMME (TePP)

The Ministry of Science & Technology has launched a novel programme known as "Technopreneur Promotion Programme" (TePP) jointly operated by Department of Scientific & Industrial Research (DSIR) and Department of Science & Technology (DST) to tap the vast innovative potential of the citizens of India. TePP will be a crucible to promote individual innovators to become technology based entrepreneurs (Technopreneurs). Any Indian citizen having an original idea/invention/know-how can apply under this programme. During the year 27 projects have been considered for support under the programme so far.

A number of product prototypes/models developed with financial support under TePP were displayed in the exhibition organised during the 'Indian Science Congress-2000' at Pune (3^{rd} – 7^{th} January, 2000) and during the 'Swadeshi Vigyan Mela' at New Delhi (2^{nd} – 6^{th} February 2000) in an exclusively created pavilion viz. **INNOVATIVE INDIA** to diffuse and disseminate various information regarding the activities among concerned scientific groups & masses. A large number of visitors including Scientists, Technocrats, Professors, Teachers, Corporate houses, Students, Farmers visited the Innovative India pavilion during the said exhibitions. The Innovative products displayed during the exhibition viz. tilting bullock cart with brakes and shock absorber and sprayers, cost effective polythene bag filling device – Kittanal, next generation membrane oxygenerator etc. were some of the major attractions which received the attention of visitors. The pavilion "Innovative India" bagged the **First Prize** during the "Swadeshi Vigyan Mela" in Rural Technology Category.

5. EXPECTED OUTPUTS AND BENEFITS

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

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

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

A) *National Register of Foreign Collaborations* (NRFC)

B) Industrial Technology

C) Transfer and Trading in Technology (TATT)

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

Activities and achievements of each of the above programmes are presented here. Although, Industrial Technology is not a part of the plan scheme, SEETOT, the information emanating out of the activities under Industrial Technology is mainly useful for SEETOT and hence it is covered here.

V(A). NATIONAL REGISTER OF FOREIGN COLLABORATIONS

1. PREAMBLE

The "National Register of Foreign Collaborations" (NRFC), which is an ongoing Plan Scheme, continued its operations during the year 1999-2000. It has completed a number of programmes those were targeted for the year.

2. OBJECTIVES AND ACTIVITIES

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

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

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

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

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

3. COMPILATION AND ANALYSIS OF FOREIGN COLLABORATION APPROVALS

The work relating to in-house compilation of primary data on approved foreign collaborations, continued during the year. The compilation for the year 1998 was brought out. It contained information such as names of Indian companies, the names of foreign collaborators, products covered under the collaborations, duration, nature etc. The compilation for the year 1999 is in progress.

4. STUDIES ON TECHNOLOGY DEVELOPMENT AND MANAGEMENT

A study on "The Status of Minor Forest Produce (MFP) Based Industries in the State of Madhya Pradesh" has been taken up. The study is entrusted to Madhya Pradesh Consultancy Organisation Ltd, Bhopal. The major objective of the study is to gather information and analyse the occurrence and availability of commercially important MFP in each agro climatic zone of the State of Madhya Pradesh. It will analyse the present methods of collection, grading, pricing and marketing mechanisms for the MFP and suggest how to improve this effectiveness and identify commercially viable enterprises based on available MFP. It would also assess the export and indigenous market potential for MFP based products, identify suitable technologies for manufacturing MFP based products and assess the viability of commercial plantation of MFP species found suitable for commercial exploitation. The report would also identify potential project opportunities together with sources of appropriate technology, for ready guidance to prospective entrepreneurs. The study is in progress.

A study on "The Status and Prospects of Electronics Industry in Eastern and North Eastern States, has been taken up. This is entrusted to West Bengal Consultancy Organisation Ltd., Calcutta. The main objective of the study is to analyse the present and future prospects of electronics Industries in the region, identify the constraints if any, assess the growth opportunities in major product groups, identify sources of technology and also the development efforts required. The study would also contain project profiles, including investment range on the identified opportunities for the ready guidance of prospective entrepreneurs. The study is in progress.

A study on "The Essential and Medicinal Plant Species in the North Eastern Region – Their present Status and Strategy for Development," has been taken up. This study is entrusted to the North Eastern Industrial and Technical Consultancy Organisation (NEITCO) Guwahati. The basic objective of the study is to collect information on essential and medicinal plant species, their present status with regard to their availability, production, commercial utilization etc. The study would cover identification and systemization of plants with potential medicinal and biocidal value, listing their uses, estimation of the available quantity, their commercial utilization, estimation of the present level of technology being utilized for preparation of medicines from the herbs or plants and sources of improved technologies and equipment, both indigenous and imported. The study would also suggest strategies for utilization of plant species for commercial purposes and for the economic benefit of the region as a whole. The study is in progress.

The DSIR has been conferring awards to industrial organisations to recognise the efforts of industry towards innovative research, technological development or commercialisation of research results. These are awarded in different sectors/areas of industry. With a view to carry out a comprehensive analysis of the status of technology growth in these DSIR National R&D Award Winning companies, a study has been undertaken. The study inter-alia covers the performance of award winning technologies and companies in various sectors over the years (1988 till 1996), especially with a view to assess the continuous technological upgradation, economic benefits, survival in a competitive environment, determine the factors leading to technological innovation, upgradation, growth or decline of the technologies awarded, assess the impact of the technology on the total operations of the company, analyse the strategy of managing technology and other related issues.

The study has been completed and the main findings are discussed below :

For the purpose of the analysis, the companies were classified into the following six categories :

- Electrical & Electronics
- Mechanical & automotive
- Chemical & allied
- Metallurgical & process
- Agro
- Drugs & pharmaceuticals

The study has examined the following issues in detail in respect of each company:

- Extent of growth of output of the award winning technology
- Factors contributing to the growth
- Efforts made for upgrading the technology

- Efforts made for marketing the output of the technology
- Extent of human resource development efforts
- Impact of the technology on market share

The analysis indicates that some of the dominant factors that have had an impact in companies where there has been growth in the output of the award winning technology, are :

- Vision and drive to be successful in the global arena
- Intensive customer interaction
- Award winning idea originating from R&D

Some of the distinguishing factors that stand out significantly in respect of these companies as compared to the others are :

- Top management support to the innovative idea
- Technology strategy being in tune with the business strategy
- Use of an inter-disciplinary R&D team.
- Use of customer interaction as a marketing strategy.
- Steps towards continuous technology upgradation.

In the case of Electrical and Electronic industries, most of the award-winning companies are large ones (out of 19, 14 are large and 5 are small). 9 companies have indicated growth in respect of the output from the award winning technology (out of 9, 5 are large, 4 are small). In this sector, some factors that have been identified as being important for spurring technology development include :

- Idea originating in R&D
- Specific strategy for new product development
- Innovation being part of the corporate vision
- Use of user trials during commercialization
- Specific R&D investments for development of the award winning technology
- Strategies for building competitiveness
- Use of concurrent engineering
- Cross functional co-ordination
- Special emphasis on technology development
- policy for continual technology upgradation
- Intensive human development efforts

In respect of Chemical & allied industries, again 9 out of 19 have indicated growth in respect of the output of the award winning technology. The major factors that have been responsible in this sector include :

- Interaction with the customer
- Intensive user awareness
- Human resource development efforts
- Top management support for risk oriented projects
- Keeping track of technological trends
- Use of project management techniques for reducing cycle times

In respect of Metallurgical & processing industries, out of the 5 award winning companies only 1 has reported an increase in respect of the output. The major factors in this case as analyzed are:

- Expertise in product and process development
- Specific investment for technology commercialization
- Infra-structural support for trial production

In the case of Agro processing industries, 6 out of 9 award winning companies have indicated increase in respect of the output of the award winning technology. The major distinguishing characteristics in respect of these are :

- Strengthening of marketing efforts
- Infrastructural support for trial production
- Technology upgradation efforts
- Use of project management techniques
- Top management support for commercialization

In the case of Drugs and pharmaceutical industries, there are 9 award winners (out of 9, 6 are medium sized and 3 are small). There are marginal differences in respect of the characteristics of all the 9 companies. In all 9 cases, only process development research focussing on chemical synthesis and process optimization has been done, as the basic research has been done elsewhere. Some of the dominant factors in this sector include :

- Individuals being willing to take up technology risk oriented projects
- Increase in R&D expenditure to facilitate commercialization, long term R&D strategy and use of test marketing

In the case of Mechanical & Automobile industries, 6 out of 14 have reported a growth in respect of the award winning technology. The major characteristics that stand out in this sector include :

- Marketing being focussed upon in the business strategy
- Steps towards technological upgradation
- Techniques for cycle time reduction
- Use of trial production during commercialization.

While the study helps in providing insights into factors that would help a company in becoming more technologically oriented, one limitation it that is has not been possible to bring out a complete understanding of 'the creativity process' in Indian companies. This is partly because the data and information base on which the analysis rests is solely dependant on that provided by the companies themselves. This apart, the analysis is restricted to the output generated from the award winning technology, for which it has not always been possible for each company to provide exclusive and complete information.

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

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

A study on "Valuation of Intellectual Property Rights in Technology Management and compilation of Current Cases on Trade Secrets" has been taken up. This is being carried out by Waterfalls Institute of Technology Transfer, New Delhi. The objective of the study is two-fold. It would firstly bring out the available techniques for valuation of IPR in different environments. The study, inter-alia, would present indicators relating to IPR as an aid in various stages in technology management including technology sourcing, technology assessment, technology selection and others; drawn from actual cases taken from global information networks. Secondly, a compilation of relevant case studies on trade secrets from cases reported internationally in journals, periodicals and in the internet, would be brought out and presented such that the major issues having a bearing in technology management get highlighted. The study has been initiated.

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

Case studies analysing the manner in which technology has been managed in corporate settings had earlier been brought out in respect of two manufacturing organisations. Two more such studies are in progress. The study covers several aspects, such as devising a strategy for developing corporate plans for technology, its suitable integration with the business plan, R&D management, organisational structures, factors responsible for technological growth in the organisations, make or buy decisions on technology, methodologies for induction and implementation of new technologies etc. Such case studies have provided useful inputs to decision makers and researchers, apart from being very useful pedagocical tools for academicians and trainers in management and technical institutes, including those of industry, and others.

Managing technology in research organisations being also of considerable significance, two studies dealing with the relevant issues were brought out. This year, two organisations which are oriented towards new technology development were taken up for study. The reports are being completed. These studies have carried out a holistic analysis of

the organisational behaviour based on numerous issues, such as, decision making mechanism, organisational structure, formal and informal mechanism of information exchange, team work, motivation methods, user interaction, communication methods and others. These studies provide useful inputs to other industrial organisations, apart from researchers, academicians and others.

6. TRAINING AND AWARENESS PROGRAMMES

With a view to enhance awareness and knowledge in the field of technology management, programmes on the subject were organised. The basic objectives of these programmes have been to apprise organisations, managers, R&D personnel and others of the importance of managing technology efficiently and of the intricacies involved therein. Various subjects such as technology strategy, issues in technology acquisition, R&D management and others are covered. During the year, 5 programmes were held as under:

- For Crescent Engineering College at Chennai
- For Karnataka Council for Technology Upgradation (KCTU) at Bangalore
- For Regional Engineering Colleges at Suratkal Warangal, Tiruchirapalli, Surat and Kurukshetra
- For Dharmsinh Desai Institute of Technology, Nadiad

Two programmes were organised at IIM, Calcutta, one on "Acquisition of Foreign know-how and Technology Management at company level" and the other on "R&D Management".

Three programmes, particularly intended for small and medium enterprises were organized; one was at Mysore in association with KCTU and Confederation of Indian Industry; the second at Managalore in association with KCTU and Asia and Pacific Centre for Transfer of Technology; and the third at Hyderabad in association with Administrative Staff College of India, UNIDO and State Bank of India.

Considering the importance of Intellectual Property Rights in the current scenario, all the above programmes contained sessions on the subject, to enhance awareness of the concerned issues amongst industry executives, researchers, academicians, consultants and others.

Assistance has been rendered to IIT Delhi in respect of a Module on 'Technology Transfer' which is a part of a course on MBA with focus on Technology Management being organised by the Institute. The module has been conceptualized and relevant topics identified. Identified sessions have also been taken and Guest Lectures by experienced persons from industry and R&D organisations have been arranged. The Institute was also assisted in the evaluation of the programme.

The DSIR has provided inputs to a Workshop on 'Training of Trainers' in the field of Technology Management held at IIT, Delhi. Specific sessions were also taken.

A lecture on "Technology Innovation and Economic Development : the new Indian Challenge" was delivered by Secretary, DSIR under the "Hindustan Lever Lecture Series" at IIT, Bombay.

7. NETWORKING

With a view to widen the impact of its efforts in the field of technology management, the Division has networked with a number of organisations. The following are specifically mentioned :

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

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

The Division has entered into a Memorandum of Understanding (MOU) with IIT Bombay in the area of Technology Management. A number of activities inclusive of modules and sessions on technology management aspects, specific case studies, news letter, focussed research studies and others are proposed to be taken up under the collaborative Programme .

The Division also has close linkages with IIT, Delhi on various aspects of Technology Management. The Division is interacting with Bhabha Atomic Research Center (BARC) for collaboration in areas like technology transfer, technology pricing and others.

Apart from academic institute linkages, the Division is taking a number of steps to enhance industry interaction. The KCTU, which is a joint venture between the Central Government and the State Government of Karnataka in association with several industry associations in the State, is proposing to undertake a number of collaborative programmes on technology management related areas, in association with the Division. These activities are primarily aimed at enhancing the competitiveness of small and medium enterprises through application of technology management methods.

8. RESOURCE BASE

A number of activities have been taken up to enhance the existing resource base in the field of technology management. Some of these are:

A manual on Negotiations for Technology Acquisition has been prepared. It covers various issues like technology issues in negotiations, development of a suitable strategy for negotiations, the process of negotiating, negotiation pattern and other relevant issues. It is a guide to intending technology acquirers.

The talks delivered under the DSIR's Distinguished Technologists lecture series have been documented and are disseminated widely to industry, R&D organisations and others.

As bibliographies provide useful sources of information, two bibliographies were brought out during the year. One bibliography relates to books and is grouped under various broad categories such as Research and Development, Management of Innovation, Technology and Society, Science & Technology, Technology Forecasting, Managing Innovation, Technology Transfer, Technology Diffusion and Appropriate technology. The other bibliography is an annotated one, covering recent articles and papers on Technology Management published in reputed national and international journals. Again, this is grouped under different categories as the former one. These have been found very useful by the users.

For the programmes organised for various institutes and organisations, background material on various subject is prepared. This provides useful reading material on various facets of technology management.

In addition, the division has indirectly aided a number of academic institutes in establishing courses on Technology Management related subjects by providing useful inputs, material and guidance to suit there own individual requirements.

V(B). INDUSTRIAL TECHNOLOGY

1. INTRODUCTION

The industrial technology deals with the proposals received from Secretariat for Industrial Approvals (SIA) for grant of Letter of Intent, foreign collaboration from Indian entrepreneurs, foreign entrepreneurs/organisations, from NRIs and those willing to set up 100% export oriented projects.

The broad activities arc (i) receiving and examining proposals for grant of LOI, PC and import of CG, including those for 100% EOU and from NRIs (ii) participating in approval Committees/Boards such as Licensing Committees, Project Approval Board and Board of Approvals for 100% Export Oriented Units.

2. INDUSTRIAL LICENSING

About 170 proposals for grant of Letter of Intent/Carry-on-Business, Extension of Letter of Intent etc. were received during the year.

17 meetings of Licensing Committee were held by SIA luring 1999. Almost all the meetings were attended.

3. FOREIGN COLLABORATIONS

During the year, the number of foreign collaborations and composite proposals exceeded 740. Of these, the department received around 140 proposals from Secretariat for Industrial Approvals as compared to 100 in the previous year. These excluded such proposals involving foreign investment, which were directly considered by the Foreign Investment Promotion Board.

During the year, the Department participated in the 16 meetings of the Project Approval Board and 8 meetings of the Board of Approvals for 100% Export Oriented Undertakings held by SIA.

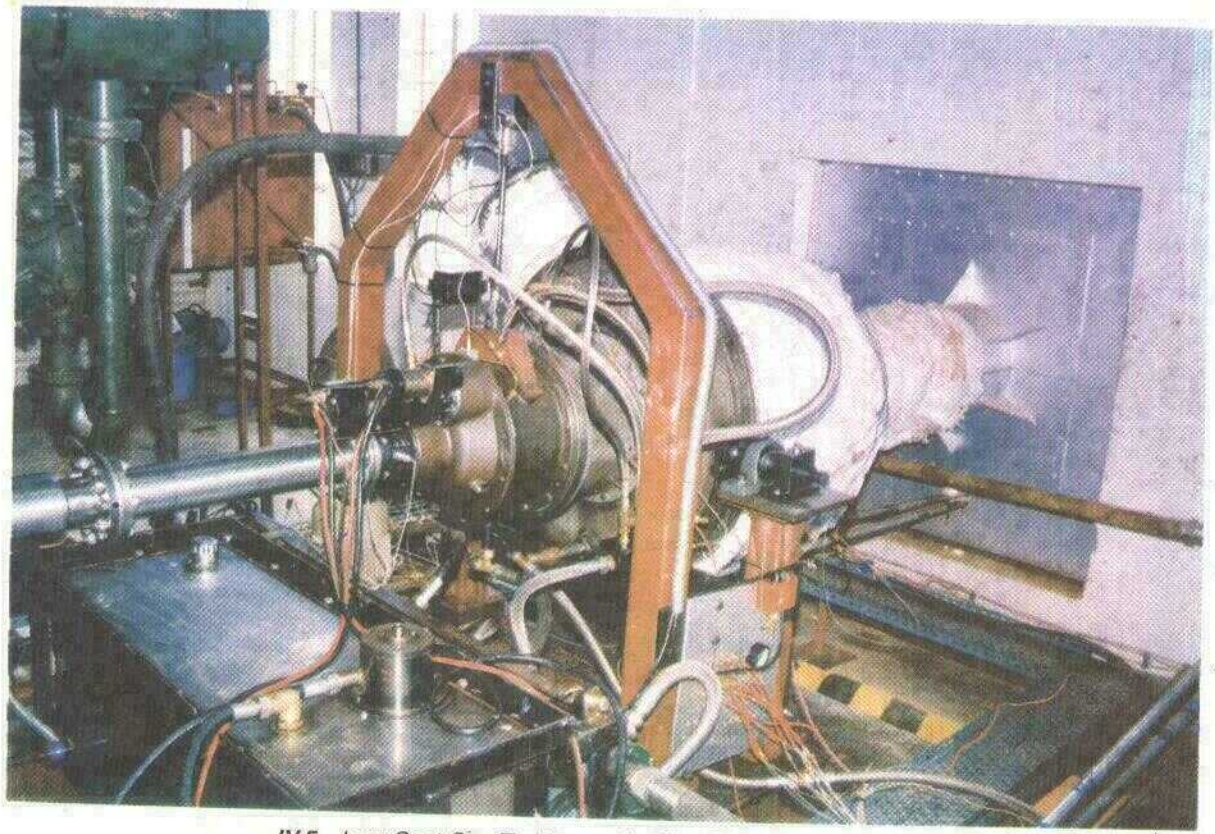
4. INFORMATION/DATA PROCESSING

The Department has a database for Foreign Collaboration proposals and Composite applications since 1988. The data regarding Foreign Collaboration Proposals were updated for the year 1999.

The Department also maintained and updated the software for editing, preparing summary, processing and quick retrieval of the desired information. The software has been developed in-house for above mentioned proposals as well as approvals.

5. INTERNET

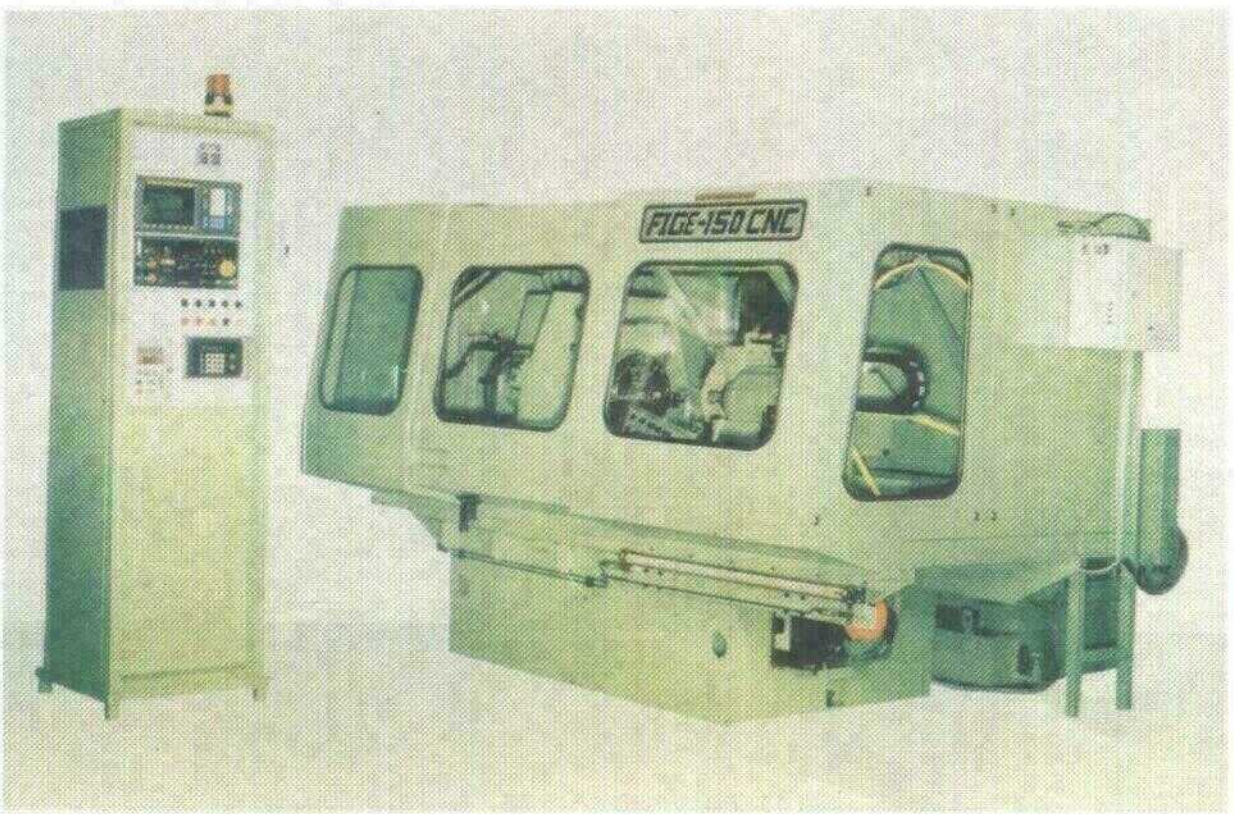
The Department is a subscriber to X400 Message Handling System of NICNET, the Network of National Informatics Centre. The E-Mail Address for the Department is **dsir@x400.nicgw.nic.in.** In the year under review, the Department also renewed its subscription to TCP/IP account of Videsh Sanchar Nigam Ltd. The E-Mail address for the Department is **dsir@vsnl.com.**



IV.5 *Low Cost Gas Turbine on the Test Rig being developed by M/s. Turbotech Precision Engg. (P) Ltd., Bangalore*

IV.6 *Fluid Bed Drier in operation at M/s. National Aluminium Company Ltd. (NALCO)*

IV.7 *70 ton Dump Truck developed under PATSER by M/s. Bharat Earth Movers Ltd., Bangalore*



VIII.A.1 *Grinding Machine developed by M/s. P.M.T. Machine Tool Automatic Ltd., Pune*

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

1. OBJECTIVES

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

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

2. ACTIVITIES

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

2.1 Publication on Technology Exports and Exportable Technologies.

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

2.2 Newsletter on Technology Exports

A quarterly Newsletter on Technology Exports, initiated during the year 1998-99 was

continued. The Newsletter is being compiled by IIFT under the guidance of Editorial Board, comprising of representatives from DSIR, IIFT, CII, Exim Bank, L&T and Waterfalls Institute of Technology Transfer. The Newsletter includes a lead article and details on technology export related policies, global technology and India's technology developments, joint-ventures, India's achievements in technology exports, technology offers and requests etc. The Newsletter has been greatly appreciated by industry, embassies/missions and other export promotion councils.

2.3 Technology Exports Pavilion in India International Trade Fair, New Delhi, Nov 14-27, 1999

The Objective of setting up a Technology Exports Pavilion was to promote display and dissemination of information related to technological capabilities, products and technologies of companies and organisations including R&D laboratories, product design institutes and academic institutions. The Technology Exports Pavilion was set up jointly by Department of Scientific and Industrial Research (DSIR), India Trade Promotion Organisation (ITPO) and Federation of Indian Micro and Small and Medium Enterprises (FISME). The Technology Exports Pavilion was organised in India International Trade Fair for the third time in succession since 1997. The space in the Technology Exports Pavilion was offered free (cost shared jointly by DSIR & ITPO) to the organisations engaged in technology intensive business, thereby encouraging them to exhibit their technology export potential capabilities. A space of 500 sqr. mtrs. was reserved in Pragati Maidan for the Technology Exports Pavilion. The association of FISME in 1999 helped in enhancing interaction of technology related organisation with SMEs.

Around 35 organisations, both from public and private sectors including national R&D laboratories participated in the Technology Exports Pavilion. These included National Physical Laboratory, Central Leather Research Institute, National Remote Sensing Agency, National Institute of Design, Central Electronics Limited, IIT-Chennai, Tata Projects Ltd. and Ion Exchange Ltd. The participating organisations in the Pavilion displayed their technological capabilities through models, prototypes, interactive computer based displays, charts, machinery/product samples, etc.

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

2.4 Seminar on Technologies from India, New Delhi, November 18, 1999.

A Seminar was organised during the India International Trade Fair, in Pragati Maidan for the second time since 1998.The objective of the Seminar was to extend a common platform to potential technology exporters from India and possible foreign customers and to provide them an opportunity to interact and explore collaborative business opportunities. The seminar covered three industry sectors, viz. Chemicals & Pharmaceuticals, Electrical, Electronics & Telecommunications and Food Processing. The Seminar helped in creating a larger awareness about India's technological capabilities and strengths in the sectors covered.

The Seminar was attended by around 80 participants from organisations participating in the Technology Exports Pavilion at IITF'99, other potential technology exporters and export promotion agencies, R&D organisations, academic institutions, government departments and some foreign representatives. Important recommendations emerging from the seminar were:

- Similar seminars may be organised more frequently on a variety of subjects of common interest to developing countries.
- The focus should be on promotion of technologies appropriate to the economic and industrial development and social conditions prevalent in the host country.
- Collaborative arrangements may be evolved between different countries to promote technology development and exports for better exploitation of available resources and maximization of benefits.
- India should use its inherent advantage of a large pool of technically qualified manpower to promote technologies, which employ manpower efficiently, instead of focusing only on technologies based on automation.

- There is need for sustained efforts in building technology and technology intensive products exports. A mechanism may be evolved which would provide technological inputs on a continuous basis to industry, especially small scale industry.

- The technology development efforts should be aimed at development of safer, cleaner and environment friendly technologies.

2.5 Technology Exports Promotion Cell in CII

The main objective of the proposed Technology Exports Promotion Cell is to promote and support technology and technology intensive exports through collaborative efforts of government, industry, research & academic institutions, financial institutions and other export promotion agencies. The Cell, proposed to be set up in Confederation of Indian Industry (CII) is expected to be a precursor to establishment of a Technology Exports Development Organisation (TEDO) as an independent registered non-profit society. An agreement between DSIR and CII towards establishment and functioning of the Cell has been vetted by the Ministry of Law. The maximum duration of the Cell in CII is proposed to be 3 years, subsequent to which it is expected that a full fledged Technology Exports Development Organisation shall be set up. CII will provide infrastructure, space, office equipment including computers and information related facilities and services, staff and professional management, etc for activities of the Cell. In addition, other resources and services of CII will also be available to the independent Cell as per requirements. The SFC approval for the Technology Exports Promotion Cell was being processed.

2.6 Feasibility study on Export Potential of Indian Technical know-how in Institution Building and Manpower Training for Construction Industry in Bangladesh and Nepal.

The above study was commissioned to National Institute of Construction Management and Research (NICMAR) in April 1998. The report on Nepal has been finalised and discussed in a Workshop at Kathmandu. The report has indicated immense export potential for Indian construction industry, in various forms, such as training of personnel in Nepal, and has suggested various mechanisms towards this objective.

The draft report on Bangladesh was discussed in the Expert Advisory Committee Meeting and was finalized, subsequently. The major recommendations emerging out of the Bangladesh study are: (i) need for enhancing the capacity for training technical manpower in Bangladesh; (ii) need for establishment of a Contractor Development Institute (CDI) and Construction Manpower Employment Exchange (CMEE) in Bangladesh; (iii) need for training project managers; (iv) establishment of building materials manufacturing facilities in Bangladesh with the help of Indian expertise/institutions i.e. HUDCO and Building Materials Technology Promotion Council (BMTPC) and (v) exploring possibilities for export of Indian technical know-how in institution building and manpower training to Bangladesh e.g. establishing linkages between Bangladesh University of Engineering and Technology (BUET) and IITs/NICMAR.

2.7 Workshop on Export Potential of Indian Technical Know-how in Institution Building and Manpower Training for Construction Industry in Nepal, July 28-31, 1999, Kathmandu, Nepal

The above Workshop was organised in conjunction with the SAARC Workshop on Managing BOT Infrastructure Development Projects in Kathmandu during July 28-31, 1999. The Workshop was organised by NICMAR in collaboration with Nepalese agencies such as Contractors Association of Nepal (CAN), Society for Consulting Architecture and Engineering Firms (SCAEF) and Nepal Engineering College (NEC). The objective in organizing the Workshop was to disseminate information about Indian capabilities and expertise relevant to the needs of Nepalese Construction Industry and discuss modalities to implement the findings of the report on "Export Potential of Indian Technical Know-how in Institution Building and Manpower Training for Construction Industry in Nepal", prepared by NICMAR. The major conclusions emerging out of the Workshop were: (i) the construction industry in Nepal can take advantage of the Indian expertise in manpower training, institution building and technical services, e.g. a MSc. Programme in Construction Management (1999-2001) has been already announced by Pokhara University, Nepal in association with NICMAR, India; (ii) setting up of a construction industry training centre at Kathmandu with the support and collaboration of NICMAR; and (iii) exploring possibilities for several other collaborative and institutional arrangements.

2.8 Seminar on Enhancing Export Competitiveness, Mumbai, August 20, 1999

A Seminar on Enhancing Export Competitiveness was organised at Mumbai on 20th August 1999 in collaboration with Confederation of Export Units, New Delhi. The main objective of the Seminar was to address the technological constraints and requirements of EOUs and review mechanisms and support measures available from various agencies with a view to mitigate technological constraints of EOUs and help them in enhancing export production. The Seminar also discussed implications of various trade & finance related policies and procedures on EOUs/EPZ. The Seminar was inaugurated by Secretary, DSIR and was attended by around 80-100 participants from select government departments, R&D institutions and EOUs. The Seminar emphasized on the role of technology in enhancing production and improving competitiveness of EOUs.

2.9 Indian Industrial Products & Technology Exposition (INDIATECH-2000)– Colombo, Sri Lanka, January 11-14, 2000.

The above Expo was organised by Engineering Exports Promotion Council (EEPC) with the support of DSIR and other organisations. DSIR supported the participation of 5 CSIR laboratories (NCL, CLRI, CFTRI, IICT and NEERI) in the above Exposition by offering them free space. Ministry of Commerce and High Commission of India in Colombo actively co-ordinated the organisation of the event. The Ministry of External Affairs supported TA/DA expenditures in respect of one representative each from the 5 CSIR laboratories and DSIR. A Seminar on "Technology Upgradation and Modernization" was also organised on January 12, 2000 simultaneously with the Expo. It included active participation of DSIR and was sponsored and supported by Ministry of Science & Technology of Sri Lanka and High Commission of India in Sri Lanka. APCTT was also actively involved in the organisation of the Seminar. The objective of DSIR support for the participation of few national laboratories from the CSIR system in the Exposition and the Seminar was to provide an opportunity for interactions between R&D and industry of both the countries. The Seminar was organised with a view to provide a forum for scientific and business interactions between Indian and Sri Lankan counterparts and promote industrial and technological co-operation not only between India and Sri Lanka but in the SAARC region, as a whole. The Expo and seminar were an endeavour to create awareness about the capabilities and needs in the SAARC region in view of the potential and significance of trade and co-operation in technology intensive projects, products and services.

2.10 A Study on Policy Measures for Accelerating Technology Related Exports in Selected Countries

The above study was conducted in association with the Waterfalls Institute of Technology Transfer, New Delhi. The study-report covers technology export related policy measures in 9 countries viz. Australia, China, Japan, Korea, Finland, France, Germany, Italy and UK besides India. The study also presents a comparative analysis of technology export related policy measures adopted in the selected countries and recommends broad policy measures and support mechanisms for promoting technology related exports from India.

2.11 Seminar on Policy Measures for Accelerating Technology Related Exports in Selected Countries, New Delhi, February 25, 2000

The above seminar was organised in association with Indian Institute of Foreign Trade, New Delhi with a view to discuss the findings of the above study in a wider gathering of concerned government departments, representatives from foreign embassies/missions/trade centres, export promotion agencies, R&D organisations, academic institutions and industry.

2.12 ESCAP/INDIA National Seminar on Regional Capacity Building for the Adoption of ISO 14000 at New Delhi, August 5-7, 1999.

The above Seminar was organised at APCTT, New Delhi by ESCAP with the financial support from Government of Netherlands. The main objective of the Seminar was to provide a good understanding and training in the manner in which the ISO 14000 series are applied at firm's level, how third-party certification/registration is arranged, and other considerations related to systems documentation, environmental audits, performance evaluations and eco-labelling. ESCAP Secretariat though the Embassy of India in Bangkok sought Government of India's interest in organising the Seminar at APCTT headquarters at New Delhi. DSIR supported APCTT in organising the Seminar. Secretary, DSIR inaugurated the Seminar on 5th August 1999.

2.13 Miscellaneous

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

a) Technologies for Infrastructure Sector – A View : NAFEN's XIII International Congress & Exhibition on "Opportunities and Financing in the Next Millennium", New Delhi, December 2-3, 1999

b) Promoting Export of SPV Technology and Services – A Case Study: Millennium International Conference on "Renewable Energy Technologies", IIT-Chennai, February 9-11, 2000

3. TECHNICAL ADVISORY COMMITTEE

Third and fourth meetings of the Technical Advisory Committee for the TATT and the Consultancy Schemes of DSIR were held during the year. The Technical Advisory Committee noted the progress of work under the two schemes. Projects, studies and other activities recommended by the Technical Advisory Committee were taken up for implementation.

V(D). PROMOTION AND SUPPORT TO CONSULTANCY SERVICES

1. OBJECTIVES

The objectives of the Scheme include:

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

2. ACTIVITIES

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

(a) *Documentation of Consultancy Capabilities* and Experience

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

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

(i) Study on Status of Consultancy services in India

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

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

With a view to have insights of various policies and incentives available to consultants in other countries for the promotion and development of consultancy profession, a study was commissioned to Consulting Engineers Association of India (CEAI). The study is completed and CEAI has submitted final draft report, which contains information of 46 developed and developing countries on various aspects related to policies and incentives available to consultants in these countries. The report is under print.

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

With a view to enhance the interactions of R&D laboratories in CSIR system with consultants and widely disseminate their technological consultancy capabilities to industry, . this study is commissioned at NISTADS and is expected to explore nature and extent of involvement of external consultants in R&D and Innovation activities of CSIR labs. It will examine potential of R&D through consultancy for consultancy development in R&D organisations. The study in nutshell will cover-specific technical areas, nature of services provided, Intellectual property generated, period of consultancy, Amount involved, Nature of clients, Export of R&D services, R&D collaborations and future prospects, etc. Information on issues related to the involvement of consultants in R&D and Innovations will be collected through a

structured questionnaire as well as from field visits. The data will be analysed and report prepared. The study is in progress.

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

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

(i) UPCIO-CFTRI Service Centre for Food Processing Industry at Kanpur

Keeping in view the large concentration of food grain production and food processing industries particularly the SMEs in the state of Uttar Pradesh, this centre is set up by U.P. Industrial Consultants Ltd., (UPICO), a technical and commercial consultancy organisation of U.P. State and Financial organisation, and CFTRI jointly to help the food processing industries in the North-Western region of the country. The centre is functional at Kanpur and has submitted report for its first phase. UPICO-CFTRI have carried out in-depth survey related to potential and availability of raw material for Food Processing Industry in the state of Uttar Pradesh. This report is printed and is available with them.

(ii) Consultancy Clinic for Textile Industry at Bhilwara

With a view to provide doorstep professional services for textile industry in particular and other industries in general, this consultancy clinic is set up by Rajasthan Consultancy Organisation Ltd. (RAJCON) at Bhilwara. The clinic has started operations, and clients have started availing the services of the clinic. However, the progress has showed down due to management problems at RAJCON is likely to pick up in next year.

Similar proposals from other organisations such as Madhya Pradesh Consultancy Organisation Ltd. (MPCON), Institution of Agriculture Marketing Management & Administration, Hyderabad, Central Institute of Plastic Engineering and Technology, Bhopal and EMPI Business School, New Delhi were under active consideration for consultancy clinics for different SME clusters.

(c) Institutional Programme Support

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

3. REPORTS/PUBLICATIONS/PAPERS

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

i) A paper on "Policies and Incentives for SMEs particularly for Essential Oil Industry for the seminar on Technological Advances in Essential Oil Industry and Opportunities for Consultants" organised by IIT, Delhi, March, 1999 at Moradabad.

ii) A paper on "Role of Consultants in Development and Promotion of R&D Business for International Conference on R&D Management – R&D as a Business" organised by CSIR on 6 – 8 December, 1999 at New Delhi.

iii) A paper on "Policies and Perspectives for Consultants in India" for the 3rd National Consultancy Congress on Beyond 2000 : Challenges and Opportunities for Consultants, 15 – 16 January, 2000, at New Delhi.

4. ADVISORY SERVICES

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

4.1 Committees

i) Governing Council, Executive Committee, Membership Committee, Accreditation of Consultants Committee, Awards Committee for Excellence in Consultancy, Review and Technical Committees of 2nd & 3rd National Consultancy Congress of CDC, Bye-laws and CDPA committees of CDC.

ii) Consultancy Committee of FIEO

iii) Programme Committee of WASME

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

v) Board of Governors of NICMAR, Bombay

vi) Governing Council of CEAI

vii) Research Advisory Committee of ATIRA, Ahmedabad.

4.2 Seminars/Workshops/Meetings

i) Organising Committee for IC-ICTP, IIT, Delhi for International Conference on Materials held on 10- 12 October, 1999.

ii) Technical Advisory Committee for International Seminar on Trade and Services organised by FIEO in February, 2000.

iii) Technical and Organising Committees for seminar on "Technological Advances in Essential Oil Industry and Opportunities for Consultants" organised by IIT, Delhi, March, 1999 at Moradabad.

iv) Technical and organising committees for Third National Consultancy Congress organised by CDC at New Delhi in January 2000.

v) Advisory and Organising Committees for the seminar on Role of Business Schools in the Cluster Development Approach for Development of SMEs.

vi) Various Committees of IIFT, New Delhi.

5. CONSULTANCY DEVELOPMENT CENTRE (CDC)

5.1 Background

CDC came into being as a registered society in January 1986, and is functioning from its office at India Habitat Centre Complex since May 1994. The centre is managed and guided by a governing Body consisting of representatives of consultancy organisations, R&D institutions, Government Departments, academic institutions, public sector units etc. CDC had a membership of 226 as on 31-3-99, representing various types of consultancy organisations and individuals connected with the consultancy. The CDC has concentrated mainly on development of human resources, providing computerised data/information services, and strengthening of technological and managerial consultancy capabilities through a scheme known as "Consultancy Development, Promotion and Assistance (CDPA)" Scheme: CDC is providing consultancy/training in ISO-9000 and 14000 Quality Management Systems, and has been awarded certificate for ISO-9002 by a Norwegian Company.

5.2 DSIR Support

An amount of Rs.73.5 Lakhs was provided as grant during 1998-99, and a release of Rs.18 Lakhs is made till 31-1-99 during 1999-2000. The capital assets at CDC include computer systems with peripherals and accessories as well as some software. This facility is used for collection, analysis and dissemination of data, for training of engineering graduates and for small consultants. It is estimated that these investments have resulted in useful activities for nurturing consultants and users of consultancy for better returns on investments and enhanced earnings of foreign exchange directly and indirectly, besides several other qualitative advantages bringing long term benefits to the country. The centre is equipped with Library facilities for consultants.

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

In order to enhance technological and managerial capabilities as well as the export capabilities of consultants, interactions with

international organisations – such as World Bank, Asian Development Bank, African Development Bank, International Trade Centre (ITC), UNIDO, ESCAP, APCTT, have been developed and programmes have been arranged for consultants at national and international levels which have proved to be useful to promote consultancy business. CDC has been identified to be a nodal agency for Technical Consultancy Development Programme for Asia and the Pacific (TCDPAP) by ESCAP. CDC was again nominated to function as secretariat for TCDPAP up to 2000 AD during its Second Meeting of Advisory/Promotional Committee. The first General Council meeting of TCDPAP held in October 1997 in Dhaka recommended that TCDPAP should be developed as an independent UN identity.

5.4 Activities

Some of the salient features of the activities carried out by CDC during 1998 are as under:

5.4.1 ISO Certification for CDC

Surveillance audit for renewal of ISO Certification for CDC was carried out by M/s Det Norske Veritas (DNV) on 10th August, 1999. It was found that the Centre confirmed to the requirements of ISO Standards and was recommended for renewal of certificate for a period of one year.

5.4.2 MOU for ISO-14000 Certification

CDC entered into a Memorandum of Understanding with Anglo American Environment Quality and Safety Certification services Ltd. (AAEQS) for Conducting Advanced Lead Auditors Course and Internal Auditors Course in ISO-14000 for CDC becoming a Certifying Agency in the area. Also, another MOU was signed between CDA and NQA Quality System Ltd. (NQAQSR) for ISO-9000 Consultancy.

5.4.3 Training

- During the year, CDC organised 4 short term specially structured training programmes on ISO-9000 Quality Management Systems and ISO-14000 Environmental Management System for consultants, construction and health care service R&D etc. to train various organisations in design, development and implementation of ISO-9000 and ISO14000 systems.
- The 4th batch of MS Consultancy Management Programme in collaboration with BITS, Pilani commenced in August 1998 with 17 students was completed.
- CDC has signed an MOU with IIT, Delhi for introducing 3 years Part-time MBA Programme in Consultancy Management. This programme would commence during the year 2000.

5.4.5 Consultancy in ISO-9000 QMS

During the year, CDC continued to provide consultancy in ISO-9000 Quality Management System to 8 organisations such as Gammon India Ltd., Central Road Research Institute, Intercontinental consultants and Technocrats Pvt. Ltd., Uttar Pradesh Industrial Consultants Ltd., National Institute of Training for Highway Engineers, National Building Construction Corporation Ltd., U.P. State Bridge Corporation Ltd. (from January 1999), International Print-O-Pac Ltd. (from January 1999) for getting them ISO-9000 Certification and bring improvements in their functional areas, totaling to a professional fee of Rs.26.82 Lakhs so far, out of which Rs. 5.3 Lakhs are received by CDC by December 1998.

5.4.6 Study Assignments

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

5.4.7 Database and Information Services

The database of Consultants and Consultancy Organisations was augmented during the year. About 1400 profiles of Consultants/Consultancy Organisations were added. A National Directory of Consultancy Services – 2000 was being prepared.

5.4.8 Developmental Services

Contact/Interaction Programmes

- During the year, CDC organised 5 contact/interaction programmes on various issues and themes related to consultancy profession such as Marketing of Services through Internet, Information Technology for Consultants, Role of Consultants in Joint-Ventures, Foreign Collaborations and Technology Transfer, Opportunities in Food Processing Industry in the next Millennium.

- During the year, CDC had close interactions with the Technical Consultancy Organisations (TCOs) and organised interaction meets in collaboration with them. They were also associated for augmentation of database pertaining to regional consultants.

- The centre continued with the scheme for R&D experts as Associates, to utilise their expertise in various developmental activities useful to consultants.

- The centre initiated a scheme for business developments for consultants through a fortnightly bulletin on business opportunities, which gives information on project opportunities likely to emerge in India and in global markets for consultants and professionals.

Third National Consultancy Congress

The above Congress was held on 15-16 January, 2000 at New Delhi, with its theme as "Beyond 2000 : Challenges and Opportunities for Consultants". The Congress was attended by about 350 Indian and foreign consultants, exporters, policy makers, industry representatives, R&D personnel, and others relevant to consultancy. Four National Awards for excellence in consultancy were given away in the Congress.

Rating/Grading of Consultants

A committee was constituted for finalisation of criteria and methodology to be adopted for Rating/Grading of Consultants. Two meetings of the committee were held during the year. Substantial work was done by the Task Force in this regard during the year, and a scheme is likely to be evolved next year.

Revolving Fund Scheme

To provide financial support for bid money to small and medium consultants/ consultancy organisations, the concept of a revolving fund at CDC was mooted. A task force constituted for finalising the scheme met during the year to discuss the modalities.

Scheme for Skill Upgradation of Consultants

Applications of three consultants/ consultancy organisations for financial assistance to attend training programmes under the skill upgradation scheme were approved during the year.

5.4.8 International Cooperation

- The First Executive Committee meeting of TCDPAP was held in June 1998 in Nepal, which was followed by a three days international workshop on Consultancy in next millennium. Delegates from 8 member countries participated in both the events. 200 delegates including 26 foreign participants attended the workshop. A total of 24 papers were presented during the workshop. The centre is making efforts to establish a permanent secretariat of the TCDPAP in CDC. Ministry of Commerce has kindly provided support to strengthen the secretariat. Also, Ministry of External Affairs has shown keen interest for the same.

- The proceedings of the First Executive Committee Meeting and the International workshop on "Consultancy in the next Millennium" held in Kathmandu, Nepal from 26 -.28 June, 1998 were brought out.

5.4.9 Publications/Brochures of CDC

Brochure on Consultancy Business Development

The brochure gives details of the facilities available at CDC for Business Development of consultancy services. It has been widely disseminated.

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

The brochure gives objectives, scope, implementation modalities and guidelines for the programme. The same has been widely disseminated to Consultants, academia and others.

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

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

CDC Newsletter - Consultancy Vision

3 issues of this Newsletter were brought out.

TCDPAP Focus – 1 issue was brought out

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

5.5 REVENUE

CDC has made serious efforts to generate revenues on its own. It has earned a revenue of about *Rs.60.89 lakhs during the year 1998-99* from services rendered to various agencies, membership fee, sale of directories etc.

VI. LINKAGES WITH INTERNATIONAL ORGANISATIONS

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

APCTT and ESCAP

The matter pertaining to the Asian and pacific Centre for Transfer of Technology (APCTT) under ESCAP were dealt with in co-operation with Ministry of Commerce. The Department of Scientific and Industrial Research continued to play the role of a focal point for the APCTT. DSIR helped in preparing a brief covering technological issues for the use of Indian delegation to the 55th Annual Session of ESCAP held in April 1999 at Bangkok.

Shri K.V. Srinivasan, Adviser, DSIR participated in the Fifteenth Technical Advisory Committee meeting of APCTT held during 22-23 November 1999 and the Fourteenth Session of the Governing Board of APCTT held during 24-25 November 1999 in Kish Islands, Islamic Republic of Iran. These meetings were attended by participants from China, Indonesia, Islamic Republic of Iran, Republic of Korea, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and others.

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

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

VII. NATIONAL INFORMATION SYSTEM FOR SCIENCE & TECHNOLOGY

1. INTRODUCTION

The increasing role of science and technology in the economic and social development of the country has generated a pressing demand for faster technology transfer to the industries. Apart from access to information generated within the country, it is also necessary to draw from the externally generated information to support internal efforts on research and development. Information centres that have come up to serve the needs of different industries and R & D units are therefore required to be co-ordinated and organized into an integrated system to avoid a haphazard growth and duplication of activities and in conformity with national and international standards.

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

2. THE BROAD OBJECTIVES

The broad objectives of NISSAT are:

- Development of national information services
- Promotion of existing information systems & services
- Introduction of modern information handling tools & techniques
- Promotion of international co-operation in information
- Development of indigenous products & services
- Organization of skill development programmes
- Promotion of R & D in Information Science & Technology

2.1 Subject Coverage

The NISSAT programme has the mandate to cover the entire spectrum of science and technology. However, during the process of programme implementation, special care is taken not to dwell upon subjects already being handled by other national programmes like the BTIS, ENVIS or an agency like the ICAR. It also consults and obtain views of respective Ministries/ Institutions and experts before taking up activities relating to any subject area. As a proactive and progressive step, NISSAT has taken the onus on itself to strengthen the library movement in the country through the introduction of modern information technology, tools and techniques.

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

The main functions under the NISSAT scheme are the following:

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

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

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

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

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

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

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

viii) Co-ordination of international activities in collaboration with UNESCO and ASTINFO and maintain the CDS/ISIS Clearing house facility

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

3. NISSAT CENTRES

3.1 National Information Centres

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

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

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

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

Some of the sectoral centres bring out serial publications of digests, indexing & abstracting materials and news highlights. Apart from publishing these in print form, the information is more often computerized.

NICFOS centre is a discipline oriented information centre to provide information in Food Science and Technology and its peripheral areas. The centre utilizes the library and documentation infrastructural facility of CFTRI, Mysore in carrying out the services. The centre maintains eleven *databases on food technology. Some of the databases* serve as supplement to the foreign database.

NICMAP is acting as a clearing house of information on machine tools and production engineering. NICMAP maintains about databases on bibliographical, statistical and product categories. The centre hosted its data on TIFACLINE of CMC for on-line accessing by users.

The centre publishes and markets its product "Database on Manufacturing Technology and Machine Tools - Mtech" on CDROMS. These apart, NICMAP also provide consultancy services to various national and international institutions to set up an information centre in their institutions.

NICDAP centre provides CDROM based services using Medline, Chemical Abstracts, Popline, Excerpta medica, International Pharmaceutical

Abstracts, Biotechnology Abstracts, Drug Information, NUCSSI etc. The centre also provides on-line services using Datastar - Dialog and STN. The centre has INTERNET connectivity through RENIC.

The Services provided by the **NICTAS** centre includes literature searches, translation, reference service, E-mail facility, and CDROM services using TTD database and colour index. The centre maintains six databases using UNIFY-RDBMS & custom made software. NICTAS continued the publication of TEXINCON and other state of art reports. The centre achieve self-sufficiency since 1994 and established an online database search centre.

Table 1. The NISSAT Sectoral Information Centres

SUBJECT AREAS	ACRONYM	HOST INSTITUTION
1. Food Technology	NICFOS	Central Food Technological Research Institute, Mysore
2. Machine Tools Production and Engineering	NICMAP	Central Manufacturing Technology Institute, Bangalore
3. Drugs and Pharmaceuticals	NICDAP	Central Drug Research Institute, Lucknow
4. Textiles & Allied Subjects	NICTAS	Ahmedabad Textile Industry's Research Association, Ahmedabad
5. Chemicals & Allied Industries	NICHEM	National Chemical Laboratory, Pune
6. Management Sciences	NICMAN	Indian Institute of Management, Ahmedabad
7. Marine and Aquatic Sciences	NICMAS	National Institute of Oceanography, Goa
8. Publications on CD-ROMs	NCCROM	Foundation for Innovation and Technology Transfer, IIT, Delhi
9. Tea manufacturing & marketing	NICMAT	Tea Board, Calcutta
10. Leather Technology *	NICLAI	Central Leather Research Institute, Chennai
11. Advanced Ceramics *	NICCAC	Central Glass & Ceramics Research Institute, Calcutta
12. Bibliometrics *	NCB	Indian National Scientific Documentation Centre, New Delhi
13. Crystallography*	NICRYS	University of Madras, Chennai
14. CD-ROM*	NICDROM	National Aerospace Laboratory, Bangalore

*** NISSAT support to the centres at serial no. 10 to 14 has since been withdrawn.**

NICHEM centre continued to perform well during the year 98-99. More than 70% of its services are provided for industry, primarily chemical and pharmaceutical industry. The services

provided by the centre includes reprography, document supply, translations, online search and patents. There has been a marked increase in the demand for patents and translations over the previous year. The centre also has set up an internet facility to provide information to the clients, ordering of patents and journal articles, online search etc. The centre has also large number of electronic resources and have made them available through internet.

The **NICMAN** Centre is providing services using ABI/Inform, Econlit, Social Science, Citation Index, Current Contents On Disc.-Behaviourial And Social Sciences. The centre developed a database consisting of records of current acquisition, articles and news items from Economics Times and Financial Express. The centre took initiatives in publishing its activities and tied up management development programme for extending information services to various programmes.

The centre has launched three information services such as information bulletin on management, current index on management and current contents in management & marketing. The information bulletin contains executive summaries of latest selected articles from important management and social science journals published all over the world.

NICMAS centre maintains databases on Marine Science studies in Indian Ocean, Directory of Indian Marine Scientists and Contributions of NIO scientists, Union catalogue of periodical holdings of science libraries in Goa, Bibliographic database of literature on Indian Ocean. The centre also provide services using ASFA (Aquatic Sciences and Fisheries Abstracts), Current Contents On Diskettes (CCOD) with three sections on :

a) Physical, Chemical and Earth Sciences

b) Agriculture, Biology and Environmental Sciences and

c) Engineering, Computing and Technology

An Indian National Oceanographic Internet Server (INOIS) established under NICMAS. The bibliographic databases available with NICMAS have been transferred into web format and published in INOIS server. The centre has developed a unique oceanographic search engine 'MANTHAN' on the web which would facilitate locating the oceanographic information/ data available on the web.

An Information Centre on Indian Tea **(NICMAT)** is being established in Tea Board, Calcutta during the current financial year for facilitating timely information on latest techniques and practices in tea production and manufacturing, providing access to latest market information on tea etc. The centre will be using appropriate information technology for establishing and maintaining a web-site on India Tea.

NISSAT has established a national collection centre for publications on CD-ROM databases on India and about India at Foundation for Innovations and Technology Transfer at Indian Institute of Technology, Delhi. A centre of this kind is deemed necessary to collect nationally produced documents on CD-ROM medium systematically, as the Delivery of Books Act (1994) does not at present include explicit provision to cover such products. The present concentration is on (a) knowledge and information products and those published on CD media (except software, games, music and purely entertainment CDS). The centre also maintaining a ***Union list of CD-ROM databases acquired in various library/information centres in India*** .

3.2 NACIDs : National Access Centres to International Database Services

NISSAT established nine NACID facilities in Ahmedabad, Bangalore, Calcutta, Chennai, Delhi, Hyderabad, Mumbai, Pune, and Thiruvananthapuram for providing online facility to access international database services.

Initially, the NACID centres were providing services by connecting Dialog through Telex lines at 300 bps. Later on, they started using GPSS, INET to access Dialog and STN databases. The advent of Internet and availability of database on Internet, the centres are also now using these facilities for providing the services.

3.3 VAPIS : Value-Added Patent Information Systems

With the changing economic scenario in the country and the impending IPR regime, it is imperative to strengthen the patents information activities in India. The fierce competition faced by

Indian industries, the necessity for creating awareness about competitions innovations and the availability of foreign technology have made the patent information vital for the industry.

Considering the expert manpower available in the national R&D systems and the increasing need from industries for technical information, NISSAT established Value Added Patent Information System (VAPIS) at National Chemical Laboratory, Pune on Chemical Sector and Central Manufacturing Technology Institute at Bangalore on Engineering sector to offer specialized, value added information services. The services are based on databases pertaining to US, European, World, Japanese and other patents available on CDROM. Separate subset of the database on Chemicals is located at NCL, Pune and on Engineering in CMTI, Bangalore. Another VAPIS centre on Biotechnology is being established during the current year of report in CCMB, Hyderabad.

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

4. INTERNET BASED ACTIVITIES

4.1 Web Servers

NISSAT has moved a step ahead by establishing web sites/servers so far on:

- Indian Ocean Server, at NIO, Goa
- MYLIBNET at CFTRI, Mysore
- Indian Consultancy at CDC, New Delhi
- Indian S&T at the IISc., Bangalore.
- Website on NISSAT
- Website on ISIS CLEARING HOUSE
- Website on Indian Tea
- Website on Indian IPR law

The Web server on Indian Ocean is a response to the recommendations made by the International Oceanographic Commission. It is also expected to help NIO to integrate its existing information activities for the provision of a one window information service. The MYLIBNET is initially meant to facilitate the exchange of information among the libraries in Mysore and in due course organize information on Indian food industries.

The Indian Consultancy site hosts home-pages of consultancy organizations, their area of activities and also a mart for consultancy offers and those required. The S&T server project become operational in 1998. It would include home-pages of R&D and academic institutions, information on materials and supplies, forthcoming events, employment opportunities, extra-mural support schemes of various agencies and so on.

The focus on Indian S&T web-server (http://vigyan.ncsi.iisc.ernet.in) is to create an internet website for S&T and to use the facilities to operate an internet training school. The school will be used to train a multitude of users for effective use of internet and trainers to act as web publishers and web administrators. The broad categories of information that would be hosted on the web-site would include, Policy and plan document, Institutional details, S&T projects, annual reports of S&T departments, expert manpower, Directory type of information, forthcoming conferences and events, Selected newsletters and journals of various S&T organizations, S&T news weekly etc.

The Indian Tea website (www.indiantea.org) contains information on tea producers directory, tea exporters directory, overseas tea importers, tea statistics, tea economics, tea business and trade, tea research, machinery used in tea industry, info on tea cultivation and tea manufacture etc.

The web site for Intellectual Property law (www.iprindia.org) is a comprehensive site for intellectual property issues in India. The Site contains judicial decisions of Indian and foreign Courts, (along with relevant head notes), a number of well-researched and innovative articles, highlighting recent trends and developments in intellectual property. The Site hosts International Conventions and the prevailing texts of the Acts relating to all the areas of intellectual property being patents, trademarks, copyrights, designs, trade secret, geographical information, traditional

knowledge. It also provides links to a number of web sites on the internet dealing with intellectual property, along with a short summary briefing the contents of these sites and also enabling to access a world wide database on intellectual property. Yet another useful feature of the site is the provision for Frequently Asked Questions (FAQs) which deals with common queries that arises in the area of intellectual property. The discussion forums enables the users to post discussion issues and get them clarify in the Site itself.

5. INDIAN LISFORUM

In collaboration with the NCSI at IISc, NISSAT has set up an Electronic Mail Discussion Forum called **LISFORUM** for providers and users of information services in India. The facility provides an E-Mail based electronic forum for its participants to discuss issues of relevance to library and information services. The facility is available to users of ERNET and other networks that have *connectivity to ERNET.*

6. INFORMATION RESOURCE SHARING

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

The NISSAT agenda for library networks is limited to the development of metropolitan systems, the logic being that libraries and library users in close geographical proximity can effectively utilize a library network. Given this, the goal of information/library networks is to inter-link information resources in a metropolitan area such that users could access information irrespective of its location, format, medium, language, etc. Further, the development of such networks require actions in several areas such as training, rationalization of acquisition of information resources, diffusion of standards, preparation of union lists, generation of database services apart from setting up hardware, software and communication facilities.

NISSAT strives further to develop self-sustaining information systems. With this end in view, NISSAT goes to the extent of setting up general infrastructural facilities like network service centres including hardware, software, manpower, organizational requirements and communication facilities. The participating institution in a network have to arrange for their own terminal hardware, software, manpower and take the responsibility of database development. NISSAT extends support for training, and common facilities like development of standards, preparation of union catalogues, data conversion and so on. Table 2 provides a list of Network Hosts and network services management bodies.

Table 2. NISSAT Sponsored Metropolitan Information/Library Networks*

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

Network activities like creation of OPAC bases, document delivery service facilities, inter library loan through local couriers (ILL), current awareness services (CAS), rationalization of periodicals acquisition, creation of Union lists of current subscriptions are taken up. With changed IT options, E-Mail, Remote login/ftp, Internet access services are offered to the participants. Network services centres also provide Online and CD-ROM based search services .

PUNENET and MYLIBNET maintains its web-sites, namely www.punenet.ernet.in and www.mylibnet.org.in respectively.

7. INFORMATION TECHNOLOGY APPLICATIONS

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

As on date, there are about 1500 installations of CDS/ISIS and 48 installations of IDAMS in India. The implementation of CDS/ISIS is monitored regularly through exchange of information, user's group meetings (seven such meetings have been held so far) and periodic surveys.

SANJAY is a package developed by NISSAT in collaboration with DESIDOC to help the libraries and information centres in India to improve their house-keeping and service functions through automation. The package is totally menu driven and can be used even by non-professionals. The package was released for marketing in September 1995, and till now it has an installation base of 50 sites.

These apart, NISSAT has collected several of small packages and utilities like **Fangorn, CCF-MARC** and vice-verse, **dBASE to CDS/ISIS** and vice-verse, **GLOB** for global replacement, **NEWSDI** from Indian institutions and abroad for distribution among Indian users.

NISSAT has entered into an agreement with the MINISIS Resource Centre at the SNDT Women's University for marketing of the package and applications development.

8. DEVELOPMENT OF SKILLS IN INFORMATION SCIENCE AND TECHNOLOGY

Existing library and information science courses cannot keep pace with the rapid developments in the information field; there is a need to supplement these with continuing education programme at various levels. In view of the situation, NISSAT encourages and supports a variety of manpower development programmes which cover topics such as Application of computers in library and information centres, Use of personal computers & CDS/ISIS, TQM in library services, ISO 9000 Quality Management System, etc. Seventeen courses were organized during the current year.

9. RESEARCH & DEVELOPMENT AND SURVEY STUDIES

9.1 Scientometrics & Informetrics in India

In consultation with and active participation of the subject specialists, the NISSAT has formulated a plan of action for scientometric and informetric studies in India. As a first step in the implementation of a programme of coordinated research, ten projects on ***National Mapping of Science*** using CA, Compendex, Inspec, SCI, Medline plus, BIOSIS, EMBASE, Georef, CAB, AGRICOLA, ISA database have been taken up. Table 3 provides the areas and institutions where the studies were carried out.

These studies attempt to map the Indian efforts in science through analysis of Indian contributions to the scientific literature as covered in CDROM databases. The executive summaries of these studies being hosted in S&T Server (VIGYAN server). The study of Mathematical Sciences is being taken up during the current year.

NISSAT also promotes and supports research and development and survey studies. The list of such projects/efforts during the year of report is given in Table 4.

Table 3 : Project Areas under National Mapping of Science

Project Area	PI Institution
Agricultural Sciences	M.S.Swaminathan Foundation , Chennai
Biological Sciences	National Centre for Scientific Information, Bangalore
Chemistry	National Chemical Laboratory, Pune
Engineering Sciences	Documentation Research & Training Centre, Bangalore
Geo-Sciences	Regional Research Laboratory, Bhubaneswar
Medical Science	Indian Council of Medical Research, New Delhi
Physics	National Physical Laboratory, New Delhi
Science & Technology	National Institute for Science, Technology, Development Studies, New Delhi

Table 4: Studies / Surveys supported by NISSAT

Activity	PI Institution
Indicators of Competence in Industrial Innovation	NISTADS, New Delhi
Database and Annual Publication on Bibliometric Indicators of Indian Science	NISTADs, New Delhi
Holistic improvement of leather workers through information support in selected villages in Tamil Nadu	CLRI, Madras

10. DATABASE DEVELOPMENT ACTIVITIES

In pursuance of its thrust on contents development, NISSAT encourages indigenous database development activities. Besides library catalogues, union catalogues and lists, the activity could be on subjects in which a global database does not exist, or on subjects in which Indian elements are not properly represented. Table 5 indicates the various projects supported by NISSAT during the period of support.

Table 5: Indigenous Database activities supported by NISSAT

Database Activity	PI Institution
Database of Indian Chemical & Pharmaceutical Industries	NICCHEM, NCL
Directory of manufacture of various kinds of Ferrous and Non-Ferrous and Special Castings	IIF, New Delhi
Bibliographical database of Indian Scientists	JNU, New Delhi
Indian Sugar Industry	VDIS, Pune
Directory of Libraries and Information Centres in Gujarat	GGSS, Ahmedabad
Database on Indian Web-site Using MINISIS	SNDTWU, Mumbai
Virus and Virology	NIV, Pune
Rosters of Experts and Resource Organizations for Rural Technology	RCIATM, Allahabad
Database on Silkworms	MKU, Madurai
Directory of Database on Agrochemicals Industry Sector	CCMB. Hyderabad

11. INTERNATIONAL ACTIVITIES

The activities of ASTINFO/UNESCO (Regional Network for the Exchange of Information and Experiences in Asia and the Pacific/UNESCO) are closely co-ordinated with those of NISSAT. The NISSAT Advisory Committee also functions as the National Advisory Committee of UNISIST and the National Advisory Group for ASTINFO.

NISSAT had earlier authored the section on South Asia in the World Information Report 1997 prepared by UNESCO. NISSAT has been included in the Advisory Group to guide preparation of the World Information and Communication Report 1999.

12. INFORMATION TODAY & TOMORROW (ITT)

Under the banner of ITT, two specific activities are undertaken.

- A national meet of information industry, promoters and users, is held every year. The Information Today & Tomorrow meet, as it is popularly called, was held in Hyderbad during November 16-19, 1999. The four day event had an inaugural function, a panel discussion on Content development, nine technical sessions consisted of 24 paper presentations, a Road show for Doctors and Exhibitions by Info-industries.

- NISSAT has been bringing out its *NISSAT Newsletter* -- a quarterly newsletter since the beginning of the programme. Over the years, the format has undergone several revisions in keeping with the changing information scenario. Now, the contents include information on new tools and techniques, events concluded and announcements, interesting Internet sites, new database products and services. With a change in the title, *Information Today & Tomorrow*, the quarterly periodical is distributed free to 5000 individuals and institutions.

VIII. PUBLIC SECTOR ENTERPRISES

VIII(A). NATIONAL RESEARCH DEVELOPMENT CORPORATION

1. INTRODUCTION

National Research Development Corporation (NRDC) is the principal organisation established by the Government to act as a link between scientific laboratories and industrial establishments for transferring technologies. It is a unique organisation in that it is the only public enterprise wholly dedicated to transfer of technologies from R&D laboratories to industry. What is more, its operations cover the entire spectrum of industrial technologies ranging from chemicals to metallurgy, mechanical engineering, electrical engineering, electronics, biotechnology etc.

During the year 1998-99, the Corporation continued to face the challenges of liberalisation with confidence in spite of sluggish market conditions witnessed during the year. The Corporation's continued sincere and stimulated endeavour and sustained marketing efforts have helped in not only increasing the turnover but the profits as well. The Corporation has earned Lumpsum Premia and Royalties amounting to Rs.172.71 Lakhs as compared to its 139.11 Lakhs during the previous year. The Gross Profit has gone up to Rs 45.96 Lakhs, as compared to Rs.30.68 Lakhs during the year 1997-98.

2. PROFIT

With aggressive marketing efforts, sincere and dedicated hard work of its executives and staff, the Corporation has increased the profit substantially. During the year the Corporation has earned a gross profit of Rs.45.96 lakhs against Rs.30.68 lakhs in the previous year.

The gross income of the Corporation from all sources, including premia and royalty, but excluding Grants-in-Aid, was Rs.284.70 lakhs as compared to Rs.245.23 lakhs in the previous year. The Department of Public Enterprises has given the 'Very Good' rating to Corporation for its MOU performance during the last year (1997-98).

3. PROCESSES ASSIGNED AND LICENCE AGREEMENTS CONCLUDED

The Corporation continued its efforts to widen its technology resource base by nurturing long term relationships with R&D Organisations as well Universities/Technical Institutes in India and abroad. During the year 42 new processes were assigned to the Corporation as compared to 38 in the previous year. Some of the commercially important processes assigned to the Corporation during the year were:

- *Pelletization of parboiled rice bran*
- A process for resting of coconut husk
- A Process for treatment of coir resting effluent
- A process for preparation for an anti-diabetic *preparation*
- A process for preparation of catalysed oxygen scavenger for prevention of metallic corrosion in systems using different grades of water
- Fly ash based acid resistant bricks/tiles
- Preparation and use of eco-friendly vegetable dyes from abundantly available forest biomass
- Process for preparation of Katha from uncaria gambier
- Preparation of adhesive from big-polymers
- A fluidised abrasive polishing machine

In spite of intensely competitive scenario, during the year 27 licence agreements were signed as compared to 34 in the previous year.

4. MAJOR TECHNOLOGIES LICENSED

Some of the major technologies licensed by the Corporation during the year were:

- Bakery margarine
- Glucose bio-sensor
- Nano-size stabilised zirconia production
- Vanadium Penta-oxide
- Spirulina algae
- Preparation of Katha from Gambier
- Defatting of groundnut without losing shape
- 777 Oil for treatment of psoriasis
- Test Kit for microbiological quality of drinking water
- Bio-degradable plastic

5. TECHNOLOGY DEVELOPMENT PROJECTS

The Corporation has been promoting and financing in collaboration with industry/R&D institutes, technology development projects for setting up pilot/semi-commercial/ demonstration plants. The Progress on major technology development projects is given below

5.1 On-Going Projects:

5.1.1 Thrombinase- a blood clot dissolving agent

Thrombinase, a novel blood clot dissolving agent has been isolated, identified and purified for the first time from a Bacillus species at the Vector Control Research Centre, Pondicherry. The Corporation in collaboration with Malladi Research Centre, Madras has been carrying out joint development work at a cost of Rs.80 lakhs. The work on the project started in June 1996. A sum of Rs.18.94 lakhs has already been released. The work is progressing satisfactorily. The Corporation has filed patent applications for the process in India, USA, EPO (Germany, Switzerland, Belgium and UK). Patents in USA & UK have already been granted. The Corporation has also initiated negotiations with a major Japanese Company for licensing of the Know how and Patent Rights.

5.1.2 Industrial Park For Backward Classes

The Corporation received Rs. 20 lakhs as Grant-in-aid from the Department of Scientific & Industrial Research for setting up of an Industrial Park for Backward Classes for the upliftment of the persons from Backward classes in association with the National Backward Classes Finance and Development Corporation (NBCFDC), New Delhi . The Corporation has signed an Agreement with National Backward Classes Finance and Development Corporation (NBCFDC), New Delhi on 14th January, 1999 for setting up of the above Park. NBCFDC has obtained a land at Kal Jharani, near Bhatinda through their state-channelising agency, Punjab Backward Classes Land Development & Financial Corporation (BACKFINCO). NBCFDC would provide the loan up to Rs. 5.00 lakhs on a subsidised rate of interest for each entrepreneur through BACKFINCO. A Co-ordination Committee, consisting of the representatives from DSIR, NBCFDC, BACKFINCO, and District Administration of Bhatinda short-listed the projects. As per the recommendations of the Committee, NRDC is carrying out survey on the availability of resources, infrastrueture, manpower, etc. at Bhatinda for selection of projects and possible marketing assistance that could be provided to the entrepreneurs.

6. PROJECTS SUPPORTED BY THE DEPARMTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH (DSIR)

DSIR has been supporting technology development projects under its "Programme Aimed at Technological Self Reliance (PATSER)" involving industry, research institutes and consultants. The Corporation has been identified as the agency to manage all matters connected with the intellectual property rights generated in these projects, as also to collect the royalty revenues accruing from the utilisation of the technology by the collaborating Company and also from third party licensing. A few of the major projects undertaken during the year under PATSER are:

- Development and manufacture of PTFE claded rubber seals with M/s Tungabhadra Steel Products Ltd., Bellari Distt., Karnataka
- Development of rough top conveyor belting with M/s Andrew Yule & Co. Ltd., Calcutta.

- Extraction of cobalt to extract copper sulphate and cobalt with M/s Hindustan Zinc Ltd., Udaipur.

- Development of stiff extrusion technology for extruding solid purforated and hollow building Bricks with M/s Priya Bricks Pvt.Ltd., Calcutta.

- Development of 5 axis CNC internal grinding machine with 4 position turret and B and C Axis with M/s PMT Machine Tool Automatic Ltd., Pune.

- Development of Fly ash slurry pump with M/s Bharat Pumps & Compressors Ltd., Naini (Allahabad).

- 4-Axis CNC cutter and tool grinder with M/s Praga Tools Ltd., Secunderabad.

- Metal hallide lamps including arc tube and electronic control gear with M/s Autopal Industries, Jaipur.

- Development of detonating card with M/s IBP, Gurgaon.

7. MARKET SURVEYS

Market surveys not only make the technology to be licensed more complete and credible, but also help in assessing the realistic price at which the technology can be licensed. With this object in view, the Corporation continued to carry out market surveys on commercially important technologies through professional market survey agencies for the purpose. During the year, market survey reports on the following items were completed:

- Nano-Crystalline Alumina Powder

- PET Recycling

- Membrane Technology

- Diamond and Diamond Like Coating

- Radiation Processed Hydrogel

- Picture Capture and Retrieval System

- Magneto Forming using Capacitor Bank Technology

- Micro Crystalline Cellulose from Groundnut Shells

- Intra Occular Lenses

- Henna Based Hair Dye

8. INVENTION PROMOTION PROGRAMME

The Corporation continued to promote and encourage inventive talent amongst scientists, engineers, industrial workers and students by awarding prizes for meritorious inventions and providing financial assistance for fabricating prototypes setting up pilot plants to prove such inventions.

During the year, the Corporation received 59 proposals for prize awards and 6 proposals for providing financial assistance.

The Corporation announced on Independence Day (1998) cash awards amounting to Rs.2.20 lakhs for 5 inventions. On Republic Day (1999) cash awards amounting to Rs 2.30 lakhs for 9 inventions were announced. Beginning from the current year, Prize Awards will be announced on National Technology Day i.e. 11th May every year.

World Intellectual Property Organisation (WIPO) Gold Medals have also been awarded to 2 inventions viz. Development of process technology for manufacture of detergent grade Zeolite and Development of process for spinning jute/cotton blended yarns in short staple spinning system that are suitable for developing countries

Some of the meritorious inventions recognised through awards during the year were:

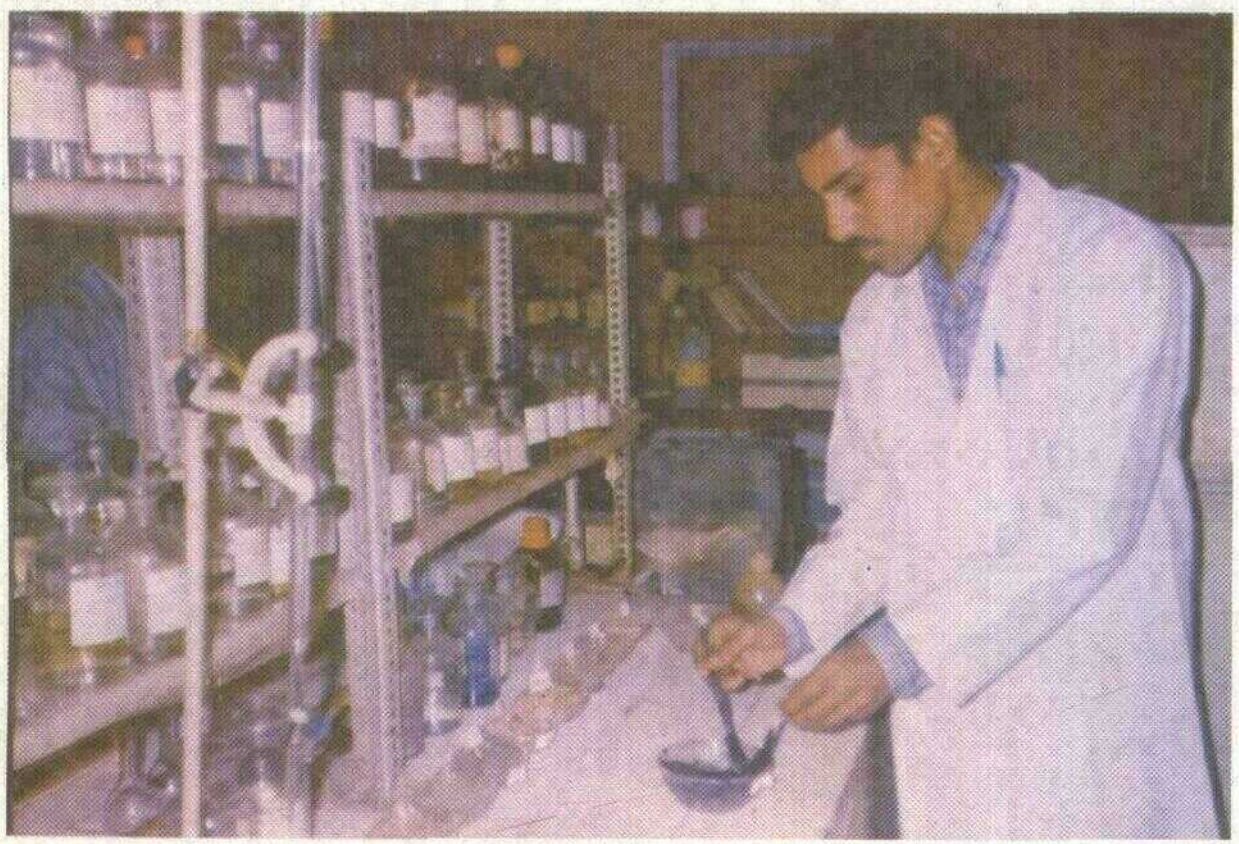
- Preparation of Alumina Hydrate of superior purity and fineness & Process for preparation of low soda, high alpha, pure alumina

- Upgradation of Electro Optical Tracking system

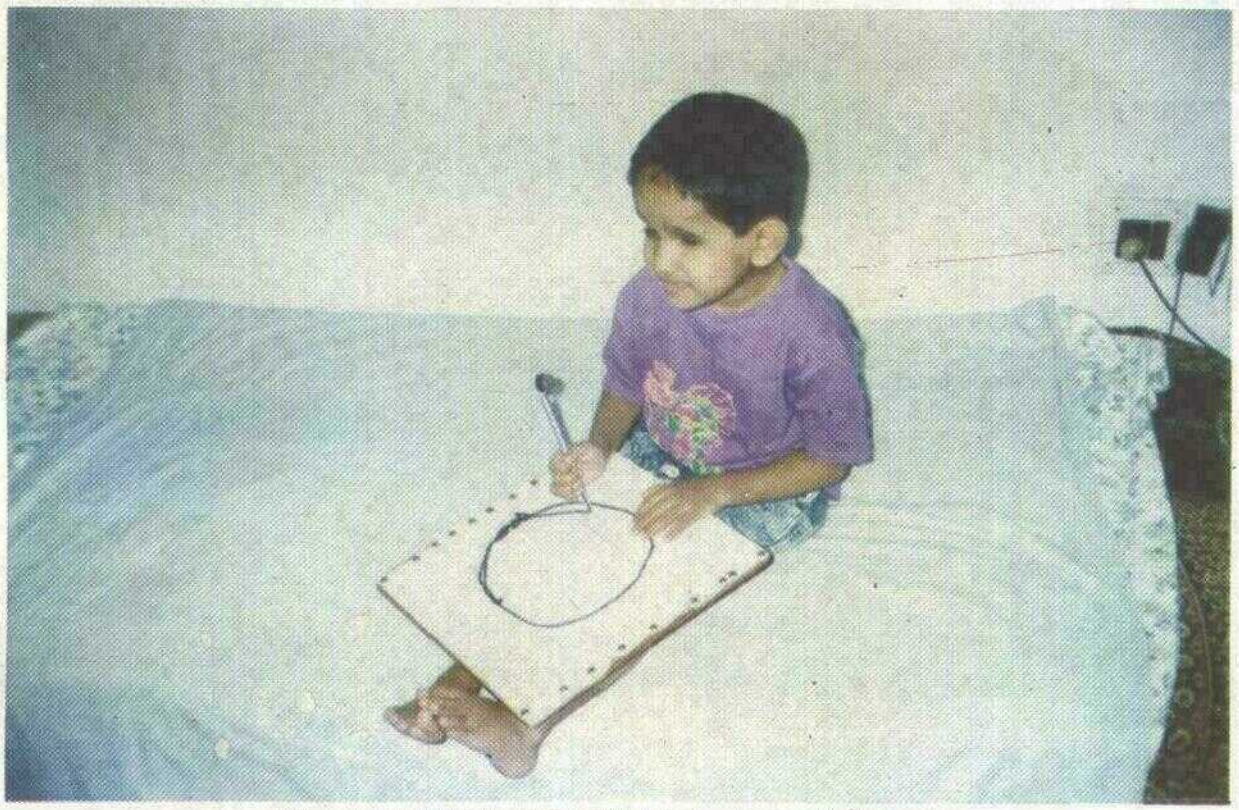
- New Ejection Mechanism of Spent Cases of Gas Operated Rifle

- Sketching Device for Tactile Graphics

- Curvex Batch Coder

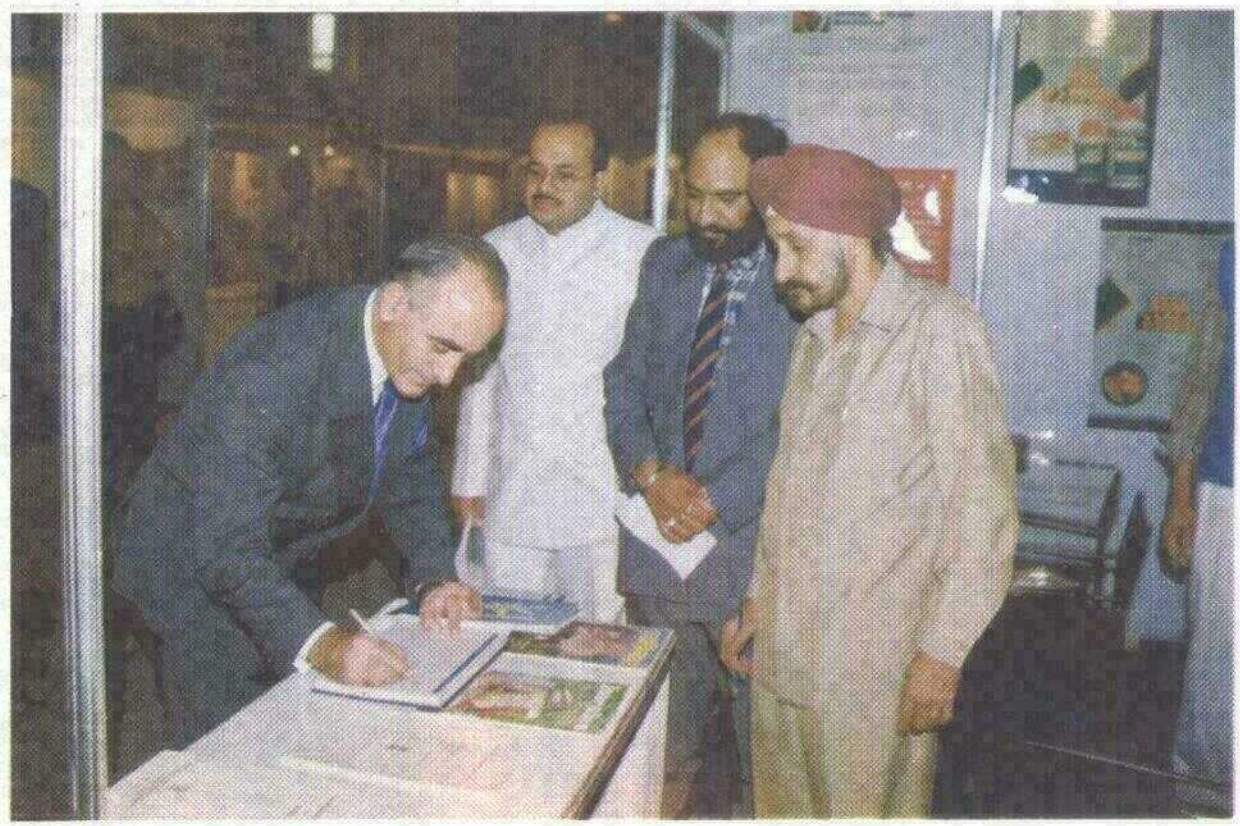


VIII.A.2 *Scientist carrying out tests on Henna based hair dye at FDRA labs, Faridabad for which NRDC carried out the market survey*



VIII.A.3 *Sketching device for the blind — An awarded invention*

VIII.A.4 *Joining hands for setting up a plant for manufacture of Cassava Starch in Senegal*



VIII.A.5 *Leader of the Croatian delegation, Mr. Nenad Porges, Minister of Trade and Tourism, Croatia visited the NRDC stall*

8.1 Patent Assistance

Keeping in view the globalisation of economy, the significance of Intellectual Property Rights is increasing. With this end in view your Corporation is putting more emphasis on providing technical, legal and financial assistance to inventors in drawing up patent specifications, processing their patent applications etc. During the year, the Corporation received 48 applications from individual inventors for such assistance. Assistance was granted to 35 inventors based on the patentability of the inventions involved and 60 patent applications were also filed on behalf of different R&D organisations.

9. DEVELOPMENT & PROMOTION OF RURAL TECHNOLOGY

The programme aimed at the application of S&T for improving the standard of living of our rural people by increasing employment potential through the development and application of appropriate rural technologies utilising local resources. With this end in view, the Corporation continued the programme of Development and Promotion of Rural Technology as detailed below:

9.1 On-going Projects

i. Design & Development of Direction Finder to Locate Radio distress Signals from Fishermen at Sea

The Corporation has provided a financial grant of Rs. 4.30 lakhs to Electronics Research & Development Centre (ER&DC), Thiruvananthapuram for the design and development of a Direction Finder to work with a sea-water proof, floatable, radio beacon for use of fishermen in distress who go to sea in open boats without any safety equipments or means of communications. ER&DC has already designed and fabricated prototype of the device. The field trials under actual sea condition are underway.

ii. Latex Based Products from Euphorbia Plants

The Corporation has paid a sum of Rs.1.5 Lakhs for setting up a Production-cum-Demonstration unit in a euphorbia growing area of Dehradun in collaboration with a voluntary agency ASHRAYA, Dehradun. It is proposed to evaluate the techno-economic viability of the project in actual field conditions. After successful field trials, this facility will be utilized for demonstration and imparting training to rural people who may be interested in setting up cottage industry in their area.

9.1.1 Completed Projects

i. Consultancy Services to Government of Nagaland for Setting up Industries in Nagaland.

An Industrial Resource Survey of Nagaland was conducted in collaboration with Govt of Nagaland, Department of Industry at a cost of Rs. 2.5 Lakhs for identification of potential technologies and to explore the possibility of setting up industries based on the Technologies which have good commercial potential in Nagaland. The survey work has been completed and the Corporation is now planning to conduct the Entrepreneurship Development Programme (EDP) in Nagaland and other North-eastern States to create awareness about the Technological Opportunities for Industrial Growth in North East-Region in close co-operation with local Govt. organizations.

9.2 Rural Technology Demonstration Cum Training Centres (RTDT)

The methodology adopted by the Corporation is to demonstrate the utility of its rural technologies and ensure their faster dissemination by setting up RTDT Centres in collaboration with voluntary agencies in various regions of the country. The Corporation has so far set up 52 RTDT Centres. Keeping in view the technological requirements of these Centres, some of the existing RTDT Centres as detailed below were strengthened during the year 1998-99:

9.2.1 Installation of Solar Timber Seasoning Unit

A solar based Timber Seasoning Unit has been installed at RTDT Centre, Kalika, Ranikhet (U.P.) with an objective to promote wood-craft industry in U.P Hills at a cost of Rs. 1.5 Lakhs, so that employment opportunities could be created at the doorstep of the rural populace. The demonstration facility is being utilised by local artisans in seasoning the local timber.

10. PROMOTION OF EXPORT OF TECHNOLOGY

The export performance during the year 1998-99 was much lower than expected and virtually no export took place. The weakness in export performance replicates various international and domestic factors which include a decline in the growth of World trade, massive depreciation of the currencies of the East Asian economics and numerous other domestic factors.

After protracted negotiations an agreement for supply of know-how and plant and machinery for manufacture of Cassava Starch at a total value of US$128,035 has been signed with M/s Societe des Produits Kaftan, Senegal.

11. PUBLICATIONS

An important activity of the Corporation is to disseminate information on new processes to industry, entrepreneurs and the general public for the promotion and commercialisation of technologies. One of the means of doing so is through publications of various types. During the year, the Corporation continued to bring out the following regular publications:

- Awishkar- (Monthly in Hindi)
- Invention Intelligence - (Bi-monthly in English)
- Booklet on NRDC Processes

12. SALE OF DSIR PUBLICATIONS

The Department of Scientific & Industrial Research has entrusted NRDC with the marketing and sale of their publications on Technology Status Studies/Tech.Evaluation Studies/Project Profiles/ Consultancy and other Studies and Handbook of foreign Collaboration Approvals (1981-90). During the year, the Corporation sold 37 reports valued at Rs. 0.15 lakhs.

13. EXHIBITIONS AND PUBLICITY

Participation in exhibitions, seminars, workshops, entrepreneurship development programmes etc. are of vital importance for the creation of awareness about the role of the Corporation in technology transfer. With this end in view, the Corporation participated in exhibitions, seminars and get-togethers organised by various agencies as detailed below:

i) R&D '98, Calcutta, (8-11 April, 1998)

ii) SATEX, New Delhi, (27 30th July, 1998)

iii) Electronics Buyer-Sellers Meet EFY'98, New Delhi, (8 – 10th Oct.,1998)

iv) The Fifth ASEAN Week, Vietnam, (12-15th Oct., 1998)

v) Technology Summit Platform '98,New Delhi, (28-29th Oct., 1998)

vi) METECH '98, Bangalore, (14-17th Nov.,1998)

vii) IITF '98, New Delhi, (14-27th Nov.,1998)

viii) INTECHMART, 98, Ahmedabad, (4 - 6th Dec, 1998)

ix) TECH-TRANS '98, New Delhi, (10-11th Dec.1998)

x) Pharma Expo India, Mumbai, (10-14th Dec.1998)

xi) Enviro International, New Delhi, (14 -17th Dec.,1998)

xii) Building Materials, (8 - 10th February,99)

xiii) IETF'99, (12-17 Feb., 1999)

xiv) IT-RD Expo '99, (13-14 March, 1999)

14. IMPLEMENTATION OF OFFICIAL LANGUAGE

The Corporation continued making efforts to implement the provisions of the Official Language Act and Rules framed there under to ensure the continued use of Rajbhasha in its day to day working. Significant progress has been made in the field of correspondence noting and drafting in Hindi. The Annual Report of the Corporation is being published in diglot form in both Hindi & English since 1986-87. The Corporation also publishes a popular science and technology monthly in Hindi, entitled Awishkar. To promote Rajbhasha "The Comprehensive Glossary of Administrative Terms (Eng-Hindi)" was distributed amongst all officers.

VIII(B). CENTRAL ELECTRONICS LIMITED

1. INTRODUCTION

Central Electronics Limited (CEL) holds a unique position among the family of Public Sector Enterprises in Electronics, with its emphasis on indigenous technology inducted both from its in-house developments and from the country's National Laboratories, for its production programmes in diverse hi-technology areas of National Relevance. The activities of CEL are sharply focussed in three thrust areas:

i) Solar Photovoltaic cells, modules and systems for a variety of both rural and industrial applications

ii) Selected Electronic Systems - equipments for Railway Signalling and Safety, Cathodic Protection equipment for oil pipelines, Rural Automatic Exchanges (RAX) and Very Small Aperture Terminals (VSATs).

iii) Selected Electronic Components Professional (soft) Ferrites, Electronic Ceramics, Piezo Electric Elements and Microwave Components.

2. PERFORMANCE IN 1998-99

2.1 Operating Results

Production and sales achieved during the year as compared to the previous year are given below:

(Rs. in crores)

	1997-98	1998-99
Production	80.21	44.67
Sales	67.00	51.13
Profit/Loss	0.46	(-) 5.96

The Company was carrying an inventory of finished goods for Rs.24.72 crores as on 1.4.98 bulk of which were SPV modules for supply against anticipated DOT requirements which did not materialise. Therefore, the production during the year was deliberately kept at low level and the Company could reduce the inventory as on 31.3.99 by Rs.6.46 crores. The Company could also reduce the sundry debtors from Rs.26.82 crores to Rs.23.2 crores.

2.2 Exports

2.2.1 Solar Photovoltaics Group

The Company has successfully executed export orders of 57 Kwp of SPV cells, modules and systems consisting of domestic lights, street lights, solar water pumping systems, solar lanterns etc. worth Rs.2.83 crores to various countries namely Burkinafaso, Turkmenistan, Libya, Bangladesh, Senegal, Syria, Cameroon, Ghana, Myanmar, Nigeria, Zambia and Mali.

2.2.2 Components Group

The Components Group exported 17000 nos. of piezo ceramic tubes to France for the fourth consecutive year with likely repeat export orders for 15000 tubes to be supplied during the next year.

3. OTHER HIGHLIGHTS OF 1998-99

3.1 Visits of Important Dignitaries

A number of VIPs visited the Company during the year. These included foreign delegations from Republic of Burkinafaso, Uganda, Zambia, Turkmenistan and Cuba. The other notable visitors were:

Mr. Gerald Sendaula - Minister of Natural Resources (Uganda), Mrs. Sibeso Simasiku - Govt. of Zambia, His Excellency Shri George Joseph - Ambassador to Turkmenistan, Hon'ble Shri Bachcha Pathak - Minister of Environment & Non-Conventional Energy (Lucknow), Shri C.R. Kamalnathan - Secretary (MNES), Shri Prabhati Lal - Director (M.E.A.), Shri V. Chander - Director, NPOL (hardware Cochin), Shri S.S. Sekhon - Director (PEDA - Chandigarh), Shri S.Mohan - Director (CSIO, Chandigarh) and others.

3.2 Disinvestment in CEL

The Disinvestment Commission in its 8th Report submitted in August, 1998 recommended that efforts should be made in the Company to substantially reduce manpower through an attractive Voluntary Retirement Scheme and further to improve its performance within the next two years failing which the CEL may not be allowed to remain a

Public Sector Undertaking. Accordingly, the Company submitted an attractive Voluntary Retirement Scheme in March, 1999. The approval for the same by the Government is still awaited.

The following steps have been taken to improve the performance of the Company:

- The Company has entered into areas of strategic applications through alliance with the Solid State Physics Laboratory of the Ministry of Defence for development and manufacture of Cadmium Zinc Telluride (CZT) Devices.
- The Company is also studying facilities for vertical integration by strategic co-operation with Russian partners to manufacture silicon wafers to ensure raw material security.
- Another area of capacity building will be in the field of digital axle counters for which large market is anticipated from Railways.
- In exploration of the possibilities of exports to new markets, recently, the Company has received an order from Republic of Namibia.
- Shift the market focus to Nodal agencies and other virgin markets by moving from the traditional DOT market.
- Exploring the possibilities of entering into a Marketing tie-up for R.O. Plants with well reputed international manufacturers in the field of water purification.
- A comprehensive water pumping programme has also been undertaken under IREDA Programme.

The future of the Company is considered to be safe and the Company will be economically viable at its own strength in future.

3.3 Y2K Compliance

All necessary steps to overcome the Y2K bug had been taken. The inventory of, application software and databases had been scanned and studied thoroughly. The old and obsolete PCs have been upgraded to enable them for hardware compliance. For centralised and integrated EDP operations which have maximum impact on our operations, the existing AT/486 based multi-user system is being upgraded to P-III/450 Mhz based Acer Allots 330 server along with SCO open server 5.0.5.

The anticipation software has been modified and converted into Y2K complaint internally which is running successfully in the year 1999-2000. The total cost to make the system Y2K compliant is likely to be Rs.15 lakhs. The system is Y2K complaint in all respects.

4. TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

Under the PATSER Scheme of DSIR, the project on the Upgradation of process technology for the production of Single Crystalline Silicon Solar Cells was taken-up. In this project, the technology acquired from Inter-University Micro Electronics Centre (IMEC), Belgium has been absorbed and trial production initiated. The adopted process will enhance the solar cell efficiency up to 14.5% as compared to earlier 12.8% - 13%. Plasma etching process has been developed and will be used in IMEC technology.

5. DESIGN AND DEVELOPMENT

5.1 Solar Photovoltaics Group

CEL has set-up a pilot plant for upgradation of Ultra High Efficiency solar cells based on the laboratory scale technology taken from UNSW, Australia. In order to enhance throughput on the line, electroless copper plating process is being developed jointly by NAL and CEL. The project is in the final stages of proving and the process will be implemented on UHE production line.

5.2 Electronic Systems

An engineered prototype of solid state interlocking equipment being jointly developed by CEL and C-DAC, has been completed for submission to RDSO for system validation. The prototype incorporates hot-stand-by feature, achieved by the duplicated dual processors and panel processors. This feature will enhance the operational availability of the equipment in the field. Site for the installation of the equipment for conducting field trials, subsequent to satisfactory system validation has been kept ready.

In order to enhance the market share and improve execution period for cathodic protection system. CEL has taken-up design and development

VIII.A.6 *MD, NRDC explaining about the new technologies of NRDC to Dr. R.A. Mashelkar, Secretary, DSIR at IIFT 1998, New Delhi.*

VIII.B.1 *Indo-Namibian Co-operation – H.E. Dr. Sam Nujoma, President of the Republic of Namibia at CEL.*

VIII.B.2 *Visit of Major Gen. Yoo Hong Ho, Director, Defence Quality Assurance Agency, Republic of Korea*

VIII.B.3 *Solar powered street lighting system installed in the Centre of a Village in Mali*

VIII.B.4 *Dr. R.A. Mashelkar, Secretary, DSIR, visits CEL Pavilion at India International Trade Fair at Pragati Maidan, New Delhi.*

of specific CP equipment and field survey techniques. The project has been initiated few months back with support from DSIR under S&T Scheme.

CEL has also obtained support under S&T Scheme for design and development of switched mode power plants specially for use by DOT. The project is in progress in association with IIT, New Delhi.

6. FOREIGN EXCHANGE RECEIPTS AND OUTGO

During the year 1998-99, the Company has spent Rs.788 lakhs in foreign exchange as against Rs.3104 lakhs in the previous year towards the purchase of capital equipment, raw materials and components and travel etc.

The Company earned foreign exchange of Rs. 195 lakhs as against Rs.1210 lakhs in the previous year from export of its products.

7. ENERGY CONSERVATION

The Company being an electronic industry, its operations are not energy intensive. Therefore, the requirement to furnish information on conservation of energy/energy consumption under rule 2(A) of Companies (Disclosure of Particulars in the Report of Board of Directors) Rules 1988 is not applicable to the Company.

8. PARTICULARS OF EMPLOYEES

In accordance with the Companies (particulars of employees) Rules 1975 read with Sub-Section 2-A of Section 217 of the Companies Act, 1956 as amended in 1988, none of the employees of the Company either employed throughout the year or employed for a part of the year under review was in receipt of remuneration more than that minimum prescribed in the Rules.

9. INDUSTRIAL RELATIONS AND HUMAN RELATIONS

The Company had fairly cordial industrial relations during the year as a result of the Management's continuous dialogue with the recognised Workers Union and with the Officers/Executive association.

In order to ensure the use of Hindi, the employees continued to be trained in Prabodh, Praveen, Pragya Hindi courses, Hindi type-writing and Hindi Computer. Hindi week was organised from 14.9.1999.

Various short time training programmes were conducted for workers as well as for officers during the year.

10. WELFARE OF RESERVED CATEGORIES

All Government directives relating to the Reserved Categories such as Scheduled Castes, Scheduled Tribes, the Physically Handicapped, Ex-Servicemen etc. continued to be implemented during the year. The total number of employees in these categories were 229 which represents about 26.54% of the total strength of the Company as on 31.3.1999.

IX. ADMINISTRATION

1. ADMINISTRATION

The Department of Scientific & Industrial Research was created through a Presidential Notification of January 1985. The administrative services were provided by the Department of Science and Technology till 1994-95. Thereafter, in the absence of any formal administrative infrastructure, the department is performing these tasks by creating a small cell within by loaning the officers and staff from its technical sections. The Administrative functions of recruitment of personnel, provision of general facilities, redressal of grievances of employees, parliament work and use of Hindi are being performed by the cell. Other house-keeping jobs and functions related to pay and accounts are being performed by Department of Science & Technology. Activities related to promotions of scientific staff and officers (under the flexible complementing scheme) are also looked after by the Department.

The department is also facing a further need for office space. A sum of Rs.3.00 crores has been provided during the 9th Five Year Plan towards creation of support infrastructure, building etc. for the DSIR and a programme towards provision of the same is under progress.

2. PROMOTION OF HINDI

DSIR made the following efforts for the use and promotion of Hindi in the official work and implementation of official language policy of the Government:

(a) The meetings of the Official Language Implementation Committee were held regularly in DSIR.

(b) The Quarterly Progress Report regarding use of Hindi in the Department was sent to the Department of Official Language regularly and in time.

(c) Under Hindi Teaching Scheme, non-Hindi knowing employees of the Department were nominated for Prabodh, Praveen and Pragya courses. Employees of the Department were also nominated for basic training on computer.

(d) From 1st to 15th September 1999 combined Hindi Pakhwara was observed by the Department of Scientific and Industrial Research and Department of Science and Technology at Technology Bhavan. To promote the use of Hindi in the official work, essay, noting and drafting, debate, painting and quiz competitions were organised in the Department during this period and winning officials of the Department were given prizes. Hindi versions of Orders, Notifications, Letters, Standard Drafts, Annual Report and Performance Budget were provided.

The staff strength in the different groups in the Department of Scientific & Industrial Research as on 1.1.2000 is given below:

	No. of Employees			
	Gen.	SC	ST	Total
Group A (Gazetted)	37	5	1	43
Group B (Gazetted)	4	2	—	6
Group B (Non-Gazetted)	10	4	—	14
Group C (Non-Gazetted)	24	3	2	29
Group D (Non-Gazetted)	12	2	—	14

ANNEXURES

LIST OF CSIR ESTABLISHMENTS

1 Central Building Research Institute (CBRI), Roorkee

2 Centre For Biochemical Technology (CBT), Delhi

3 Centre for Cellular and Molecular Biology (CCMB), Hyderabad

4 Central Drug Research Institute (CDRI), Lucknow

5 Central Electrochemical Research Institute (CECRI), Karaikudi

6 Central Electronics Engineering Research Institute (CEERI), Pilani

7 Central Fuel Research Institute (CFRI), Dhanbad

8 Central Food Technological Research Institute (CFTRI), Mysore

9 Central Glass and Ceramic Research Institute (CGCRI), Calcutta

10 Central Institute of Medicinal & Aromatic Plants (CIMAP), Lucknow

11 Central Leather Research Institute (CLRI), Madras

12 Central Mechanical Engineering Research Institute (CMERI), Durgapur

13 Central Mining Research Institute (CMRI), Dhanbad

14 Central Road Research Institute (CRRI), New Delhi

15 Central Scientific Instruments Organisation (CSIO), Chandigarh

16 CSIR Centre Mathematical Modelling & Computer Simulation (C-MMACS), Bangalore

17 Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar

18 Institute of Himalayan Bioresource Technology (IHBT), Palampur

19 Indian Institute of Chemical Biology (IICB), Calcutta

20 Indian Institute of Chemical Technology (IICT), Hyderabad

21 Indian Institute of Petroleum (IIP), Dehradun

22 Institute of Microbial Technology (IMT), Chandigarh

23 Indian National Scientific Documentation Centre (INSDOC), Delhi

24 Industrial Toxicology Research Centre (ITRC), Lucknow

25 National Aerospace Laboratories (NAL), Bangalore

26 National Botanical Research Institute (NBRI), Lucknow

27 National Chemical Laboratory (NCL), Pune

28 National Environmental Engineering Resarch Institute (NEERI), Nagpur

29 National Geophysical Research Institute (NGRI), Hyderabad

30 National Institute of Oceanography (NIO), Goa

31 National Institute of Science Communication (NISCOM), New Delhi

32 National Institute of Science Technology and Development Studies (NISTADS), New Delhi

33 National Metallurgical Laboratory (NML), Jamshedpur

34 National Physical Laboratory (NPL), New Delhi

35 Regional Research Laboratory (RRL, BHO), Bhopal

36 Regional Research Laboratory (RRL, BHU), Bhubaneshwar

37 Regional Research Laboratory (RRL, JM), Jammu Tawi

38 Regional Research Laboratory (RRL,JT), Jorhat

39 Regional Research Laboratory (RRL, TVM), Thiruvananthapuram

40 Structural Engineering Research Centre (SERC, G), Ghaziabad

41 Structural Engineering Research Centre (SERC, M) Chennai

ANNEXURE III.A.

STATEMENT ON RECOGNITION OF IN-HOUSE R&D UNITS

Month	Year	Receipts	Cumulative Receipts	Disposal Pendency	Cumulative Disposal	Cumulative pendency at the end of the month
December	1998	2	-	-	-	21
January	1999	12	33	7	7	26
February	1999	7	40	5	12	28
March	1999	7	47	14	26	21
April	1999	7	54	12	38	16
May	1999	13	67	2	40	27
June	1999	3	70	7	47	23
July	1999	8	78	3	50	28
August	1999	16	94	5	55	39
September	1999	14	108	10	65	43
October	1999	7	115	6	71	44
November	1999	5	120	8	79	41
December	1999	6	126	20	99	27

STATEMENT ON RENEWAL OF RECOGNITION OF IN-HOUSE R&D UNITS WHOSE RECOGNITION WAS VALID UP TO 31-3-1999

Month	Year	Receipts	Cumulative Receipts	Renewal Applications processed	Cumulative Renewals Processed	Cumulative Pendency at the end of the month
December	1998	-	-	-	-	-
January	1999	155	155	-	-	155
February	1999	25	180	-	-	180
March	1999	32	212	133	133	79
April	1999	8	220	13	146	74
May	1999	13	233	30	176	57
June	1999	8	241	22	198	43
July	1999	1	242	19	217	25
August	1999	1	243	14	231	12
September	1999	-	243	1	232	11
October	1999	-	243	2	234	9
November	1999	-	243	8	242	1
December	1999	-	243	1	243	-
Total			**243**		**243**	

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE MORE THAN Rs. 500 LAKHS

Sl. No.	Name of the firm	R&D Expenditure (Rs. in Lakhs)
1	Alfa Laval (India) Ltd.	600
2	Asea Brown Boveri Ltd.	1516
3	Ashok Leyland Ltd.	2168
4	Asian Paints (India) Ltd.	550
5	Associated Cement Companies Ltd.	769
6	BPL Limited	556
7	Bajaj Tempo Ltd.	1066
8	Bharat Earth Movers Ltd.	1194
9	Bharat Electronics Ltd.	6610
10	Bharat Heavy Electricals Ltd.	5274
11	Central Electronics Ltd.	509
12	Central Mine Planning & Design Inst. Ltd.	1667
13	CMC Limited	1097
14	Cipla Limited	1630
15	Crompton Greaves Ltd.	2174
16	Cummins India Ltd.	1044
17	Eicher Ltd.	2220
18	Electronics Corporation of India Ltd.	909
19	Gharda Chemicals Ltd.	663
20	Gujarat State Fertilizers Company Ltd.	549
21	GEC Alsthom India Ltd.	564
22	HMT Limited	541
23	Hindustan Aeronautics Ltd.	5281
24	Hindustan Lever Ltd.	3731
25	Hoechst Marion Roussal Ltd.	1169
26	Indian Aluminium Company Ltd.	1189
27	Indian Oil Corporation Ltd.	7716
28	Indian Petrochemicals Corporation Ltd.	1005
29	Indian Telephone Industries Ltd.	3383
30	Kinetic Engineering Ltd.	506
31	Lakshmi Machine Works Ltd.	1187
32	Larsen & Toubro Limited	1446
33	MRF Limited	1145
34	Mahindra & Mahindra Ltd.	4135
35	Maruti Udyog Ltd.	972
36	Motor Industries Co. Ltd.	1559
37	Natco Fine Pharmaceuticals Pvt. Ltd.	506
38	National Organic Chemical Industries Ltd.	711
39	National Telecom of India Ltd.	641
40	Novarits Enterprises Ltd.	500
41	Oil & Natural Gas Corporation Ltd.	2499

Sl. No.	Name of the firm	R&D Expenditure (Rs. in Lakhs)
42	Oil India Limited	1043
43	Pharmaceutical Products of India Ltd.,	504
44	The Projects & Development India Ltd.	650
45	Rallis India Ltd.	872
46	Ramco Industries Ltd.	994
47	Ranbaxy Laboratories Ltd.	5230
48	Reliance Industries Ltd.	7509
49	Southern Petrochemical Industries Corpn. Ltd.	712
50	Steel Authority of India Ltd.	4832
51	Tata Engineering & Locomotive Co. Ltd.	7530
52	Tata Hydro-Electric Power Supply Co. Ltd.,	783
53	The Tata Iron & Steel Co. Ltd.,	1350
54	The United Phosphorous Ltd.	650
55	Tractors & Farm Equipment Ltd.	634
56	Venco Research & Breeding Farm Ltd.	857
57	Whirlpool Of India Ltd.	934
58	Widia (India) Ltd.	530
59	Wipro Limited (formerly Wipro Infotech Ltd.)	805
60	Wockhardt Limited	1561

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE IN THE RANGE OF Rs. 100 LAKHS TO Rs. 500 LAKHS

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
1	ARM Limited	228
2	Alembic Chemical Works Co. Ltd.	254
3	Altos India Ltd.	187
4	Amalgam Leather Pvt. Ltd.	283
5	Amara Raja Batteries Ltd.	208
6	The Apex Electricals Ltd.	152
7	Apollo Tyres Ltd.	262
8	Applied Electro Magnetics Pvt. Ltd.	118
9	Arvind Mills Ltd.,	101
10	The Astra-IDL Limited	218
11	Atul Limited,	396
12	The Avasarala Tungsten Ltd.	144
13	BASF India Ltd.	130
14	BPL Engineering Ltd.	125
15	BPL Sanyo Utilities and Appliances Ltd.	288
16	BPL Telecom Ltd.	382
17	Ballarpur Industries Ltd.	111
18	Balmer Lawrie & Company Ltd.	203
19	Baroda Rayon Corporation Ltd.,	174
20	The Bata India Ltd.	190
21	Berger Paints India Ltd.	126
22	Bharat Dynamics Ltd.	283
23	Bicycle & Sewing Machine R&D Centre	118
24	Biological E. Ltd.	140
25	Brakes India Ltd.	360
26	Britannia Industries Ltd.	179
27	Bush Boake Allen (India) Ltd.	311
28	Cadila Pharmaceuticals Ltd.	107
29	Camphor & Allied Products Ltd.	124
30	Carborundum Universal Ltd.	141
31	Castrol India Ltd.	128
32	Century Textiles & Industries Ltd.,	105
33	Cheminor Drugs Ltd.	246
34	Clariant (India) Ltd.	398
35	Coates of India Ltd.	347
36	Cochin Refineries Ltd.	211
37	Colour-Chem Limited	376
38	Core Healthcare Ltd.	143
39	DCM Shriram Consolidated Ltd.	128
40	DCM Shriram Industries Ltd.	237
41	DE-NOCIL Crop Protection Ltd.	216

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
42	DGP Hinoday Industries Ltd.	190
43	DGP Windsor India Ltd.	112
44	Dai-ichi Karkaria Ltd.	355
45	Datapro Electronics Pvt. Ltd.	120
46	Dhampur Sugar Mills Ltd.,	175
47	The Dharamsi Morarji Chemical Co. Ltd.,	138
48	The Divi's Laboratories Ltd.	199
49	Dr. Reddy's Laboratories Ltd.	338
50	Dunlop India Ltd.	284
51	E.I.D. Parry (India) Ltd.	363
52	Eicher Limited	133
53	Eicher Motors Ltd.	192
54	Electronic Research Ltd.	105
55	Elin Electronics Ltd.	150
56	Engineers India Ltd.	356
57	Esvin Advanced Technologies Ltd.	148
58	Excel Industries Ltd.	247
59	FDC Limited	142
60	FGP Limited	142
61	Foseco India Ltd.	242
62	Fujitsu ICIM Ltd.	101
63	Gammon India Limited	128
64	Garware Polyester Ltd.	167
65	German Remedies Ltd.	106
66	GEIL Projects & Services (India) Ltd.	210
67	Glaxo India Ltd.	315
68	Global Bulk Drugs & Fine Chemicals Ltd.	450
69	Godrej & Boyce Mfg. Company Ltd.	308
70	Godrej Soaps Ltd.	267
71	Goodlass Nerolac Paints Ltd.	386
72	Gujarat Communications & Electronics Ltd.	412
73	HCL Infosystems Ltd.	427
74	Haryana State Electronics Development Corpn. Ltd.	191
75	Hawkins Cookers Ltd.	100
76	Heinz India Pvt. Ltd.	217
77	Herdillia Chemicals Ltd.	101
78	Hindustan Antibiotics Ltd.	252
79	Hindustan Cables Ltd.	178
80	Hindustan Copper Ltd.	155
81	Hindustan Motors Ltd.	327
82	Hindustan Petroleum Corporation Ltd.	86
83	Hindustan Photo Films Manufacturing Co. Ltd.	127
84	Hindustan Zinc Ltd.	379
85	Hyderabad Industries Ltd.	149
86	IBP Company Ltd.	198
87	ICI India Ltd.	316

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
88	IDL Industries Ltd.	202
89	IPCA Laboratories Ltd.	318
90	ITC Limited	398
91	ITC Zeneca Ltd.	100
92	India Glycols Ltd.	192
93	India Nippon Electricals Ltd.	133
94	India Pistons Ltd.	103
95	India Satcom Ltd.	111
96	Indian Drugs & Pharmaceuticals Ltd.	243
97	Indian Dyestuff Industries Ltd.	211
98	Ion Exchange (India) Ltd.	191
99	J.K. Drugs & Pharmaceuticals Ltd.	206
100	J.K. Industries Ltd.	299
101	Jaysynth Dyechem Ltd.	273
102	Jindal Strips Ltd.	190
103	Jindal Steel Power Ltd.	188
104	Johnson & Johnson Ltd.	165
105	Jyoti Limited	312
106	K.C.P. Limited	105
107	Keggfarms Pvt. Ltd.	138
108	Khandelwal Laboratories Ltd.	101
109	Kirloskar Brothers Ltd.	171
110	Kirloskar Copeland Ltd.	203
111	Kirloskar Electric Co. Ltd.	125
112	Kirloskar Oil Engines Ltd.	183
113	Knoll Pharmaceuticals Ltd.	345
114	Kopran Limited	424
115	Krishna Maruti Ltd.	247
116	L&T-McNeil Ltd.	117
117	L&T Komatsu Ltd.	138
118	LML Limited	366
119	Lakhanpal National Ltd.	181
120	Lubrizol India Ltd.	388
121	Lucas-TVS Ltd.	381
122	Lyka Labs Limited	123
123	MAX-GB Limited	190
124	Madras Refineries Ltd.	232
125	Mafatlal Industries Ltd.	122
126	Mafatlal Industries Ltd.,	126
127	The Maharashtra Hybrid Seeds Company Ltd.	240
128	Manali Petrochemical Ltd.	156
129	Medicrop Technology India Ltd.	152
130	Merind Limited	327
131	Midas Communication Technology Pvt. Ltd.	159
132	Minda Industries Ltd.	172
133	Mirc Electronics Ltd.	406

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
134	Modi Rubber Ltd.	247
135	Modipon Limited	274
136	Monica Electronics Ltd.	177
137	Mysore Kirloskar Ltd.,	263
138	The NRC Ltd.	197
139	National Mineral Development Corporation Ltd.	472
140	Neyveli Lignite Corporation Ltd.	362
141	Onward Technologies Ltd.	231
142	Otis Elevator Co. (India) Ltd.	100
143	Parke-Davis (India) Ltd.	153
144	Pfizer Limited	220
145	Philips India Ltd.	495
146	Pidilite Industries Ltd.	110
147	Premier Automobiles Ltd.	476
148	Premier Instruments & Controls Ltd.	435
149	Proagro Seed Company Ltd.	185
150	Procter & Gamble India Ltd.	400
151	Punjab Communications Ltd.	189
152	Punjab Tractors Ltd.	383
153	Rane Brake Linings Ltd.	122
154	Rashtriya Chemicals & Fertilizers Ltd.	103
155	Recon Limited	168
156	Renewable Energy Systems Pvt. Ltd.	128
157	S.H. Kelkar & Company Ltd.	118
158	SOL Pharmaceuticals Ltd.	205
159	Samtel Color Ltd.	115
160	Sandvik Asia Ltd.	201
161	Saraswati Industrial Syndicate Ltd.,	263
162	The Scooters India Ltd.	252
163	Sealol Hindustan Ltd.	115
164	Searle (India) Ltd.	260
165	Secure Meters Ltd.	163
166	Semiconductor Complex Ltd.	304
167	Shantha Biotechnics Pvt. Ltd.	148
168	Shasun Chemicals and Drugs Ltd.	124
169	Sieflex Robotics Co.	101
170	Simpson & Co. Ltd.	108
171	Siel Compressor Ltd.	100
172	Smithkline Beecham Pharmaceuticals (India)Ltd.	207
173	Sudarshan Chemical Industries Ltd.	245
174	Sun Pharmaceutical Industries Ltd.	390
175	Sundaram Brake Linings Ltd.	163
176	Sundaram Clayton Ltd.	354
177	TVS-Suzuki Limited	247
178	Tamilnadu Petroproducts Ltd.	241
179	Tata Elxsi (India) Ltd.	145

Sl. No	Name of the firm	R&D Expenditure (Rs. in Lakhs)
180	Tata Sons Ltd.	357
181	Tata Tea Ltd.	291
182	Tata Refractories Ltd.	241
183	Technicom Systems (India) Pvt. Ltd.	125
184	Thermax Limited	338
185	Tide Water Oil Co. (India) Ltd.	130
186	Torrent Pharmaceuticals Ltd.	300
187	Travancore-Cochin Chemicals Ltd.,	105
188	The Unichem Laboratories Ltd.	170
189	United Catalysts India Ltd.	110
190	United Phosphorous Ltd.	125
191	United Telecoms Ltd.	207
192	Uptron India Ltd.	110
193	Vatanu-Cool Rotary Vanes Ltd.	178
194	VIP Industries Ltd.	138
195	Venkateshwara Hatcheries Ltd.	113
196	Vera Laboratories Ltd.	118
197	Vitara Chemicals Ltd.	188
198	Voltas Limited	135
199	Webel Telecommunication Industries Ltd.	107
200	Wheels India Ltd.	212
201	Wipro GE Medical Systems Ltd.	100
202	Wipro Limited	297

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS *APPROVED DURING JANUARY 1999 TO DECEMBER 1999.*

AGRICULTURAL, MEDICAL, NATURAL & APPLLIED SCIENCES

Sl. No.	Name of the Organisation	Approval Valid upto
1	Gujarat Ecological Education & Research (GEER) Foundation, Gandhinagar	31.3.2001
2	Bio Technology and Eco Development Research Foundation, Bangalore	31.3.2000
3	Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri	31.3.2001
4	The Baba Jaswant Singh Trust, Ludhiana	31.3.2001
5	Gujarat Ayurveda University, Jamnagar	31.3.2001
6	Central Council for Research in Yoga & Naturopathy, New Delhi	31.3.2002
7	Association of State Road Transport Undertakings, New Delhi	31.3.2002
8	Manovikas Kendra Rehabilitation and Research Institute for the Handicapped, Calcutta	31.3.2001
9	Construction Industry Development Council, New Delhi	31.3.2002
10	Society for Innovation and Development, Bangalore	31.3.2002
11	Kerala State Science and Technology Museum, Trivandrum	31.3.2002
12	Matrivani Institute of Experimental Research and Education, Calcutta	31.3.2002
13	Centre for Science and Environment, New Delhi	31.3.2002
14	Agency for Non-Conventional Energy and Rural Technology, Thiruvananthapuram	31.3.2002
15	Punjab State Council for Science and Technology, Chandigarh	31.3.2002
16	Inter University Consortium for Dept. of Atomic Energy, Indore	31.3.2002
17	Bakul Finechem Research Centre, Mumbai	31.3.2002
18	Indian Institute of Information Technology, Bangalore	31.3.2002
19	Swami Dayanand Medical College & Hospital Managing Society, Ludhiana	31.3.2002
20	Centre for Human Genetics, Bangalore	31.3.2002

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS APPROVED DURING JANUARY 1999 TO DECEMBER 1999

SOCIAL SCIENCES

Sl. No.	Name of the Organisation	Approval Valid upto
1	The Kerala History Association, Kochi	31.3.2001
2	Institute of Economic Growth, Delhi	31.3.2002
3	Institute of Social and Economic Change, Bangalore	31.3.2002
4	Centre for Study of Society and Secularism, Mumbai	31.3.2002
5	International School of Dravidian Linguistics, Thiruvananthapuram	31.3.2002
6	Tamil Isai Sangam, Chennai	31.3.2002

CERTIFICATES FOR CLAIMING ACCELERATED DEPRECIATION ALLOWANCE ISSUED BY DSIR UNDER RULE 5(2) OF I.T. RULES VIDE NOTIFICATION NO.133/342/86-TPL DATED 1.4.1988

Sl. No	Name of the Company	Source of know-how/ Technology	Item of Manufacture	Investment Certified (Rs in Lakhs)
1	ECIL	BARC, In-house	Electronic equipment	76.70
2	Bharat Electronics Ltd.	In-house	Electronic equipment	614.45
3	Bharat Electronics Ltd.	In-house	Electronic equipment	1,174.05
4	ICI Explosives	In-house	Small dia Emulsians	365.65
5	Bhagiradha Chemicals & Inds. Ltd.	IICT,Hedrabad	Chlorpyriphos	0.49
6	ISCO Track Sleeper Pvt. Ltd.	RDSO	Concrete Sleepers	22.18
7	Vantech Pesticides Ltd.	IICT	Monocropohos	123.00
8	Punjab Tractors Ltd.	In-house	Swaraj Tractors, Grey Iron castings	4,791.00
9	Punjab Tractors Ltd.	CMERI & In-house	Tractors & Harvestors	2,258.00
10	ECIL	TIFR, BARC	Electronic equipment	189.85

ABBREVIATIONS USED

ACC	Associated Cement Company
ACE	Association of Consulting Engineers
APCTT	Asian and Pacific Centre for Transfer of Technology
BEL	Bharat Electronics Limited
BHEL	Bharat Heavy Electricals Limited
CBDT	Central Board of Direct Taxes
CDC	Consultancy Development Centre
CEL	Central Electronics Limited
CMPDIL	Central Mine Planning & Design Institute Limited
CSIR	Council of Scientific and Industrial Research
DSIR	Department of Scientific and Industrial Research
ECIL	Electronics Corporation of India Limited
ERDA	Electrical Research and Development Association
ESCAP	Economic and Social Commission for Asia and the Pacific
GSI	Geological Survey of India
HMT	Hindustan Machine Tools
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICSSR	Indian Council of Social Science Research
IIFT	Indian Institute of Foreign Trade
IPCL	Indian Petrochemical Corporation Limited
ISRO	Indian Space Research Organisation
ITI	Indian Telephone Industries
NCAER	National Council of Applied Economic Research
NICMAR	National Institute of Construction Management and Research
NIDC	National Industrial Development Corporation
NISSAT	National Information System for Science and Technology
NRDC	National Research Development Corporation
ODS	Ozone Depleting Substances
PATSER	Programme Aimed at Technological Self Reliance
TePP	Technopreneur Promotion Programme
RDI	Research and Development by Industry
SEETOT	Scheme to Enhance the Efficacy of Transfer of Technology
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation
WIPO	World Intellectual Property Organisation