ANNUAL REPORT
1991 - 92

Department of Scientific and Industrial Research
Ministry of Science & Technology
New Delhi - 110016

CONTENTS

LIST OF FIGURES AND PHOTOGRAPHS

Cover Page

I. AN OVERVIEW

The formation of the Ministry of Science and Technology was announced through a Presidential Notification dated January 4, 1985 (74/2/1/85. 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.

The Minister Incharge of Ministry of Science and Technology is the Prime Minister Shri P.V. Narasimha Rao.

1.2. Several laboratories under the Council of Scientific and Industrial Research made significant contributions during this year.

Development of a cost-effective Shallow-well Handpump was taken up with an objective to design a cost-effective pump with increased reliability, reduction in failure rates, and reduction in human pumping effort from material available in the country. A modern Oil Expeller of 10 TPD capacity, developed by CFTRI, extracts almost 95% of the oil that is present in the seeds. Other features of this expeller are its low power consumption, high reliability, lower wear and tear of critical components, and the production of clearer oil and suitable cake for animal use. Studies were carried out by NIO in the coastal waters of Andaman for setting up demonstration scale units of aquaculture production. Eight suitable areas have been identified. Technology of intense polyculture of finfishes were successfully demonstrated in the Andaman and Nicobar groups of islands. The NPL Aeronomy payload to be flown aboard Indian SROSS-C satellite has been successfully fabricated, tested and qualified for space qualification and delivered to ISRO Satellite centre (ISRC), Bangalore for spacecraft integration and launch. IIP, in collaboration with Engineers India Limited (EIL), has developed a technology for the production of food grade hexane, a solvent used for production of vegetable oils. NCL has isolated the active principles with insecticidal properties from neem seeds, and their formulations have been prepared and tested. The process has been transferred to industry for commercialisation. In the area of rural tanning, CLRI has been involved in a joint programme with the Khadi & Village Industries Commission (KVIC) at Kallupatti in Tamilnadu and Wardha in Maharashtra. Suitable technologies have been worked out for upgradation of low grade leathers, particularly rural tanned leathers, for getting better returns. The process for Timol Maleate, a drug widely used for glaucoma has been released to M/s FDC Ltd., Bombay for commercialisation. IICT has provided a commercially feasible process for obtaining the "S" enantiomer starting from D-mennitol. CECRI has come out with an interesting process to coat a conducting polymer on insulating materials such as cloth, glass and plastics. CBRI has developed a new type of low cost load bearing large aggregate concrete block. These concrete blocks have low content cement, will reduce wall thickness and eliminate internal plastering.

CSIR is involved in the following important societal missions and national programme:

i) Provision of drinking water and water management.

ii) Development of Wastelands

iii) Oil Seeds

The involvement of CSIR laboratories is in the nature of water quality assessment by installation, commissioning and evaluation of Iron re-

moval plants in Assam, Gujarat and in West Bengal.

Ten CSIR laboratories have been connected on the computer network which, at present, is supporting the INSDOC E-mail facility. Eleven user nodes and two mail nodes have been established.

1.3 Scientific Associations, Institutions, Universities and colleges which undertake research in the area of medicine, agriculture, natural and applied sciences seek approval to avail the fiscal incentives provided for pursuing such work. During the year 32 institutions were recommended for approval. A Research Review Group regularly examines the returns submitted by such research associations and institutions. On the basis of such a review, earlier approvals granted are renewed or withdrawn. During the year, review of 233 such institutions was made. Similarly institutions engaged in social science research were also examined. 6 institutions were recommended for approval; the Research Review Group in the area of social science had examined the return of 44 institutions.

1.4 Under the Scheme of granting recognition to In-house Research and Development Units, there were 1205 units having valid recognition as on 31st December, 1991. 131 In-house R&D Centres incurred an annual expenditure of over Rs. 1.00 crore each. During the year 1991, the Inter-Departmental Screening Committee accorded recognition to 69 In-house R&D Centres. During the year 536 units were accorded renewal; several of these In-house centres are having sophisticated facilities and their scientists have made impressive contributions. During the year 1991-92 four issues of In-house R&D in Industry update were brought out.

1.5 The Government had notified an incentive and relief to the user of know-how developed in the country. This would be in the form of depreciation allowance at the higher rate of 50% on the cost of plant and machinery installed after 1st April, 1987. During the year 20 certificates involving Rs. 4628 lakhs as cost of plant and machinery were issued in the area of electronics and chemicals.

1.6 The Department intensified its activities relating to the scheme on National Register of Foreign Collaborations. A compilation of primary data on FCs for the year 1990 was brought out. Computerisation of data collected on Foreign Collaborations for the year 1981-90 has been completed. During the year reports on technology status of various sectors/products like petroleum refining, dry process cement plants, self-advancing roof support and PTFE & PVDF were printed. Technology status studies have been commissioned on various products which include seamless steel tubes, electrolyte, manganese dioxide, caprolactum, welding equipment and ceramic capacitors.

The scheme on, Promotion and Support to Indigenous Development of Capital Goods, was launched in the year 1990-91. The draft report of the studies of capital Goods requirement by the manmade fibre sector, mouldable polymer sector, metal forming industry and electronics industry were prepared and evaluated by expert committees. Studies of capital goods requirements by the food processing industry, packaging sector, naphtha and gas crackers, secondary steel sector and dies and moulds are in progress. Some development projects pertaining to packaging machinery and variable speed A.C. motors are considered.

1.7 The Technology Absorption and Adaptation scheme provided partial financial support to 30 firms involving over 50 Research, Design, Development and Engineering projects in the areas of absorption of imported technology. These include: import substitution of hydraulic AGC (Automatic Gauge Control) system, by MECON, Mining and Allied Machinery Corporations project related to Development of Slide Discharge loaders, Keltron Controls project related to indigenous development of custom build IC's used on computer, HCL's projects related to Plasma enhanced MCVD process and recovery of raw material used in fibre Optic Cables, Hindustan Organic Chemicals project related to simulation

studies for the distillation train in the phenol plant, Swaraj Mazda project related to improvement of fuel consumption and emission reduction in Diesel Engine and Bharat Heavy Plates and Vessels Ltd., project related to development of flexible super insulated piping. In addition a Roster/Directory of Research and Design Experts in Technology Absorption has been commissioned in this year. Studies relating to the norms in use in certain important sectors were commissioned and this includes the sectors such as Glass, Refractories, Home Appliances, Paints, Packaging and Plastics. Under Talented Indian Engineers and Scientists Scheme a total of 82 preliminary industry profiles have been commissioned. Support has been approved to ERDA for a technology demonstration project related to Energy Efficient Motors.

1.8 The Transfer and Trading in Technology scheme has supported several activities such as: commissioning studies relating to preparation of technology profiles of developing countries; conducting studies highlighting India's technological capabilities in select industrial sectors; creation of computerised database on technologies available for transfer; organising workshops/ interaction meetings and live demonstration of exportable technologies at pilot plant level. In addition, a survey of Indian joint ventures in 4 South-East Asian countries was carried out. Close linkages were maintained in the area of technology transfer with international organisations such as UNCTAD, ESCAP, WIPO, and UNIDO.

1.9 The scheme relating to promotion and support to consultancy services essentially aims to strengthen consultancy capabilities for domestic and export markets. The activities have been towards: Documenting consultancy needs and capabilities in important economic sectors and at State levels; Providing institutional and programme support to CDC, Associations and other promotional agencies; Registration scheme for consultants has been initiated; An ESCAP workshop was organised at Delhi in September, 1991, to discuss promotion of cooperation in consultancy in the ESCAP region and setting up of a Regional Apex Body for the purpose; and Technology Business Incubator Programme has been launched to promote Technology based small enterprises.

CDC was promoted in January, 1986 as a Non-profit society, with the support of consultancy promotion agencies, such as FIEO, ACE, NACE, with a view to implement some of the programmes of DSIR and also promote and strengthen the consultancy capabilities. It is not to undertake any commercial activities but, at the same time, earn reveneus to the extent possible. The Chairman of CDC is to be Secretary in the Ministry of Science and Technology or his representative, and the Governing Body consists of representatives from Consultancy (Private and Public), Government Departments, agencies, industry, R&D and academic institutions. CDC is implementing programmes such as CDPA, computerised Databases, training and human resources development for consultancy, Registration scheme, and programmes sponsored by other agencies. DSIR is providing recurring and non-recurring support to CDC.

1.10 The National Information System for Science and Technology (NISSAT) programme envisages promotion and support to the development of a compatible set of information systems on science and technology and inter-linking of these into a network. Ten sectoral centres have been established in Leather Technology, Food Technology, Machine Tools, Drugs and Pharmaceuticals, Textiles and Allied subjects, Chemicals, Bibilometrics, Advanced Ceramics and Compact-disk. NISSAT has taken the initiative for the development of metropolitan library networks to ensure better utilisation of S&T information resources through resources sharing.

1.11 Two public undertakings namely National Research Development Corporation (NRDC) and Central Electronics Limited (CEL) attached to this Department, were engaged in important activities in the commercialisation of indigenously developed technology. Some of the major technologies licensed by NRDC during the year include: Succinic Acid, Flyash Bricks, Lindane, Spice Oleoresin, Rice Husk Particle Board,

Disposable Blood Bags. NRDC gave awards and presented certificates of merit to investors thereby promoting innovative efforts in the country. NRDC has been successful in promoting several projects based on their technologies in Indonesia, Vietnam and Thailand.

1.12 The activities of CEL are sharply focused in three thrust areas namely selected electronic components, electronic systems and solar photovoltaic cells, modules and systems for a variety of applications, intensive technology development work was carried out by the company in the field of growth of multicrystalline solar cells, new SPV systems and high permeability ferrites.

1.13 During the year 1991-92, there was an alround growth in the activities of different programmes of DSIR, particularly in the Plan Schemes.

II. COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

1. INTRODUCTION

1. The Council of Scientific & Industrial Research (CSIR), established in 1942, has entered into the fiftieth year of its existence. The Golden Jubilee Celebrations were inaugurated by Prime Minister, Shri P.V. Narasimha Rao, who is also the President of CSIR, on its Foundation Day. CSIR is observing the period 26 September 1991 - 25 September 1992 as the Golden Jubilee Year.

The Council of Scientific and Industrial Research Consists of 42 National Laboratories and Research Associations covering Physical & Earth Sciences, Chemical Science, Biological Sciences, Engineering Sciences, Information Science and Industrial Research Associations. Annexure 11.1 gives a list of these 42 institutions together with abbrivations which are used in this text. An indication of the research aoutput of the Council is presented in Figure II.1.

2. A brief account of the significant achievements of CSIR in different areas of its activity is given in this report covering activities in: Technology Mission on Drinking Water; Technology Mission on Oilseeds, Wastelands Development; Ganga Action Plan; Standards; Space Physics; National Literacy Mission; Electronic Devices and Systems; Instrumentation; Geophysics; Oceanographic Research; Antarctic Research; Chemicals; Drug Development; Polymer Science; Agro and Post-harvest Technologies; Biotechnologies; Ecology and Environment; Materials; Building Materials and Construction; Computer Science & Modelling; Transportation; Basic Research and National Facilities.

2.1 DRINKING WATER MISSION

The CSIR involvement in the National Drinking Water Mission (NDWM) was to evolve cost-effective technologies for providing drinking water in sufficient quantities on a long-term basis. These relate to: application of geophysical techniques for groundwater exploration, conservation and augmentation, water quality assessment and treatment technologies to get rid of chemical and bacterial contaminants.

Groundwater exploration was done by NGRI in 80 villages; in all 70 sites were recommended for drilling.

Development of Cost-effective Shallow-well Handpump was taken up with an objective to design a cost-effective pump with increased reliability, reduction in failure rates, and reduction in human pumping effort, from materials available in the country. Fabrication of 50 pumps has already been completed. Two pumps were tested for continuous running for 4000 hours. Five pumps were installed in Madras and are in operation for the last two years. In the meantime field demonstration is being continued, and 75 pumps are being fabricated for installation in different field stations.

On the request of the Dept. of Rural Development, ITRC had 17 mobile laboratory vans fabricated incorporating the equipment needed for water analysis. These vans have been distributed to various States and regional centres identified by the Department of Rural Development.

Installation, commissioning and valuation of 240 Iron Removal Plants in Assam and 3 fill-and-draw Fluoride Removal Plants in Gujarat were completed by NEERI. CMERI was assigned the responsibility of setting up 460 iron removal

plants in 9 (nine) districts of West Bengal. The plants are being fabricated through a Public Sector Undertaking in Calcutta. Most of the fabrication work is over and four such plants are undergoing extensive field trials in the State. CMERI has also developed a second-generation iron-removal plant.

2.2 TECHNOLOGY MISSION ON OILSEEDS

The process for thermal stabilisation of rice bran using the Rota Disc heater was demonstrated by IICT to the rice millers of Madhya Pradesh at Raipur. The stabiliser has been installed and commissioned in the rice of Markfed at 2Durg. As a part of the programme of popularising rice bran stabilisation using HCL, demonstrations were organised in Kerala, Uttar Pradesh and Madhya Pradesh. The prototype stabilisers fabricated at CFTRI were used for these demonstrations.

The dehulling capacity of the decorticator has been upgraded from 250 kg. to one tonne per hour by CFTRI. The process has also been released to 12 entrepreneurs. The Tamil Nadu Agro Industries Corporation collaborated with CFTRI in the modernisation of seed processing in its Sunflower Seed Complex near Pochampalli. An integrated process for mustard has been developed by CFTRI to obtain high pungency oil, mustard flour, cake from the ghani for use in pickles and solvent extracted cake for use in poultry feeds. The process has been released to an industry.

A modern oil expeller of 10 TPD capacity, developed by CFTRI, extracts almost 95% of the oil that is present in the seeds. Other features of this expeller are its low power consumption, high reliability, lower wear and tear of critical components, and the production of clearer oil and suitable cake for animal use. Several novel mechanical design concepts such as computer-optimised main shaft and worm design, watercooling of main shaft and cage inserts, centralized lubrication in gear boxes and the use of antifriction bearings have been used in the CMERI design. Based on the demonstrated performance of the prototype expeller, the Hindustan Machine Tools (HMT) Limited has accepted the CMERI design, for production.

2.3 WASTELANDS DEVELOPMENT

Studies were carried out by NIO in the coastal waters of Andaman for setting up demonstration scale units of aquaculture production. Eight suitable areas have been identified. Technology of intense polyculture of finfishes was successfully demonstrated in the Andaman and Nicobar groups of islands.

Maps of mangrove distribution of Andaman and Nicobar Islands have been completed. The total mangrove area has been estimated to be about 80,000 ha. RRL, Jorhat continued introduction of large scale cultivation of medicinal and aromatic plants like Java citronella, lemongrass, Palmarosa, Mentha sp. and Dioscorea floribunda in the North-eastern region. The programme covered 144 hectares of wastelands predominantly in shifting cultivation areas at Manja, Boko, Buragaon, Kamarkuchi, Oating, Rangsali, Nayakgaon, Phuloni of Assam; Yaogyimsen of Nagaland; Lamphelpat of Manipur; Sonamura and Shovapur of Tripura and Jorabat and adjoining areas of Meghalaya. Utilisation of "jhum" and "deforested" land has generated employment opportunities to more than 600 people of the scheduled tribes.

2.4 GANGA ACTION PLAN

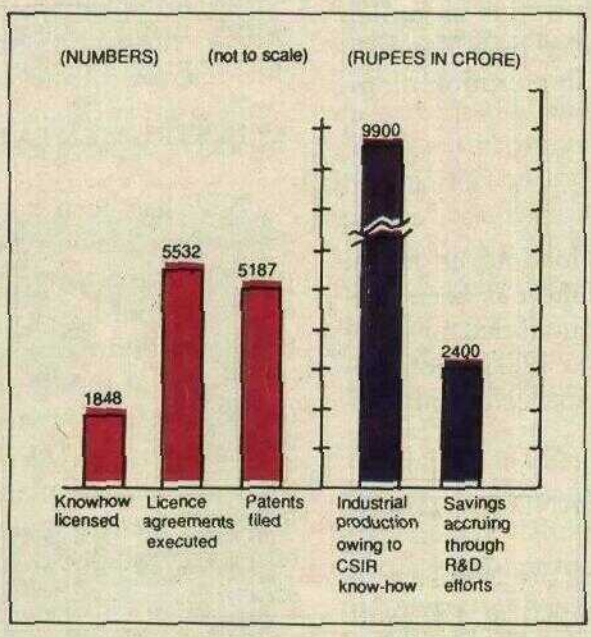
The Ganga Project Directorate had asked ITRC to take up monitoring of Ganga Water quality for heavy metals and pesticide residue levels regularly every month at 27 different locations between Rishikesh (U.P.) and Uluberia (W.B.)

During this period, 324 samples of Ganga water were analysed for heavy metals and pesticides. Among the metals, iron and manganese levels were found to be high in most of the samples from different locations. Zinc levels were below the permissible limits in most of the cases. Among the pesticides, the organophosphorus pesticides were detected in a few samples;

RESEARCH OUTPUT INDICATORS

	1990-91	Cumulative
Knowhow licensed (No.)	35	1848
Licence agreements	132	5532
Industrial production based on CSIR knowhow (Rs. crore)	1300	9900
Saving in productivity accruing through CSIR R&D efforts (Rs. crore)	135	2400
Patents filed (No.)	202	5187
Contract value (Rs. crore) (of projects in hand)		
(a) Contract Research)	170	
(b) Consultancy	20	
Cash flow (Rs. crore) through		
(a) Contract Research)	58.5	
(b) Consultancy	5.7	

RESEARCH OUTPUT CUMULATIVE



II.1 Research Output indicators in 1990 (table) and Cumulative Research Output.

organochlorous residues were present in a majority of samples.

A tripartite collaborative programme on biological and environmental monitoring of Yamuna river was started for a period of three years involving experts from Holland, the Central Pollution Control Board (CPCB), the Deptt. of Environment & Forests, Govt. of India & ITRC (CSIR). The aim of the project is to develop a biomonitoring methodology to assess the pollution load.

2.5 NATIONAL LITERACY MISSION

CSIR's role in the National Literacy Mission consists of development and demonstration of techno-pedagogic inputs to improve the learning process of adult illiterates. The following tasks were undertaken: Improved dustless chalk; 75 AH and 180 AH high discharge lead acid batteries suitable for environs and conditions in rural areas; Two-in-one sound systems suitable for rural areas.

2.6 STANDARDS

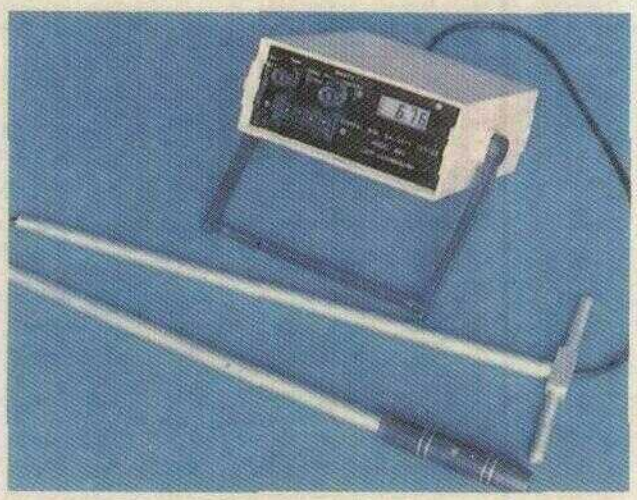
Standard Reference Materials are of prime importance for comparing the purity of the material in use in research and industry. The first batch of the three kinds of battery waters as Indian Reference Materials was released by NPL which are meant for users engaged in pollution monitoring and control.

2.7 SPACE PHYSICS

The NPL Aeronomy payload to be flown aboard Indian SROSS-C satellite has been successfully fabricated, tested and qualified for space qualification and delivered to ISRO Satellite Centre (ISAC), Bangalore for spacecraft integration and launch.

2.8 ELECTRONIC DEVICES AND SYSTEMS

Under the sponsorship of the Ministry of Education, CEERI has developed: a 150 watt chargeable power pack (CPP), a 100 watt Uninterrupted Power Supply (UPS), and a 100 watt



II.2 Portable Digital Soil Salinity Tester with four Electrode Probe.

Solar Power Convertor. 500 Such units will be fabricated for use in the National Literacy Mission. The know-how for the 100 VA UPS was transferred to two firms and negotiations are in progress with three more.

Silicon double drift region impatts fabricated in CEERI gave pulse power output of the order of 6-7 Watts at 94 GHz. Tested devices are found to be quite rugged and reliable. Fabrication, encapsulation/packaging and testing schedules have been successfully developed. The Defence Electronics Application Laboratory, Dehradun has started using these devices in their circuits for missile programmes.

2.9 INSTRUMENTATION

NPL has been participating in a project on "Superconducting Magnet Ore Separator" approved by the Programme Management Board for Superconductivity. The first successful run of the Superconducting Magnet Ore Separator was conducted at the Bharat Heavy Electricals Ltd. (BHEL),.(R&D), Hyderabad, the coordinator of the programme. The Superconducting Magnet, the Cryostat, the magnetic shield, the Helium Recovery System and the Slurry Handling System were installed in a record time and ahead of schedule.

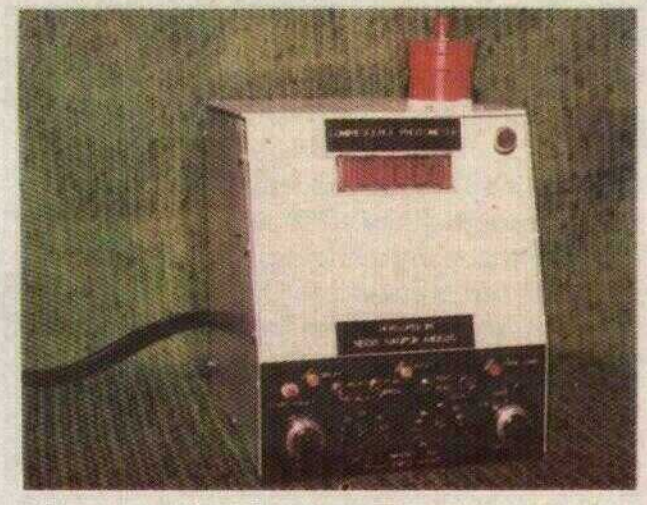
A five-crystal X-ray diffractometer designed, developed and fabricated at NPL has been com-

missioned and rigorously tested. Its three crystal combination of monochromaters and collimators enables experiments at state-of-art resolution. Experimental uncertainties due to wavelength and direction spreads in the X-ray beam have been reduced to less than 1/7th of the theoretical half-widths of diffraction curves of absolutely perfect crystals.

An electrochemical sensor probe for monitoring chloride level in the solid phase has been designed and fabricated at the Madras Centre of CSIO. The necessary software for signal processing and control has also been developed. The probe was mounted at the feedable chute of M/S. Tata Chemicals Ltd., Mithapur (Gujarat). The flow of material across the probe was found quite satisfactory and the response obtained from it was also quite good.

The integrated system interface for leather process control was completed by the Extension Centre of CEERI at Madras and installed in CLRI, Madras. Short term trials have been completed successfully. Regular long term trials have started.

CSIO has developed a Portable Digital Soil Salinity Tester for applications in: reclamation of arid land: treatment of sewage water; management of soil water and determination of soil salinity caused by seepage. This instrument can directly be used in the field as well as the laboratory. The know-how has been released to industry.



II.3 Luminiscent Photometer.

The PC based double beam UV-VIS spectrophotometer developed by CSIO, Chandigarh. The agencies for production of this instrument were identified and a M.O.U. was signed among DST, CSIO, Systronics, Ahmedabad, Toshniwal Instruments, Bombay and Associated Instrument Manufacturers India Ltd., (AIMIL), New Delhi.

NEERI has designed and developed a prototype automatic sequential air sampler based on Transistor Transistor Logic (TTL) integrated circuit chips and other available hardware. The prototype has been tested in the field and found to work satisfactorily. The know-how for a 10 micron size fractionator has been transferred to M/s Envirotech, Delhi.

2.10 GEOPYSICS

Digital telemetry network of 5 remote stations telelinked to the central recording station at Tezpur were test operated by NGRI. The necessary infrastructural facilities at 5 remote stations as well as at the central recording station have been created. Digital recording of earthquakes is being initiated through this telemetry network on a regular basis. Work on site selection and test operation for the second digital telemetry network with a central recording station at RRL-Jorhat has commenced. These two digital telemetry networks would provide high-quality data on earthquake wave form in digital mode and enable extraction of more accurate and detailed information on the source parameters of earthquakes in the region. The local earthquake data of the North Eastern Region have been processed by NGRI for the determination of hypo central parameters for the period January to September 1990. The region has experienced widespread earthquake activity.

The aftershock activity of earthquakes recorded by the local network in the region has given rise to valuable information on the nature of earthquake processes in the region of confluence of 3 important seismic lineaments, namely E-W trending Dauki fault, NE-SW trending Naga-Lussai Thrust and NW-SE trending Kopili lineament.

Under an OIDB (Oil Industry Development Board) funded project, magnetotelluric field studies were undertaken by NGRI in Saurashtra and Measurements were extended to cover a total of 48 field stations. The results of 1-D modelling of these data have provided subsurface geoelectric sections along the 250 km. long north-south profile starting from Una at the southern edge of Saurashtra to Halvad near Rann of Kutch in the north, and an approximately east-west profile running from Rajpara in the east to Memana near Jamnagar in the west traversing a length of about 200 km.

2.11 OCEANOGRAPHIC RESEARCH/ ANTARCTIC STUDIES

NIO participated in the International Programme "Heard Island Experiment" on board ORV Sagar Kanya during Jan-Feb 1991 and collected data on acoustic field utilising deep sea drifting buoys, sono buoys and receiver arrays suspended from the ship. Ray tracing employing a range-dependent programme was carried out utilising 66 historic sound speed profiles starting from the Heard Island covering a propagation range of 7000 km. It was found that for source depth of 150 m, the travel time was of the order of 4686 seconds and the intensity loss was 150 dB.

NIO undertook exploration of Caribbean waters on board the research vessel Sagar Kanya during April-May 1990 for the benefit of Caribbean countries under the Caribbean Oceanographic Resources Exploration Project (CORE). The CORE Programme was developed by the Commonwealth Science Council (CSC) in collaboration with DOD, NIO and the Caribbean Commonwealth Countries. This is hailed as a new initiative in the South-South Cooperation and the biggest project ever taken by CSC for promoting scientific collaboration among Commonwealth countries.

Detailed and accurate bathymetric maps of the Central Indian Ocean Basin (CIOB) area of about 145,000 sq. km. were prepared by NIO. These maps are of immense importance as the topographic variations on the sea floor are found to influence chemical composition of nodules as well as the variability of nodule mining. A system for cataloguing and interpretation of seabed photography data was evolved and used to predict the potential impact of nodule mining in the CIOB area.

A Monostatic Acoustic Sounder (SODAR), designed and fabricated by NPL under a joint project with the Sri Venkateswara University, Tirupati, and financially supported by the Department of Ocean Development, had been sent for installation and operation at Antarctica, during the Tenth Expedition.

The specially designed, computer-controlled SODAR is modular in construction to facilitate transportation and assembly at site. It is capable of withstanding wind speeds of 300 km/hr., observed in Antarctica.

2.12 PETROLEUM REFINING

IIP, in collaboration with Engineers India Ltd., (EIL), has developed a technology for the production of food grade hexane, a solvent used for production of vegetable oils.

This has replaced the obsolete technology of oleum treatment step which was operating at Bharat Petroleum Corporation Ltd., (BPCL), Bombay, and was incapable of producing FG hexane due to changed feedstocks. The BPCL unit, of 25,000 TPA capacity, based on IIP-EIL technology is successfully operating since June. Another unit at Madras Refineries Ltd., (MRL), Madras, is expected to be commissioned soon. Both the units use sulfolane as the solvent.

IIP, jointly with EIL and the Hindustan Petroleum Corporation Ltd., (HPCL), has developed a solvent extraction technology for production of ATF and the process has been offered to the Digboi refinery of the Indian Oil Corporation (IOC). Demonstration run has been successfully completed at the HPCL pilot plant at Bombay, using the feed proposed to be used at Digboi. The technology may replace the obsolete sulphur dioxide technology being used in the four exist-

ing units in Eastern refineries.

IIP has, in collaboration with the Indian Petrochemicals Complex Ltd., (IPCL), Vadodara developed a state-of-the-art Pt-Re bimetallic reforming catalyst which so far had been the monopoly of multinationals like Chervron, Universal Oil Products (UOP), Institut Francias du Petrole (IFP - the French Institute of Petroleum) etc. Catalytic reforming is a secondary refinery process for production of aromatics like benzene, toluene and xylenes, which are major petrochemical feed stocks. It is also used to boost the octane requirement of gasoline.

The catalyst has been successfully commercialised and is presently in operation at MRL, Madras and IPCL; their reformers have capacities of 90,000 and 110,000 TPA with a catalyst load of 6.2 and 6.8 tonnes respectively. This unique technology will result in saving of foreign exchange to the tune of several crores of rupees per year. It does have potential for export too. The IIP-IFP technology for catalytic reforming has been accepted for putting up new reformers of IOC refineries at Digboi (90,000 TPA) against stiff international competition.

IIP has developed a technology for dealumination of the Na-Y zeolite, which is to be used for the preparation of new generation catalyst for fluidized catalytic cracking (FCC). FCC is the process for production of light and middle distillates from the bottoms of the barrels of crude petroleum. Presently 9 FCC units are operating in the country. The dealumination technology has been transferred to M/s Hindustan Lever Ltd., Bombay and IOC R&D, Faridabad.

IIP has developed know-how for production of PTBP, a speciality chemical which has wide applications in petroleum and petrochemical industries and is being imported in substantial quantities. IIP technology uses an environment friendly, recyclable solid alkylation catalyst and a liquid alkylating agent avoiding use of pure isobutylene gas. The process had been earlier successfully commercialised by Balmer Lawrie & Co., Madras, the plant capacity being 150 TPA.

Lube production at Haldia Refinery had been far below the design level. IIP-EIL had jointly identified the need to revamp the SDU for augmentation of Lube production. Based on the studies carried out at IIP, EIL prepared a study report. Low cost modification was done in the SDU, resulting in significant increase in throughput and lube production, in higher operational flexibility in handling the frequently changed feed stocks. The success has prompted a full scale revamp to be undertaken.

2.13 CHEMICALS/CATALYSIS

NCL has isolated the active principles with insecticidal properties from neem seeds, and their formulations have been prepared and tested. The process has been transferred to industry for commercialisation. A new zeolite-based process, which may substitute the conventional, hazardous hydrofluoric acid based process, has been developed by NCL for the preparation of Linear Alkyl Benzene (LAB), by the alkylation of benzene with C_{11} to C_{14} olefins. Studies on the life of the catalysts developed are in progress. The project has been carried out in collaboration with the Reliance Industries Ltd., Patalganga.

Technology for the manufacture of sodium azide, a mild detonator has been provided to M/s Parsin Chemicals Ltd., Hyderabad, a NRI unit. Based on the know-how, detailed designs and commissioning assistance were provided by IICT. M/s Parsin have gone into commercial production with a capacity of 1tpd. The product is for export. A 10 kg/hr plant for the production of cyanuric chloride has been designed and installed at IICT.

Ediphenphos is an organophosphate compound used as preventive eradient fungicide. It is imported and the present requirement is about 200 t per year. A process for its production has been developed by RRL, Jorhat on laboratory scale; the sample prepared compares very well with the technical sample. A formulation for producing liquid deodorant cleaners was developed by RRL Jorhat. The formulation was released to a Jorhat firm for commercial produc-

II.4 Cyanuric Chloride Pilot Plant

tion. The firm is marketing the product. A cationic flocculant has been developed by RRL, Jorhat for use as an oilfield chemical, particularly for treatment of the effluent generated in the oilfields. The process has been released for commercialization and a firm is producing and selling the product, to ONGC. Pheromones are non-toxic chemical substances used as communication systems for trapping insects and are useful in monitoring pest population and controlled use of pesticides. IICT has developed a technology for synthesis of pheromones for cotton crops. The process has been handed over to M/s Pheromones India Ltd., Tenali. Pheromones were also supplied to another party at a cost of Rs. 1.25 lakh per kg.

With a view to providing a suitable finishing technique without use of sophisticated machinery and speciality chemicals, a simple and cost effective finishing technique, "Seal & Sink" has been developed by CLRI. For adoption by all tanners - big or small. With this technique, leathers from different sources of raw materials can be finished with an exotic look. CLRI has undertaken extensive work on modernization of tanneries at M/s Khizar Hussain & Sons, Ranipet. Under this programme complete engineering back-up for the modernization has been provided by CLRI. In the area of rural tanning, CLRI has been involved in a joint programme with the Khadi & Village Industries Commission (KVIC) at Kallupatti in Tamilnadu and Wardha in Maharashtra. Suitable technologies have been worked out for upgradation of low grade leathers, particularly rural tanned leathers for getting better returns. The recent ban imposed by West Germany on the use of Pentachlorophenol (PCP) as a preservative in leather manufacture has necessitated CLRI to device methods for qualitative and quantitative determination of PCP in leather samples. The assay method developed at CLRI has been accepted internationally as one of the methods for determining PCP. With the help of the Council of Leather Exports (CLE), additional facilities for testing of PCP were created at Kanpur and Calcutta to cater to the needs in those regions.

CECRI has developed an impressed current anode system: titanium substrate insoluble anode (TSIA), for cathodic trials at the Madras Port Trust, and proved the efficacy of the system for more than three years. The successful exploitation of TSIA in conjunction with its advantages such as low cost, low weight and high current carrying capacity, demonstrates that TSIA will replace the lead-silver alloy anodes currently used for the purpose.

A comprehensive State of Art Report on corrosion protection in pre-stressed concrete bridges has been prepared by CECRI and submitted to the Ministry of Surface Transport. Six formulations of retro reflective paints based on alkydes have been developed by CECRI and field trials for their performance evaluation are in progress in some city roads in Delhi.

2.14 DRUG DEVELOPMENT

The process for Timol Maleate, a drug widely used for glaucoma has been released to M/s FDC Ltd., Bombay for commercialisation. IICT has provided a commercially feasible process for obtaining the 'S' enantiomer starting from D-mennitol. Presently Timolol is imported at a cost of Rs. 2.00 lakh per kg. The process for the manufacture of metaprolol a betablocker has been released by IICT to M/s Lupin Laboratories, Ahmedabad. A process for the manufacture of the anti-ulcer drug omeprozole was released by IICT to CIPLA, Bombay.

NRDC, New Delhi signed an agreement with

M/s EP Nasr Pharmaceutical Chemical Company, Cairo (Egypt) for licensing the know-how developed IICT, Hyderabad for the drugs: Norfloxacin, Salbutaline, Terbualine, Atenolol, S-Timolol Maleate, Sulbactem, Ciproloxecin, Metoprolol, Diltiazem, L-Dopa, Omeprazole, Cisplat. IICT also is engaged in developing technologies for chiral drugs such as S-Ibuprofen, Diltiazem, Beta blockers and B-Lactam antibiotics.

Centchroman, a non-steroidal contraceptive for the female has been released to Hindustan Latex Ltd., Trivandrum for marketing in the National Family Welfare Programme and social marketing programme of the Ministry of Health & Family Welfare, Government of India. Centchroman of CDRI is the first nonsteriodal contraceptive introduced anywhere in the world. It is now marketed with the brand name of SAHELI.

Phase III multicentric clinical trials at 60 mg. on alternate days were continued by CDRI at Bangalore, Delhi, Varanasi and Lucknow; and about 40% of the cases responded or had stable disease. The Regional Cancer Institute, Trivandrum was also included for conducting trials.

CDRI has developed a highly sensitive (99%) and specific immunodiagnostic test (DOT ELISA) for leishmaniasis after testing its efficacy in over 1000 people drawn from a Leishmaniasis endemic area of malda District, West Bengal and a non-endemic area of Lucknow. The test's efficacy has been established in cases confirmed for the presence of the parasite and in subjects presenting symptoms of leishmaniasis. The advantages of the test are: (i) Blood obtained on filter paper after finger print is sufficient to carry out the test thus replacing cumbersome and painful bone-marrow/spleen puncture required for diagnosis; (ii) It takes 90 minutes to pronounce results and does not demand much of technical competence.

Phase III clinical trials with chandonium iodide have shown that its onset of action is quicker than pancuronium and the duration of action is longer. Chandonium iodide has shown complete reversal of neuromuscular block with neostigmine, no histamine releasing activity and is safe and effective in patients at 0.12 mg/kg.

2.15 POLYMER SCIENCE

A process for producing a novel drag reducing oil soluble polymer (DROP) based on the principle of associating polymers was successfully transferred by NCL to Lubrizol India Ltd. A grade of special mineral filled PTFE for moulding applications, such as value seats, was developed by NCL in collaboration with Hindustan Fluorocarbons Ltd., and commercialized. A critical engine component, namely reed valve base, made of an engineering plastic, has been commercialized by Bajaj Auto Ltd., based on NCL know-how.

A 20 TPA pilot plant for producing coating grade polyphenylene sulphide based on NCL process was commissioned at Shriram Fibres Ltd., Madras.

CLRI has developed a high performance acrylic syntan called polytan. This product has been synthesised by graft copolymerization of acrylic ester and acid monomers on to a renewable resource material. The process technology has been successfully demonstrated to M/s Chem. Crown India, Madras. The Company has since started producing polytan on a commercial level.

2.16 POST HARVEST/AGRO-TECHNOLOGIES

A chromatographic method for prolamine purification and an ELISA test for prolamine have been developed by CFTRI. An antifungal protein from Sorghum endosperm has been identified and purified. A method has been worked out for quick cooking of rice with acceptable rehydration and culinary properties. A prototype of an improved mini rice mill has been developed. A manually operated machine (costing Rs. 4,000) to dehusk pulses at the rate of 50 to 60 kg. per hour has been developed by CFTRI for rural application.

II.5 Tissue Cultured Tea Plant

A formulation called Energy Food had been developed by CFTRI to overcome the deficiencies with respect to protein and energy in the diet of weaned children. Energy food presently manufactured under the aegis of the Govt. of Karnataka has been improved by CFTRI with increased caloric density.

A new gamma ray induced chlorophyl variegated mutant of double braced bougainvillea cv. 'Los Banos Beauty' was released by NBRI. Out of the three varieties of NBRI developed foliage ornamental amaranths entered in the International flower trials at the Pennsylvania State University in 1990. This opens up possibilities of its commercialization in the International floricultural trade.

Fractionation of Mentha citrata oil from the improved variety 'KIRAN', developed earlier by CIMAP, was carried out in an efficient high vacuum column to isolate linalool and linalyl acetate in pure form. Both these products had 92-95% purity and were found to be quite suitable for use in perfumery industries. The technology is ready for commercial exploitation.

2.17 BIOTECHNOLOGY

As a prerequisite for evolving disease-resistant lines of the crop, NCL has succeeded in regenerating plants in vitro via direct embryogenesis; these have been planted in the field for evaluation. NCL has been successful in conserving germplasm of four endangered species, viz. Vanilla walkerie, Delphinium malabaricum, Cyathea spinulosa and Pterocarpus santalinus, using tissue culture protocols.

RRL Trivandrum has signed an MOU with the International Potato Research Centre, Peru, for large scale field trials of biological pest control for sweet potato crop. Earlier trials carried out by the laboratory in collaboration with the Central Tuber Crops Research Institute (CTCRI) (ICAR) have proved successful.

CFB has developed technology for the preparation of high molecular weight Hyaluronic acid used in ophthalmic surgery. This resulted from the collaboration of CFB with a visiting TOKTEN expert. Negotiations are on for transfer of technology to industry for commercial exploitation. Methodologies for large scale preparation of gangliosides and phospholipids were developed. The know-how is to be transferred to Industry.

RRL Jammu continued the work on increasing silk production by application of chemicals on silkworm races of Bombyx mori L. A formulation using BPE which increases silk yield by 10% associated with one day increase in larval period at a dose of 6 mg/ounce of seed about (40,000 larvae) has been evolved. The r sults have been verified in the field. BPE administered laboratory trials, have resulted in increase of silk yield ranging from 20 to 25% with the larval period increase of 30 to 40 hrs.

Tissue culture studies in tea, some ornamentals and maggar bamboo are continuing at the CSIR Complex Palampur for mass multiplication and production of disease-free plants. Somatic embryos, formed directly on the cotyledonary surface have been encapsulated to produce artificial seeds. These have been successfully germinated and completed plantlets have been obtained.

2.18 ECOLOGY AND ENVIRONMENT

Membranes using poly-methyl methacrylate polymer have been developed. The system, designed by NEERI, is under scale-up process now in collaboration with a textile mill at Nagpur.

A state of art report on pollution control and abatement in the tanning industry covering various aspects, viz. characteristics, physico-chemical and biological treatment, scale-up, resource recovery, and cost benefit analysis has been prepared. A mathematical model based on catalyst mechanisms for biofilm attachment has also been developed. A DNES financed demonstration plant with a capacity of 65 m^3/d is presently being installed at Amburtech, Madras to demonstrate the cost-effectiveness of the fixed-film technology to tannery wastewaters.

A bench scale molten salt combustor with a feed rate of 1.5 kg/h (pulverised solids) has been designed, fabricated and installed by NEERI. It was found that 5 Kg of salt would be necessary to maintain the salt bed depth sufficient for complete combustion. Test runs have been carried out to determine the efficiency for destruction of commercial pesticides like BHC and DDT as also wastes procured from IPCL, Vadodara.

NEERI has undertaken twenty one projects on environmental impact assessment for such customers as Port Area Authorities, Oil & Natural Gas Commission, Refineries, and Nuclear Power Plants.

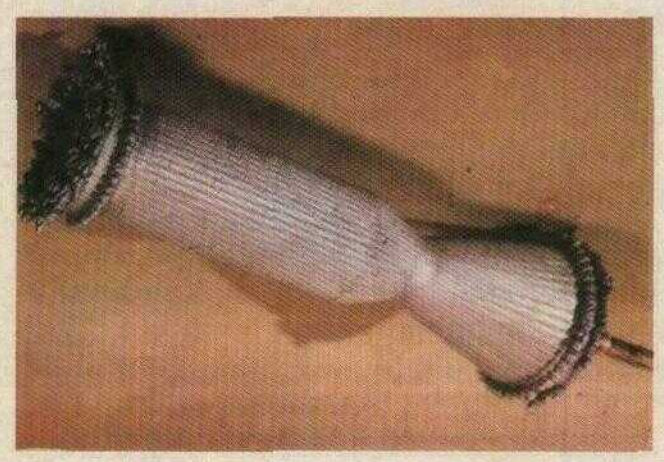
2.19 MATERIALS

Hindustan Aeronautics Ltd. (HAL), Bangalore approached NPL to undertake the development of optimum process parameters for the widely used aluminium alloy rivet using the two technologies - hot extrusion, followed by cold drawing. NPL has developed the parameters and the wires produced have been finally accepted by the HAL Quality Control Department, the approved inspection agency of the Directorate of Technical Development & Production (Air), Ministry of Defence, Government of India.

II. 6 Aerospace Grade Rivets.

NPL has also prepared the detailed design of the cold drawing equipment required for drawing rivet wires. Bulk production facility for wire drawing has been set up at the Foundry & Forge Division, HAL, Bangalore. With this facility, it will be possible to produce 15 MT of rivet wires per year, in the initial stage.

A regeneratively cooled rocket thrust chamber of one ton trial engine has been successfully electroformed and despatched by CECRI to ISRO Thiruvananthapuram, the sponsors of the project. CECRI has come out with an interesting process to coat a conducting polymer on insulating materials such as cloth, glass and plastics. Yet another CECRI process of interest relates to the preparation of highly flexible conducting polymer composites, which besides being dissipators of electrostatic charges, can also be used for the fabrication of zebra connectors for low display devices.



II. 7 Electroformed Regeneratively Cooled Rocket Thrust Chamber.

Primary coated multimode graded index fibres of standard dimensions (50/125 micron) and properties (N.A. 0.21, loss at 850 nm 3.0-3.5 dB/km, minimum loss being 2.61 dB/Km) were drawn in single continuous lengths upto 2.5 km. Laboratory scale studies for perform and fibre making were successfully completed, and an agreement was signed by CGCRI with M/s Universal Cables Ltd. for transfer of the process know-how for commercial upscaling.

Silver doped alkali aluminophosphate glasses are known as excellent materials for use as dosimeters. These glasses are of strategic importance and there are only a few overseas manufacturers producing them. Success has been achieved in developing the method for the production of silver doped phosphate glass in the form of rectangular polished pieces of 15mm x 12mm x 4mm weighing approximately 1.8 gm each. The glasses were evaluated by the Defence Laboratory Jodhpur (DLJ) and tested in field trials. The results show that the glass made by CGCRI conforms to the specifications.

A thermal phosphate laser glass equivalent to LHG-8 is used both as oscillator rod and amplifier disc in highpower laser system design. This glass is a strategic material and the country's demand is entirely met by import. The composition and methodology for the production of the above glass was developed at CGCRI and tested. The results show the glasses conformed to the properties.

A technology transfer agreement has been signed with a private company for commercial production of ferromagnetic chromium dioxide powders through a novel process developed in NAL. A "very critical" seal disc has been developed by NAL at the request of the Nuclear Power Corporation (NPC) Bombay. The NAL process is estimated to have saved NPC an expenditure of over Rs. 7 crore in foreign exchange.

2.20 BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY

CBRI has developed a new type of low cost load bearing large aggregate concrete block. These concrete blocks have low content cement, will reduce wall thickness and eliminate internal plastering. CBRI has successfully developed a new machine for the mass production of these blocks. The machine is under commercial production by a firm in New Delhi. The technical know-how is available from NRDC.

2.21 COMPUTER SCIENCE AND MODELLING

Parallel Processing : A 16 processor parallel computer (Flosolver Mk2) is now in operation in NAL, and an exercise carried out with Suprenum in Germany has demonstrated the portability of NAL parallel codes. A panel code has been parallelised, enabling us now to handle on the computer 3D flow problems involving nearly ten thousand panels.

The CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS) carried out a number of modelling studies last year, in collaboration with other CSIR laboratories and government departments, notably in the area of ocean modelling.

2.22 TRANSPORTATION

NAL has undertaken two projects for the design and development of Civil Aircraft. As regards the NAL Light Aircraft (NALLA), which is a two-seater that could serve as a trainer, negotiations with an industrial partner are in an advanced stage: work on design has already started, and test parts are being fabricated. The Light Transport Aircraft (LTA), is expected to fill multiple roles including those of a six passenger executive aircraft, a 9-14 passenger commuter/air taxi, and air ambulance and other services. A detailed feasibility report on LTA has been completed. A PC based system has been developed by NAL for reading quick access recorders (QARs) of Airbus A 320 aircraft. QAR tapes are useful to quickly analyse flying incidents and monitor the health of the aircraft.

The readout system has recently been supplied to the Indian Airlines at a cost of Rs. 7 lakh.

This system will result in valuable saving of time and foreign exchange. The system has already been successfully used to analyse two recent flying incidents involving the A 320.

The design of a prototype model of a flow angle sensor has been completed. An exercise carried out as part of a joint project sponsored by the Commonwealth Aeronautical Advisory Research Council, involving the comparison of the prediction of computer codes developed in different Commonwealth laboratories with careful experimental data, has led to considerable improvements in NAL's full potential code for predicting aerofoil characteristics.

NAL has formally handed over the 1/7th scale LCA air intake model to ADA. This model will soon be sent to ONERA, France for generation of aerodynamic data primarily at transonic speeds. The model will later be tested in the NAL 1.2 m trisonic wind tunnel (H1) at supersonic speeds.

2.23 BASIC RESEARCH

At NPL, the rf SQUID behaviour has been observed at the liquid nitrogen temperature (77K) for the first time in a SQUID made of Bi-Sr-Ca-Cu-O (BSCCO) superconductor. The SQUID is made from a thick film of BSCCO prepared by screen printing technique with a starting composition of (1112). The BSCCO film of about 20 um thickness is prepared on MgO (100) substrate and has a superconducting transition temperature of 100K.

A systematic study on the differential thermal calorimetry of Polyacrylonitrile (PAN) fibres at NPL has shown the presence of an additional exothermic maxima at about 350°C. The PAN fibres oxidised to 350°C and above and not upto 270°C as conventionally done so far, show much better thermally stabilized structure. A model of such stabilized fibres has been proposed.

CEERI has fabricated an aluminium gate Superconducting Field Effect Transistor (S-FET) in bismuth cuprate superconducting films and observed transistor action.

Analytical work has been carried out in three different areas like CAD of Gyrotron interaction, RF interacting structures, and CAD of Magnetron Injection Gun (MIG). Two different approaches have been considered (i) small signal approach, and (ii) large signal approach. At CEERI a large signal model has been studied and the program has been implemented.

The sheath helix model was updated for determining the interaction impedence characteristics. The tape helix model was also developed and better results were achieved in comparison to sheath model.

Michael reactions carried out by NCL on 2-arylidene-1-tetralone complexed with chromium tricarbonyl using nitromethane as the nucleophile, proceeded with a very high degree of stereoselectivity at room temperature; only two diastereomers were produced. The selectivity in the conjugate addition of the nucleophile was shown to be 100% from the face away from the metal. Similar results were also obtained when malononitrile was used as nucleophile. Such complete steric control of nucleophilic addition at a site remote from the metal complexation has been shown for the first time. QSAR studies at NCL of alkyl aryl mixed diethers of 3,7-dimethyl-2,6-octadiene-1 8-diol (1) suggested that the diaryl diethers of (1) may exhibit higher insect growth regulating activity. A variety of oxime ethers were synthesized from acetylalloisolongifolene,-acetyllongifolene and - formyllongifolene. These compounds showed juvenile hormonal and IGR activities on Culex quinquefaciatus in the range of 70-90% at 1 ppm, 60-70% at 0.1 ppm and 0.01 ppm.

The condensation of dimethyl N-sulfonyl carbonimidodithioates with amino guanidine bicarbonate in presence of base in ethylene glycol furnished in one step the required N-(5 amino-IH-1,2,4-triazol-3-yl) sulfonamides. Several sulfonamide derivatives have been synthesized at NCL.

Ongoing studies at IICT in the area of photo-induced electron transfer reactions have led to a

successful generation of minimum cation by sequential electron-proton-electron (EPE) transfer from amino functionalities to excited singlet arenes. The intramolecular muleophilic cuclisation of minimum cations by a variety of nucleophiles represents a novel approach for biologically active oxazolidine and indazolidine alkaloids. Further, the synthetic utility of this reaction was demonstrated for generating the a-amino radical by selective desilulation from amine cation radical formed by an initial one-electron oxidation. The SET desilylation sequence served as a selective method for carbon radical generation which upon intramolecular addition to a electrons gave pyrroilidines and piperidines. Enantioselective total synthesis of (+) - pumiliotoxin, a potent cardiotonic alkaloid, has been achieved employing this methodology. The potent drugs (+) Castenospermine and (+) Nojitomycine are being synthesized by this methodology.

The effect of medium on the reaction between excited cyclohex-2-en-1-one and cyclopentadiene showed that an exiplex and a transoid enone are involved in the different photochemical and photophysical process. 6-(3-Butenyl)-cyclohex-2-en-1-one was synthesised by an improved method and its intramolecular photo annelation gave a bridged cuclobutane derivative.

The lysine and threonine sensitive isoenzymes of asparatate kinase were purified to homogenity and antibodies to these isoenzymes were raised in rabbits. The antibodies were characterized by immunological techniques. Immunotitrations of the increasing amount of enzyme protein against a fixed volume of antiserum (25 ul) showed that the neutralization of the enzyme activity was more with a smaller amount of the antigen.

A method has been developed for the preparation of the antileishmanial drug pentamidine in good yield from p-hydroxybenzaldehyde. Acivicin, an irreversible affinity analogue for carbymul synthetise, the first enzyme for pyrimidine pathway has been found by IICB to be a potent inhibitor for L donovani growth both in promastigote and in amastigote in vitro assay systems.

A novel method of radioactively labelling proteins, using labelled nucleotide triphosphates, in the presence of Cu^{2+} or Zn^{2+} has been developed at CCMB. The method simplifies molecular weight determination of proteins, while improving accuracy and reducing cost.

2.24 NATIONAL FACILITIES

Distributed Information Centre on Enzyme Engineering, Immobilized Biocatalysts, Microbial Fermentation and Bioprocess Engineering, a National Facility funded by the Department of Biotechnology has successfully put IMTECH on E Mail network for facilitating communication. This allows direct access to the latest databases such as Genbank and EMBL nucleic acid and protein sequences. It is possible to search the databases, retrieve any sequence, examine such a sequence for similarities against a sequence of interest using programs such as FASTA and get the results by E Mail. Staden's package for sequence analysis has been made available on the system. The use of DIALOG service for bibliographic searches increased significantly lately.

This National Facility has been set up at IMTECH to undertake research and development work in the process engineering aspects of existing or emerging biochemical and microbial technologies to prove workability of technologies being imported by private or public sector industries and to make available to universities and other R&D laboratories large scale fermentation facilities for process development work.

2.25 INFORMATION DISSEMINATION

PID continued to publish the journals. Some of the special issues of the various journals brought out during 1990-91 are: August 1990 issue of the Indian Journal of Radio & Space Physics (IJRSP) on Solar Terrestrial Physical Research and October-December 1990 issue of IJRSP on Prof. S.K. Mitra Birth Centenary; February 1991 issue of Indian Journal of Chemistry Sec. B dedicated to the Central Drug Research Institute on its 40th anniversary. The Journal of Scientific & Industrial Research has completed 50 years of existence

and from January 1990, each issue is being brought out as a Golden Jubilee issue.

Ten CSIR laboratories have been connected on the computer network which, at present, is supporting the INSDOC E-mail facility. Other facilities like data, file or document transfer and database access will also be available in due course. Eleven user nodes and two mail nodes have been established.

The bibliographic database pertains to items like wood, polymer, composites, alloys and provides information on research carried out in India and published by Indian scientists abroad. The database contains about 9000 references for online access from INSDOC.

At the instance of the Planning Commission, an integrated document on Rural Road Development was brought out by CRRI under the sponsorship of the Council for Advancement of People's Action and Rural Technology (CAPART), the Ministry of Surface Transport and the Ministry of Agriculture (Rural Development).

In the theme of Information System and Science and Technology Archival Resources, the major databases maintained and upgraded by NISTADS are: Indian literature on science policy studies, deputation of CSIR scientists abroad, research papers published in S&T journals, technology transfer from India, technical consultancy and women scientists in CSIR. The Devanagri version of CDS/ISIS has been developed.

2.26 PLANNING

The 8th Five Year Plan (1990-95) of CSIR was revised on the basis of the guidelines formulated by the Planning Commission, Govt. of India. The Annual Plan 1991-92 of CSIR was also finalized on the basis of changes indicated in the priorities by the Government. A compendium entitled "Compendium of Technologies for application in Rural Areas", was brought out.

2.27 TECHNOLOGY UTILIZATION

A compilation entitled "Model Agreements for Contract Research, Licensing of Know-how" was brought out.

The joint Business meeting with the Federation of Indian Chambers of Commerce & Industry (FICCI) on Technologies for Energy Alternatives & Conservation in the context of the Gulf Crisis was also organized. An important outcome of the meeting was the setting up of a FICCI CSIR joint cell to scrutinize proposals pertaining to 'Energy Alternatives' and 'Energy Conservation'.

During the year, the PTCs attended to about 3000 enquiries, paid visits to about 600 industries, identified over 700 problems of which nearly 90% were satisfactorily resolved, organized 50 training programmes/workshops and played a major role in the issue of 30 licences based on CSIR technologies.

CSIR had representation in various Govt. Committees for industrial approvals: Technical Evaluation committee, Foreign investment Board, Special Approvals Committee (SAC) for NRI, Board of Indigenous Technology (BIT) etc. About 500 proposals for import of technology, over 3000 Industrial Licences, 25 NRI, 15 Industrial Delicensing and around 10 BIT applications were examined. Besides nearly 250 applications from industrial units seeking registration of their In-house R&D were scrutinized.

A 'Safety Cell' has been set up in CSIR, and an Advisory Committee constituted to help plan and guide its programme. Arising out of the initiatives of the Safety Cell a 'Safety Officer' has been designated in each laboratory. The first ever Workshop of all Safety Officers was organised and an annual convention of safety officers institutionalized. A preliminary audit of safety in CSIR laboratories has been undertaken.

2.28 HUMAN RESOURCES DEVELOPMENT

The number of Research Fellows and Associates receiving financial assistance during 1990-91 was 4254. Out of these 1059 were JRFs, 2394 SRFs and 801 RAs. The awards made during the year

numbered 450 JRFs, 603 and 343 RAs.

The number of Pool Officers working as on March 31, 1991 was 677. Of them about 45 per cent were scientists, another 45 per cent medical personnel and 10 per cent were engineers and technologists. A total of about 350 Pool Officers left the Pool either after securing regular employment or after completing their tenure in the Pool.

A new programme known as the CSIR Visiting Associate Scheme was started to foster interaction among the working scientists of various universities, industries and CSIR-laboratories and other Departments of the Government. A total of 40 positions of visiting associates were filled.

Superannuated scientists represent a pool of talented and experienced teachers, guides and researchers. CSIR provides financial assistance to such scientists to pursue research or write monographs or books in their respective fields of specialisation relevant to the programmes and activities of CSIR. This year 79 Emeritus Scientists were in position.

CSIR distributes research grants to non-CSIR laboratories, mainly in the universities. A total of 910 projects were supported this year. More than 1200 fellows and associates were collaborating with the Principal Investigators in these projects.

In order to promote a higher degree of originality and for the overall improvement of manpower quality, CSIR provides travel grants for the participation of Ph.D. students and research associates in important international symposia, seminars conferences. This year, a total of 198 grants was sanctioned.

Two volumes of directories of Non-Resident Indian (NRI) Scientists and Technologists containing biodata of 1500 professionals were brought out by the Division of Scientific & Technical Personnel of CSIR Hqrs.

Under the TOKTEN (Transfer of Knowledge Through Expatriate Nationals) project, a joint programme of the Government of India and the United Nations Development Programme, a total of 68 consultants (including 4 revisits) visited Indian institutions.

2.29 INTERNATIONAL SCIENTIFIC COLLABORATION

A Protocol on Scientific and Technological Cooperation between CSIR and the Scientific Studies Research Centre, Syria was signed. The areas of cooperation of interest to SSRC are materials, electronics & optics and applied mechanics.

A two member CSIR delegation visited Thailand during 4-6th November '90 to review the First Working Programme between CSIR and TISTR, Thailand and sign the Second Working Programme for the year 1991-93. Under the Indo-French S&T Cooperation, the projects on (a) "Synthesis of biologically active natural products - antitumour and immunosuppressive agents" at the Indian Institute of Chemical Technology and the Institute Chimie des Substances Naturelles, Gif-sur-Yvette, France with funding to IICT of Rs. 13 lakhs and (b) "Thermal and Photochemical degradation and stabilization of polymer blends and alloys" at the National Chemical Laboratory and Lab.-de Photochimie, Aubiere, France with funding to NCL of Rs. 15 lakhs, were approved.

Under the ongoing Indo-U.K. project on Heat Pumps at NCL, a workshop on 'Industrial Energy Conservation' was organised during Feb. 6-8, 1991 at NCL. This included participants from the UK, Mexico and Sweden.

Under the CSIR - KFA arrangement, a new collaborative project on Very Long Baseline Interferometry (VLBI) between NGRI and the Geodetic Institute, University of Bonn was approved.

The sixteenth binennial meeting of the Commonwealth Science Council was held in Malta during November 12-16th, 1990. The meeting, for the first time, was held along with and attended by the Commonwealth Ministers responsible for Science & Technology. The meeting approved the new initiatives in remote sensing, mathematical modelling and environmental areas for re-

gional cooperation. CSIR was represented in both.

Technical Assistance Under the 'Institutional Strengthening of the Indian Leather Sector in the field of Environmental Technology a programme of Cooperation between CSIR (CLRI) and TNO, Netherlands was approved by the Government of India and the Government of Netherlands. Assistance envisaged from the Netherlands Govt. under the project is of the order of Dfl 4.8 Million. Three projects have been approved by the Govt. of India for assistance under the UNDP Programme for CP-IV :

CSIR participated in three international and two national exhibitions.

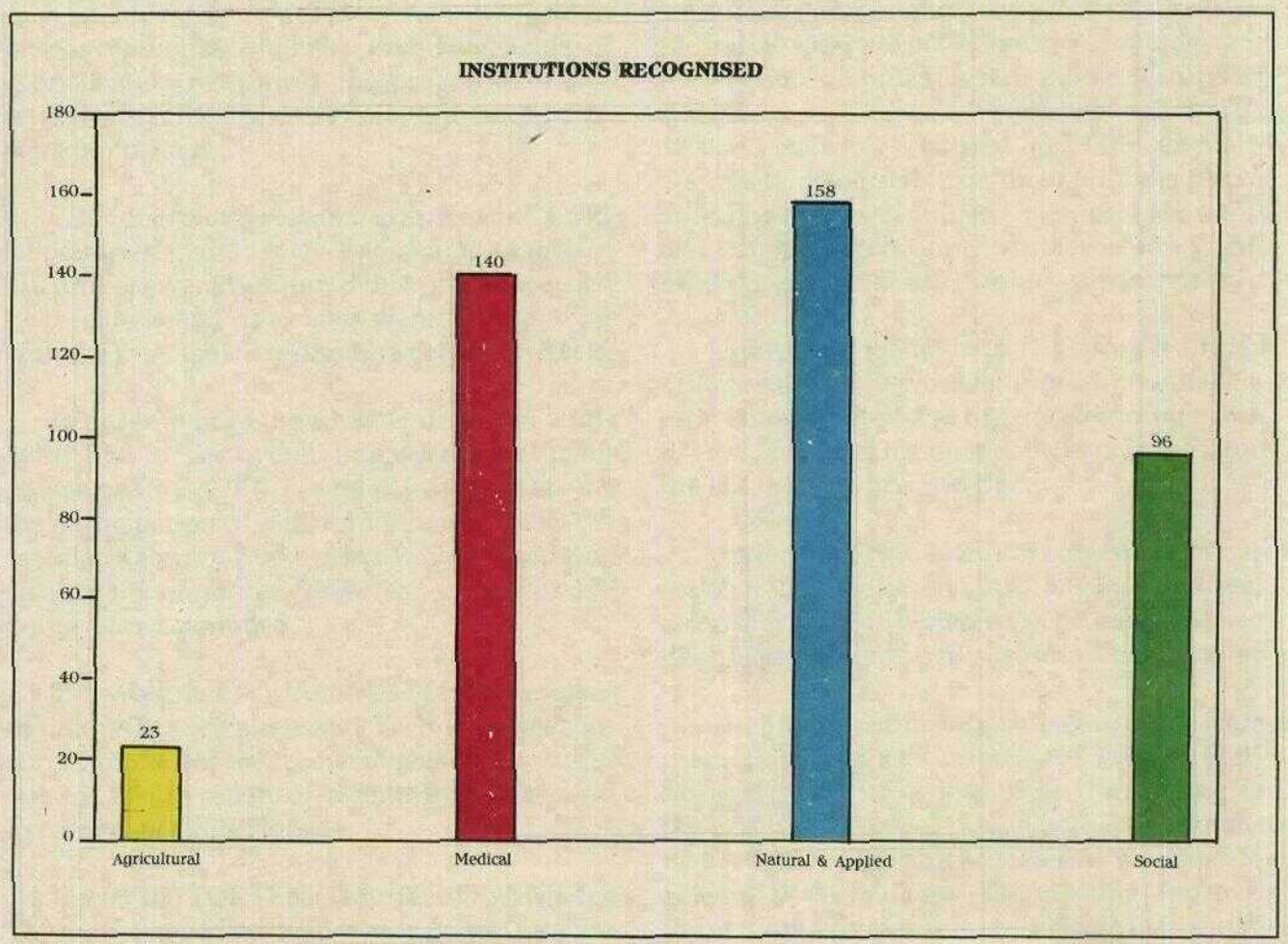
III. SCIENTIFIC RESEARCH ASSOCIATIONS/ INSTITUTIONS

1. INTRODUCTION

To promote the growth of research and development activities in industry and non profit organisations, various measures have been evolved. Some of the provisions in the Income Tax Act have been designed to encourage research and development. The Department also considers modifications and amendments to various schemes and suggests amendments thereof to the Ministry of Finance in order to give stimulus to the growth of research in the country.

2. SCIENTIFIC RESEARCH ASSOCIATIONS IN THE AREA OF NATURAL & APPLIED SCIENCES

Scientific Research Associations, Institutions,



III. 1 Institutions Recognised

Universities and Colleges which undertake research in the area of medical, agriculture and other applied sciences seek approval under section 35(I)(ii) of the Income Tax Act if they wish to have donations from Industries or other sources. The institutions notified under the section obtain benefit to the effect that any sum paid to them is wholly exempted from the levy of Income Tax. The donors who, pay sums to such notified institutions are allowed deductions from the profits and gains of their business. Prior to June 1, 1982, ICAR and ICMR were the Prescribed Authorities for making recommendations to the Ministry of Finance in the areas of agricultural sciences, medical sciences respectively. With effect from June 1, 1982, Secretary. Department of Science & Technology was designated as the Prescribed Authority to deal with all the above areas. Consequent to the creation of Department of Scientific & Industrial Research, Secretary, DSIR has been designated as the single Prescribed Authority. Following certain amendments to the I.T. Act in 1989, the Director General, Tax Exemptions is the Prescribed Authority, with the concurrence of Secretary, Department of Scientific and Industrial Research.

For considering the cases for approval under section 35(I)(ii) and (iii) of the Income Tax Act there is a standing committee known as Screening Committee which consists of the representatives of Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council of Social Science Research (ICSSR), Central Board of Direct Taxes (CBDT) and Department of Scientific & Industrial Research (DSIR). The recommendations of the committee are submitted for seeking approval of the Secretary, DSIR.

Approval to these institutions is granted for a limited period in the initial phase. These institutions are required to submit the annual returns to Secretary, DSIR. These annual returns are reviewed in the Department by a group known as Research Review Group. The group makes necessary recommendations regarding the further extension or withdrawal of approval.

In order to ensure conformity with the guidelines, wherever necessary the organisations are advised to make necessary changes such as in the objectives of the Memorandum of Association or in the Investment clause. During the year, about 60 organisations held discussion with the Department. Through an amendment by the Direct Tax Laws (Amendment) Act, 1987 effective from 1st April 1988 Section 35 *inter-alia* was deleted. The department therefore prepared a scheme on Recognition of Scientific and Industrial Research Organisations. For operating the scheme which was almost on similar lines as the earlier approvals u/s 35 a Screening Committee was constituted. The Screening Committee consists of representatives of Indian Council of Agricultural Research,Council of Scientific and Industrial; Research, Indian Council of Medical Research (ICMR), Ministry of Finance CBDT, Indian Council of Social Science Research and Adviser (DSIR) as the Chairman. During 1991, the aforesaid committee met 12 times and approved 32 fresh and reviewed 233 cases. A list of 32 fresh cases approved under the scheme in the area of Natural and Applied Sciences and Medical Sciences is given in Annexure-III-1.

At present there are 140 research organisations in the area of medical sciences, 158 in natural and applied sciences and 23 in agricultural sciences, thus making a total of 321 research organisations in various categories. Fig. III-4 may be seen which gives details of approved associations/ institutions.

Govt. of India restored section 35 of the Income Tax Act with modifications by Direct Tax Laws (Amendment) Act 1989 from 1.4.89. Sub-clauses (ii) and (iii) of clause 1 of section 35 deal with approval of the scientific research organisations and institutions in the area of agriculture, animal husbandry and fisheries, medical and other applied sciences.

In dealing with such associations and institutions the Amendment Act has made the following modifications:

(i) Application in the prescribed form will be made to the Prescribed Authority.

(ii) The Prescribed Authority could call for additional information as considered necessary.

(iii) Approval at a time will be for 3 years or less.

The Prescribed Authority for Section 35 is the Director General (Income Tax Exemption) in concurrence with Secretary, Deptt. of Scientific and Industrial Research (Ministry of Science & Technology), Govt. of India.

The new procedure for making applications for approval and renewal has been laid down by Ministry of Finance Notification No. SO 669(E)(8436)/F.No. 142/25/89_TPL dated 23.8.89. This procedure is summarised below:

(a) Applicant will make application to the Director General (Income Tax Exemption) in triplicate through the Commissioner of Income Tax having jurisdiction over the applicant.

(b) Simultaneously 6 copies of the application will be sent to Secretary, Department of Scientific & Industrial Research, Ministry of Science & Technology. The applicant will furnish any further details as may be required for dealing with this case by the Director General (Income Tax Exemption) or DSIR.

(c) The organisation will submit to the Prescribed Authority and to the DSIR a copy of the annual return showing income and expenditure balance sheet showing its assets and liabilities. The auditor should certify that the amounts incurred are for scientific research if the organisation is to avail of exemptions u/s 10(21) of the Income Tax Act.

The DSIR will examine the applications according to the norms laid down by the Department and after obtaining of approvals, Secretary, DSIR, Department will communicate its comments to Director General (Income Tax Exemption), Calcutta.

3. SCIENTIFIC RESEARCH INSTITUTIONS IN THE AREA OF SOCIAL SCIENCES

Section 35(I)(iii) of the Income Tax Act 1961 provides for deductions from profits and gains of business of profession and in respect of other incomes and stipulates that any sum paid to a university, college or other institutions to be used for research in social science or statistical research will qualify for deductions at the hands of the donors related to the class of that business.

Till June 1, 1982, the Indian Council of Social Science Research was the Prescribed Authority for the purpose of section 35(I)(iii) of the I.T. Act 1961. On June 1, 1982, Secretary, Department of Science & Technology was designated as the Prescribed Authority for this purpose. Consequent to the creation of the DSIR, Secretary, DSIR had been designated as the Prescribed Authority.

This section has been amended in 1991 resulting in that tax treatment to donors making donations to any institute in the area of social sciences is the same as in the area of Natural and Applied Sciences.

In June 1984, a group called the Research Review Group on Social Sciences was set up to review the activities of social science research institutions approved u/s 35(I)(iii) of the Income Tax Act 1961. This Group was reconstituted in October 1985 so as to include the representative each of the Ministry of Finance and Indian council of Social Science Research and in November, 1987 to include a representative of Ministry of Welfare.

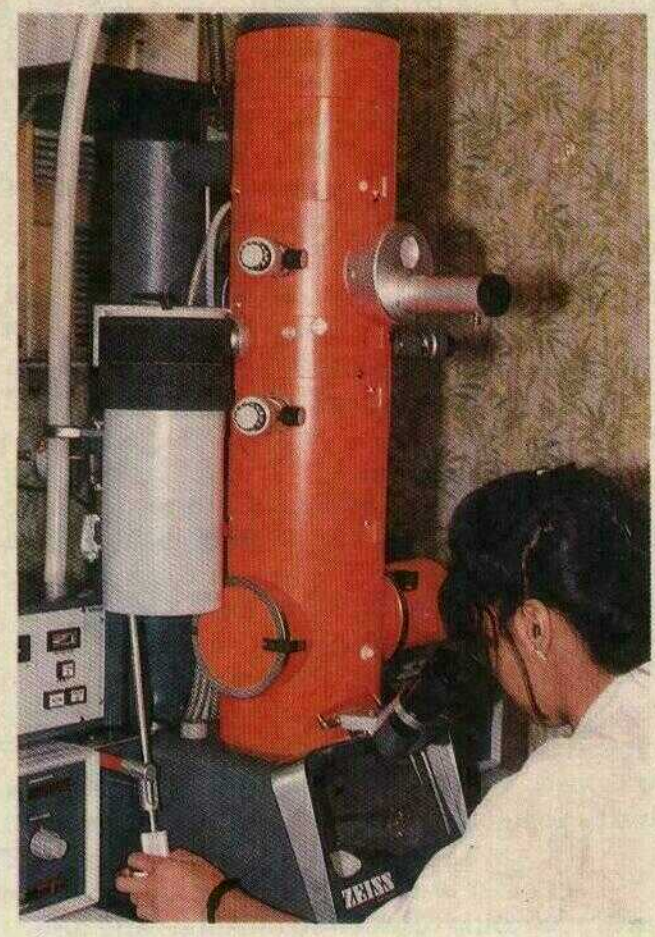
From 1.4.88, DSIR launched a new scheme of recognition of scientific and industrial research organisations as mentioned in section 2. During the year Screening Committee had 12 meetings and approved 6 new cases as given in Annexure III-1 and reviewed 44 cases. At present there are 96 research organisations in the area of social sciences.

The formal procedure adopted in 1984 for consideration of fresh applications by the Fresh

Approval Committee has resulted in considerable reduction in the time lag between the receipt of fresh applications for consideration u/s 35/(I)(iii) and their disposal.

Similarly, the setting up of the Research Review Group on Social Sciences has led to a quicker disposal of application for renewals, received from the interested institutions and an overall review of the social science research work carried on by the institutions approved u/s 35/(I)(iii) of the I.T. Act,1961.

After obtaining Secretary, DSIR's approval, necessary comments are sent to the Director General (Income Tax Exemption), Calcutta.

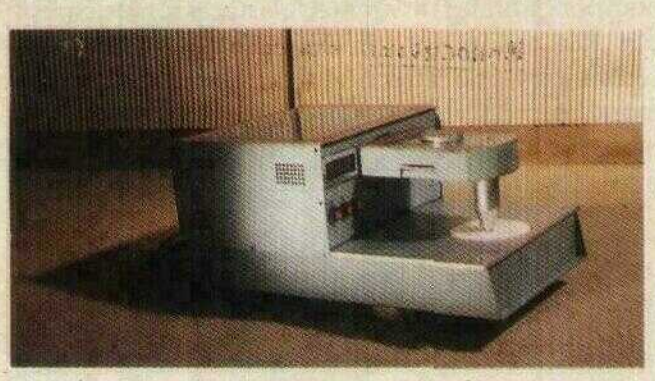


III. 2 Electro Microscope

4. SCIENTIFIC ACHIEVEMENT OF THE ORGANISATIONS

In order to evaluate and bring out the scientific activities and achievements of these Scientific Research organisations, a publication entitled "Profile of Scientific Research Associations" covering about 74 institutions was brought out in 1988. A second volume of Profile of Scientific Research Organisations was brought out in 1989, covering 180 organisations. A third volume covering 179 institutions was published in 1991. This has enabled a better appreciation of the good work done by these organisations indicating therein the contribution they make in the overall scientific research activities in the country.

III. 3 New Linear Accelerator



III. 4 Optical Densitometer

IV. IN-HOUSE R&D IN INDUSTRY

1. RECOGNITION OF IN-HOUSE R&D UNITS

A strong S&T infrastructure has been established in the country.This covers a chain of national laboratories, specialised centres, various R&D and academics institutions, training centres, etc. which continuously provide expertise, technically trained manpower and technological support to the industry. Various policy measures and organizational structures have also been evolved from time to time to meet the changing industrial and technological requirements of the country. 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 private sector 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 now dealt by the Department of Scientific & Industrial Research, Ministry of Science & Technology. One of the objects of this scheme is to provide liberalised import facilities to recognised In-house R&D Units for equipping their laboratories with equipment, components and raw materials necessary to carry out R&D work as for example to update the technology and effecting improvements in the manufacturing process, introducing new products, processes and developing substitutes for imported items.

The In-house R&D Units qualifying for recognition are expected to be engaged in research and development activities related to the manufacturing activity of the firm. For this purpose R&D would include: efforts for import substitution, export promotion, process/product/ design impovements, development of new technologies, design and engineering, testing and analysis related to these efforts, development of new products or discovering new methods of analysis, productivity research for increased efficiency in use of resourses, capital equipment and materials, fuel efficiency, recycling of wastes and research for efficient use of scarce materials.

The R&D activities are expected to be separate from routine activities of the firm such as production and quality control. It is not necessary to have all the R&D activities segregated and located in a separate building. It is appreciated that In-house R&D activities are likely to be intermingled with the activities related to manufacturing in the factory and often part of the production equipment and infrastructure would be utilised to carry out certain aspects of their R&D activity. The in-house R&D Units would have at least some staff exclusively engaged in R&D and there would be full-time Head for the R&D 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 250 by 1975, to over 600 by 1980, over 900 by 1985, and 1205 as on 31 December, 1991. The growth is also represented in Figure IV.I. Of these 1205 units, about 100 are in public sector and the remaining are in private sector and joint sector. A revised and updated Directory of recognised In-house R&D Units was brought out during September, 1991.

A set of 26 In-house R&D Units which are strictly scientific research foundations and also approved as SIRO, by DSIR are transferred to the Fiscal Incentives Group and are no longer listed as In-house R&D Units.

For the purpose of recognition, the R&D Units are to apply to DSIR as per a standard proforma. The proforma and other details about the scheme are available in the DSIR publication "Promotion and support to Indigenous Technology". The applications after scrutiny in the DSIR are circulated for comments to various other Departments/ Agencies such as concerned administrative Ministries, DGTD, DCSSI, CSIR, ICAR, ICMR, DRDO, NRDC, etc. The Units having more than 26% foreign equity are normally visited by expert teams comprising of representatives of DSIR as well as outside agencies like administrative Ministries, CSIR, NRDC, ICAR, IOMP, IITs and local educational and Research Institutions before they are taken up for consideration. The applications along with commemts from outside agencies, visit reports, discussion reports along with the Departments evaluation are considered in an Inter-Departmental Screening Committee constituted by the Secretary DSIR. The Screening Committee is presently chaired by Joint Adviser, DSIR with members from Department of Chemicals & Petrochemicals, Department of Fertilizers, Department of Industrial Development, Ministry of Environment and Forests, Department of Coal, Department of Electronics, DOT, DGTD, CSIR, DCSSI, and NRDC along with the DSIR representatives. The Committee considers the applications along with other relevant data put up and makes recommendations to the Secretary, DSIR for : (a) Granting recognition for a specified period ranging from 1 to 3 years, or (b) for rejecting the applications, or (c) for deferring the case for obtaining further details, discussions with the company or visit to the unit for clarification of various points.

A major effort was made in 1985 to reduce the processing time and the pendency of applications for recognition of In-house R&D Units. The Screening Committee meets every month and considers the application for fresh recognition. Arising out of this, the pendency at any point of time during the year 1991 has been very much within a small number.

During the year 1991 the Screening Committee met 12 times and considered 111 applications for recognition; 69 R&D Units were granted fresh recognition, 7 R&D Units were endorsed on the existing letters of recognition in respect of other R&D units of their company and 35 applications were rejected.

The pendency at the end of December 1991 was 18. A statement giving monthwise receipt, disposal and pendency of applications for recognition of R&D Units is given at Annexure IV.1.

194 Units were visited till the end of December 1991 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 150 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. During 1991, 575 In-house R&D Units were due for renewal of recognition beyond 31 March, 1991. Based on the evaluation of the performance of the R&D Units, renewal of recognition was granted to 536 Units. All applications received for renewal were dealt with and there was no pendency by September, 1991. A statement showing monthwise receipt, disposal and pendency of the cases of renewal of recognition of the R&D Units is given at Annexure IV.2.

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

The In-house R&D Units are distributed throughout the country. A zonal distribution or the Units is given in Figure IV.2.There are nearly 200 units in the Northern Zone comprising of Delhi, Haryana, Punjab, Uttar Pradesh, Jammu & Kashmir, around 100 units in Western Zone covering Rajasthan and Gujarat, about 500 units in the Central Zone covering Maharashtra, Madhya Pradesh and Orissa, over 300 units in the Southern Zone covering the 4 Southern States and around 150 units in the Eastern Zone covering

In-house R&D in Industry

Major Activities

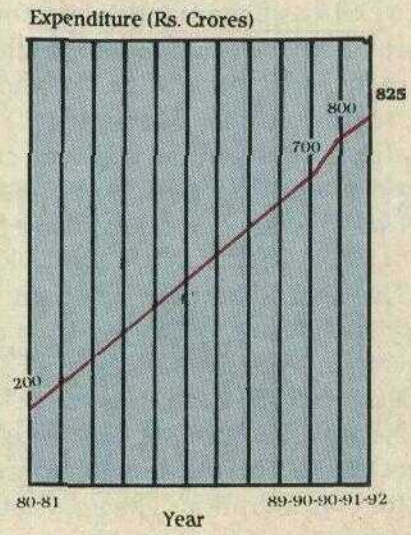
To Recognise and
To Renew Recognition

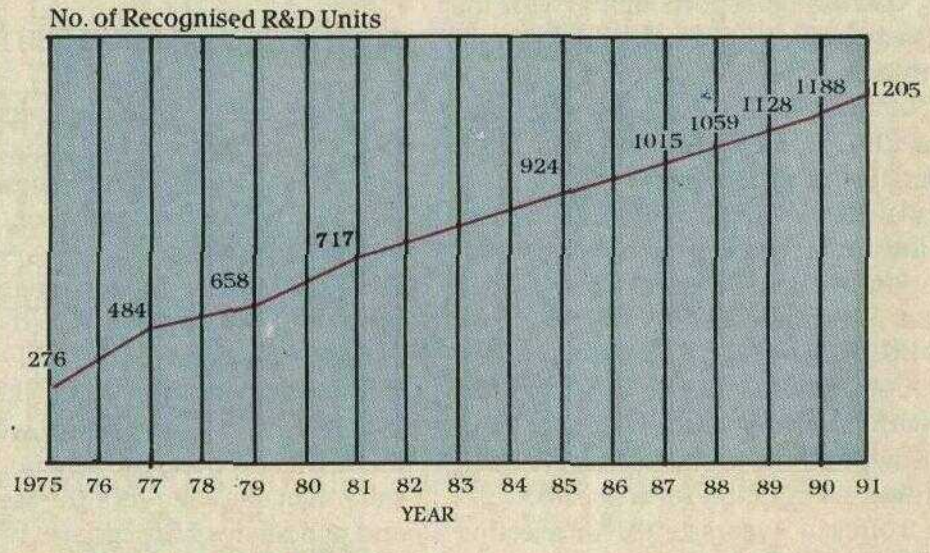
Facilities Provided

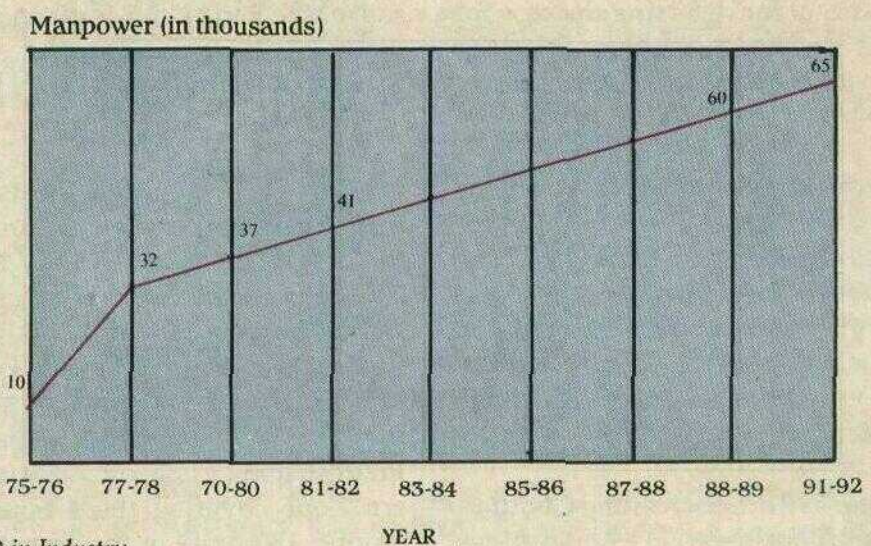
Import of Equipment and Materials on OGL for R&D

Fiscal Incentives

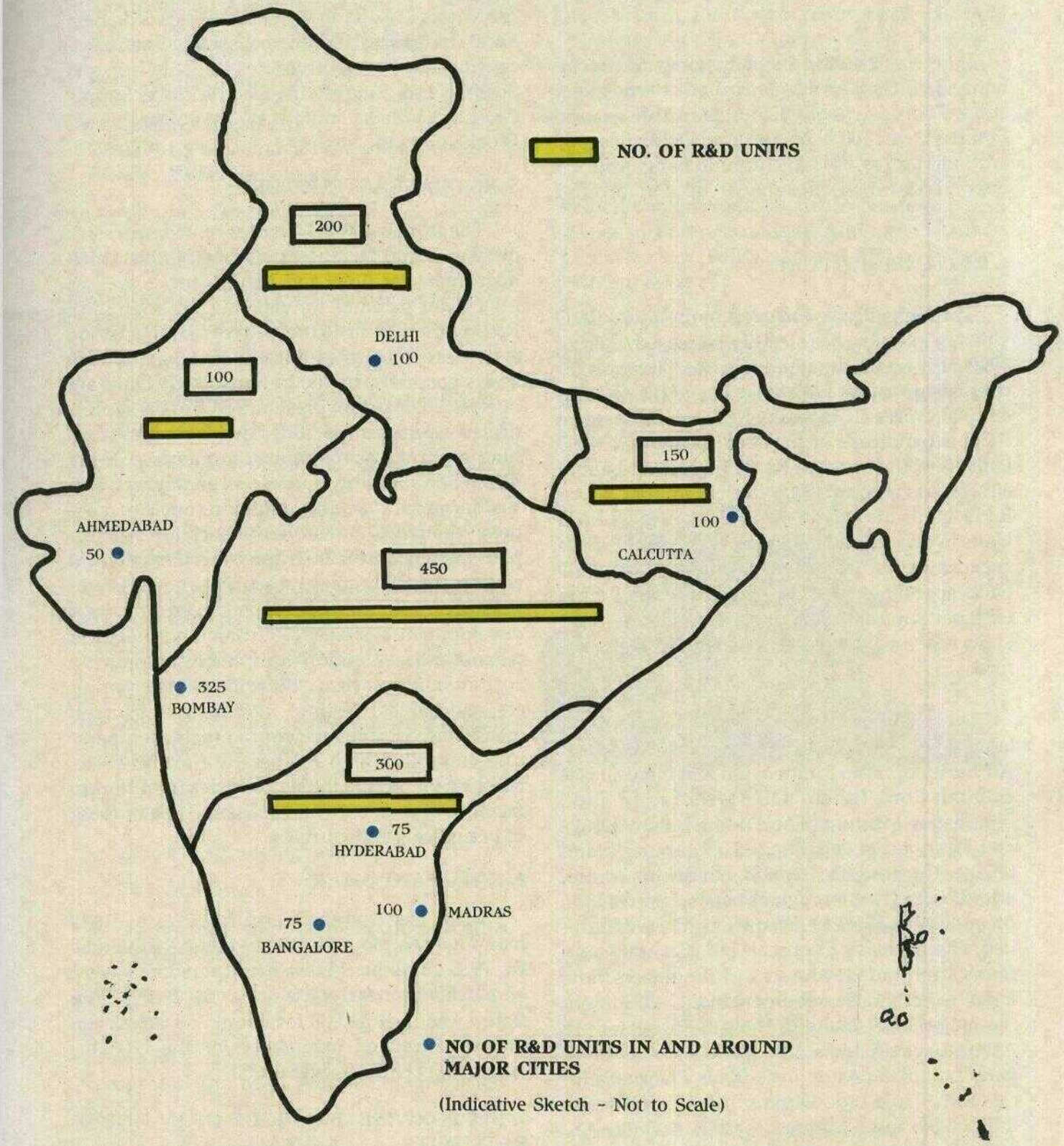
All R&D Expenditure **Qualifies for Tax** Exemption







IV. 1 In-house R&D in Industry.



IV. 2 In-house R&D units — Zonal Distribution

Bihar, West Bengal, Assam etc. The length of the bars is proportional to the number of units in the zone.

It is worth noting that a majority of the In-house R&D units are located in and around major cities. There are about 325 units in and around Bombay; over 100 in and around Delhi; over 100 around Madras, 75 in and around Bangalore, 75 near Hyderabad, nearly 50 in and around Ahmedabad.

4. R&D EXPENDITURE

The expenditure incurred by In-house R&D Units in industry has steadily increased. During 1980-81 it was estimated to be Rs. 200 crores for over 600 units. By 1985-86, it was of the order of Rs. 500 crores. It is estimated that the present R&D expenditure of the 1205 recognised R&D Units is of the order of Rs. 825 crores and about 40% of it is accounted by over 100 public sector R&D Units and about 60% by about 1100 R&D Units in private and joint sectors. 131 R&D Units spend over Rs. 1 crore each on R&D, 283 R&D Units spend between Rs. 25 lakhs to Rs. 1 crore each per annum on R&D. The list of these R&D Units is given in Annexure IV.3 and IV.4 respectively.

The major R&D Units in public sector undertakings are Hindustan Aeronautics Ltd., Steel Authority of India Limited, Oil and Natural Gas Commission, Indian Oil Corporation Ltd., Hindustan Machine Tools Ltd., Indian Drugs and Pharmaceuticals Limited, Computer Maintenance Corporation Limited. Hindustan Antibiotics Limited, Indian Telephone Industries Ltd., Bharat Electronics Ltd., Bharat Earth Movers Limited, Bharat Heavy Electricals Ltd., Gujarat Communication and Electronics Ltd., Engineers India Ltd., Project and Development India Ltd. Some of the major R&D Units in the private sector are Ashok Leyland Ltd., Associated Cement Company Ltd., Bajaj Auto Ltd., Boots Pharmaceuticals Ltd., Cipla Ltd., Dunlop India Ltd., Escorts Ltd., Glaxo India Limited, Godrej & Boyce Co. Ltd., Hindustan Lever Ltd., Hoechst India Limited, J.K. Synthetics Ltd., Kirloskar Cummins Ltd., Larsen & Toubro Ltd., MRF Ltd., National Organic Chemicals Ltd., Peico Electronics and Electricals Ltd., Ranbaxy Laboratories Ltd., Reliance Industries Ltd.,Siemens Ltd., Tata Engineering and Locomotive Co. Ltd., Tata Iron and Steel Co. Ltd., Tata Hydro-Electric Power Supply Co. Ltd., Voltas Limited, Wipro Infotech Ltd., Wockhardt Ltd., etc.

5. R&D INFRASTRUCTURE

The In-house R&D Centres have impressive infrastructural facilities including sophisticated instrument facilities and equipment as well as pilot plant facilities for carrying out high level R&D work relating to the areas of manufacturing activities of the firms.It is estimated that the R&D assets possessed by the In-house R&D Units are over Rs. 800 crores at present. Some of the sophisticated equipment facilities available are: scanning electron microscope; computerised X-ray diffraction and X-ray fluorescence analyzers; UV-Vis, infrared, vacuum emission, nuclear magnetic resonance, and atomic absorption spectrophotometers; chromatographs; thermoanalytical equipment; RUL; creep measuring and high temperature evaluation equipment; microprocessor development systems; electronic and electrical testing and evaluation equipment; computers; custom built test rigs; colour matching computers; mechanical testing, fatigue testing creep measuring equipment; programmable temperature controlled high temperature furnaces etc. Most of the R&D Units also have good library facilities of their own and subscribe to a number of periodicals and journals.

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 13,000 R&D personnel were employed by nearly 400 units. By 1981-82 the figure was over 41,000 for about 750 units. The present estimated manpower for the 1205 In-house R&D Units is over 65000.

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

A broad sectorwise break-up of the recognised

In-house R&D Units is as below:

(i)	Chemical and Allied Industries	- 375
(ii)	Electrical and Electronics Industries	- 275
(iii)	Mechanical Industries	- 225
(iv)	Processing Industries (Metallurgical, Refractory, Cement, Textile, Paper and others)	- 250
(v)	Agro Industries and others	- 75

8. IN-HOUSE R&D UNITS : OUTPUT

(a) Contributions from the In-house R&D Units can broadly be summarised as under:

- — Availability of R&D facilities.
- — Availability of trained manpower for industrial R&D.
- — Interphase with public funded institutions.
- — Participation in national and international seminars and workshops.
- — Papers published in journals/seminars; patents and designs.
- — Joint research projects/programmes/ sponsored research.
- — Pilot plant and semi-commercial plant level investigations.
- — Import substitution of materials/components.
- — Assist in technology absorption.
- — Diversification.
- — Technology Improvement/upgradation of technology.
- — Assist in technnology transfer/negotiations.

(b) Major R&D achievements reported by the recognised In-house R&D Units are listed below:

Chemical and Allied Industries

— Developed process for dibenzyloxyacetphenone, Amitriptyline Hydrochloride, Mufenide Acetate, Tinidazole, Parachlorophenol. Isosorbide Dinitrate from basic stage, Uridoacetonitrile, O-Hydroxyacetophenone, P-Hydroxyaceto-phenone, Nifedipin, Tripotassium Dici-trate Bismutrate (TDS), Enalopril Maleate.

— Commercialised production of drugs Isosorbide-5-Mononitrate, Dicloxaicillin Sodium, Flucloxacillin Sodium, Cipro-floxacin, Norfloxacin, Fluoro quinilone, Antibacterials like Enrofloxacin, Pefloxacin and anti-ulcerative Omeprazole.

— Developed an efficient immobilised penicillin G Acylase using polymeric sythetic matrix thereby replacing fibrous metrix resulting in threefold increase in 6-APA productivity per unit of immobilized enzyme.

IV. 3 Cryolite Recovery Pilot Plant.

— Developed process for large scale production of detergent grade soda-ash, aluminium phosphate on bench scale, specific absorbant to abate mercury content of the hydrogen from caustic soda plant to obatain 0.1mg. Mercury per cub.m.

— Commercialised process developed for Mepiquat chloride, Anilofos, ortho and Para Nitrochlorobenzene, Rafoxanide, Cypermethrin tech.

— Developed process for Cumene, Chlorothalonil, Chlorpyriphos, Quinalphos, Carbendazim.

— Developed catalysts for Alcohol dehydration, sour gas shift and methanol steam reforming.

— Developed liquid fertilizer, micronutrient incorporated solid and liquid fertilizers.

— Developed pilot phenolic effluent treatment unit, process for scrubbing H_2S in biogas.

— Developed Polyurethane coating for plastic bodies, HB Epoxy coating for atomic power stations, chlorosynthetic coating for fertilizer plants, polyester paste filler.

— Developed specialised pigments, such as NCNF-Alpha Blue, quinacridones, Isoindolinores, k direct dyes such as direct blue 199, 189, Ingrain dyes such as 1BN, Phthalogen 1FG 3M & solvent blue 38.

— Commercialised N-ethyl- -Naphthylamine, Aminoanisic acid anilide, high performance grades of phthalocyanine blue and green pigments.

IV. 4 The Glatt Coater

— Developed aqueous coating for carbon boards, water based flexo and gravure inks, high gloss heat set inks, silk screen PVC inks, web offset blacks for high speed machines, high gloss offset inks, phenolic resins for can coatings, polyester coating for cans sheets, product resistance tube coatings, acrylic coatings, plastisol inks, low toxic low order inks, thermal cure printed circuit board inks, gravure lamination inks for BOPP film, inks for polywoven sacks.

— Ratanjot oil and other mineral oils upgraded for soap manufacture, neem oil solidified using elaidinisation technique; formulated and commercialised non grease Amla hair oil, controlled foam machine wash powder.

— Developed thin decorative veneers with better flexibility and formability; heat setting paper phenolic laminate for lamp cap applications, heat resistant cold punching light coloured paper; phenolic laminate for potentiometric applications; phenolic resin for FRP; hot coating resin system for foundry application; refractory resin for Taphole/Dry ramming mass; polyester resin for flooring, cultured marble, filament winding, pultrusion application, decorative trays.

— Developed differnt grades of vinyl resins, sealants, waterproofing compounds, speciality anaerobics for cyanocrylate adhesives pigment intermediates, polyols and polyurethane resins.

— Process developed on bench scale for para tertiary butyl phenol (PTBP), para octyl phenol (POP) and para cumyl phenol (PCP); epoxidation of propylene, alpha olefins, cyclohexene and styrene by using cumene hydroperoxide, metaphenoxy toluene, saturated alphamethyl styrene dimer, styrenated phenols, aldehydes by isomerisation of epoxides.

— Developed a special grade diluent for the atomic power plant to recover uranium and plutonium from the spent nuclear fuel.

— Developed process for methyl diethanolamine 9(MDEA) Dioctyl sebacate and dioctyl adipate.

— Commercialised process for alkylated ethanolamines, dimethyl ethanol amine, N-methyl

morpholine.

— Novel molecules synthesised and evaluated as potential crop protection agents, developed new recipie for formulation of a new fungicide Rubigan.

— Developed batteries for class 209 submarines for Indian Navy, low maintenance batteries for train lighting and solar application.

— Plant set up with know-how from own D&D for parachloro Benzyl cyanide, para chloro benzy chloride, benzyl cyanide, para chloro meta cresol, para chloro phebol, ortho chloro phenol, 2,4-dichloro phenol, dichlorophene, para chloro benzyl iso propyle nitrile.

Electrical & Electronics Industries

— Development of PC MC radar, tactical secure manpack VHF radio; electronic voting machine; ship handling simulator for Indian Navy, digital mobile tropo scatter system for army; BMP-II stabilizer, IFF antenna for SPAGU radar, B-vehicle driving simulator; navigational radar-I band; composite communication system for frigates; 15 channel digital VHF radio relay type LUS788, PTCR components for colour TV degaussing; Public display LCD panel.

— Development of PC based messaging system for unattended remote transaction processing between computers connected on PSTN network (OCTOPUS), ZEUS (A cash cheque depository), 8 channel teleprinter interface, ISDN network terminator, microvox, microguard, TVSAT, Encrypt/Decrypt package; 16 line terminal seven interface to 10M bit ethernet LAN, LAN cards, RTUs, National protocol, SMART LAB, automatic FINGERPRINT Indication system; 1kw television transmitter.

— Development of PC based supervisory control and Data Acquisition package-SPAVISOR, programmable controllers, mission computer for defence, coaching disk controller for the EISA bus;

— Development of timer module for environmental chamber, microcontroller based autozero electronic milk tester, milk collection and data processing stations; SPV based luminaries, solar lantern, SPV operated television; programmable thread selectors, fabric temperature profile system, Piezo electric type weft stop motion, microprocessor for fully automatic operation or yarn/jet/beam drying machine;

IV. 5 Bare Printed Circuit Board Tester

— Development of Multipoint temperature indicator and controller for texturising machine with thyristorised power supply for electrical heating; thyristorised power plant for DOT as per TP 110090 specification, 1200 mA/70 KV bridge rectifier assembly, 500 mA/5 KV and 10 KV diodes, power transistors in TO 220 and TO3P package.

— Development of SCS 1+1 subscriber carrier system, SCS 1+7 subscriber carrier system, SLC 90/16 line concentrator, MLA-4500 changed number intercept system; remote unit line concentrator; electronic flash key telephones, multi memory telephone, STD lock, pulse switchable telephone, tone pulse

switchable telephone.

— Development of 6 Mic input 225 W RMS integrated amplifier, fire/security alarm signalling system amplifier, audio test set with side band audio generator.

— Design and fabrication of SUPER CAT-90 tester to test XEJ-16 boards of E 10 B, dual module tester, MILT-64 power plant tester; Development of speed indicating and recording system for locomotives SP-90; Telephone call Monitoring and Analysing System (TMAS); Tele Traffic Generator (TTG), Junction Monitoring Equipment (JME), voice announcing modules for voice mail application.

— Development of portable thermocouple calibrator; 4-20 mA loop analyser; portable RTD simulator, digital indicator and controller with two set point; complete range of cutter for biomass, synthesized selective level meter 1KH2-18 KH2, synthesized selective level oscillator; 0-0001 H2 to 50 MH2 function generator with FM and AM facilities.

— Development and commercialisation of a number of halogen lamps for flood lighting, projection photocopiers and infrared heating, new bromine dosing process.

— Development of Energy Saving Luminaries (ESC), electronic ballast; new generatiom, street-light luminaries, totally indigenous touch control panel for domestic microwave oven; battery operated electric vehicle; injection moulding machine for stepper motors; DC power supply 135 KW, 90V at 1500 Amp. for plasma research.

— Development of 21" FST colour TV/FST 53R, 14" colour TV CP36, Home television interface for PC, 44 cm (17") B/W TV with electronic tuner; EHT lot for colour TV; special test facilities for turbocharger; Dish antenna to receive signals (3.7GHZ to 4.2 GHZ) in various sizes.

Mechanical Industries

— Development of CNC tube bending machine, Die lifting arrangement for presses; CNC powder compacting presses; CNC hot sintering presses; prefill values for presses; hydraulic flow switch, CNC hydraulic press brake, CNC/NC gun hydraulic guillotine sheering machine; 3 axes CNC gun drilling machine, skiving and roller burnishing machine, CNC cylindrical boarding machine with depth control; watch showing world time, 24 hrs. display by hand.

— Development of an energy economiser "Robostar' for induction furnace, a miniature measuring m/c for shoe industry, industrial robots; a programmable leather dryer, robotic manipulator for mini foundry, intensive mixer, 2nd stage and 3rd stage rocket motor bodies; industrial centrifuges, robotic system for plasma spraying;

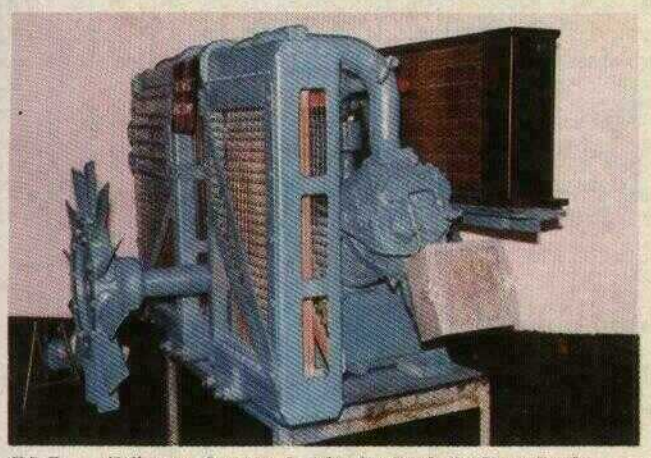
IV.6 Machine Model 150-100B Hopper Loader

— Development of number of products for metal cutting, metal forming, measuring tools and special purpose machines including microfine grades of carbide, improved carbide ATP for cast iron machining, 9-7/8' tungsten carbide rod roller bit for coal mining; 2 tier hard - faced bit for water well drilling application; hard faced cutter picks for underground mines; gun drills of less than 6mm diameter.

— Designed, developed and productionised a number of products, components, systems equipment attachment, dozer with hydrostatic transmission; radio controller dozer, aircraft towing tractor, missile launcher vehicles.

— Development of Passenger/LCV radial tyre

vertical chuck loader, hydraulic scooter tyre curing press, tray type services for tyre building machines, electric motor operated truck tyre post cure inflators, electronic cure programmer for 2 wheeler/3 wheelers/passenger car light truck tyre curing presses.



IV. 7 'W' type, 2 state, 3 cylinder Recl. Railway Brake Compressor.

— Development of electrical excavator PC 1000, snow cutter and snow plough equipment, crash fire tenders for defence, telescopic boom dumper excavator for steel mill, face shovels; 25 tons rear dumper with tail gate option, 2 cu yd front end loader with revised linkage and hydraulic system, 310 FHP rubber tyred dozer.

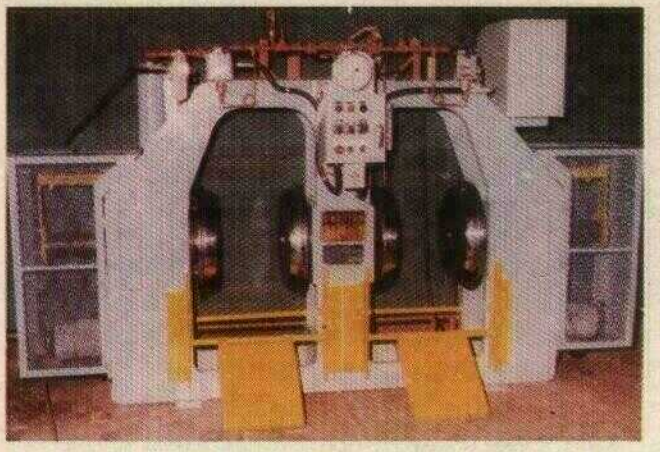
— Development and commercialisation of mobile straw reaper - picker baler, balu with tractor, mobile loose biomass pick and grab handler and stacker; Indigenisation of code 46 gear pumps in hydraulic control power transmission and lubrication system of T-72 battle tank, encapsulted coils for industrial directional control valve, power steering pumps for trucks and buses.

— Design and development of Mobile water analysis laboratory, Swaraj Mazda T-3500 four wheel drive, 'Vijeta' triloader - a hybrid of scooter and 3 wheeler; bearing for premiers 118 NE car, Hino WO 6D, Ashok Leyland C series engine; shock absorbers for export, pollution control carburettor and new fuel pump for Ambassador and Maruti car.

— Development and commercialisation of Induction melting furnace 4000 KW 8 ton capacity; stainless steel vacuum flask, high vacuum high temperature furnace with rapid inert gas cooling facilities and vacuum hot pressing facilities; Magnaflux quality spring steel for railways and axle quality steel for automobile application;

— Development of PV2 (22 HP/2000 rpm) & RV3 (33hp/2000 rpm) tractor engine conforming to TMA norms, pielstick 18 PA 6V 280 engine (k7200 HP/1000 rpm), W4 AG (400 HP/280 rpm) engine on dual fuel operation; Steel pins weighing 0.55 gms for defence application by cold forming techniques; CD pinion + carona gear En 353 => combination forging, close tolerance connecting rod En 353 speed gears from new material CM 20 H/CR 20-H to replace earlier material SAE 8620;

— Development of Cylinder head gaskets for Tata 407, 118 NE, Swaraj Mazda, Maruti 1000, Benz OM 616 engine for Bajaj tempo Ford 3600 and 3610 tractor for enhanced performance; non asbestos gasket for exhaust system using graphite and mica material;



IV. 8 Electric Motor Operated truck Type Post Cure Inflator.

— Development of Bladders for larger size, accelerator DPG, glader type size 20.5-25, IRR-O-GATOR tyre size 11.2-24, new machine for vent trimming; 7.5-16 Haultreck tyre for tractor trailer; premium depth passenger car tyres in 5.20-14/5.90-15 sizes, 10.00-20 lug truck tyre and 7.50-16 lug tyre.

— Development of super flame gas stove model 2001 with electronic ignitation and flame fail-

ure device, 140L and 425L two door chest type deep freezer; 56' luminarie under light ceiling fan; Plastic resin dryers for plastic industry (50, 100, 200 lbs/hr and pneumatic conveying system - 300 lbs/hr, 1300 lb/hr; multi-speed SLR bicycle and hybrid bicycle, aerobic exerciser 19' ATB-10 speed bicyle with carrier; Air conditioned container for mobile exchange.

Processing Industries

(Metallurgical, Refractory, Cement, Textile, Paper and others)

— Developed high alumina core bricks, thermally balanced Ingot moulds to reduce mould consumption, low aluminium FeSi, techonology of using Mill scale for manufacture of FeSi, 500 mm dia electrodes of AISI 403 grade for ESR, 720 mm dia blooming Mill forged rolls. Development of special alumina, technology for production of gallium metal from Bayer Process liquor on pilot plant scale upto 4N purity. Indigenisation of plant spares and components; Flexible Wiring Board, Metal Core printed Wire Board.

Developed new process for the production of high purity cadmium metal eliminating impurities like nickel and thallium; roasting of concentrate to remove antimony at different temperatures;

— Developed Hykrom Grinding media for dry grinding; Cu and Cu-Cr castings and forgings finish machines electrical contacts, alloy 978C value castings, semi continuous casting, Billet Casting to make Cu. Cr billets for subsequent extrusion, forging and drawing; precision machine Bronze Castings for valves, off highway vehicles and commercial vehicles, new quality insulation material for metallurgical industry, lining with high shear strength.

— Optimum utilisation of indigenous raw material to make products for UHP furnace meeting rigorous requirements of Graphite Electrodes.

— Development of various fancy yarn by using new fibres; yarn of various composition with various fibres in various blends; very fine count (upto 100 NM) Yarn, Repco Yarn, 100% Wool Yarn, Wool and acrylic on Repco Spinning, two Ply Carpet Yarn from Indian Wools. Development of 30s, 40s and 60s Hosiery yarn for export, Metallic Printing Pastes; short and economical process of having quality fabric and processing of viscose technology.

— Development of flexible packaging which are superior, less cumbersome, increasing the shelf life and right mix (of paper, foil, films, BOPP, Polyethylene, PVC, Polyester Nylon etc.) to protect packed items.

Agro Industries and Others

— Micro propagation systems for large scale production of Tumeric, Ginger, Eucalyptus, Ficus, Vanilla and Pineapple have heen standardised. Low cost production of green houses for cut flower production was establised.

— Developed hybrid products e.g. Sorghum, Bajra, Maize, Cotton, Sunflower, Sofflower, Piglanpea and vegetables like Okra, Onion, Chillies and Bitter Gourd. 7 Hybrids in sorghum and maize developed and commercialised . Yellow corn Hybrid developed is resistant to Downy Mildew and turnicum blight, white corn hybrids for rabi season in Bihar, hybrids of Sorghum Multicut fodder Sorghum and high yielding Sunflower.

— Indigenous development of broiler breed STARBRO; hybrid layer STARCROSS with a potential to lay 300 + eggs in one year of lay; poultry stock suitable for the tropical countries.

— Fruit flour wafers like fruit punch, Mango and icecream wafers; High ratio cake flour and high Calcium biscuits (Glucose C) have been developed and commercialised.

— Developed a new hybrid red tilapia named Golden fish for culturing in digested effluent having capacity to stand adverse culture conditions, growth in dense population and produce high yields in short periods of 4 to 6

months.

— Low and Medium Density particle boards from agricultural residues and Decorative & plain laminated particle boards are developed. To improve durability, waterproof film faced plywood has been developed. The use of flue gases from boiler house, system for energy conservation has been developed.

— Development of blends with low tar and low nicotine in filter cigarettes for export and domestic markets. Designed instruments for specially e.g. pouch pack sealing machines.

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 under the Open General Licence facilities available to them by virtue of the recognition. These includes: JASCO model DIP-370 digital polarimeter, Micro board tester, Testrite Thermal Shrinkage oven, Monsanto Theometer MDR 2000E, Sulphur Determinator, AVIV Hematofluorometer, DX-100 Ion Chromatograph, Perkin-Elmer PTIR System & Accessories, Head Lamp Aligner, EC Dynamometer, Spectrometer, Data Acquisition System, Sound level meter with recorder, Digital storage Oscilloscope, Shimadzu high performance liquid chromatography, Dust test apparatus complete with vacuum pump, HPTLC System, Jitter Modulation Oscillator, Non-storage curve tracer main frame, Film cut sheet, Resco Model Compacter, Power Oscilloscope with front cover, Digital transmission analyser etc., Telecommunication equipment, Unversal programmer, Mini Catalytic reactor, X-ray powder diffractomer system, Sheetfed offset printing machine, low model Deep freezer, Accessories for brabander extruder, Spindle complete FU 11, Rigidimeter, Digital Pendulum Stiffness tester and Santacruz Operation Computer Software Packages.

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

The Department also examines the issues relating to the pricing for the products whose technology has been developed indigenously. The bulk drugs manufactured through process know-how developed through In-house R&D *are exempt from the Drug Price Control Order* (DPCO) for a period of 5 years after their first introduction in the market. The department examines the requests of various in-house R&D units for claiming exemption and issues certificate of indigenous development of technology/ process, in deserving cases.

During the year 1991-92, certificates of indigenous development of technology/process for manufacture of bulk drugs for claiming exemption from Price Control were issued in respect of 6 bulk drugs viz. Atenolol (IPCA Laboratories), Ephidrine,Hcl (Emmellen Biotech Pharmaceuticals Ltd.), Betamethasone Disodium Phosphate (Glaxo Laboratories), Cephalexin (Lupin Laboratories), Rifampicin (Lupin Laboratories), Diclofenac Sodium (Unique Chemicals).

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

The department provides assistance to the recognised In-house R&D Units in a number of ways: 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 of R&D and for maintenance/commissioning of imported R&D equipment requiring such expertise; and allotment of special controlled materials, for R&D are dealt with.

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 were examined and the decisions of the Department conveyed.

12. PLAN SCHEME ON R&D IN INDUSTRY

DSIR has a Plan Scheme on Research and Development in Industry. The broad objectives

of the scheme are:

— bring in-house R&D into sharper focus;

— strengthen R&D infrastucture in industry;

— promote R&D initiatives of the industry;

— ensure that the contributions made by the in-house R&D Centres dovetail adequately in the overall context of technological and industrial development.

Major activities undertaken under the scheme during the year are reported below:

(a) 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 all the recognised in-house R&D units are computerised and updated. as on 31st December, 1991, there were 1205 in-house R&D units recognised by DSIR and whose data is entered in the computer.

(b) In-house R&D-DSIR interaction

The Department of Scientific and Industrial Research (DSIR) has organised a one day 'Brain Storming' session on Evolving Stategies for Indigenous Technology Development in the light of the new policies with Heads of selected industrial R&D units, National Laboratories and Government Departments on 5th September, 1991 in Technology Bhavan, New Delhi.

Following major points emerged for action:

— Identification of R&D thrust areas in proven technologies where we have strengths.

— Promoting technology upgradation in small scale sector, particularly to cover exports.

— Promoting user sector research and technology guidance cells

— Continued technological support for sustainable exports

— Promoting co-operative research in major sectors/products

— Developing technological advisory capabilities by R&D institutions for testing and certification

— Patent and technical information services

— Quick response by R&D institutions to industrial needs

— Promote international R&D collaborations at industrial level

— Support absorption and upgradation of imported technology

— Strengthen consultancy and professional services

— Promote user based development/purchase contracts for technology development

— R&D co-operation amongst stake holders covering parks and incubators

— Role of DSIR for promotion and utilisation of indigenous technology and matters relating to R&D in all sectors

— Special efforts to maximise resource potential

— Funding R&D in private sector

(c) Fifth National Conference on In-house R&D in Industry

The Fifth National Conference on In-house R&D in Industry was organised by the Department of Scientific and Industrial Research (DSIR) jointly with the Federation of Indian Chambers of Commerce and Industry (FICCI) during 10th December, 1991 in New Delhi. Attended by over 500 delegates from industry, National Laboratory system, Universities, Consultancy Organisations, Scientific and Industrial Research Organisations, Government Departments, the Conference was inaugurated by Prof. P.J. Kurien, Hon'ble Minister of State for Industry in the Golden Jubilee Auditorium, FICCI. Prof. Kurien also presented the DSIR 1991 National Awards for outstanding R&D achievements to 8 industrial units. He also released the DSIR publications "Compendium on In-house R&D Centres - 1991"

and "Outstanding In-house R&D Achievements-1988-91". The Valedictory address was delivered by Dr. S.Z. Quasim, Member (Science), Planning Commission.

IV. 9 Prof. P.J. Kurien, Minister of State for Industry looking at the DSIR publication on Compendium of 100 Major In-house R&D Centres at the DSIR publications display.

Suggestions and recommendations arising out of the Conference are given below:

i) Effective planning and management of R&D is vital for optimising the inputs and achieving maximum returns. This calls for:

   (a) Directing R&D thrust to areas where we have strengths and which can lead to increasing our exports of internationally competitive goods.

   (b) Technology support for small sector and vendor development may be provided; Supporting co-operatve R&D particularly, for small and medium scale sectors.

   (c) Taking up collaborative programmes with overseas organisations in hi-tech areas through the already existing international R&D collaboration scheme.

   (d) Involving consultancy services for technology transfers and need assessments, as well as for design engineering of capital goods.

   (e) Increasing R&D co-operation among stake holders viz. industry, National Laboratories - Universities, Financial Institutions. There is an urgent need to break the barriers between universities, research laboratories, and industry, and create an atmosphere of partnership and closer co-operation which will strengthen Indian R&D base and accelerate development. The research laboratories should endeavour for successful commercialisation of bench scale technologies by putting up pilot plants with the support of industry and DSIR.

   (f) Liberalised fiscal incentives and more freedom for Scientific and Industrial Research Organisations (SIRO) in management of their resources.

(ii) Energy conservation should be made a slogan in all energy intensive industries. Greater thrust should be given to R&D leading to energy conservation in energy intensive sectors, such as iron and steel, cement, paper, alkali industries and power generation and distribution sector. Regular energy audit should be carried-out.

DSIR should institute a special National Award for outstanding R&D having successful commercial orientation in Energy Conservation.

(iii) R&D in Micro Electronics development is weak and needs to be strengthened. The requirement of capital goods for Micro Electronics industry should be assessed through quick market surveys and development projects initiated for equipment required in large quantities. DSIR may bring out a status study on the requirement of CG for Micro Electronics sector under their Capital Gooods Scheme. There is need for procurement of more technical journals and exchange of information through Indonet and Delnet.

(iv) There is great potential for exports in processed food from India. Suitable techniques and technologies for processing, packaging and storage need to be evolved keeping in view the environmental conditions and the large employment potential in rural areas in

India. Greater R&D thrust should be given to packaging and also development of capital goods for food processing industry. Tax structure of material in the packaging industry should be reviewed and brought down keeping in view the importance attached to this industry.

(v) Sustainable development should be the goal of all industrial sectors. Maintenance of ecological balance is essential for growth and development. R&D efforts should be directed towards acquiring cleaner technologies particularly in the area of mining, manufacturing, aforestation, effluent treatment. Incentives should be evolved for R&D programmes leading to sustainable development in the industry. Areas should be identified where sustainable development should be given high priority as well as where consultancy inputs were urgently needed.

(vi) Mechanisms should be evolved to effectively implement the suggestions made by, the National Conferences and also R&D Seminars/Workshops. A Compilation of all the recommendations made in the NRFC,TASS and Consultancy Promotion Seminars organised by DSIR may also be compiled and a system may be evolved to implement these recommendations.

(vii) DSIR should be the single nodal agency for all administrative, promotional and incentives measures related to R&D in industry, specially in drugs and pollution.

(viii) Proposal of FICCI for setting up of Technology Data Bank should be supported by DSIR

(ix) DSIR should encourage and support skill development and training programmes relating to technology and R&D management at enterprise level.

(x) DSIR may organise a Seminar to examine the impact of new policies on the anvil such as those related to financial institutions, FERA and tax structures on R&D in industry in early 1992.

(d) National Awards for R&D Efforts in Industry

In order to provide recognitaion 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 trophies made of sterling silver and are pesented along with citations at the inaugural seession 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 and in 1991 to 8 industrial units have been selected for presenting the DSIR National Awards for outstanding R&D achievement.

Prof. P.J. Kurien, Hon'ble Minister of State for Industry gave away the DSIR 1991 National Awards for outstanding R&D achievements to the following 8 industrial units at the Inaugural Session of the Fifth National Conference on Inhouse R&D in Industry on 10th December, 1991:

IV. 10 National Award Winners with Prof. P J Kurien, Minister of State for Industry.

Pharmaceuticals, Biological and Chemical Industries

1. Southern Petrochemical Industries Corporation Ltd., Tuticorin
2. Lubrizol India Limited, Bombay

Electrical and Electronics Industries

3. Litex Electricals Pvt. Ltd., Pune

Mechanical Industries

4. Bharat Earth Movers Limited, Bangalore
5. Widia (India) Limited, Bangalore

Processing Industries

6. Hindustan Aeronautics Limited, Bangalore

Agro Industries

7. Vorion Chemicals and Distilleries Ltd., Madras

Successful Commercialisation of Public Funded R&D

8. Diamines and Chemicals Limited, Baroda

(e) Outstanding In-house R&D Achievements (1988-1991)

During the years 1988 to 1991, 36 industrial units have been presented the DSIR National Awards for outstanding in-house R&D achievements in a wide range of disciplines covering Chemical and Allied Industries, Electrical and Electronics Industries, Mechanical Industries, Processing and Agro Industries. It was considered that it will be useful if a clear picture of the details of the achievements of the award winning companies are compiled for wide dissemination in the country. Such particulars relating to the activities which were rewarded with the National Award would be of considerable interest not only to the In-house R&D but also to the public funded R&D institutions and other agencies. Keeping in view the above, DSIR has brought out a 272 paged special publication titled "Outstanding In-house R&D Units Achievements 1988-1991". This publication was released by Prof. P.J. Kurien, Hon'ble Minister of State for Industry at the inaugural session of the Fifth National Conference on In-house R&D in Industry held on 10th December, 1991.

(f) Compendium on In-house R&D Centres-1991

At present there are 1205 In-house R&D Units recognised by the Department of Scientific and Industrial Research. Efforts have been initiated to assess the contributions made by these In-house R&D Units. While some of them have claimed achievements in the areas of import substitution, technology absorption and improvement to the technologies in use, a more qualitative and quantitative assessment of the same would be required to be made in order to ensure that the contributions made by the In-house R&D Centres dovetail adequately in the overall context of technological and industrial developments. DSIR has made a beginning in bringing out some of the highlights of the achievements claimed by the In-house R&D Centres. The first publication of Compendium of In-house R&D Centres was brought out during 1985 covering 193 In-house R&D Units, the second in 1986 covering 132 units, third in 1987 covering 209 units, fourth in four volumes in 1988 covering 589 units. The fifth one covering 189 units was brought out in 1989. The sixth one covering 448 In-house R&D Units in two volumes was brought out in 1990.

DSIR has compiled and brought out an impressive 815 paged Seventh successive publication on Compendium on In-house R&D Centres - 1991 in two volumes covering the activities and achievements of 439 In-house R&D Units. First volume covered the Chemicals, Processing and Agro Industries and second volume covered Engineering Industries. These two volumes were released by Prof. P.J. Kurien, Minister of State for Industry during the inaugural session of Fifth National Conference on In-house R&D in Industry on 10th December, 1991.

(g) 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 expected to provide a communication link between DSIR and In-house R&D Units and serve

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

During 1991-92, four issues of In-house R&D in Industry were brought out in April, July, October, 1991 and January 1992. These have been well received by the Industry, and all other concerned agencies.

(h) Support for R&D Conferences/Workshops/ Seminars/Studies

DSIR commissioned two status studies viz. "Wealth of technologies generated by the In-house R&D system" and "Major R&D facilities and infrastructure available with in-house R&D centres in Industry" on sponsorship basis to M/s. Mantec Consultants and M/s. Group for Industrial Progress (GRIP).

DSIR has also supported the Catalysis Society of India-Eastern Chapter for printing the publication on "Literature on Industrial Catalysts in the area of Energy Conservation and Environment".

(h) Publications

Following 13 publications were brought out during the year 1991-92:

(i) Compendium on In-house R&D Centres, - Chemical, Processing and Agro Industries and others. (1991)

(ii) Compendium on In-house R&D Centres, - Engineering Industries. (1991)

(iii) Outstanding In-house R&D achievements (1988-1991)

(iv) Compendium on 100 Major In-house R&D Centres (1991)

(v) National Awards for R&D Efforts in Industry (1991)

(vi) In-house R&D in Industry - 100 salient points (1991)

(vii) R&D in Industry - An overview (1991)

(viii) Directory of Recognised In-house R&D Centres, September, 1991.

(ix) In-house R&D in Industry - Information Update - April 1991.

(x) In-house R&D in Industry - Information Update - July 1991

(xi) In-house R&D in Industry - Information Update - October 1991.

(xii) In-house R&D in Industry - Information Update - January 1992.

(xiii) Proceedings of the Fifth National Conference on In-house R&D in Industry, 1991.

V. FISCAL INCENTIVES FOR SCIENTIFIC RESEARCH

1. INTRODUCTION

Several incentives have been evolved for utilisation of the technologies based on the indigenous research and development efforts. These incentives include 100 per cent deduction of the expenditure incurred on scientific research, investment allowance at enhanced rate upto 31.3.87 and custom duty exemption on the scientific equipment and consumables imports by the non-commercial institutions. 100% deduction of expenditure on scientific research on both revenue and capital expenditure is permissible and is availed of by many In-house R&D units in industry as detailed in section IV of this report. Similarly contributions made to approved scientific research organisations is also entitled to 100% deduction and indications of such Associations and Institutions are detailed in Section III of this report.

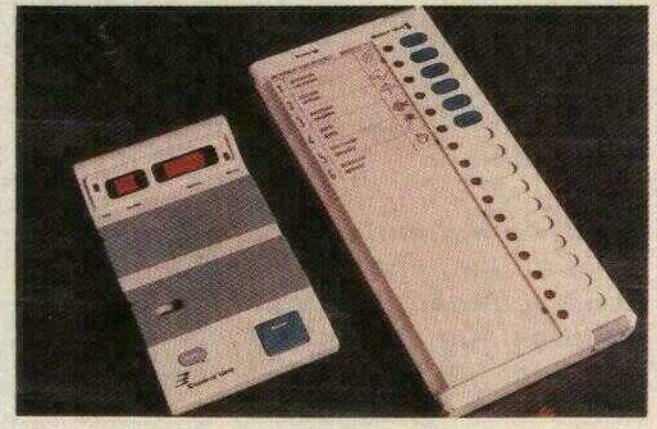
2. DEPRECIATION ALLOWANCE ON INDIGENOUS TECHNOLOGY

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

Plant and machinery used as anti-pollution device and those using indigenous know-how are proposed to be placed in a block carrying the higher rate of depreciation 50%. The measure has been brought into effect by the third amendment in the Income Tax Rules 1962, vide notification No. 133/342/86 TPL dt. 1.4.87.

Secretary, Department of Scientific & Industrial Research, Ministry of Science & Technology, is the Prescribed Authority for issuing certificates where depreciation of 50% is to be allowed for the plant and machinery using indigenous know-how. Guidelines have been issued for making applications for obtaining the aforesaid certificates.

During the year 1991, 20 certificates involving Rs. 4628 lakhs as cost of plant and machinery were issued in the area of electronics and chemicals. Details of these cases are given at Annexure V.1.



V. 1 Electronic Voting Machine

3. CUSTOM DUTY EXEMPTION

The Scientific Research and Development Laboratories and Institutions of non-commercial character are eligible for Custom Duty Exemption on the import of scientific equipment, instruments, spares as well as consumables for research and development activities and programmes. Custom Duty Exemption has been extended to consumables imported by the public funded institutions as well as Institutions/Foundations approved by DSIR under SIRO scheme and u/s 35(I)(ii) of the I.T. Act 1961.

The procedure for issuing the custom duty certificates to the institutions under administrative control of DSIR has been formalised. A Committee for this purpose was constituted which meets normally once a week to examine the proposals.

Scientific Equipment, Accessories & Spares

The Institutions (non-commercial in nature) are required to obtain Not Manufactured in India (NMI) certificate from DGTD and Essentiality Certificate from the concerned Administrative Ministries.

V. 2 Digital Mobile Troposcatter Communication System

Consumable Items

i) Import upto Rs. 5.00 lakhs c.i.f. annually

(a) The Research Institutions engaged in non-commercial activities and registered with DSIR or by any University are required to produce Essentially Certificate from the Ministry of Science & Technology or the Administrative Ministry concerned with them. A certificate from the Head of the Department is also required regarding the nature of the Institution and certifying the amount of the import i.e. less than Rs. 5 lakhs (c.i.f.).

(b) The publicly funded institutions are required to produce a certificate from the Head of the Department regarding the nature of the institution and certifying the amount of import i.e. less than Rs. 5 lakhs through the Pass Book Scheme. Essentially Certificate and NMI are not required.

V. 3 Ariline plant

ii) Import over Rs. 5.00 lakhs (c.i.f.) annually

In the event the import of the consumable items exceeds Rs. 5 lakhs annually the institutions are required to produce the Not Manufactured in India NMI certificate from DGTD in addition to Essentiality Certificate from the respective Administrative Ministry and also a certificate from the Head of department regarding the institution.

During the year a total of 669 certificates were issued for the import of scientific equipment, accessories and components, including consumable items. The value of scientific equipment instruments and the consumables was over Rs. 36 crores.

Some of the major equipments imported were: X-ray tube megalix, Rectangular blood bank refrigerator, Terufusion syringe pump, Laboratory filter larox, CHN-O rapid elemental analyzer, Microbalance, Photometer, High temperature furnace model K-1710, electronic heating system, Fluorescence spectrometer, RF generators, ABL-3 radiometer, Model blood gas analyser, Flame photometer M-480, Beckman microzone densitometer, Mass spectrometer, macroread laser disk drive, Plant efficiency analyser, Multichannel recorder, Waters HPLC systems, Environmental chambers, Acufexes, Thermal printer papers, Hybridisation transfer, Microcomputer controllers, Zoom sterioscopic, Microscopes, Milli-Q-Pump kit, Milli Q-control box, Rotronic humidity sensor, Rheovi 2100 capillary rheometer, Echocardiograph machine, Laboratory filter larox PF 0.1 H2, X-ray powder diffractometers and Universal testing machine.

VI. INDUSTRIAL TECHNOLOGY

1. INTRODUCTION

The industrial technology group deals with : (a) 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 project. (b) proposals received for grant of certificate for indigenous development of technology required for preferential treatment in grant of LOI for non-MRTP units and exemption from the provisions of Section 21/22 of the MRTP Act. 1969 for MRTP units. However, after the liberalisation of Industrial Policy, delicensing several industries on 24th July 1991, the proposals for delicensing Certificate were no more required. After the issue of ordinance to amend MRTP, Companies Acts on 27th September 1991, the exemption under the MRTP Act is no more necessary.

The broad activities of the group are (i) receiving and examining proposals for grant of LOI, FC and import of CG, including those for 100% EOU and from NRIs (ii) participating in meetings for technical evaluation and Approval Committees/ Boards such as Technical Evaluation Committee and Foreign Investment Board (iii) holding meetings of Board of Indigenous Technology and Delicensing Committee for disposal of Proposals for grant of exemption certificates and delicensing certificates (iv) creation and updation of database on the above proposals and preparing suitable software for easy and quick retrieval. Of late, the Dept. has also been receiving Industrial entrepreneurs Memorandum for scrutiny.

2. INDUSTRIAL LICENSING

About 1800 proposals for grant of Letter of Intent were received during the year as compared to 2200 in the last year. About 2000 Industrial Entrepreneurs memorandum were also received. The group attended 47 meetings of Licensing Committee and 14 meetings of LC-cum-MRTP Committe held by SIA. The following is an illustrative list of products approved for grant of Letter of Intent based on indigenously developed technology.

512 Port RAX
Push Button Telephone Instruments
EPABX
Light Air Craft
High Performance Computing Systems

3. FOREIGN COLLABORATION

The number of foreign collaborations and composite proposals dropped from 750 in the previous year to 430 in the year under review. The proposals involved technology transfer and/ or foreign equity participation. The proposals of NRI were slightly above 7 and those entrepreneurs proposing to set up 100% EOU were of the order of 454.

Additional information was sought from about 200 applicants for Foreign collaboration so as to facilitate detailed examination with respect to import of technology.

During the year the Department participated in the Technical Evaluation Committee, which held 48 meetings, for consideration of the above proposals and to send recommendations to Foreign Investment Board, Project Approval Board, Special Approval Committee (NRI) and Board of Approvals for 100% EO Undertakings.

The Department also participated in the fol-

lowing meetings of the Approval Boards/Committees :

	No. of Meetings
Foreign Investment Board	2
Project Approval Board (PAB)	13
Special Approval Committee (NRI)	6
Capital Goods Committee	10
Board of Approvals for 100% EOU	9

The Foreign Investment Board (FIB) was abolished since 25th October 1991 and all the proposals for consideration by FIB were transferred to the PAB.

4. INDIGENOUS TECHNOLOGY EXEMPTION FROM MRTP ACT

During the year under review, a proposal based on indigenous technology was received for grant of certificate for MRTP exemption. 3 proposals were pending from last year. In view of the ordinance to amend MRTP, Companies Act issued on 27th September 1991, all the four proposals were treated as closed.

VI. 1 Shock Pulse Tester T2000

Technology Approval Pertaining to Delicensing

The Department received 6 proposals from non-MRTP companies for grant of delicensing certificate for manufacture of products based on indigenously developed technology. In view of the Statement on Industrial Policy announced on 24th July 1991, these proposals were treated as closed.

5. INFORMATION/DATA PROCESSING

The Department has already created a database for the following :

a) Proposals for Letter of Intent	1989 onwards
Foreign collaboration proposals	1989 onwards
Composite applications	1989 onwards
b) Foreign Collaboration approvals	1981 onwards

During the year under review, another database on the Industrial Entrepreneur Memorandum was created. About 2000 records have already been entered.

The Department has also developed software for updating, preparing summary, processing and quick retrieval of the desired information. The software has been prepared for above mentioned proposals as well as approvals. These databases are continuously updated with the help of the above software.

Publications

The work of compilation for Directory of Industries based on Indigenous Technology' was completed and the publication was brought out in 1991.

Based on the data for foreign collaboration approvals from the 1981 to 1989, a productwise, sectorwise compilation titled 'Handbook' of Foreign Collaborations Approved during 1981-1989' was brought out in March 1991.

Due to overwhelming demand the second edition of the compilation for the years 1981 to 1990 was brought out in December 1991.

VII. NATIONAL REGISTER OF FOREIGN COLLABORATIONS

1. PREAMBLE

The on-going Plan Scheme. "National register of Foreign Collaborations" (NRFC), picked up further momentum during the year 1991-92. An inter-departmental Technical Advisory Committee (TAC) set up to advise on and to guide the functioning of the scheme, held two meetings during the year 1991-92. It reviewed various activities initiated under the scheme and took stock of the progress made, besides approving new projects to be undertaken.

2. OBJECTIVES AND ACTIVITIES

Following are the major objectives set for the scheme:

- Establish/create a data bank on import of technology.
- Undertake financial, economic and legal analysis for the above set of data.
- Carry out a detailed analysis of the imported technology in use in the country.
- Provide a basis for a national technology strategy and indicate directions for national science strategy, wherever possible.
- In the long run, lead to unpackaging of imported technology and in generation of national strength in competitively purchasing only selected components of technology.

Activities initiated, so far, under the NRFC scheme can be put into following broad categories.

- Compilation and study of basic data on foreign collaborations (FCs) approved.
- Analytical study of technological; economic and legal aspects of foreign collaborations (FCs).
- Preparation of reports on technology status in identified sectors/products.

3. FOREIGN COLLABORATION DATA COMPILATION

Contuining the work of In-house compilation of primary data on FCs beginning with year 1981, the compilation for the year 1990 was brought out, in the year under report. The data include the basic information like the names of Indian/foreign companies, products, duration of collaborations, nature and amount of payments involved. The available data on FCs approved during 1991 has been computerised and is being prepared for printing.

The work of computerisation of detailed information on foreign collaborations for previous years (1978-86) was completed through the National Council of Applied Economic Research (NCAER), New Delhi.

4. ANALYTICAL STUDIES

4.1 A project to analyse the various factors involved in technology acquisition such as economic aspects, impact of technology import on indigenous technology development, effect on exports and other related factors was undertaken. The study was in respect of the following four industry sectors.

(a) Switchgear industry
(b) Cement Machinery Manufacturing industry
(c) Transformer industry
(d) CNC Machine Tool industry

The study was entrusted to NCAER. The draft report was discussed by an inter-departmental evaluation committee comprising of representatives from concerned Govt. Deptts., Financial and Research Institutes and others concerned. The report has been finalised based on the suggestions received from the members of the committee. It analyses the influence of uncertain demand of these equipment on the technology acquisition activities, major changes in technology and the growth of the manufacturing capabilities in the country and other related issues. The report has since been completed. The other study on the effects on economic liberalisation on exports in Indian Engg. Industry relating to the period 1976-85 which was commissioned to NCAER, has also been completed.

4.2 A project on "Transnational Transfer of Technology - legal Aspects with Special Reference to Arbitration" was undertaken. This was assigned to Indian Council of Arbitration (ICA), New Delhi. The draft report which has since been submitted deals with legal aspects involved in technology transfer agreements. It covers details regarding arbitration agencies under whom the arbitration may be carried out, venue of the arbitration, applicable laws, aspects which need to be kept in view to avoid disputes and other related matters. The report also gives a model structure of the licensing agreement. To give a final shape to the report, an interaction meeting was organised by the Deptt. jointly with the Indian Council of Arbitration. It was attended by a large number of representatives from Industry, Govt. departments, experts from the legal profession and other concerned organisations. Based on the suggestions made during the interaction meeting the report is being finalised.

4.3 A project on the Consultancy Development Centre, (CDC), New Delhi, on follow up of the implementation of foreign collaboration agreements, was supported. The report which is in two parts, one pertining to the period January-June, 1986 and other July-December, 1986 submitted by CDC analyses the foreign collaboration agreements made during the period and compares the same with the terms and conditions of the approval by the Government. The report has been submitted by CDC.

4.4 A project on "Implications of Applicable Law in Relation to Foreign Collaboration Agreements" was commissioned on the Law Faculty, University of Delhi. This project aims that analysing implications of applicable laws of India, as well as USA, UK and West Germany (who are major suppliers of technology to India) to technology transfer agreements, in order to make the perspective Indian importers of technology aware of these implications. The draft reports relating to Indian and UK applicable laws have since been received from the University. With a view to finalise the same an Evaluation Committee meeting was held wherein representatives from the concerned Govt. departments, Industry, experts from legal profession, consultants and others concerned, participated. Based on the suggestions, received in the meet, the report is being finalised.

4.5 A study on "Technology Acquisition and development in Indian Telecommunication Industry" was taken up. The study was assigned to the Institute of Public Enterprises, Hyderabad. The draft prepared, was discussed by an inter-departmental evaluation committee comprising of representatives from concerned Government Departments, financial and research Institutes and others. The comments and suggestions of the evaluation committee have been incorporated in the report. In this study, the role of technological changes, affecting structural changes in the telecom industry world wide and the implications have been analysed. The main features of both the telecom network have been brought out. The effect of allowing partial deregulation of the telecommunication equipment sector and the changes in the distribution scheme have been highlighted. The study has been completed.

4.6 A project on "Assessment of technological

status of foreign collaborations in respect of power plant turbo generators/alternators" was taken up. The study was assigned to the Institute for Financial Management and Research, Madras. The study aims to analyse the factors responsible for the technological gaps in terms of manufacture, erection, operation and management of the units with imported technology. The draft report was discussed in an inter-departmental evaluation committee meeting which was attended by representatives from Industry, users, concerned Government Departments, R&D organisations and others concerned. The report is being finalised based on the comments and suggestions received from the members of the committee.

4.7 A project on "Impact of foreign collaborations on Indian Industry" was entrusted to National Council of Applied Economic Research (NCAER), New Delhi. The study aims to analyse the impact of foreign collaborations approved during 1984 on production value, foreign exchange and R&D activities in Indian industry. The study is in progress.

4.8 A project on "Australian Technologies of Relevance to India" was assigned to Consultancy Development Centre (CDC), New Delhi. The study aims to provide acompendium on Australian technologies which would be of relevance to India. This would ultimately serve as an information base to Indian entrepreneurs regarding availability of certain technologies from Australia. The study is in progress.

4.9 A project to study the "System of Intellectual Property and Transfer of Technology including its Global Challenges and Problems" has been taken up. This is a four phased project. Phase 'I' deals with the appraisal of the Indian Patent System and the current problems. The study would undertake critical appraisal of the system and would concentrate on policy and on legal and practical aspects of the Indian Patent Systems. The 2nd phase deals with the normative framework in national and global perspective. The study would concentrate on problems relating to operation of the patent system particularly of arresting the trend of low level of and decline in patenting and of providing impetus to the growth of inventive activities. The dimension of intellectual property law system in national and global context will also be analysed. The 3rd phase involves comparative studies and appraisals of policies and practices in the international context. The 4th phase deals with the normative framework: reality and global perspective. In this study, the current challenges and emerging problems will be analysed and an indepth examination of the problems would be undertaken in national and global perspective with a view to answer some questions of key importance as regards technology transfer. The project has been entrusted to the Indian Society of International Law, New Delhi. The work on the project has commenced.

4.10 A project on "Effectiveness of Import of Design & Drawings as a Mode of Transfer of Technology" is being commissioned on the National Productivity Council (NPC), Bangalore. The study aims to evaluate effectiveness of import of design and drawings as mode of transfer of technology in the areas of cost effectiveness, time effectiveness, production, quality, failure rates, merit, de-merits, limitations, etc.

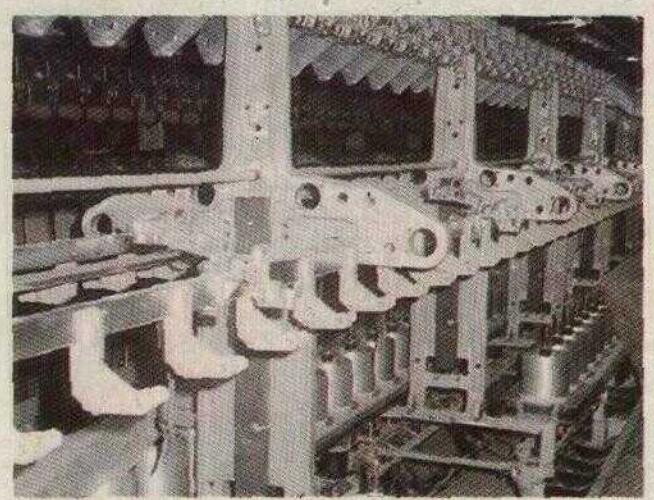
4.11 A project on "Techno Economic Study of Synthetic Fibre Industry in India" was commissioned on Shriram Research Institute and the Institute of Economic Growth, New Delhi. This study aims at assessing the overall dependence of the synthetic fibre industry on imports and efforts made so far in indigenising various components of the technologies in this sector. The study reveals that inspite of import of technology for new plants and fiscal incentives by way of reduction of excise duty which have been liberaly allowed on all fibres,no significant attempt on technology development towards self reliance and capability built up for future indigenisation and export is apparent.Synthetic fibre production capacities are likely to double within next decade. Support to this industry by the way of indigenous development of anciliaries like fibre finishes anti oxidants, anti static agents, delustering agents, like titanium dioxide, etc. as well as precision engineering components and

tools like metering pumps, valves, seals, spinnerettes, etc. is very much needed. The industry should be asked to contribute to its development by creating an independent cooperative organisation to meet its needs of technological and engineering services. The study has been completed.

5. TECHNOLOGY STATUS STUDIES

5.1 One of the main objectives, of the NRFC scheme, is to conduct technological analysis of imported technology and state-of-the-art of technology inuse in the country. About 100 priority sectors/products, including those involving repeated imports of technology were identified, in consultation with other ministries and departments during the VII Plan. The task of preparation of status reports is entrusted to exports/ organisations, professionals/consultants in the respective fields.

5.2 During the year, reports on technology status of 17 sectors/products were discussed by



VII. 1 Two for one Twister

their respective evaluation committees. These are:

i) Jelly Filled Cables
ii) Chloroflourocarbons and their substitutes
iii) Ethylene Oxide/Ethylene Glycol
iv) New Drug Delivery Systems
v) Styrene/Polystyrene
vi) Fuel Injection Equipment for IC Engines
vii) ABS/SAN/AES
viii) Water & Effluent Treatment Plants
ix) Purified Terephthalic Acid
x) Titanium Dioxide
xi) Electrolytic Manganese Dioxide
xii) Two-for-one-Twister
xiii) TV Picture Tubes
xiv) Xylene
xv) Resin Bondede Fibre/Particle Board
xvi) High Pressure Boiler
xvii) Acrylonitrile

These reports deal, at length, with important aspects relating to the industries in the country in these sectors/products. These aspects include: current status of technology: efforts by the industry to absorb and to adapt the imported technology, performance of foreign collaborations; contemporary international trends in technology, etc. The reports identify technology gaps in Indian industry. Recommendations for action by industry, R&D institutions, Government and other concerned organisations to bridge these gaps have also been made. Reports on studies under NRFC are being used inter-alia as inputs to the Technology Absorption and Adaptation Scheme (TAAS) and Promotion and Support to Indigenous Development of Capital Goods Scheme, operated by the Department.

5.3 The following are the major findings of the studies completed.

VII. 2 Jelly Filled Telephone Cables

Jelly Filled Cables: The study has revealed

that due to expansion of "Telcom Network" the requirement of cable has gone up from 22.9 LCKM to about 90 LCKS during 1989-90. The DOT requirement of Cables in 1994-95 is estimated at 177.46 LCKM. Most of the units in the country have been set up with foreign collaborations mainly by way of transfer of technology. The role of the foreign collaboration has largely been that of giving advice for selection of machinery and laying down the routine of production system. A number of different foreign collaborators were involved in transfer of technology to Indian companies. But the technology imported from all of them is essentially similar.

The major raw material for conductor insulation used is medium density polyethylene. The indigenous development of this material is necessary for updating the technology. Other materials like filling compound poly Al-laminate strips and moisture barriers are also required to be fully indigenised to the required specifications.

Ethylene Oxide/Ethylene Glycol: The study has revealed that Ethylene Oxide is produced from feed stocks like Naptha or Natural Gases by oxidation over silver catalyst by air or 0_2 whereas Ethylene Glycol is produced by non catalytic hydration of ethylene oxide at elevated temperature and pressure. There are three units manufacturing Ethylene Oxide/Ethylene Glycol in the country. The production of Ethylene Oxide and Ethylene Glycol during the year 1989-90 was 18,340 MT and 24850 Mt respectively. There was appreciable import of Mono Ethylene Glycol to meet the demand supply gap during 1989-90. Out of 3 units, for Ethylene Glycol two units that of IPCL and NOCIL are based on Naptha, while that of India Glycol is on ethanol feed stocks. Both NOCIL and IPCL are using oxygen as oxident and has indigenously fabricated reactors. Majority of capital goods required for the industry are available in the country but some equipment like recycle gas processer, oxygen mixing devices and others are still imported.

The Indian Industry have put in some amount of R&D efforts towards development of catalysts and technology in collaboration with NCL, Pune & EIL Delhi. In-house R&D could be termed only moderate in most of the cases. Natural gas fraction (C_3 and C_4) may be given preference to Naptha for production of Ethylene followed by Ethylene Oxide then to Ethylene Glycol to reduce the import of naptha for the purpose. Ethanol based Ethylene Oxide and Ethylene Glycol producing units may be encouraged.

New Drug Delivery Systems: The report concludes that new drug delivery systems developed in the world are transdermals, Implants, microcapsules, osmotic systems and ion exchange systems; and liposomes, monoclonal antibody systems, nonoparticles and microspheres are on verge of commercialisation. It identifies significant gaps in technology in almost all areas with respect to raw material availability/development, machinery, formulation and manufacturing technology.

New drug delivery systems of relevance to India are liposomes, monoclonal antibody systems and osmotic systems. In India, there is a need to scale up laboratory scale production of several new technologies such as micro encapsulation, liposomes and nonoparticles for commercialisation in the area of new drug delivery systems. The report also suggests for gainfully utilising the technologies if necessary in the areas of generic osmotic pumps and specific transdermal devices by procuring them from abroad after establishing their extent of usage in India.

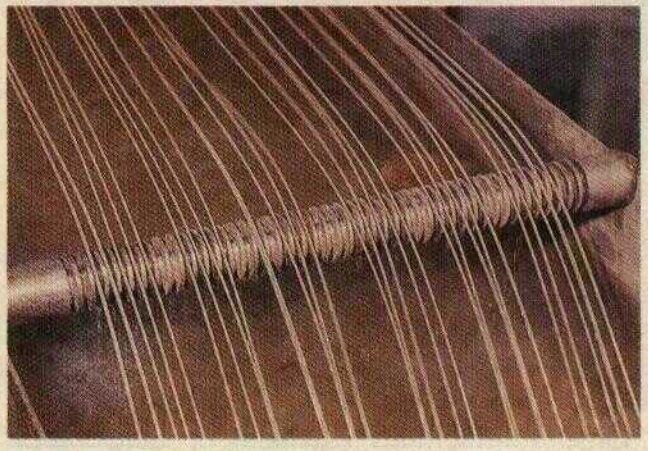
Styrene/Polystyrene: The report concludes that the Indian processing sector is far behind in

VII. 3 Polystyrene Plant

terms of applications of polystyrene in areas such as fast food packaging, micro ovenable manufacturers and research associations should therefore work towards new application development besides new product development. The report advocates the need of a centralised research institute for development of commercially viable polymer technology.

The report emphasized the need to scale up Albene Technology to minimum economic size level of 80,000 tpa; which has been jointly developed by NCL, Pune and Hindustan Polymers. The catalysts required for the technology i.e. iron oxide based catalyst for dehydrogenation of ethyl benzene to styrene, and zeolite catalyst to manufacture ethyl benzene from benzene and ethanol derived from molasses have also been developed by NCL, Pune.

Fuel Injection Equipment for IC Engines: The report reveals that the manufacturing capability for fuel injection system is well established in the country. Both world renowned technologies, rotary as well as inline, are available in the country. The basic difference in these two are that the rotary pump meters first and then pressurises while inline pump first pressurises and then meters. Secondly, the rotary pump requires a single plunger, regardless of the number of cylinders in the engine whereas in the other case, it depends upon the number of cylinders. For new development, assistance is taken from foreign counterparts. As regards experts while there is no expert of the system as a whole, certain components are exported. The report recommends that a joint effort is required on equity participation basis by the diesel engine manufacturers and fuel injection system manufacturers to achieve better fuel effeciency and lower pollution level, in line with international norms.



VII. 4 ABS Strands

ABS/SAN/AES: The report reveals that although the demand of various ABS grades has been met by the Indian manufacturers but there is a still a need to develop ABS alloys and blends for automobile, heat resistant and flame retardant applications. The need for a product application centre in close interaction with R&D institutions, equipment suppliers and user industry would be of use for the overall development of engineering plastics. R&D efforts should also be directed towards ABS/PVC and ABS/PE blends.

The report also suggests the import of latest state-of-the-art of technology for continuous bulk process for ABS resins. The raw material manufacturers should made every possible effort to provide the materials of required specification to the manufacturers of ABS/SAN.

Purified Terephthalic Acid: The study reveals that there is likely to be a demand supply gap of about 2 lakh tonnes of PTA in the year 1994-95 which may rise to about 5 lakh tonnes by the end of centuary in the country. Presently, Reliance Petrochemical Industry is a only producer of PTA with an installed capacity of 100 thousand TPA which is being increased to 200 thousand TPA under the minimum economic size scheme. Two units of PTA are in the pipeline, JK Petrochemicals is setting up aplant at Saleempur in technical collaboration with AMOCO Corporation while National Aromatics and Petrochemicals Corpn. is setting up a Plant at Manali in technical collaboration with Mitsui Petrochemicals. Both these plants are of 200 thousand Tonne capacity for PTA alongwith other Aromatic Products.

The present installed capacity of PTA world overis 5.4 million tonne which islikely to go up to 8.3 million tonne by 1994-95. The manufacturing process consists of air oxidation of p-xylene to

produce crude Terephthalic Acid. This Terephthalic Acid is purified to produce fibre grade Terephthalic Acid. Presently there are three technology suppliers for PTA viz. Amoco (USA), ICI (UK), & Mitsui Petrochemicals (Japan), Amoco process accounts for nearly 80% of the installed capacity in the world. R&D efforts in the field are primarily directed towards improving the catalyst system.

Electrolytic Manganese Dioxide: The report concludes that technology optimization in India is still far behind compared to the developed countries. It needs a consortium approach for optimisation of process know how and technology improvement leading to cost saving and successful commercialisation of indigenously developed Electrolytic Manganese Dioxide (EMD) technology. The consortium approach could be through National Metallurgical Laboratory (NML), Jamshedpur; Central Electro-Chemical Research Institute (CECRI), Karaikudi and Indian Institute of Technology (IIT), Madras in association with engineering firms like Metallurgical Engineering Consultants India Limited (MECON) and other manufacturers and users. There is also a need for creating fresh capacity to cater the domestic need as well as tap the export market by promoting at least one export oriented plant based on the latest state-of-the-art of technology.

Xylene: The study brings out that, major improvements have been taken place in all areas of design engineering during the last two decades. Major developments are in terms of heat recovery, plant integration, reactor and fractionater design. In a modern manufacturing complex the actual heat requirement can be as low as 110% of the theoretical minimum. Over the last 10 years a number of engineering tools have been developed, which assist the designer in the design of reactors. Scope, therefore, exists to revamp existing complexes, making use of present day design engineering tools.

The three xylene plants in commercial production at present, in the country, are IPCL, Baroda, Bongaigaon Refinery and Petrochemicals and Reliance Petrochemical Complex at Patalganga. The Reliance Petrochemicals, has for the first time in India used, CCR naphtha reforming technology. and has excellent capabilities for plant and machinery. However, thrust should be on development of items such as low NPSH pumps, precision dosing pumps, centrifugal compressors in high pressure process services and electronic instrumentation.

Resin Bonded Fibre and Particle Board: The report reveals that particle board manufacturing technology based on wood and wood waste is at par with international level. One of the Indian company have also set up a joint venture in USA. However, major items of plant and machinery for capacities higher than 20 TPD are being imported. Technology based on medium density fiber is relatively new in India and it would take some time to assimilate the same. The report further brings out that technology for using agro wastes, annuals and non-conventional wood species is not available within the country. The report emphasizes that for long run technological self-sufficiency and to avoid technology adaptation problems faced earlier in respect of imported technology, the process know-how and engineering expertise is desired to be developed in the country.

High Voltage Transformer: The study reveals that, in India System Voltage upto 400 KV are well established and 800 KV AC transmission system is in the planning stage. This will require manufacture of 800 KV transformers. Most of the major transformer manufacturers in India had collaborations with reputed International companies. They have the know-how to design and manufacture transformers up to 400 KV indigenously.

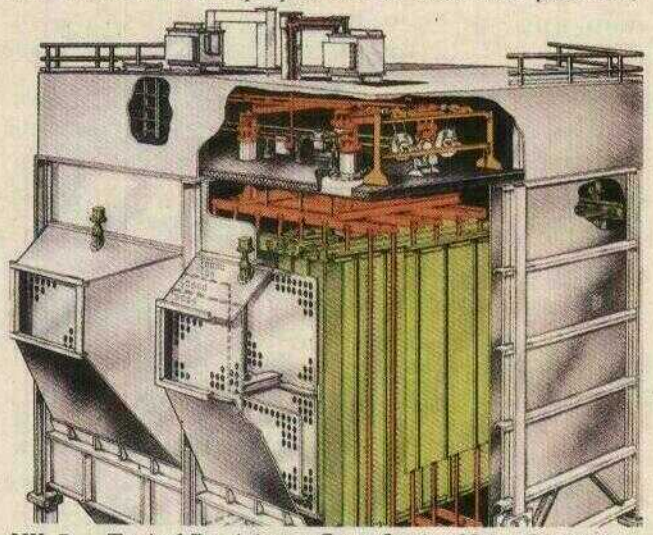
There is a need to seek alternative to transformer oils since the napthanic base crude is becoming scarce. SF_6 gas insulated transformers can be an attractive alternative to oil immersed transformers. Possibility of site assembly of large transformers can be looked into to overcome transport limitations. Extension of collaboration agreement of leading manufacturers to cover

design and production know-how of transformers of 800 KV class is required to be considered.

Methanol: The study brings out, that there are five units spread all over the country for Methanol with a licensed and installed capacity of 351,000 and 301,500 TPA respectively. The production in 1988-89 was 145,000 MT. There was appreciable import of Methanol in the past, but now apparently there is no import. The current demand of Methanol is 200,000 TPA and their demand is expected to grow to 300,000 TPA by 1994-95 and 425,000 TPA by the turn of the century. Methanol is produced mainly f rom natural gas, naptha, fuel oil and coal are other suitable feed stocks. Two manufacturing units RCF and NFL have Haldor Topsoe technology while Rama Petrochemicals is based on Lurgi technology GNFC and Assam Petrochemicals Ltd. are based on ICI Technology. The thrust in technology internationally is towards energy efficient process, which is reflected in total energy requirements claimed by various process licensors.

By world standard the methanol plants in India are small in size and only one is close to gas source. Feed stock used is not in line with world trend. Except for methanol synthesis catalyst. India is self sufficient with respect to other catalysts required for methanol industry.

Electrostatic Precipitators: The report brings out that the ESPs are tailor made, fabricated and site assembled equipment to suit the process, application, operating parameters, space availability and others, as specified by the users. Therefore, design and fabrication capabilities are of considerable significance for the industry. There is a need for (i) retrofitting the existing ESPs installations with microprocessor controllers for energy conservation, and (ii) human resource development for maintenance of electronic equipment. The report suggests thrust area for research and development as pulse energisation, increase in electrode spacing, material development for mechanical & electrical components, monitoring instruments, etc.



VII. 5 Typical Precipitator Cross Section Using Rigitrode Discharge Electrodes.

5.4 Status reports on the technology studies of 37 more sectors/products have been commissioned during the year. These are:

i) Seamless Steel Tubes
ii) α - Olefins & α - Olefin Sulphonates
iii) Electrolytic Manganese Dioxide
iv) Servo/Micro/Stepper Motors
v) Ceramic Capacitors
vi) Caprolactum
vii) Linear Alkyl Benzenes
viii) Electronic Weighing Machines
ix) Dimethyl Formamide
x) Inverters & AC Drives
xi) Welding Equipment
xii) Microwave Ovens
xiii) Polyols
xiv) Drilling Oil/Field Chemicals
xv) Electronic Watches & Clocks
xvi) Bonded & Coated Abrasives
xvii) Energy Meters
xviii) Air & Gas Compressors
xix) Polybutadiene
xx) Paracetamol
xxi) Sorbitol & Vitamin 'C'
xxii) Carbon Tetrachloride
xxiii) Acetic Acid
xxiv) Radiators for Automobile Applications
xxv) Photographic Films including X-ray Films
xxvi) High Fructose Corn Syrup & Artificial Sweetners
xxvii) Heavy Commercial Vehicles including Body Building
xxviii) Wire Drawing machines
xxix) Zinc

xxx) Butanol
xxxi) Trimethoprim
xxxii) Hydraulic Equipments/Systems
xxxiii) Welding Electrodes
xxiv) Uninterrupted Power Supply including Stabilizer used therein
xxxv) Copper
xxxvi) Biopesticides
xxxvii) Biofertilizers

6. FINAL REPORTS

The following technology status reports have been printed/are under printing:

— Penicillin G/V
— Petroleum Refining
— Dry Process Cement Plant
— Self Advancing Roof Support
— Surge Arrestor
— Coal Washery
— PTFE & PVDF
— Electrolytic Capacitor
— XLPE Cable
— Sponge Iron
— H.T. Insulator
— T.V. Glass Shell
— Process Control Instruments & Data Acquisition Systems
— Rolling Mills for Flat Products
— Streptomycin & Rifampicin
— Hard Ferrites
— Methanol
— Coke Oven
— Passenger Car
— LLDPE
— PVC
— VCM
— Ampicillin
— Phthalic Anhydride
— Jelly Filled Cables

7. MEETINGS

During the year 1991-92 interaction meets were organised to finalise the following technology status reports:

— Ampicillin on 11th June, 1991.
— High Voltage Transformer on 5th July, 1991.
— High Pressure Sodium Vapour Lamps on 26th July, 1991.
— Transnational Transfer of Technology: Legal aspects with special reference to arbitration organised in association with Indian Council of Arbitrations, New Delhi on 8th October, 1991.
— Electrostatic Precipitator in association with National Thermal Power Corporation, New Delhi, during 12-14th November, 1991.
— Semiconductor Devices LSIs & ICs in association with Central Electronics Engineering Research Institute, Pilani on 20th November, 1991.
— Styrene/Polystyrene in Association with the All India Plastics Manufacturers Association, Bombay on 5th December, 1991.
— Polypropylene in association with the All India Plastics Manufacturers Association, Bombay on 5th December, 1991.
— New Drug Delivery Systems in association with Indian Pharmaceutical Association, New Delhi on 12th February, 1992.

8. PROMOTION AND SUPPORT TO INDIGENOUS DEVELOPMENT OF CAPITAL GOODS

8.1 Introduction

Capital Goods are essential inputs for economic growth. They are required for all sectors of economy. They are needed for : setting up new capacities, for expansion of existing capacities, as well as, for modernisation and replacement. Indian capital goods producing industry, had an estimated output of Rs. 38,000 crores, during the year 1989-90, which is roughly 82% of the indigenous demand. Imports during the year 1990-91, were Rs. 10,400 crores on c.i.f. basis. The share of imports, in the total demand, on landed cost basis, was higher.

The ratio of payments, for capital goods imports to the payments for importing the knowledge and skills, part of the technology, has been of the order of 8:1 to 14:1 during last few years. The experience of many other technology im-

porting countries is similar.

Exports of capital goods from India are small forming only 2-3% of the indigenous production. The share of exports of Indian capital goods in the global trade of such goods is negligible despite the fact that India, with its low wage rate of skilled and trained manpower, has an advantage in production of industrial capital goods, whose manufacture is mostly labour intensive.

Though, manufacturing infrastructure may be in need of modernisation in some areas, the availability of manufacturing capacity is not the prime constraint in development of capital goods. In fact many of our leading CG manufacturers have sub-optimal capacity utilisation.

The need for promoting indigenous development of capital goods has also been highlighted by a number of technology status studies carried out under the National Register of Foreign Collaborations (NRFC). Some of these status reports are listed below :

— Aluminium Foil

— Phosphoric Acid

— Mopeds

— Nylon Tyre Cord

— Nylon Filament Yarn.

— Polyester Staple Fibre

— Magnetic Tapes

— TV Glass Shells

— Electrolytic Capacitors

Some important recommendations, in these studies, are

— Encourage specific R&D projects in the area of equipment design and development of new product.

— The critical equipment like agitator, hydrolyser, filter and special pumps, should be indigenised.

— Technology absorption efforts should be encouraged for the production of certain process equipments in the area of synthetic filament yarn.

8.2 Constraints faced by the Indian Capital Goods Manufacturing Industry.

With industrial growth over past many years, the requirements of capital goods is becoming more sophisticated technologically. Indigenous CG industry is unable to develop the Capital Goods required by these newly developing industries. An attempt was made to identify constraints faced by the Indian CG industry in becoming internationally competitive. Some of these are :

— Inadequate design and engineering capability with indigenous CG industry.

— Unsteady demand of specialised capital goods.

— Inability of user industries, particularly, those based on imported technology to provide detailed specifications of capital goods needed by them.

— Inadequate ability to unpackage project imports

— Unfavourable duty structure on import of components, sub-assemblies and raw material, vis-a-vis, finished capital goods.

— Inadequate systems engineering capability in consultancy sectors, to integrate various stand alone equipments into complete plants.

— Inadequacy of human resources for design and engineering of advanced capital goods.

8.3 Plan Scheme for "Promotion and Support to Indigenous Development of Capital Goods"

A plan scheme for implementation during the VIII five year plan had been conceptualised and included in the report of the Working Group for the VIII plan of DSIR, which was constituted by the Planning Commission. The scheme received

wide support from members of the working group as well as the Planning Commission.

The scheme aims to promote indigenous development of capital goods by removing some of the identified constraints. Major aims of the scheme are :

— Promoting indigenous development of capital goods by providing technological inputs and catalytic financial support for such development.

— Promoting interaction between producers and users of capital goods to enable unpackaging of capital goods import packages.

— Providing information base on : demand, costs, prices, impact of taxes, duties and export potential, on capital goods to help in formulation of policies for further growth of capital goods industry.

In accordance with objectives, the scheme will have the following functions :

— Providing partial financial support to the R&D projects of capital goods manufacturing industry, aimed at, development and technological upgradation of capital goods so far imported and capital goods which have export potential.

— Provide assistance to users of imported capital goods, to develop, design and engineering infrastructure. Such users are familiar with user's aspects of capital goods. They are in the best position to develop, design and engineer know-how, provided that they have skills in, design and engineering.

— To support R&D and academic institutions with a view to provide technical, analytical and testing expertise for design and engineering of capital goods.

— Providing partial support to industry for obtaining services of competent consultants for drawing up specifications of capital goods for new projects which are based on imported technology thereby promoting unpackaging of capital goods.

— Carrying out studies on demand of capital goods on sectoral basis.

— Carrying out studies pertaining to cost/price structure of capital goods and impact of duties and taxes on the cost structure.

— Bringing out detailed compilations of capital goods imported on year-wise basis.

— Providing support to efforts of associations of industry in documentation and dissemination of information on indigenous capabilities in production of capital goods and sub-assemblies/sub-systems of capital goods.

8.4 Activities

Reports of the following studies on the demand of capital goods by major sectors have been commissioned and draft reports have become available. Some of these have been evaluated through appropriate evaluation committees.

— Requirement of capital goods for the man-made fibre sector.

— Requirement of capital goods for the mouldable polymer sector.

— Requirement of capital goods for the metal forming industry.

— Requirement of capital goods for the electronics industry.

The studies brought out broadly contain : the demand of capital goods for these sectors till the year AD-2000; the present scenario of indigenous production and imports of capital goods for these sectors; capability of indigenous manufacturers producing C.G. for these sectors; constraints on indigenisation of imported capital goods; possibility of further indigenisation in years to come; and the recommendation of measures to be taken for expediting indigenous development of the

capital goods for these sectors.

The specific points brought out by these studies are given in the following paragraphs :

8.4.1. Man-made Fibre Industry

During the period 1984-91, the requirement of capital goods for the man-made fibre sector was Rs. 1400 crores, out of which Polyester Filament Yarn sector contributed Rs. 765 crores, Polyester Staple Fibre sector Rs. 347 crores, Acrylic Staple Fibre sector Rs. 214 crores and Polypropylene Multifilament Yarn Rs. 63 crores. During the period 1992-2001, the requirement of capital goods by the man-made fibre sector, is likely to be Rs. 2890 crores, out of which about Rs. 1600 crores worth of capital goods on c.i.f. basis are likely to be imported. The bulk of imports, Rs. 925 crores, will be for polyester filament yarn sector followed by acrylic staple fibre sector (Rs. 200 crores). The level of indigenisation is fairly satisfactory in case of static equipments and to some extent, in pumps. Bulk of spinning equipment (Rs. 800 crores), fibre processing equipments (Rs. 200 crores) and rotary equipments (excluding pumps, Rs. 250 crores) may have to be imported.

Main constraints in indigenisation are : weak design and engineering capability for CG; long delivery periods for indigenous CG, because of lack of timely availability of construction materials like special alloys and stainless steels; high cost of components and materials because of higher duties on materials and components; proprietary nature of some equipments; lack of NC fabrication technology; inadequate process guarantees by indigenous CG suppliers; lack of basic process design and basic engineering capabilities with consultants and CG suppliers.

The recommendation to promote indigenous CG development include, inter-alia promoting joint ventures in India involving leading basic engineering contractors abroad in the field of man-made fibres; increased awareness on part of users of the indigenous CG capabilities; fiscal incentives to indigenous CG suppliers; feasibility studies of indigenous manufacture of some important high value CG items.

8.4.2 Mouldable Polymer Industry :

Mouldable Polymer industry engaged in the production of HDPE, LLDPE, LDPE, Polypropylene, PVC, Polystyrene and ABS Plastics, is likely to have an investment of Rs. 5500 crores, during the period 1992-2000 AD, out of which Rs. 3900 crores will be on CG. These figures are for polymer production only, exluding upstream monomer production and down stream moulding and processing sector. Import of CG is likely to be Rs. 1050 crores, on c.i.f. basis. Major items of imported CG are likely to be : special equipments like extruder, palletiser packages, driers, centrifuges and pneumatic conveyors (Rs. 414 crores); reactors (Rs. 268 crores); compressors (Rs. 120 crores); and instrumentation (Rs. 65 crores).

The reasons for slow pace of indigenous development are : lack of design and basic engineering; know-how, both for process and CG; inadequate user support for process design data; long procurement time for special components and materials, which are of imported origin leading to long delivery times for the CG; lower volumes of production because of restricted size of the indigenous market; high cost of special raw materials and components; inadequate NC fabrication facilities; and lack of consortium approach in supplying comprehensive packages instead of standalone equipments.

The report has recommended some measures for promoting indigenous development of CG. These include : strengthening of design and engineering skills by CG manufacturers; cooperative R&D for CG development for polymer industry; encouraging joint ventures with leading engineering companies abroad in the field; financial support to users for establishing D&E infrastructure; strengthening consultancy capabilities in polymer sector; strengthening system engineering capabilities; creation of data bank on CG for the polymer sector; and increasing awareness, amongst users of indigenous CG capabilities.

8.4.3 Metal Forming Industry :

Production of metal forming machine tools, in India, in the year 1990 was about 675 nos. valued at about Rs. 50 crores and import in the year 1988-89, were Rs. 40 crores. Domestic market for such machine tools is relatively small and exports difficult because of long delivery period, poor product quality and stiff international competition. Level of standardisation is quite low and R&D support inadequate. Foreign collaborations are the main source of technology and there is considerable dependence, on imported materials and components, leading to, high cost and long delivery periods.

Report recommends : better interaction between producers and manufacturers of metal forming machine tools; easier access to imported materials; identification of export possibilities; increased standardisation; import of state of the art technologies; strengthening of institutional R&D support. Areas identified for further indigenous development are : quick discharge systems; hydraulic/pneumatic gripper feed; press/hammer lines; multi-station cold forming machines; accurate temperature and pressure control device for isostatic & isothermal pressing and near net shape forming technology.

8.4.4 Electronic Industry :

The requirements of CG, of imported origin, by the electronics industry, has been of the order of Rs. 200 crores p.a. during the recent past. The requirements of CG for the electronic sector, during the eighth plan, is likely to be of the order of Rs. 3000 crores out of which equipments Rs. 2000 crores worth may be imported. The indigenisation of CG in electronic sector is desirable as it may bring down the cost of such equipments which are often custom-made and often developed by users abroad. Indigenous CG manufacture is limited to the area of PCB manufacture only. CG producing firms are, mostly, in small scale. There is hardly any interaction between producers and users of CG. Improvement of Indian CG is hampered by relatively easy availability of imports, Inadequate institutional help in R&D for CG development; and lack of testing and certification agencies is also hampering exports. Measuring and testing equipment manufacture has the problem of nonavailability of electronic components of requisite quality and specifications. The time lag between revision of code numbers in the import list, and development of latest components and materials, abroad. Availability of such components is hampered on account of non inclusion of these material components in the import list. Absence of good quality aluminium, tin, silver and gold plating facilities and good die and tool making facilities are also some of the constraints.

The report recommends : all furances, ovens and welding equipments should be indigenised with the help of import of design and drawings by the existing manufacturers of these items; turnkey capabilities for machines of line production nature such as those required for passive components, capacitors and resistors, should be developed; there should be a good interface between the machine builders and machine users in electronic sector; partial Govt. support for development of equipment for upcoming sectors like IC's and LSI production should be provided; import duties on CG versus components and materials should be rationalised; financial incentives and commercial risk cover for development of new CG for electronic sector should be provided; and R&D and institutional support for development of CG should be strengthened.

8.4.5 Studies in Progress :

Studies of CG requirements of food processing sector; packaging sector; naptha and gas crackers; dies and moulds and the secondary iron and steel sector, are in progress. Reports are likely to be available in draft form in the year 1992-93.

8.4.6 Studies/development projects under consideration :

Studies pertaining to the CG requirements of: textile industry; garments fabrication industry; pharmaceutical industry; oil production and

transportation industry; and biotechnology based industries are being considered for commissioning. Development projects for : development of blister packaging and wrapping machines; and variable speed switched reluctance A.C. motors, are also under consideration, for support.

8.4.7 Directories :

Directories of capital goods approved for import during 1989 and 1990, have been prepared and are under print.

VIII. TECHNOLOGY ABSORPTION AND ADAPTATION SCHEME

1. INTRODUCTION

The Technology Absorption & Adaptation Scheme (TASS), in the Ministry of Science & Technology, has been introduced to enable absorption and upgradation of imported technology. An inter-Departmental Advisory Committee has been set up in DSIR to advise and review the activities and functioning of the Scheme besides approving new projects to be undertaken.

2. OBJECTIVES AND FUNCTIONS

2.1 The major objectives of the scheme are:

— To reduce the necessity for further import of technology after having it in use over a long period.

— To upgrade the technology imported, incorporating improvements identified during its use.

— To strengthen the base for selecting and negotiating appropriate and competitive technology.

— To study and evaluate the efforts in implementation and absorption of imported technology.

2.2 The main functions for achieving the above objectives are:

i) Catalytic support to the industry for technology absorption exercises and upgradation programmes related to imported technologies.

ii) Monitoring and evaluating the efforts in implementation of technology and absorption exercises by the industry.

iii) Technology Evaluation & Norms studies in important sectors/areas.

iv) Information dissemination through seminars workshops/training related to imported technology.

3. ACTIVITIES :

Details of the important activities covered during the period are given as under :

3.1 Support/Assistance for Technology Absorption/Upgradation Projects and strengthening R&D base.

3.1.1 The scheme provides promotional support and assistance to the industry for technology absorption and upgradation exercises related to imported technologies. Financial support is essentially catalytic in nature and is directed to trigger and stimulate target oriented technology absorption activities by the industry.

3.1.2. Proposals include projects for filling up of technology gaps in aspects such as:

— Product/Process technology evaluation exercises/analysis.

— Process/product/production technology optimisation and upgradation.

— Evaluation and upgradation of existing process/equipment through design investigations and development work.

— Accelerated indigenisation/substitution of imported raw materials/components.

3.1.3. Projects of 30 companies involving over 50 projects have been approved so far for absorption exercises related to imported technology. the support has been for the developmental expenditure such as prototype/pilot plant build up/raw materials/components/testing/consultancy and user trials. While capital and other expenditure are expected to be borne by the industrial units themselves. Project periods are usually 2 to 3 years. The details of the various projects approved, are as follows:

(i) Kerala Minerals & Metals Limited, Quilon

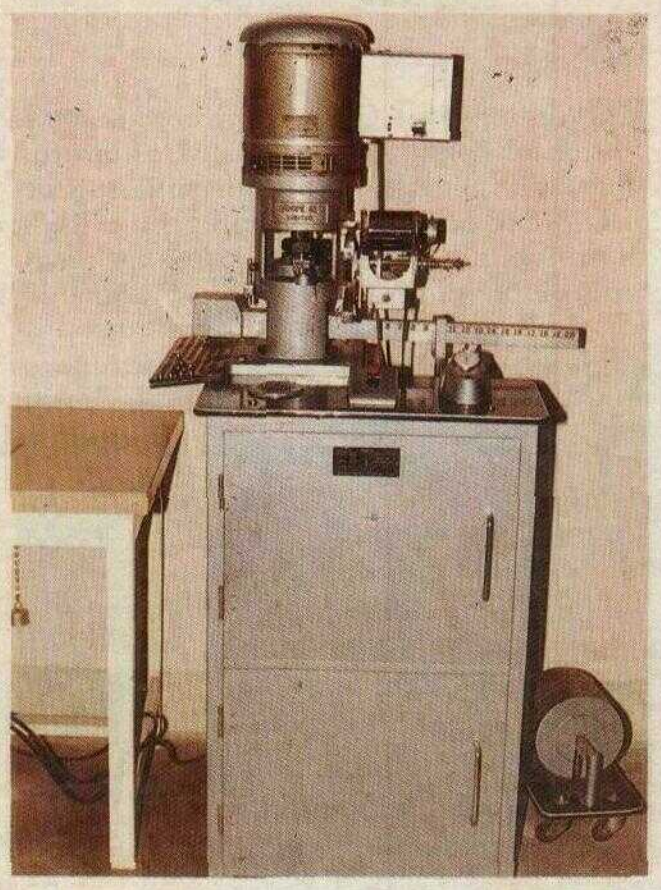
Four projects related to Titanium Dioxide (Collaborators M/s Kerr McGee Corp., USA); Beneficated Illeminite (collaborators M/s Benelite Corp., USA and HCL recovery (collaborators M/s Woodall Duckham, UK) were initiated in 1987 with partial support of Rs. 40 lakhs, out of a total project cost of Rs. 157 lakhs.

VIII. 1 Purification of Crude Titannium Tetrachloride using indigenous oil.

All the projects are completed. The benefits include import substitution of silica crystals, 'Trimet' coating agent and sodium silicate resulting in foreign exchange savings of the order of about Rs. 3 crores per annum; recovery and successful application of waste Bi-products e.g. Iron oxide in primer & paints and achievements aiming for improved process, better productivity and energy savings. The firm consulted RRL, Trivandrum in studies related to illeminate beneficiation and other aspects of the project.

(ii) Southern Pesticides Corporation Ltd. Hyderabad

The project related to Gamma BHC pesticides (collaborators M/s Stauffers Chemicals, USA) was initiated in 1988 with partial support of Rs. 19 lakhs, out of total project cost of Rs. 43 lakhs. The work so far includes successful substitution of all glass material of construction with glass lined material resulting lesser breakages. The firm have



VIII. 2 Sophisticated Performance Testing rig for Greases

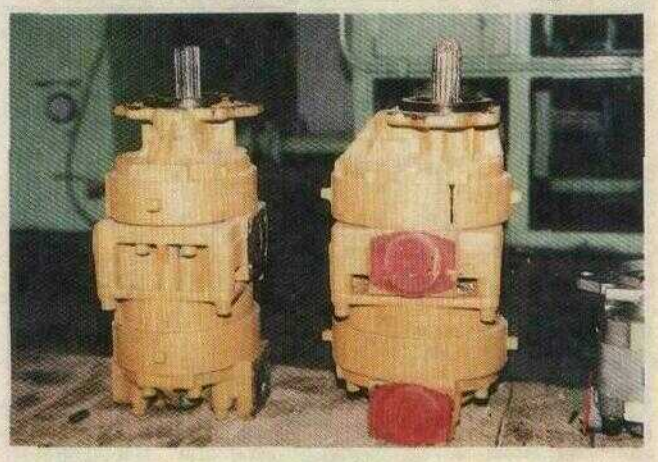
also strengthened their R&D facilities by installing a 50 litre distillation vessel. An agreement with IICT lab for reactor design has been entered and work concerning pilot plant studies is progressing.

(iii) M/s Bharat Earth Movers Limited, Bangalore

Two projects related to High Pressure (210 bar) Hydraulic Pump for dumpers (collaborators

VIII. 3 Side View of D80 HST

M/s Westinghouse, USA) and hydrostatic transmission for dozers (collaborators M/s Komatsu, Japan) were initiated in 1988 with partial support of Rs. 14 lakhs, out of a total project cost of Rs. 74 lakhs. The firm have developed 210 bar prototype pumps in each category of 3, 3.5, 4.5 and 6.5 module. Prototype Dozer using hydrostatic transmission in place of mechanical transmission was evaluated for field performance and subsequently



VIII. 4 High Pressure Hydraulic Pump

released for batch production. The projects are completed.

(iv) M/s Gujarat Communications & Electronics Ltd., Baroda

The project related to Rural Radio Telephone System (collaborators M/s Italtel, Italy) was initiated in 1988 with partial support of Rs. 7.50 lakhs, out of a total project cost of Rs. 48 lakhs. The Phase I of the project which deals with technology updating for subscriber radio equipment and radio base station has been taken up through redesign of equipment with respect to its mechanical engineering aspects and electronics circuitry and is completed. In phase II concerning the Exchange Terminal Equipment, prototype Development has been completed.

The other project which relates to Digital Video effects (collaborator M/s Ampex, USA) was initiated in 1988 with partial support of Rs. 10 lakhs, out of a total project cost of Rs. 52 lakhs. The project deals with development of low cost Digital Video Effect for smaller studios. Costs were reduced while developing the product as required by Doordarshan.

(v) M/s Kerala State Electronics Development Corp. Ltd., Trivandrum

Four projects based on 3 phase uninterruptible power supply systems (collaborators M/s Brown Boveri Co., Switzerland) were initiatted by ERDC, Trivandrum in 1988 with partial support of Rs. 15 lakhs, out of a total project cost of Rs. 52 lakhs. The projects include upgradation of 3-phase UPS, development of single phase UPS, AC drives and SCADA systems as an adaptation of 3 phase UPS technology. The upgraded version of 3 phase UPS System has been designed and a working module of 40 KVA 3 phase UPS assembled. The prototypes of single phase UPS system, AC drives and SCADA, have been developed and evaluated. The projects are completed.

(vi) M/s Mishra Dhatu Nigam Limited, Hyderabad

Three projects related to Electroslag Refining

Technology for the manufacture of special steels & high performance alloys (collaborators M/s Creusot Loire, France) were initiated in 1988 with partial support of Rs. 13 lakhs, out of a total project cost of Rs. 90 lakhs. The projects involve establishment of liquid slag start technology, optimisation of slag chemistry and indigenisation of ESR slags. The firm have successfully refined indigenous calcium fluorospar, indigenised the slag and has also developed liquid slag start technique. The projects are completed.

(vii) Electronic Corporation of India Ltd., Hyderabad

The project related to communication system for Distributed Monitoring & Control System, was initiated in 1988 with partial support of Rs. 5 lakhs, out of a total project cost of Rs. 47 lakhs. The project deals with understanding of basic hardware & software of Manufacturing Automaion Protocol (MAP) (imported from M/s Impex USA) and development of collapsed version of Full MAP for application in smaller projects. The firm have been assisted by CEERI, Pilani in development of Controller Boards. The project is completed.

(viii) M/s Hindustan Machine Tools Limited, Bangalore

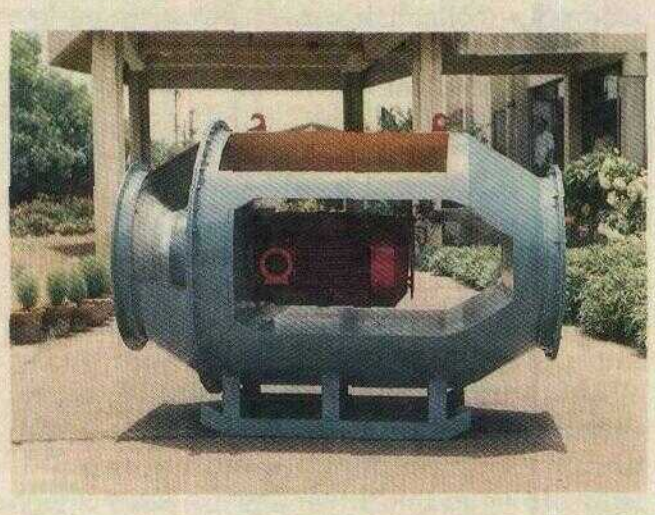
The project related to advanced CNC system (collaborators M/s Siemens, West Germany) was approved in November, 1988 for partial support of Rs. 30 lakhs, out of a total project cost of Rs. 180 lakhs. The project aims at upgradation and development of state-of-the-art CNC system using latest technologies. The hardware design & mechanical system design are completed with user group. Specifications for the advanced CNC systems have been formulated and prototype development is in advanced stages. The project is progressing satisfactorily.

(ix) M/s Uptron India Limited, Lucknow

Two projects related to Distributed Digital Process Control System (DDCS) (collaborators M/s Leeds & Northrup, USA) and Coal, Washery System (collaborators M/s Hawker Sidley Dynamics Engg. Ltd., UK) were approved in 1988 with partial support of Rs. 30 lakhs each, at a total project cost of Rs. 200 lakhs & Rs. 217 lakhs respectively. Both projects aim at upgradation and development of improved version of the systems. Expert systems were designed and demonstrated to Bokaro Steel Plant. In Coal Washery System, the system design has been completed. Project for DDCS is nearing completion.

(x) M/s Andrew Yule & Company Ltd., Calcutta

The project related to manufacture of heavy duty industrial fans (collaborators M/s Davidson & Co. Ltd., UK) was approved in 1990 for partial support of Rs. 10 lakhs out of total project cost of Rs. 47 lakhs. The project deals with optimisation of energy efficiency/abrasion resistance characteristics of industrial fans. Mathematical Modelling/design analysis has been carried out by Indian Institute of Science, Bangalore and IIT,



VIII. 5 Side View of Skin-cut BFB-700 ILC

Madras. Prototype development and testing/ user trials are under way. Detailed engineering has been undertaken by the firm based on design support given by IISc and IIT. The project is progressing satisfactorily.

(xi) M/s Tamil Nadu Industrial Explosives Ltd., Vellore

Four projects related to Nitroglycerine based explosives, were approved in November, 1989 for partial support of Rs. 7.25 lakhs, out of a total project cost of Rs. 71 lakhs. The projects deal with replacement of Guargum for improving gelling/ water resistance property, reduction/replacement of Nitrotoluenes to reduce toxic effects in post detonation fumes; Biological degradation of waste water; and import substitution of dextrine used in lead azide. For replacing guargum, trials with Rosin & TKP were completed. Nitrotoluene is eliminated by incorporating Turpentine oil, and Dextrine is substituted with indigenous tapioca starch. Work on biological degradation is done with guidance from microbiological deptt. of Christian Medical College. The projects have been completed.

(xii) Tamil Nadu Newsprint & Papers Ltd., Madras

Two projects related to improvement in preservation of bagasse for brightness and quality and for improving the quality of mechanical bagasse pulp (collaborator M/s Beloit Walmsley, England and M/s Beloit Corpn., USA) were approved in 1990 for partial support of Rs. 9.40 lakhs out of total project cost of Rs. 65 lakhs. The projects are closed.

(xiii) M/s Hindustan Teleprinters Ltd., Madras

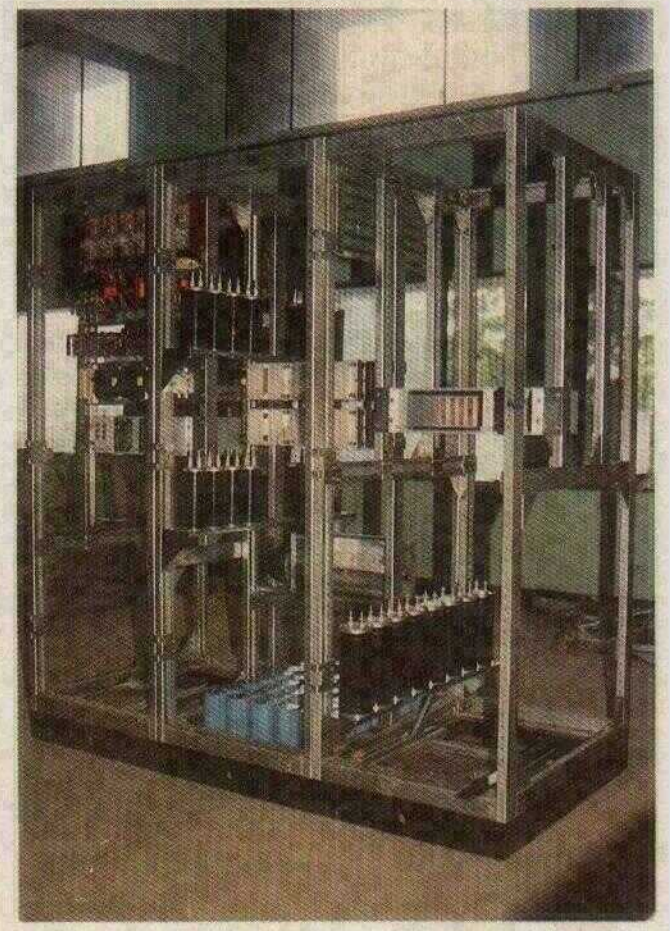
The project related to adaptation and upgradation of Electronic Teleprinters (collaborators M/s SAGEM, France) was approved in 1990 for partial support of Rs. 12 lakhs out of total project cost of Rs. 63 lakhs. The project deals with upgradation of existing electronic teleprinter TX-30 by adding additional features like 32 k memory, real time clock, auto dialling, add and VDU, add on FDD and adapting the ruggedised version for military aapplication. The project is progressing satisfactorily.

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

The project envisages import substitution of hydraulic AGC (Automatic Gauge Control) system, simulation and testing for understanding/ know-why and adapting it to multistand tandem mill. The project was approved in 1990 for partial support of Rs. 10 lakhs out of total project cost of Rs. 75 lakhs. Project is in progress.

(xv) M/s Mining and Allied Machinery Corporation, Durgapur

The project related to Development of Side Discharge loaders, based of Technology received from KOPEX, Poland was approved in 1991 for partial support of Rs. 10 lakhs out of total project cost of Rs. 25 lakhs. Project is in progress.



VIII. 6 1 phase UPS

(xvi) Keltron Controls, Aroor

The project related to indigenous development of custom build IC's used in computer manufactured with technology received from Hitachi, Japan was approved in 1991, for partial support of Rs. 10 lakhs out of total project cost of Rs. 20 lakhs. Design work at ERDC is completed for 4 types. Project is progressing satisfactorily.

(xvii) Hindustan Cables Ltd.

The projects related to Plasma enhanced MCVD process and recovery of raw material used in Fibre Optic Cables with technology of NKT, Denmark were approved in 1991 for partial support of Rs. 15.50 lakhs out of total project cost of Rs. 300 lakhs. The projects are in progress.

(xviii) Hindustan Organic Chemicals, Rasayani

The preoject related to simulation studies for the distillation train in the Phenol plant at Cochin set up in collaboration with Universal Oil Products Inc., USA was approved in 1991 for partial support of Rs. 4.50 lakhs out of total cost of Rs. 13.50 lakhs. Mathematical modelling is being done by NCL. The project is progressing well.

(xix) Swaraj Mazda, Chandigarh

The project related to improvement of fuel consumption and emission reduction in Diesel Engine, manufactured with technology from Mazda Motor Corporation, Japan was approved in 1991 for partial support of Rs. 21.50 lakhs, out of total project cost of Rs. 76 lakhs. The project is in progress.

(xx) Bharat Heavy Plates and Vessels Ltd., Visakhapatnam

The project related to development of flexible super insulated piping used as a part of cryogenic system manufactured based on technology received from L'Air Liquids, France was approved in January, 1992 with partial support of Rs. 16.00 lakhs, out of total project cost of Rs. 35 lakhs. Project is in progress.

3.2 Roster/Directory of Research & Design Experts

A Roster/Directory of Research & Design Experts in Technology Absorption has been commissioned in this year. The roster will contain specific expert assistance required by Industries in 8 priority sectors and resumes of concerned experts. The work is in progress.

3.3 Technology Profile Studies

The profile studies of imported technology in 18 States have been initiated. The reports contain details of existing industrial units based on foreign collaborations; brief highlights of absorption of technology, and a broad analysis of foreign collaborations in the concerned States. The reports of all the 18 States have been finalised. Interaction Meetings were held at Bangalore, Madras, Hydaerabad, Cochin & Ahmedabad with respective industrial units, State Governments and other concerned with import of technology to review these reports, besides presentation of experiences of industrial units and research labs on absorption of imported technology. Similar Interactions are being planned in other States in early 1992.

3.4 Implementation of Foreign Collaborations:

The studies on "Implementation of Foreign Collaborations approved in 1981-83, 1984 and 1985" undertaken by Consultancy Development Centre have been completed. The reports are being reviewed. These studies aim to evaluate the pres2ent status with regard to implementation of foreig2n technology approvals. The reports throw light on aspects such as reasons for non implementation of approved cases and constraints in implementation.

3.5 Technology Evaluation and Norms Studies:

3.5.1 Under the Scheme, Technology Evaluation and Norms Studies were initiated in various sectors/areas of importance. The Norms Studies *inter alia* aim at identifying major elements of technological gaps and to formulate the time targeted projects/programmes for technology ac-

quisition/R&D modernisation/operational improvements to bridge the technology gradients existing between India and intenational level of operations. These aims are proposed to be pursued through suppporting of sectoral and unitwise studies. The technology norms studies in 65 sectors/areas have been commissioned so far through profesional consultants in their respective fields. 50 more areas for the studies have been indentified in consultation with other Ministries/Departments.

3.5.2 The reports on Electric lamp, Non ferrous castings, Aluminium, Mini steel, Fertilizers (Phosphatic) and Fertilizer (Nitrogenous), aluminium, boilers, forged & portable tools, paper & pulp machinery, steel, drug formulations, Ferrous castings and steel forgings have been finalised and printed. The reports on Flour and Rice Mills, Ferro Alloys, Industrial Furnaces, H.T. Fastners and Cement have been finalised taking into account the observations in the respective workshops recently held and are being printed. The draft reports on packaging, refractories, medical electronics equipment, pesticides, industrial oils & Fatty acids, Edible Oils, leather tanneries, rubber processing industry, and glass are being finalised. The studies which are under progress include Sulphuric Acid, Electrical Motors, Leather Products, Railway Wagons, Home Appliances, Marine Food, Industrial Alcohol, Fruit Juices, Textile Processing, Spinning and Weaving technology in Textile Sector, Marble and Granites, Paints, Secondary Aluminium products, Fertilizer granulation, Bicycle, Soda Ash, Waste recycling, Dye stuff and intermediates. Other studies commissioned during the year are in the areas of Paper Mills, Hosiery & Knitting, Bakery industry, Secondary Steel Refining, Plastic Tank and Plastic Furniture, Decorative Laminates, Industrial and Control Valves, Garments, Galvanising and Calcium Carbide.

3.6 Talented Indian Engineers and Scientists (TIES)

Talented Indian Engineers and Scientists Scheme (TIES) is one of the measures recommended by a Committee constituted by the Minister of State for Science & Technology to review the policy of Government and various schemes already in operation for attracting back talented Indian Scientists and Technologists settled/working abroad. These recommendations were further endorsed by Scientific Advisory Council to Prime Minister.

The "Talented Indian Engineers and Scientists Scheme (TIES)" of the Department of Scientific & Industrial Research aims to streamline and *Co-ordinate all activities in providing assistance* to talented Indian Engineers and Scientists, in areas such as: ascertaining the TIES expertise and intentions; awareness of areas of importance; status and feasibility reports; and clearances with various agencies.

During the year, DSIR has initiated preparation of preliminary industry profiles of items considered to be of interest to TIES. 82 reports were commissioned and these concern with Plastic Lenses, Acryamide & derivatives, Nickel Cadmium Batteries, Pay telephones, Micro motors, Multilayer Ceramic Capacitors, Electron gun, Enzymes for food and beverage Industry, High Pressure hoses, Computer software, Cardiac Pace Makers, Refining used lubricants, Miniature Circuit Breakers, Self adhesive tapes, Sensors for robots, Electrical contact assemblies, Dry type transformers, Pyridines and picolines, Amoxycillin trihydrate & cloxacillin sodium, Cyclohexanone, Tetracycline/Oxy tetracycline, Poly vinyl alcohol, Chloroquine, diphosphate, Trimethoprim, Food yeast, Boric acid, Activated carbon, Magnesium trisilicate, Glass making machinery, Tartaric acid from sugar molasse, Tetra-hydrofuran, Citral and derivatives from lemon grass, Silicone rubber, Nicotine sulphate from tobacco waste, Hexachloro cyclopentadine (HCCP), Diethylmaleate, Butachlor, Carbo furan, Ceramic colours, Acephate, Vinyl sulfone, Resuscitators/Ventilators, Soft ferrites, Acidproof cement, Acidproof bricks, Artificial hear valves, Human Vaccine, Animal Vaccine, Burglar Alarm Systems (Electronic), Amino acids (Lysine and its salts and esters), Acetone, Oxalic acid (through nitric acid treatment), Phthalates plasticisers, Pre sensitised offset printing plates, Hard Disc Drive 3.5", High test hypochlorite (HTH), Gallic acid,

Narrow necked glass containers, Engineering Plastic components (SMC), Transmitter & receiver capsules for telephone, Synthetic marble, Thick hybrid Micro circuit (THMC), Vending machine, Composite Dye Intermediate (Beta nathol, Bonacid, Chicago acid, Gamma acid, Jacid), Digital BP measuring, Video games, Zirconium oxide, Copper foils for PCB's, Synthetic Vapour heating fluids, Photocopier toners & inks, Timer switches, Poly butenes, Oxo alcohol, Methyl ethyl ketone (MEK), Wire wound resistors, Liquid crystal displays, Electronic energy meters, Vacuum metalised articles, Synthetic wood, Phosphors, Bromine from bitterns, Recirculating Ball Screws.

3.7 Technology Demonstration Project of Electrical Research Development Association, (ERDA), Vadodara

The project of ERDA relating to evaluation of parameters of energy efficient electronic motors both Indian and global, towards achieving capability to design manufacture of energy efficient motors, was approved in this year with partial support of Rs. 8 lakhs out of total project cost of Rs. 10 lakhs. This is aimed to assist particularly the small and medium manufacturers.

IX. TECHNOLOGY TRANSFER

1. TRANSFER AND TRADING IN TECHNOLOGY (TATT)

1.1 Objectives

The TATT Scheme aims to promote and support activities towards the export of technologies, projects and services. The measures adopted are:

— Support to preparation of technology profiles of developing countries;

— Support to preparation of reports related to capabilities and experiences of industrial units in technology export and video films highlighting India's technological advances;

— Publicity and dissemination of Indian capabilities through workshops, trade fairs and delegations;

— Study and analysis of Indian Joint Ventures Abroad;

— Supporting live demonstration of exportable Indian technologies overseas as well as within India;

— Supporting activities leading to upgradation of technologies identified for **export;**

— Assist in export of technology based services in areas such as setting up R&D institutions, R&D collaborations, operation and maintenance of plants, hospital and telecommunication services.

1.2 Activities

The TATT Schene became operational during the year 1986-87 through the cell set-up for this purpose and also by way of initiating and completing a large number of programmes and projects aimed towards meeting its aims and objectives. Eleven meetings of the Technical advisory Committee on TATT were held during 7th Five Year Plan. Technical Advisory Committee on TATT has been reconstituted. One meeting was held during 1990-91 and two meetings were held during the year 1991-92. 15 new projects/ programmes were approved & initiated in addition to about 70 projects undertaken during 1985-1991. The thrust of the projects during the 1985-1991 has been towards documenting our technological expertise and capabilities, preparation of technology profiles of select developing countries, and to help the Indian exporters in enhancing their export efforts in the area of technology transfer through seminars/ workshops, and video films. Details of some of the projects/activities completed or in progress during the year under report are given below:

(a) Technology Profile for Developing Countries

(i) Final draft reports namely, Technology profile on Thailand, Botswana, Nepal and Vietnam were printed.

(ii) Study on technology profile on Egypt was commissioned to TDA last year. The data collection for the study is in progress.

(iii) Reports on Technology profile of Mauritius and Zaire were commissioned during the year to WEBCON and Dalal Consultants respectively. The study is in progress.

(b) Technology Export Capabilities and Experiences

Several projects primarily aimed towards assessing and projecting our technological activi-

ties and experiences through preparation of reports, video films, and disseminating the same to the concerned organisations including Ministries/ Departments, Indian embassies/missions abroad and foreign embassies/missions in India were completed or are in various stages of completion. Some of these projects/activities are indicated below:

(i) Technological and Consulting Capabalities in Metal Powders & Powder Metallurgy

A seminar on technical, economic and social aspects of powder metallurgy and its applications was organised by ESCAP in February 1989 which was hosted by DSIR. One of the recommendations of the seminar was that DSIR should compile and distribute a compendium on expertise available in India for providing consultancy and other services in the field of powder metallurgy to the regional countries. With the above objective a study was sponsored to CDC. A report which includes details regarding manufacturing methods of various types of powders and profiles of major powder manufacturers, component manufacturers; equipment manufacturers, R&D organistions and consultancy organisations has been printed.

(ii) Trade and Technology Directory of India-1991

With a view to project total Indian scenario with emphasis on technological development and transfer to the outside world, "Economy & Trade, New Delhi" was provided partial assistance to bring out the directory. The directory was released by the Hon'ble Prime Minister of India in September, 1991. The directory in two volumes, has five parts; part I dealing with liberalising economy, part II describing the policy statements, part III devoted to statistical tables, part IV presenting organisation profiles and part V dealing with New Initiatives.

(iii) Status and Future Thrust on Exports of Technology and Services

The objective of this study is to highlight the status and strength of the certain select sectors and to pin point the future thrust areas including policies for promoting technology exports. It is expected that the document will increase awareness among developing countries about source of technology from India. The sectors being covered are: (i) Agriculture including dairy, (ii) Food Processing, (iii) Health, (iv) Rural Development, (v) Irrigation and water resources, (vi) Minerals, (vii) Energy, (viii) Chemicals & Pharmaceuticals, (ix) Leather manufacturers, (x) Transport, (xi) Telecommunication, (xii) Electronics & (xiii) Textiles. The study would also highlight role of Government departments, export promotion agencies and financial intitutions related with export of technology. The study is being conducted by M/s Centre for Studies on technology & Trade, New Delhi.

(iv) Technologies Available for Transfer

A computerised data base as well as a report on 48 product/process technologies in 5 sectors, viz. Engineering, Telecommunication, Electronics, Chemical & Fertilizers, and Power generation has been produced with the assistance of National Foundation of indian Engineeers (NAFEN), New Delhi. The technology package includes details such as brief description about technology, plant & machinery cost, operating cost, ecological aspects, requirements of manpower, plant area, and raw materials. The technologies bave been offered by 28 companies whose profiles appear in a separate section in the report. The report is under printing.

(v) Export of Technology in Mechanical Plants and their Derivatives

A study was sponsored to M/s Enterprises, New Delhi to document the activities of government institutions, research laboratories and industrial organisatons engaged in systematic cultivation, collection, extraction and processing of medicinal herbs. The draft report was discussed in an interaction meeting involving industries in February 1992. It gives profiles of important Government and Private institutions doing significant work in this area. Also described are some model extraction plants for herbal extracts.

IX. 1 Pyrethrum

(vi) Study on Indian Electrical Industry

A study was sponsored to M/s Symatec Assiciates, New Delhi to identify the technological strength of the Indian Electrical Industry with specific emphasis on; (a) indentifying specific products for which technologies can be transferred, (b) identifying entrepreneurs having capability to transfer technology and (c) formulating strategies for technology transfer. The draft report has been printed for discussion in an interaction meeting. The report identifies specific product areas where India can offer technology. These are: Mini-micro hydel sets, Turbo-generators, Alernators. Distribution Transformers, Power Cables, LT Switchgear, Porcelain Insulators, Motors, Energy Meters, Fans, Lamps & Tubes, Power Capacitors and Panel Instruments. It also gives profiles of 30 organisations capable of offering technology in the above areas.

(vii) Technology export potential in solvent Extraction Industry

The study has been conducted through M/s

IX. 2 Filters for Heating Oils, water, acids, air, gases

ABC Consultants Pvt. Ltd. The draft report prepared has been printed for discussion in an interaction meeting. It discusses in detail India's strength in the Solvent Extraction Industry covering preparatory / pre-treatment processes, extraction technology, de-solventising & toasting, distillation and oil finishing. Process available for various seeds such as castor, rice bran, cotton, soyabean, sal, sunflower are included. The report also includes profiles of 26 plant and equipment manufacturers, R&D institutions and processors.

(viii) Technology export potential in Rice Milling and By Products Industry.

The study has been conducted through M/s ABC Consultants Pvt. Ltd. the draft report prepared has been printed for discussion in an interaction meeting. It discusses in detail, Indian capabilities and services offered in various types of rice mills such as Hullers, Shellers, Huller-cum-Sheller and Modern Rice Mills. The report also covers the by-products industry such as utilisation of husk, use of rice bran and defattened bran, use of crude rice bran oil in soap manufacture etc. Profiles of 20 Equipment Manufacturers and Processors, Consultants and R&D institutions are available in the report.

ix) Technology export potential in Dairy Industry

The study has been conducted through M/s

ABC Consultants Pvt. Ltd. The draft report prepared has been printed for discussion in an interaction meeting. It discusses Indian capabilities and services offered in processing of milk and milk products. Capability for equipment manufacture such as chilling systems, liquid milk handling, pasteurization plants, pumps, separators/ clarifiers, cream pasteurization plants, homogenizers, evaporators are also covered. The report also brings out processes available for manufacture of ghee, butter and cheese. Profiles of 16 equipment manufacturers and processors, consultants and R&D institutions are available in the report.

(x) Mini Technology profiles of select sectors

Financial support was extended to EEPC to bring out technology profiles of select sectors based on the requirements of Somalian Government. A list of 10 sectors was identified where Somalia was keen to collaborate with India and import technology. The sectors are : Tannery, Textiles, Utensils, Mechanical workshop, Sugar plants, Deep-sea fishing, Farming, Agricultural Machinery, Transport and Food Processing. Visit of Somalian delegation to see Indian Industry in operation could not materialize due to political problems in Somalia. However, since the support was sanctioned towards preparation of profiles, the profiles are presently under print. These would be utilised for publicity by the Indian industrial missions going abroad as well as foreign mission visiting India.

(xi) Technology export capabilities in the Ministeel Industry

The objective of the study is to pin-point specific areas in Ministeel Industry where India has potential to offer knowhow, carry out engineering design, set up turnkey plants and export capital goods. It would also give profiles of organisations operating leading mini-steel plants, machinery manufactures and consultants engaged in design of furnaces and other related machinery. The study has been commissioned recently to M/s UPICO.

(xii) Capabilities of Indian Packaging Industry to export technology

The objective of the study is to document India's capabilities in conversion technology of raw materials to packaging media and also technology for aseptic packaging including flexible packaging. It would also study capability for manufacture of machinery required for various processes. Profiles of organisations highlighting their manufacturing, design engineering, training and R&D capabilities would be also included in the report. The study has been commissioned to Indian Institute of Packaging, Bombay.

(xiii) Technology export potential in the areas of Veterinary Formulation

The project would study Indian capabilities for developing formulations for various kinds of animals and diseases. It would also study plant and machinery manufacturers in the field and include profiles of organisations, R&D organisations and institutions in the report. The study has been commissioned to M/s Eastern Enterprises, New Delhi.

(xiv) Technology export potential in Two Wheeler Industry

The project would study India's capability for manufacturing Scooters, Motor cycles and Mopeds. It would document enginering design and R&D capability of organisations having potential to export knowhow, plant and machinery.. The study has been commissioned to M/s M.M. Suri, New Delhi recently.

(c) Seminars/Workshops/Meetings

The folowing Seminars/Workshops/Technical Meetings were supported/sponsored during the period :-

(i) Seminar on Technology Transfer among Developing countries - IIFT :

The seminar will project India's capabilities for transfer of technology, projects and service

vis-a-vis needs of the developing countries. It is proposed to present 10 papers on technology transfer during the seminar. Some of the papers are "International Code of Conduct on Transfer of Technology". "Technology transfer in hospital and medical services" and "Capabilities, expertise and Overseas activities of ONGC". Technology profiles of developing countries prepared by DSIR will also be discussed. Ambassadors/High Commissioners of developing countries are expected to attend the seminar.

A preliminary meeting of industry delegates was organised in association with FICCI in July, 1991. The meeting was chaired by Ms Arundhati Ghose, Officer on Special Duty, Ministry of External Affairs. The industry appreciated the technology profiles of developing countries prepared by the department and stressed the need for setting up of a nodel agency which could maintain a data base of technological demands and enquires from overseas. Ms. Ghose called upon the industry to establish rapport with overseas businessmen for promotiing our exports.

(ii) A National Technology Fair - Techsource '92 was organised in Madras during March 4-9, 1992 by Industrial and Technical Consultancy Organisation of Tamil Nadu (ITCOT). During the fair, seminar on technology exports from India was organised in which organisations like APCTT, EXIM bank, NSIC, NRDC etc. participated. The department extended partial financial support for organising the seminar.

(iii) An interaction meeting on "Export of technology in Medicinal Plants and their Derivatives" was organised on February 12, 1992 to discuss the draft report prepared under the scheme in a gathering of comprising of industries, consultants, R&D institutions and Govt. officials.

(d) Indian Joint Ventures

A study on Experience of Indian Joint Ventures on technology transfer to four developing countries namely, Singapore, Thailand, Malaysia and Indonesia was commissioned to IIFT, New Delhi. A visit to these countries was undertaken by the study team comprising of one IIFT faculty member and one DSIR consultant during October-November 1991. About 36 joint venture units in 4 countries were visited. The report on the survey conducted in under finalisation.

(e) Live- Demonstration of exportable Indian technologies

Pilot Plant demonstration for Re-refining of used Lubricating Oils based on Non-Acid process

Financial support has been provided to M/s Balmer Lawrie & Co. ltd., Calcutta for setting up a 300 TPA capacity pilot plant in India for rerefining of used lubricant oil by non-acid process for demonstrating Indian technology to potential clients abroad. The novel process consists of four steps, viz., flocculation of used lube oil, filtration to remove flocculated contaminants, adding additives to correct certain properties of filtered oil and distillation. It eleminates all the limitations of the conventional acid clay process from the environmental point of view. The plant is being set up to treat raw material from UAE with a view to prove the workability of the technology so as to export it to UAE and other countries in middle east.

1.3 A list of reports/publications printed under TATT during the period is given below :

i) Trade and Technology Directory of India, 1991; Vol. 1 & II.

ii) Supporting and Ancillary Construction Equipment Manufactured in India.

iii) Technology export potential in Rice Milling and By-products industry (draft).

iv) Technology export potential in Solvent Extraction Industry (draft).

v) Technology export potential in Dairy Industry (draft).

vi) Technology export potential in Electrical Industry (draft).

vii) Technological and Consulting capabilities

in Metal Powder and Powder metallurgy.

viii) Technology Profile on Vietnam (draft).

2. 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 forums on issues related to Technology Development and Technology Transfer in coordination with other concerned Ministries.

2.1 UNCTAD

The Eighth session of the UNCTAD Committee meeting on Transfer of Technology was held in Geneva from 22-30 April, 1991. This was an important session in terms of giving an indication of what is achievable on the item of technology at the main UNCTAD Conference scheduled to take place in Columbia in 1992. Adviser DSIR participated in this meeting. The Eighth Session was also supposed to give a decisive direction to the issue of resuming regulations for the Code of Conduct on Transfer of Technology. The session considered the following issues with regard to technolgoy : i) Transfer and Development of technology in changing world environment during this decade; ii) Trade and Development aspects and implications of new and emerging technologies; iii) further considerations on a draft international code of conduct on the transfer of technology.

2.2 APCTT and ESCAP

The matters pertaining to the Asian and Pacific Centre for Transfer of Technolgoy (APCTT) under ESCAP, were dealt with in cooperation with the Ministry of Commerce. The Department of Scientific and Industrial Research continued to play the role of a focal point for the APCTT. DSIR prepared a brief covering technological issues for the use of the Indian delegation to the 47th Annual Session of ESCAP held at Seoul, Republic of Korea during April, 1991.

The construction of the APCTT building was

IX. 3 Shri P. Chidambaram, Hon'ble Minister of State for Commerce delivering the Inaugural Address at the Sixth Session of the Governing Board of Asian and Pacific Centre for Transfer of Technology, New Delhi

taken up by CPWD in April, 1991 after taking clearance from the various related authorities in Delhi. The first phase of the building is expected to get completed during middle of 1992 and the Centre is likely to start functioning from Delhi after that. Adviser, DSIR participated in the Seventh Technical Advisory Committee Meeting of APCTT which was held in Bangalore, India, on 19th August, 1991. Government of India hosted the 6th Session of Governing Board of APCTT which was held during 25-26, November, 1991 at New Delhi and all the arrangements related to this were undertaken by DSIR. The 6th Session of the Governing Board was attended by participants from Australia, Bangladesh, China, India, Islamic Republic of Iran, Japan, Republic of Korea, Nepal, Philippines, Thailand, Socialist Republic of Vietnam. Senior officials attended the meeting from ESCAP, UNDP and UNESCO. An observer from Norway also attended the meeting. The Secretariat was provided by APCTT. Dr. S K Joshi, Secretary, DSIR was unanimously elected as the Chairman of the Governing Board for the year 1991-92. A brief covering the issues of APCTT was prepared in connection with these meetings for the use of Indian delegation.

Senior officers of DSIR participated in Working Group meetings and Training courses for Master trainers for Mechanism for Excharge of Technology Information (METI) and other international workshops or FIDIC and BOT arranged by APCTT in Bangkok and in India.

3. PROMOTION AND SUPPORT TO CONSULTANCY SERVICES

Promotion and support to Consultancy Services is one of the initiatives of the Seventh Five Year Plan.

3.1 Objectives

The objectives of the Scheme are:

— Providing incentives to Consulting Engineering Firms to document their useful experience in major projects, particularly abroad.

— Support to Consultancy Development Centre.

— Empanelling Eminent Engineering Professionals on retainer basis for consultancy.

— Providing fellowships to bright and promising engineers as apprentice with eminent consultancy organisations, arrange training etc.

— Support R&D efforts of consultancy organisations.

— Organise Seminars, Workshops, etc.

3.2 Activities

Fourteen meetings of the Technical Advisory Committee (TAC) including three during the year 1991 have been held till Dec. 1991 in which several programmes/projects were recommended. The thrust of the Scheme has been to identify the needs of consultancy organisations as well as users of consultancy specially small ones for domestic and export markets. Studies on status of consultancy capabilities sector-wise, and State-wise and development of skills as well as building a professional cadre on long term basis, creation of awareness for the needs and capabilities of the Indian Consultants, and assessment of the futuristic needs of consultants and industry, and preparedness to meet the same, have been areas of importance. One of the major initiatives has been to support Consultancy Development Centre (CDC) New Delhi.

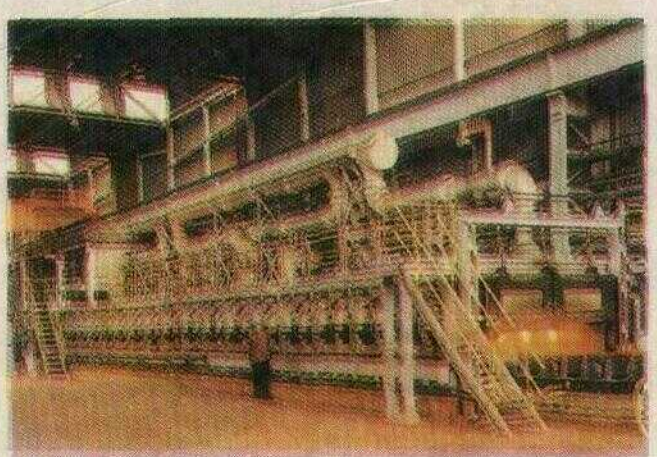
Some of the programmes carried-out during the year are briefly described below:

a) Documentation of Experience

i) A Manual on Guidelines for practising consulting Engineers in India giving details of practices and procedures followed by consulting Engineers was brought out through ACE(I), New Delhi. It contains information on Indian Consultancy profession - past, present and future, types of consultants, ethics of the profession, forms of consulting organisations, code of ethics, fee structure and office and financial management, client - consultant agreement.

ii) Two brochures, one on "Agricultural consultancy in India", through CDC, New Delhi, giving national scenario and consultancy available in the area of agriculture and other related allied areas, and the other on "Consultancy Services from India" through FIEO, New Delhi giving spectrum of specialized services from FIEO member consultancy organisations, were brought out.

iii) A study on Management Consultancy capabilities in India through NPC, Madras was completed, and report printed in final form and disseminated widely. The report assesses and evaluates the capabilities of Indian management consultants and gaps existing vis-a-vis to foreign Management consultants capabilities. It gives information on capabilities of Indian Management Consultants, leading foreign Management Consultants, as well as



IX. 4 Roller Hearth Plate Heat Treatment Furnaces.

leading Management Consultancy Promotion and Development agencies.

iv) A Compendium of foreign consultants, giving details of consultants in 87 countries, about their profiles, areas of specialization, services, projects handled in their own countries or abroad, etc. was completed through ACE (I), New Delhi.

v) Studies on Indian consultancy capabilities in sectors of Electronics, Telecommunications and Computers, Civil Engineering and Construction Management, and Pollution Control have been completed. The reports identify, assess and evaluate the consultancy capabilities of Indian consultants in respective areas and consultancy gaps existing vis-a-vis foreign consultancy in the industry. Information in these reports include profile of the Indian consultants, leading foreign consultants and supporting agencies such as R&D/ Academic institutions and testing/tool room facilities concerning each sector. Earlier similar reports were brought out in cement, food processing, foundry & forging, auto ancillary and plastic processing industry.

vi) A study on the need for technological assistance to small scale industries in Foundry and Pump Sectors in Gujarat was completed. The study was carried out by Gujarat Industrial & Technical Consultancy Organisation Ltd. (GITCO), Ahmedabad. The two reports identify the problems faced by small scale industries in economical production of the castings and pumps and provide a practical consultancy guide to help the entrepreneurs in modernisation and upgrading their facilities.

vii) Two studies on consultancy capabilities in Union Territory of Delhi and in the State of Rajasthan were completed. The reports assess and evaluate the consultancy capabilities of consultants in the State and Consultancy gaps, besides profiles of the consultancy organisations, R&D/Academic institutions, foreign consultants operating in the State, and other concerned agencies. Similar study in the State of Uttar Pradesh was earlier completed.

b) Fellowships/Training

With a view to develop a cadre of professional consultants, and attract young engineers for the consultancy profession, three types of training programmes were undertaken.

i) One year consultancy training for young Engineers in India: Nine Engineering graduates in the area of Electronics/Electrical, Civil Engineering, Mechanical Engineering, were given one year training at CDC and another batch of twelve Engineers was undergoing one year training at the Centre. Efforts were on to identify suitable trainees in various disciplines and develop a cadre of consultancy personnel on continuing basis.

ii) Short duration Training Programmes: Six programmes in the form of workshops and expert lectures of one to three days duration, were organised through CDC in which about 150 consultants and users of consultancy, were given training on various aspects of consultancy.

iii) Overseas Training for Young Consultants: One young consultant availed of this facility. Efforts were on to popularize he programme and identify areas for overseas training.

c) Seminars/Workshops (organised/supported)

In addition to the Workshops/Seminars organised by CDC under its various programmes, the following workshops/seminars were supported/organised:

i) A seminar on consultancy capabilities in the Auto Ancillary Industry was organised at New Delhi to discuss the draft report on this subject.

ii) A seminar on Consultancy capabilities in the State of Uttar Pradesh was organised through UPICO, NOIDA, in which the draft report on the subject was discussed.

iii) A seminar to discuss the draft report on "Consultancy capabilities in plastic processing industry in India" was held.

iv) An interaction meet to discuss the draft report

on consultancy for upgradation of foundry pumps SSI units in Gujarat, was held.

v) An ESCAP Regional meeting of Directors/ Heads of consulting firms on provisions of Technology Management and other services was held at New Delhi.

vi) An Interaction Meeting on "Consultancy capabilities in Electronics, Telecommunications & Computers in India" was held to discuss and finalise the draft report on this subject, prepared by TCIL, New Delhi.

d) Technology Business Incubator Centres in India

A Technology Business Incubator (TBI) is essentially a shared physical facility to promote small entrepreneurs particularly those with innovative technologies, and providing low-cost facilities for the first few years of an enterprise, thereby reducing the risk for the entrepreneurs. UNFSTD had approved a programme relating to Feasibility Study for setting-up Technology Incubators in India. Under this programme, UNFSTD experts visited India who helped DSIR/CDC in preparation of the feasibility report and educating Indian organisations about the relevance and need for TBIs. Feasibility Report for the setting of TBICs has been completed in which specific sites have been identified and mode of operation indicated. Proposals received from MITCON at Pune, CEERI at Pilani, and SRI at New Delhi, for setting up of TBIs have been finalised, and other several proposals were under consideration.

e) Institutional Support

Apart from supporting CDC for its recurring and capital expenses, support was given to the Association of Consulting Engineers (ACE) India, New Delhi, towards creating infrastructure and office equipment for their effective working. ACE (I) Secretariat is working with a core staff of one Registrar and one Assistant. The Association of Consulting Civil Engineers (ACCE) at Bangalore and IMCI at Bombay were also supported.

3.3 Reports/Publications

Reports/publications on the following have been brought out during 1991:

i) Consultancy capabilities in Food Processing Industry in India.

ii) Consultancy capabilities in Automotive Ancillary Industry in India.

iii) Consultancy capabilities in foundry and forging industry in India.

iv) Consultancy capabilities in plastic processing industry in India.

v) Consultancy capabilities in the State of Uttar Pradesh.

vi) Management consultancy capabilities in India.

vii) Brochure on Agriculture consultancy in India - CDC.

viii) Brochure on Consultancy Services from India - FIEO.

ix) Two special issues on consultancy in Chemical Industry in India on "Safety & Environment" and "Experiences of Consultants" - Block Dale, Bombay (Chemical Industry Digest).

x) A Manual on Guidelines for practising Consulting Engineers in India - ACE (I), New Delhi.

xi) Brochure on Water & Power Consultancy Services in India (WAPCOS).

3.4 Other Advisory Services

Advisory services were made available to various Ministries and Departments in relation to evaluation of their project proposals and other activities. An indication of the areas and subjects dealt with could be had from DSIR participation in various Committees, workshops/seminars and exhibitions as well as examination of several project proposals on various related matters.

3.4.1 Committees

i) Governing Council, Membership, and CDPA Committees of CDC.

ii) Consultancy Committee of FIEO.

iii) Programme Advisory Committee of Technology Systems Group of DST.

iv) Programme Advisory Committees of National Council of Building Materials.

v) Board of Director of U.P. Industrial Consultancy Ltd., Kanpur, UP.

vi) FIEO committee on Role of consultants in Manufactured products.

vii) Management Advisory Committee for 'Young Scientists' programme of DST.

3.4.2 Proposals

Following proposals received from various Departments/Organisations were examined:

i) A DOT proposal for MOCVD technology for electronics materials for UNIDO support was examined and comments given.

ii) An IIC proposal relating to trade fair/exhibition of global business opportunities convention, Japan was examined and comments given.

iii) A proposal from DCSSI for UNDP support for Electronics Services and Training Centre at Rampur, UP was examined and comments given.

iv) The proposal of Ion-Exchange India Ltd. for hiring foreign consultants from Canada was examined and recommendations made.

3.4.3 Other Seminars/Workshops/Meetings etc.

A seminar on Flexible Packaging Materials, New Delhi organised by Indian Institute of Packaging.

Third International Meeting on Technology Transfer, WASME, New Delhi.

— ESCAP Expert Group Meeting on legal aspects of bio-technology, Bangkok.

— 'Technology Management' course at IGNOU, New Delhi.

4. CONSULTANCY DEVELOPMENT CENTRE (CDC)

(i) Consultancy has been recognised as an important knowledge-based input for technical, industrial and economic development in the country. The Government has evolved various measures from time to time to support and encourage the consultants and consultancy organisations. The Technology Policy Statement of the Government of India and subsequently the Technology Policy Implementation Committee emphasized the need for evolving necessary measures and mechanisms to support and strengthen the consultancy capabilities in India. As a follow up of these recommendations, DSIR is implementing a scheme relating to Promotion and Support to Consultancy from April 1985. This scheme essentially aims to catalyse consultancy activities for domestic and export markets. Among the various programmes and activities undertaken by DSIR in this scheme, a Consultancy Development Centre (CDC) at New Delhi has come into being, with the support and active co-operation of Consultancy Promotion Organisations such as Association of Consulting Engineers (ACE), National Association of Consulting Engineers (NACE), Federation of Indian Export Organisations (FIEO). The main objective of Consultancy Development Centre is to assist DSIR in implementation of some of its programmes relating to Consultancy and other related areas.

(ii) CDC came into being as a registered society in January 1986 and initially started operating from the premises of FIEO at PHD House, New Delhi, and was subsequently shifted to rented apartments at Qutab Hotel, New Delhi in mid of 1987. 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 has a membership of over 120, 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 and Promotion Assistance (CDPA)" Scheme.

(iii) Since the inception of CDC in January 1986, DSIR has been providing support for its capital and recurring expenses, in addition to programme support, amounting to a total of about Rs. 200 lakhs till Dec., 1991. CDC has been allotted 1000 sq. mtrs. builtup space for its office at India Habitat Centre, Lodhi Road, New Delhi, at an estimated cost of Rs. 2 crores. DSIR, through CDC, has paid to Indian Habitat Centre (IHC) Rs. 60 lakhs till the end of last financial year, and during the year, it has released Rs. 55 lakhs and the accommodation is likely to be occupied by the Centre some time in the early 1993. The capital assets at CDC include a computer system 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.

(iv) The Committee of Secretaries had decided in its meeting held on 1.1.1987 that CDC should be developed into a "Certifying Agency" for screening the activities and certifying the capabilities of Design Engineering Consultancy Companies in the country. Accordingly, CDC had planned to initiate a 'Registration Scheme' for registering consultants based on certain criteria and then providing referral services to the users of consultancy. Such a scheme will be useful to improve the credibility and quality of consultancy services.

(v) In order to enhance technological and managerial capabilities of consultants as well as their export capabilities, interactions with international organisations - (World Bank, Asian Development Bank, African Development Bank), International Trade Centre (ITC), UNIDO, ESCAP, has been developed and several programmes have been arranged for consultants at national and international levels which have proved to be useful to promote consultancy businesses. CDC has been recommended to be an Apex body for Technical Consultancy Development Programme for Asia and the Pacific, by an the ESCAP Workshop on Consultancy held at New Delhi in Sept. 1991. Besides, ITC, ESCAP and other agencies have supported CDC training programmes in the past.

(vi) CDC is implementing various projects and programmes sponsored by DSIR under its various Plan Schemes, such as National Register of Foreign Collaborations (NRFC), Technology Absorption and Adaptation Scheme (TAAS), Transfer and Trading in Technology (TATT), and other organisations:

(vii) Some of the salient features of the activities carried out by the CDC during 1991 are:

a) A Consultancy Development and Promotion Assistance (CDPA) Scheme; which primarily aims to support and encourage small and independent consultants and the consultancy profession as a whole, was evolved and operationalised through CDC Some of the incentives under the Scheme include:

— National Awards for Young Consultants: Two Awards for 1990 were given away. Applications received for awards 1991 were scrutinised and necessary action being taken for presentation of annual awards.

— Use of Approved Consultants: Two consultants were retained at CDC mainly to provide services to small units. Their services were being utilised by some small units as well as for programmes at CDC. Action was being taken to recruit more consultants in order to have a wider coverage of expertise at CDC.

— Support for participation in Seminars/Work-

shops/Conferences: Support was provided to five consultants/consultancy organisations to attend various workshops and seminars.

— Support for participation in Trade Fairs/Exhibitions: Support was provided to four consultants/consultancy organisations to attend Trade Fairs and Exhibitions.

— Trainee Consultants: Nine engineers were given one-year training at CDC during 1990-91 and another batch of twelve trainees was under going training at CDC during 1991-92 and more training programmes are being planned on continuing basis. Also, the number of trainees is likely to be increased.

— Regional Training Programmes: Six programmes on "Computer Based Data Management for Industry, Trade and Commerce", "Refresher courses for Professional Consultants" at three places, on "Consultancy Effectiveness", Development of Management Consulting Skills, were organised in association with various consultancy organisations and agencies.

— Consultancy Awareness/Contact Programmes: Seven programmes on "Enterpreneurship Development for Consultancy Practice", "Pollution Control Management in SSI Chemical Industry", "Appraising Performance of Management Consultants", "Emerging opportunities for Consultants", "Technical Audit" and Industrial Research & Development - Challenges Ahead" etc. were held at different parts of the country in association with various consultancy organisations and other related agencies.

— International Training Programme: A programme on "Effective use of Consultancy" was organised at New Delhi in which participants from China, Nepal, Philippines and Srilanka participated, with the help of ESCAP.

— Special Lectures: One special lecture on "Construction Projects Exports - perspective and problems" was organised.

b) Computerised Information and Computer Aided Design (CAD) facilities were created at CDC and the Centre is now equipped with these facilities to help the small industries/consultants in this area. Special Computer Training Programmes were organised for computer personnel and consultants. This facility is mainly for the trainees at CDC.

c) CDC completed various studies such as, Compendium on India's Industrial, Technological and Consultants' Capabilities in Powder Metallurgy, Technology Status in the area of Water and Effluent Treatment Plants, follow-up of Foreign Collaboration agreements 1986, Consultancy capabilities in Auto ancillary industry in India, and consultancy capabilities in the Union Territory of Delhi.

d) CDC was associated in the organisation of ESCAP Regional meeting of Directors/Heads of Consultancy firms on provision of Technology Management and other services held on 23-27 September, 1991 in New Delhi. In this meeting CDC has been nominated as an Regional Appex Body in the Interim phase of Technical Consultancy Development programme in Asia and the Pacific.

e) CDC has been designated as the co-ordinating agency for the implementation networking to the Database Programmes of the Asia and Pacific Centre for Transfer of Technology (APCTT) and local consultants for the UNFSTD supported Project on Technology Incubation Centres in India.

f) A scheme for Registration of Consultants and Referral Services to help consultants and users is evolved and being implemented.

g) CDC has been associated with the Technology Business Incubator Programme of DSIR, including preparation of feasibility report and business plans of the proposed incubators in the country.

X. NATIONAL RESEARCH DEVELOPMENT CORPORATION

1. INTRODUCTION

NRDC, a public sector company has been specially created to develop and commercialise indigenous know-how, inventions, patents and processes eminating from various R&D institutions in the country. The performaance of the Corporation continued to improve during 1990-91 in all areas of its operations.

The most distinctive achievement of the year was the earning of income of Rs. 124.37 lakhs from lumpsum premium and royalty on licensing of technologies and a foreign exchange earning of Rs. 96.72 lakhs.

2. PROFIT

As a result of the hard and dedicated work by its officers and staff, the Corporation has been able to earn a record gross profit of Rs. 63.67 lakhs compared to Rs. 21.71 lakhs during 1989-90.

3. PROCESSES ASSIGNED & LICENCE AGREEMENTS CONCLUDED

To enlarge its pool of technologies, the Corporation continued its efforts to increase the inflow of processes from various R&D laboratories. As a result, 42 new processes were assigned to the Corporation in 1990-91 for licensing as compared to 40 processes during the previous year. Some of the commercially important processes assigned during the year included: Cyclosporin A; Thrombinase; Antigens; Clinical Diagnostic Kits; Oxygen Free High Conductivity Copper; Catalytic Cracker-cum-Adsorber; Fusion Splicing Machine for Optical Fibre Jointing; Fibre Optic Liquid Level Sensor; NMR Analyser for Industrial Applications.

4. MAJOR TECHNOLOGIES LICENSED

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

* Succinic Acid
* Flyash Bricks
* Lindane
* Spice Oleoresin
* Monocrotophos Pesticide
* Rice Husk Particle Board
* Direct Reduced Iron (Sponge iron) by VRDR process
* Disposable Blood Bags
* Soft Shell Blood Oxygenator and Soft Shell Cardiotomy Device

These technologies have generated during the year a lumpsum premium income of Rs. 26.5 lakhs out of the total lumpsum premium earned during the year Rs. 58.93 lakhs.

5. TECHNOLOGY DEVELOPMENT PROJECTS

5.1 Completed Projects

Rice Husk Particle Board

In collaboration with M/s Padmavathi Panel Boards Pvt. Ltd., Bangalore, a semi commercial plant with a capacity of 600 tonnes per annum of Rice Husk Particle Board was commissioned in late 1989 with significant financial and technical

inputs from the Corporation. The plant is now satisfactorily producing approximately 2 tonnes of Rice Husk Particle Boards per day i.e. its rated capacity. The product has been very well received in the market both at home and abroad. In addition to the first licensee, the technology was licensed during the year to the following parties.

X. 1 Rice Husk Particle Board

(i) Atwal & Co., Yamuna Nagar (Haryana)

(ii) Punjab Board Pvt. Ltd., Kadian (Punjab)

(iii) B.R. Agro Boards Pvt. Ltd., Hyderabad (Andhra Pradesh)

Flyash Bricks

The project for the development of a hydraulic press with a capacity of 1000 bricks per hour in association with M/s Jagatdhatri Brick Industries, Barrackpur, West Bengal was completed successfully in 1989-90. The party was able to achieve almost full capacity utilisation during 1990-91 with good profitability. The party is now planning to double the production capacity during 1991-92.

Based on the above success, the improved technology package was licensed during 1990-91 to the following parties:

(i) Bright Bricks Pvt. Ltd. Raichur

(ii) Pulver Ash Projects Ltd., Calcutta

(iii) Tirumala Flash Tech. Pvt. Ltd., Vijayawada

Spirulina Algae

Spirulina Algae is a high quality, protein-rich, food supplement containing Vitamin B_1, B_2, B_6, B_{12}, C, E besides Beta-Carotene which is the precursor for Vitamin A. The project for the optimisation of the pilot plant for producing Spirulina and the generation of the process know-how documentation package and the engineering package was satisfactorily completed last year. The upscaled process had subsequently been licensed during the year 1990-91 to M/s New Ambadi Estate Pvt. Ltd., Madras. A programme for feeding 5,000 children in Pudukottai district of Tamil Nadu has also been initiated with financial support from the Department of Bio-Technology. Based on the experience gained with popularising the use of this exceptional nutrition supplement through such large scale field trials, it is proposed to introduce Spirulina into the Mid-day Noon Meal Programme of the Tamiladu Government.

X. 2 Spirulina Algae Products

5.2 Ongoing Projects

Electrolytic Manganese Dioxide

The process for the manufacture of Electrolytic Manganese Dioxide (EMD), a key material used in the manufacture of Dry Cells, developed by the National Metallurgical Laboratory of CSIR is being upscaled by M/s Magno Mining Co. Ltd. (MMCL) who are setting up a Demonstration Plant having a capacity of 300 tonnes per annum

at a cost of Rs. 4.23 crores. After the Demonstration Plant is successfully set up and run it would be expanded on a modular basis in stages to realise a 2,500 tonnes per annum commercial plant. For setting up the Demonstration Plant, the Corporation is providing equity assistance of upto 26% of the total equity of Rs. 100.6 lakhs while IDBI is committed to provide equity assistance of Rs. 10 lakhs and a Venture Capital loan of Rs. 328.41 lakhs. MMCL has carried out the civil works at the site and ordered the major items of plant and machinery.

Drivers' Reflexes Testing System

The system enables measuring the simple and complex reaction time, depth perception, side vision acuity, night vision and glare recovery of automobile drivers. The Corporation configured the project with the Central Scientific Instrument Organisation (CSIO) of CSIR as the design organisation, Punjab Tractors Limited as the production agency and the Central Road Research Institute of CSIR as the consultancy and evaluating agency. The first complete prototype incorporated in the driver's cabin of a Swaraj Mazda light commercial vehicle has been used for not only validating the test data by testing a large number of road vehicle drivers but also to set standards under our conditions which a driver should meet for being eligible for obtaining a heavy/medium vehicle driving licence. The final version of the prototype, which would form the basis for commercial production, is likely to be available by mid 1992.

Heart Valve

The development of an artificial mechanical Heart Valve at the Sree Chitra Tirunal Institute of Medical Sciences (SCTIMST), Trivandrum under financing from the Corporation, had to be restructured due to unexpected fracture of the Sapphire Disc which was replaced by an Ultra High Molecular Weight Polyethylene (UHMWPE) disc having very low wear rate and good tissue compatibility. The trials carried out on animals implanted with the modified valves were satisfactory. After the approval of the Ethics Committee of the Institute, human trials have commenced. The Institute expects to implant about 60 valves during 1991-92. In parallel, the Corporation has proceeded to identify a major party for licensing the know-how for commercial production.

Precipitated Silica

The Corporation reviews from time to time the working of the various plants set up by its licencees. While carrying out such a review of the plant for the manufacture of Precipitated Silica from Rice Husk Ash (developed at the Indian Institute of Technology, Kharagpur) of M/s Unique Silica Development Pvt. Ltd., Cuttack it was found that the overall techno-economics could be improved if the two by-products viz. Calcium Sulphate and Activated Carbon could be extracted. To carry out this development work the Corporation had sanctioned a development loan of Rs. 1.8 lakhs. The development work is more or less complete but the product needs aggressive marketing.

5.3 New Projects

Semi-Chemical Pulp for Kraft paper

Kraft paper made by the standard process involves chopping of the raw material such as hardwood, rice, straw, bagasse etc. to proper chip size, cooking with Kraft liquor under high temperature and pressure for an appropriate period of time, washing and beating the material to get a pulp of the desired fineness followed by paper making.

However, the process conditions cannot be universal, as the same cooking conditions cannot be adopted for all raw materials, the reason being the basic differences in their chemical compositions and fibrous structure. Hence, it becomes necessary to standardise the chemical concentration and cooking conditions for different raw materials. For utilising cotton stalk, a waste agricultural product, to produce Kraft paper, laboratory scale trials have been conducted at the Cotton Technological Research Laboratory (CTRL), Bombay and all the pulping conditions

have been standardised to prepare good quality Kraft paper. To study the process further on a pilot plant scale (so that the problems if any of the process for industrial scale adoption could be identified and resolved and the process optimised in techno-commercial terms) efforts were made to identify an industry to conduct pilot plant trials. M/s Empress Papers Mills Ltd., Nagpur (A Govt. of Maharashtra Undertaking) has agreed to carry out one shift trial to prepare 1.5 Tons of paper at a total cost of Rs. 30,000/-.

One of the important uses of Kraft paper is to prepare corrugated boxes for packing purposes. Therefore, the entire 1.5 tonnes from the trial production is proposed to be converted into (i) 3 ply and (ii) 5 ply corrugated sheets which will then be used for making corrugated boxes in collaboration with:

i) National Research Centre for Citrus (ICAR) Nagpur for trials with oranges

ii) Shere-e-Kashmir University of Science and Technology, Shalimar for trials with apples.

These organisations have facilities to test corrugated boxes.

6. MARKET SURVEYS

Market information alongwith the technical know-how not only makes the techno-commercial "package" more complete and attractive but also helps in assessing the realistic price of the technology for licensing. The Corporation therefore started this important activity in 1987-88 by commissioning professional market survey agencies on some of its major technologies. Continuing this activity, the market survey agencies commissioned during 1989-90 completed market survey reports for the following items:

* Collagen Sheet

* Spirulina Algae

* Selected Electronic Products

Further, during the year, market survey agencies were commissioned for conducting market surveys on the following:

* Automotive components

* Ceramic colours,

* Industrial Burners

7. DEVELOPMENT & PROMOTION OF RURAL TECHNOLOGIES

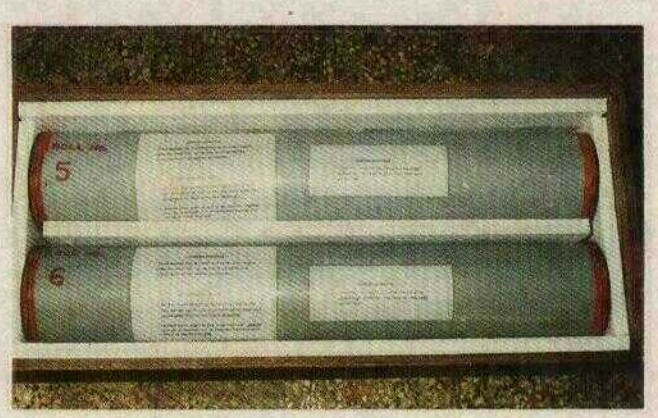
The Corporation initiated its Rural Development Programme in 1982. The programme of the Corporation aims at the application of S&T for improving the standard of living of rural people by increasing employment potential through the development and application of appropriate Rural Technologies utilising local resources.

The methodology adopted by the Corporation to pursue this programme included: development of appropriate technologies and machinery and establishment of Rural Technology Demonstration-cum-Training (RTDT) Centres in collaboration with recognised voluntary organisations to demonstrate the utility of such technologies to create greater awareness and ensure faster dissemination of these technologies among beneficiaries. Continuing this activity, the Corporation, besides strengthening some of the existing RTDT Centres, opened 6 new RTDT Centres at Mau, Raibareli, Pilani, Dhule, Ahmednagar and Rudrapur.

8. TECHNOLOGY EXPORTS

As a result of aggressive marketing efforts targeted at selected countries in Asia and Africa the Corporation has been able to generate interest amongst entrepreneurs there in Indian Technologies. During the year, besides securing fresh contracts the Corporation completed the projects worth Rs. 98 lakhs. During the year the Corporation developed excellent contacts in Egypt and identified a major company for licensing of 2-3 major technologies of the Corporation.

The Corporation was also able to secure the interest of major international companies in licensing some of the Corporation's technologies particularly for new, life saving drugs. Negotia-



X. 3 *Reverse Osmosis Membrane Paper*

tions with these companies are under way.

9. FOREIGN EXCHANGE RECEIPTS

During the year 1990-91, the Corporation earned foreign exchange amounting to Rs. 98.72 lakhs as compared to Rs. 33.05 during 1989-90, while the total foreign exchange spent amounted to only Rs. 1.71 lakhs.

10. INVENTION PROMOTION

The Corporation continued to encourage inventive talent amongst Scientists, Workers, Students and Inventors by Awarding prizes to meritorious inventions and financial assistance for building prototypes.

During the year under review, the Corporation received 94 applications for prize awards and 64 applications for financial assistance. On Independence Day (1990) cash awards amounting to Rs. 1.40 lakhs were awarded to 20 inventors for 4 inventions. On Republic Day (1991) cash awards totalling Rs. 2.15 lakhs were awarded to 28 inventors for 8 inventions and a Certificate of merit for one invention. Financial Assistance of Rs. 27,565/- was also given to six inventors for the building of prototypes and testing.

Some of the meritorious inventions recognised through Awards given during the year were:

* Process for the manufacture of Monochrome Television Picture Tube Phosphor
* Hybrid Thick Film Microcircuits
* Microwave Ferrite Phase Shifters
* Wide Field Unit Magnification Telescope (Guidescope)
* A device for Reducting Carbon Monoxide Emission from the Exhaust of Automobile Engines
* Spark Arrestor for Tractors

The Corporation is the agency nominated by the World Intellectual Property Organisation (WIPO) of the United Nations for selecting suitable Indian Inventions to be awarded the annual Gold Medal and Silver Medals of WIPO for inventions suitable for developing countries. The WIPO Gold Medal for 1990 was awarded to the inventors of "An improved (Modular) Cell for production of Magnesium Metal by Fused Chloride Electrolysis" and the Silver Medal to the invention for "Sennova Tea Processor".

11. PATENT ASSISTANCE

The Corporation continued to provide technical, legal and financial assistance to individual inventors in drawing up patent specifications of their inventions, processing their patent applications. During the year, the Corporation received 37 applications from individual inventors for such assistance for filing patent application in India of which assistance was granted to 21 inventors based on the patentability of the inventions involved.

12. TRAINING PROGRAMMES

As part of the entrepreneurial developmental programme, the following training programmes were conducted: Management of Technology Transfer, Patents and Information Systems; Workshop on Patent Systems Procedures and its utility; NRDC-DCSSI Trg. Programme on the Management of Technology Transfer, Patents & Information Systems.

13. PUBLICATIONS

Publications are an important means for carrying to the people the message of an organisation. The Corporation is therefore bringing out the

following magazines:

Awishkar (Monthly in Hindi)

Invention Intelligence (Monthly in English)

Gram Shilp (Quarterly in Hindi)

The Corporation also brought out the following special publications during the year:

* Process Diary - an innovative publication which was very well received.

* Pre-feasibility Report on Rice Husk Particle Board

* Monograph on Flyash Bricks

* Literacy for Rural Development

* Patent Systems and Procedures

* Rural Technology Demonstration-cum-Training Centres

14. EXHIBITIONS & PUBLICITY

It is through visual presentation that an organisation can create an impact on the people about its role, activities and utility. With this end in view, the Corporation participated in a number of Exhibitions, Seminars and Get-togethers.

* Tech. Source 90, Madras (Oct. 25-28, 1990)

* India International Trade Fair 90, New Delhi (Nov.14-24, 1990)

* National Symposium on Impact of Urbanisation & Industrialisation on Rural Society, New Delhi (Dec. 19-21, 1990)

* Instrumentation Exhibition '91, New Delhi (Jan. 15-17, 1991)

* Naya Gujarat '91, Ahmedabad (March 3 to April 18, 1991)

* Innovation for Sustainable Development, New Delhi (March 19-27, 1991)

* Tech-Trans '90, Madras (April 27-28, 1990)

* Tech-Trans '90, Trivandrum (June 9-10, 1990)

* Tech-Trans '90 Pune (July 19-20, 1990)

* Tech-Trans '90, Madras (Oct. 25-26, 1990)

* Tech-Trans '90, Aurangabad (Nov. 27-28, 1990)

*. Tech-Trans '90, Ahmedabad (Dec. 12-13, 1990)

To create awareness amongst entrepreneurs about the Corporation as a major source of indigenous technologies hoardings were put up at important sites in New Delhi and advertisement in important magazines such as 'Swagat' - the inflight Magazine of Indian Airlines were brought out for the first time.

15. COMPUTERISATION

Computerisation has particularly significant benefits for an engineering & Technical services company like NRDC. Therefore, top priority was continued to be assigned during the year to build up the physical facilities, skills, systems and procedures to maximise the utility of computerisation of the Corporation's activities.

Application software packages for many of the core activities of the Corporation e.g. System Establishment Accounting (SEA), Legal Information Processing System (LIPS), Technology Release Information System (TRIM), Decision Monitoring System (DMS), CPF Accounting Package (CAP), Invention Support And Award Module (ISAM), Management Information System (MIS) were developed, debugged, and put into regular use.

It is expected that all the other major activities of the Corporation i.e. Personnel & Administration, Patent Assignment, Financial Accounting & Budgeting, Technology Export will also be com-

puterised during 1991-92.

16. HUMAN RESOURCE DEVELOPMENT

The Corporation continued to provide training facilities and opportunities at all levels for self development of employees in their current jobs as also for their career advancement. During the year, 14 executives and 11 staff of the Corporation were deputed to take computer awareness courses at reputed institutions like the All India Management Association, Computer Maintenance Corporation, WIPRO, New Delhi and Administrative Staff College, Hyderabad.

XI. 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 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 & Safety, Cathodic Protection Equipment for Oil Pipelines and Projection Television Systems.

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 the fifth largest producer of Single Crystalline Silicon Solar Cells in the world.

2. PERFORMANCE IN 1990-91

2.1 Operating Results

The production and sales achieved by the Company in 1990-91, rounded off to the nearest lakh of rupees compared with those of the previous year are given below:

	1989-90 (Rs. in Lakhs)	1990-91 (Rs. in Lakhs)	Increase/ Decrease
Production	2237	1879	(-) 16%
Sales	2188	1560	(-) 29%

The production and sales were also short of the revised targets for the year i.e. Rs. 2600.00 lakhs of production and Rs. 2763.0 lakhs for sales, by 40% and 43% respectively.

The reduced production and sales both with respect to the previous year's achievement and current year's targets were mainly due to lack of orders, particularly in the SPV area. Further, even the two major SPV orders received during the year came in almost at the end of the year. Since the major activity in the Systems Group was in the form of projects of Railway Electronics, they would, by their very nature, contribute to full production and sales only after complete execution of the project which would be in the following year(s).

The total net loss reflected in the year's final accounts in Rs. 744 lakhs. The net loss on the operations of the year 1990-91 was Rs. 700.67 lakhs which includes write offs towards bad debts, advances etc. of Rs. 0.73 lakhs and arrears on account of executives' salary revision for the period from 1.1.87 to 31.3.90 amounting of Rs. 88 lakhs. The net expenditure for the prior period is Rs. 43.81 lakhs.

2.2 Highlights of Operations :

In the Solar Photovoltaics (SPV) Group, 672 KWp of Solar Cells were produced of which 661 KWp were sold. 1728 SPV systems were supplied during the year bringing the total number of SPV systems deployed by the Company around the country by March 1991 to 18631. The installation of the 1200 SPV Lighting Systems for Adult Education Centres supplied to the Department of Education as part of the National Literacy Mission as also the 90 SPV Deepwell Water Pumping Systems supplied to the Department of Rural

Development (DRD) as part of the National Drinking Water Mission towards the end of the previous year, was completed. The Department of Telecommunication placed an order for 2000 SPV Power Sources for VHF Rural Telecommunication Systems. The order was received in February 1991 against which about 500 systems were despatched by the end of the financial year. An order for supply of 150 KWp of SPV modules was received from the Department of Non-Conventional Energy Sources (DNES) in January, 1991, all of which was supplied by the end of the year. SPV Systems were supplied to the Royal Government of Bhutan under financing from the Ministry of External Affairs, Government of India. The Company made a major move into the area of exports by quoting against a global tender floated by the Nepal Telecommunication Corporation for purchase of 450 SPV power sources for Rural Telecommunication Systems with World Bank financing. As in the previous years the company procured a substantial portion of its silicon wafer requirement from Metkem Silicon Ltd., thus giving the necessary promotional boost to indigenous production of this key material.

In the Components Group, the first order for about 150 Nos. of the C-Band Microwave Ferrite Phase Shifters was received from LRDE, Bangalore. These phase shifters had been successfully developed under a multi-institutional R&D programme involving IIT, Delhi, Solid State Physics Laboratory, DRDO, and CEL and financed by DRDO. Two special machines were received from Siemens West Germany as part of the production equipment for the manufacture of PZT Transducer Elements in Technical collaboration with Siemens.

XI. 1 Microwave Ferrite Phase Shifter for Military Radars.

In the Systems Group, the first turn-key order secured from the Railways in 1989-90 for Block Working Equipment to be installed in the Itarsi-Bhusaval and Nagda-Bhopal sections of Central Railways was executed after the equipment was technically approved by RDSO. Concurrently, further orders for turn-key contracts from the Railways in excess of Rs. 3.00 crores were received during the year, including the turn-key supply and installation of Colour Lighting Signalling (CLS) Systems. The production of new models of the Projection TV Systems could not however, take off as planned due to delay in the receipt of the electronic and plastic components from the new vendor (M/s. Nokia, West Germany) who had taken over this production line from ITT, West Germany.

3. DESIGN AND DEVELOPMENT

The Company continued its design and development (D&D) activities in each of its major operational areas both as part of its on-going activities as also against specific projects funded through Grants-in-Aid from DSIR and other government agencies. During the year, the Company received an amount of Rs. 253 lakhs for projects in the area of Solar Photovoltaics, Phase-Shifters, Microwave and Communication Ferrites. In the SPV area the development of new SPV systems continued as in the previous year to widen the range of applications of SPV technology in the country. Particular emphasis was given to the development of SPV Systems for high altitude, very low temperature applications especially for the Defence Services. Notable among them were special, lightweight, foldable SPV modules for battery charging systems for man-pack wireless sets and laminated folding tray type of modules for trans-receivers and for special torches and lanterns with Ni-Cd batteries integrated with special man-pack SPV modules. After prototype development during the year, each of these systems were being subjected to rigorous electrical and environmental tests by the Defence Inspection Authorities at the close of the year. Efforts

continued to develop indigenous sources of supply for submersible motor pump sets with inverters for use in SPV-powered Deepwell Water Pumping Systems to be supplied against future Improvement of the Company's range of SPV street lighting systems and SPV interior lights based on energy efficient compact fluorescent lamps, also continued during the year.

In the Components Group, the team working on the Phase Shifter Project, jointly with the Ferrites Division, have successfully designed and developed ferrite based "Matched Elements" - a critical element needed in the Missile programme. These matched elements are used in the arrays of the Phased Array Radars as also in the test set up for measuring the radiation pattern of the Phase Control Modules (PCM) in the array environment. This development was carried out on a crash basis to meet the requirement of the users - LRDE (of DRDO), Bangalore. These elements are now in use in the existing C-Band arrays.

XI. 2 Solar Powered Pumping System installed by CEL at Churu, Rajasthan under the National Drinking water Mission.

In the Systems Group, Block Proving Equipment using Axle Counters and Multiplexer were field tested by the RDSO in the Babina-Khajaraha block section of the Jhansi Division of Central Railways and the system was finally approved by RDSO and cleared for use in the Railways. The Company had on its hand at that time an order for supply and installation of 25 block sections during the following year. The Systems Group was also involved in the final development of the Solid State Interlock System for the Railways, a modern sophisticated system meant to replace the mechanical type of route interlocking presently in use by the Railways. Improved system design and final integration of two prototype models were taken up based on the earlier field trials carried out on the first development model developed jointly by CEL with IIT-Delhi and RDSO and installed at Brar Square Railway Station in New Delhi.

4. TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

While continuing its efforts at effecting improvements and updating/modernising the Solar Cell production process based on its own know-how developed In-house, the Company has also concluded a collaborative agreement with the University of New South Wales (UNSW), Australia for acquisition of a laboratory scale process developed by that university for the fabrication of Ultra-High Efficiency solar cells using single crystalline silicon. After obtaining the necessary technical documentation from UNSW, the Company would undertake further development and engineering work including the induction of some specialised production equipment to up scale the UNSW know-how to a fully commercial production worthy technology. The successful development of this upgraded technology and its induction into the Company's production line would enable manufacture of solar cells of much higher efficiency and hence result in sizeable reduction in costs.

5. CEL AND NATIONAL MISSION

5.1 Role In National Technology Missions

The Company has been contributing substantially to the different National Technology Missions through the deployment of several of its products, especially SPV systems and Projection Television (PTV) Systems. Drinking water pumping systems are being used as part of the National Mission on Drinking Water, while SPV-powered interior lights at Adult Education Centres and Projection Television Systems (PTV) are being used as part of the National Mission on Literacy and SPV powered Reffigerators for storing Vac-

cines in village health centres are in use as part of the National Mission on Immunization.

5.2 Welfare of Water Sections

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. As on 31 March 1991, the total number of employees in these categories was 255 which represents about 27% of the total strength of the Company.

5.3 Use of Hindi

In accoordance with the guidelines on the progressive use of Hindi, the various sections of the Company were encouraged to use Hindi in both internal and external correspondence and also in the In-house training programmes for employees.

6. INDUSTRIAL RELATIONS AND HUMAN RESOURCES DEVELOPMENT

The Company had fairly cordial industrial relations during the year as a result of continuous dialogues by the management with the recognised Workers Union and the Officers/Executives Associations. Employees' participation in management continued through the forums of Shop Level and Plant Level Committees constituted for the purpose. 16 meetings of the Shop Floor Committees and 3 meetings of the Plant Level Committees of the different divisions of the Company were held during the year as against the corresponding number of 15 and 4 respectively in the previous year.

7. REVISED PLAN FOR 1991-92 AND TARGETS FOR 1992-93

The Revised Plan targets for 1991-92 are Rs. 34.95 crores for Production and Rs. 37 crores for Sales. The corresponding targets Budgeted for Production and Sales for 1992-93 are Rs. 42 crores for both.

XII. NATIONAL INFORMATION SYSTEM FOR SCIENCE & TECHNOLOGY

1. INTRODUCTION

The tremendous growth in the output of scientific and technical research and in the number of information users has brought about the need for an effective system for information transfer. The increasing role played by science and technology in the economic and social development of the country has created a pressing demand for quick technology transfer to the industries. Apart from getting access to information generated in 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 integrated system following uniform national and international standards to avoid a haphazard growth and duplication of activities.

The National Information System for Science & Technology (NISSAT) programme envisages promotion and support to the development of a compatible set of information systems on science and technology and interlinking these into a network. The approach adopted is to bring the existing centres, systems and services to a higher level of operation so that the interests of the national community of information users could be better served. The programme also contemplates experimentation with and introduction of modern information handling tools and techniques and development of endogenous capabilities for the purpose.

Since the year 1985, the responsibility of implementation of NISSAT programme has been with the Department of Scientific and Industrial Research.

1.1 Objectives

NISSAT functions with the following objectives:

- Provision of national information services to meet the present needs of users, generators, processors and disseminators of information.
- Optimum utilisation of existing information services and systems and the development of new ones.
- Promotion of national and international cooperation and liaison for exchange of information.
- Support and provide active encouragement for the development of facilities for education and training in information science and technology.
- Support and provide for active participation in research & development, innovation in information science and communication to enhance both the efficiency of information services and quality of the information provided by these services.
- Support and promote research & development and innovation in information technology.

2. SECTORAL INFORMATION CENTRES

An Information Centre is the major instrument for information resources development and dissemination. Following Sectoral Information Centres (SIC) were established with objectives to create information awareness and to meet the information needs of scientists, technologists, aca-

demicians, entrepreneurs, management executives and decision makers.

Subject Area (Acronym)	Host Institution
i. Leather Technology (NICLAI)	Central Leather Research Institute, Madras
ii. Food Technology (NICFOS)	Central Food Technological Research Institute, Mysore
iii. Machine Tools & Production (NICMAP)	Central Machine Tools Institute, Bangalore
iv. Drugs and Pharmaceuticals (NICDAP)	Central Drugs Research Institute, Lucknow
v. Textiles and Allied Subjects (NICTAS)	Ahmedabad Textile Industry's Research Association, Ahmedabad
vi. Chemicals & Allied Industries (NICHEM)	National Chemical Laboratory, Pune
vii. Advanced Ceramics (NICAC)	Central Glass and Ceramics Research Institute, Calcutta
viii. Bibliometrics (NCB)	Indian National Scientific Documentation Centre, New Delhi
ix. Crystallography (NICRYS)	University of Madras, Madras
x. CD-ROM (Compact Disk) (NICDROM)	National Aeronautical Laboratory, Bangalore

The Sectoral Information Centres (the first seven SICs) were built around the existing information resources and facilities. However, they were provided with a wide range of documents, sophisticated equipment and manpower so that they could provide information services on a national scale. Each SIC maintains an extensive collection of published and unpublished documents in the form of books, periodicals, research reports, development and trade reports, monographs, conference proceedings, standards, patents etc., pertaining to the relevant subject areas. Regular monthly technical publications from these centres include Current Awareness, Current Indian Titles in respective sectors and also semi-technical and popular ones in the form of digests. Besides, the centres have also brought out ad hoc publications like Buyers Guides, Directories of Agents, Research, Foreign Collaborations. The centres have also developed information management tools like Thesaurii, Data input procedures and so on.

The Sectoral Information centres maintain several databases to cater their clientele. For example, NICDAP maintains databases on Natural Product, Folklore, Drugs & Pharmaceuticals, Letters of Intent, Industries and Research Product, Union Catalogue of periodicals in Lucknow city; NICLAI maintains database on Leather Science and Technology and Allied areas (LESA), Holdings of Periodicals, Thesaurus of Leather Technology terms; NICFOS maintains Food Science & Technology Abstracts (FSTA), Indian Food Technology Abstracts Abstracts (IFTA) database, Indian Food Industry Directory, Food Patents, CFTRI Pbulications and Bibliographies; NICMAP maintains database like Metal Working Abstracts & Bulletin, Patents, World Machine Tool Statistics, Indian Machine Tool Production Statistics & Import/Export Statistics. NICTAS has also stored the Indexes of World Textile Abstracts for 1975-1989. In addition to TEXINCON, a quarterly compilation of abstracts of articles relevant to the Indian textiles and allied industries, NICTAS has launched a series of state-of-art reports. NICHEM provides the Monthly Indian Chemical Patent Abstracts, various library, information, reprographic and translation services. Similarly NICAC brings out various publications such as Documentation List on Glass & Ceramics; Superconductor Abstracts; Ceramic Update; New Industrial Development in Glass & Ceramics and Indian Industrial & Technological briefs.

National Information Centre for Crystallography (NICRYS) is the first hard data established at the University of Madras. The centre obtains global information compiled and collated at Cambridge on organic and organo-metallic com-

pounds and stored on magnetic tapes. The database pertains to X-Ray & Neutron diffraction and also provides structural as well as bibliographic information on about 70,000 compounds. NCB's regular activities include analysis of CSIR Research Output, Citation Profile of individual scientists/institutions, Indian Science Citation Index, Bibliographic Services and Computation of Impact Factor for Indian Journals. NICDROM caters to the Information professionals and institutions providing information on CD-ROM a reference collection of books and journals on CD-ROM, technical specifications, choice & cost of the CD-ROM equipment, CD-ROM database and services. Though not comparable to the other SICs, NICDROM services are national.

In contrast to a sectoral information centre which provides mainly bibliographic support, Information analysis centres and data centres (NCB, NICRYS and NICDROM) have been established under NISSAT scheme for undertaking the task of acquiring, evaluating, integrating, consolidating and analysing factual and numeric information.

Some of the NISSAT SICs mentioned have also taken certain additional responsibilities. For example, NICDAP is a WHO Collaborating Unit in India; the User Centre for Biotechnology Information System and also runs information activities on Marine Drugs. NICFOS collaborates with Technology Information, Forecasting and Assessment Council (TIFACLINE) for the development of a database of Food technology and with Food Science Technology Information System (FOSTIS), provides inputs to the global FSTA database. NICHEM interacts with the Chemical Information System (CHIN) of UNESCO towards developing a Chemical Reaction database.

3. UNION CATALOGUE

In view of the high potential of the National Union Catalogue of Scientific Serials in India (NUCSSI) as an access tool to support various information programmes, NISSAT has incorporated a plan of action for updation and maintenance of NUCSSI. The NUCSSI data has been converted into a database with a view to making it appropriate for online searching and online ordering for journals, articles. Production of secondary databases, namely holdings of libraries in specific regions, institutions, subject area etc. would be made available on floppies for use on PC/AT/XT. It is also being contemplated that NUCSSI database may be loaded on CALIBNET, INDONET, NICNET etc. for Online search and retrieval. Efforts are being made to prepare catalogues on specific type of materials, cover-to-cover translated periodicals and Indexing and Abstracting periodicals in India.

4. NISSAT CARD

It is extremely difficult for an end user to access or use resources located outside the library of own institution. In such cases, an information/literature search gets restricted to the resources available within the institution and the user would need to depend entirely on external courtesy. The concept of NISSAT CARD is to develop a Universal Libray Card System that would facilitate utilisation of external library resources with due safe guards for protection of the interests of cooperating libraries. A feasibility study on this concept is nearing completion.

5. RATIONALISATION OF PERIODICALS THROUGH CONSULTATIVE COMMITTEE

The cost of S&T periodicals increases at a rate of 15-20%. Recent devaluation of Indian Rupee would imply another 20% higher cost. As the library budget in most institutions tend to remain static, the net result would be a reduction in acquisition of journal titles. On the other hand, our scientists and technologists are delving into newer areas. Their activities naturally would demand acquisition of periodicals in those newer areas.

The aim of the consultative committees promoted in 16 cities, is to get the librarians in a city together and to discuss their acquisitions especially renewal of subscriptions of periodicals, and explore resource sharing possibilities. Such an exchange of notes is expected to lead to a

rationalised acquisition effort and considerable savings to the institutions or the group of cooperating libraries. The potential of the appropriate invisible for the subscription year 1991 amounting to an estimated savings of Rs. 29.9 lakhs through mutually agreed to adjustments. Such mechanisms are already operational in Ahmedabad, Bangalore, Bombay, Calcutta, Delhi, Lucknow, Mysore, Nagpur, Pune and Trivandrum. Efforts are underway to set up these mechanisms in Bhopal, Chandigarh, Cochin, Hyderabad, Kanpur and Vishakhapatnam.

Sl. No.	**City**	**Institution/Association**
i.	Ahmedabad	ATIRA
ii.	Bangalore	CMTI
iii.	Bhopal	*
iv.	Bombay	IIT
v.	Calcutta	CGCRI
vi.	Chandigarh	*
vii.	Cochin	*
viii.	Delhi	India Intl. Centre
ix.	Hyderabad	*
x.	Kanpur	*
xi.	Lucknow	CDRI
xii.	Mysore	CFTRI
xiii.	Nagpur	NEERI
xiv.	Pune	NCL
xv.	Trivandrum	Kerala Lib. Association
vxi.	Vishakhapatnam	*

** Convenor Institution/Association to be identified*

6. ONLINE AND SDI SERVICES

In order to bring the information support services to the scientists and technologists in India at par with those available to their counterparts in the developed countries. NISSAT has established five Online National Acceess Centres to International databases - NACIDs.

S.N.	**Place**	**NACID Host Institution (Acronym)**
i.	Bangalore	National Aeronautical Laboratory (NAL)
ii.	Calcutta	Indian Association for Cultivation of Science (IACS)
iii.	Madras	Central Leather Research Institute (CLRI)
iv.	New Delhi	Indian National Scientific Documentation Centre (INSDOC)
v.	Pune	National Chemical Laboratory (NCL)

The NACIDs use PSTN telephone lines upto the local PAD of Videsh Sanchar Nigam Limited (VSNL) and there onwards, the international carriers via the Gateway Packet Switching Services (GPSS) at Bombay. Online access by Telex is a stand by. NACIDs have trained intermediaries to assist or conduct online searches. The centres are slowly gaining popularity considering that there is an increased number of users and full search costs are being recovered from them.

Selective Dissemination of Information (SDI) is provided regularly to users on the basis of their information profile. Such services are offered by NICMAP/CMTI, Bangalore using the COMPENDEX database and by NICDROM/CMTI, Bangalore using NTIS database. Steps have been taken to generate similar services using CD-ROM databases of FSTA, ERIC, MEDLINE, INSPEC, CHEMBANK, EMBASE and so on.

7. LIBRARY NETWORKING

NISSAT has taken the initiative for the development of metropolitan library networks :

— to ensure better utilisation of S&T information resources through resource sharing;

— to moderate functional load of information centre management and to take care of motivational factors to a large extent by better means of communication.

The implementation of Calcutta Library Network (CALIBNET) has been taken up in two phases. In CALIBNET Phase-I, the Network Services Center at the Regional Computer Centre (RCC), Calcutta and 7 participating library/information centres in and around Jadavpur area are being networked. The necessary hardware,

software, and sites are now ready. Meanwhile, in collaboration with RCC and Regional Center, INSDOC, Calcutta, NISSAT has taken up manpower development activities. MAITRAYEE, the CALIBNET Library Automation and Networking Software, has been developed and demonstrated to the library and information professionals in New Delhi, Caucltta and Bangalore. Activities related to database creation and retrospective conversion are also now initiated.

On similar lines, the Delhi Library Network (DELNET) aims at connecting about 30 libraries in Delhi. In DELNET Phase-0, 20 library/information centers have been connected through Electronic mail. As in CALIBNET, NISSAT regularly organises computer courses for the operational level professional from the participating institutions. Similar metropolitan networks are contemplated for Bombay, Bangalore, Madras and Pune in the immediate future. NISSAT has further taken initiatives for providing E-Mail facilities to the various NISSAT information centres dispersed in the country.

8. COMPUTER BASED BIBLIOGRAPHIC INFORMATION PROCESSING

The demand for use of computers varies from automation of routine management functions in libraries to information retrieval or analysis of global databases. NISSAT gives a high priority to all aspects of computer based bibliographic information processing.

NISSAT acquires proven software packages like CDS/ISIS Mini-Micro version, SUPERDOC and IDAMS (Statistical package) from UNESCO. On behalf of UNESCO-PGI, Paris, NISSAT has official rights for the distribution of CDS/ISIS in India.

At the present time, CDS/ISIS ver. 2.32 distributed to libraries, information centres and non-profit institutions along with adequate training support. There are over 604 installations in India (as on 31st December, 1991). The implementation of CDS/ISIS in these institutions is monitored regularly through exchange of information, user's group meetings and periodic surveys. NISSAT has also acquired the CDS/ISIS VAX version package, tested and distributed to 13 user institutions. The yearwise distribution of Micro-ISIS is given in Figure XII. 1

Going a step further, in collaboration with Defence Scientific Information and Document Centre (DESIDOC), New Delhi, NISSAT has helped the development of a software for Library Automation on CDS/ISIS (now called SANJAY). The package is capable of inter-linking two or more databases for a single application, handling numerical calculations and of carrying out several other library house-keeping activities. SANJAY is implemented in the DST Library, Technology Bhawan, New Delhi as a model application. A generalised version of SANJAY is also expected to be ready shortly for application in any Indian library with a medium size document collection and user clientele.

Another CDS/ISIS based package known as TRISHNA has been developed in collaboration with National Institute of Science Technology and Development Studies (NISTADS), New Delhi. TRISHNA support database in Devnagri and several other Indian scripts using a GIST CARD.

9. MANPOWER DEVELOPMENT

NISSAT has been organising short term courses with a view to improving upon and update the skills of the information professionals on a continuing basis.

It may be observed that NISSAT has developed facilities for the conduct of regular series of courses at INSDOC, New Delhi; DRTC, Bangalore; RCC, Calcutta and University of Poona, Pune.

NISSAT, on its own initiative or at the behest of UNESCO has undertaken preparation of standard course materials. Some of these are:

— Anglo American Cataloging Rules II
— Common Communication Format
— CDS/ISIS
— Management Information System for Libraries

NISSAT also organises/supports several demonstration and technical group meetings.

10. STUDIES/DIRECTORIES

NISSAT promotes and supports studies, preparation of directories, databases, basic and applied research in information science. The list of such supported projects/efforts, operational during 1991-92 include:

S. No.	Activity	Institute
	Database Creation	
i.	Current Serials in Delhi including Sectional Directories on Agricultural Medical, Physical and Engineering Sciences, Social Sciences & Humanities	Jawahar Lal Nehru University, New Delhi
ii.	Generation of Earth Science	Geological Society of India, Bangalore
iii.	Indian database in S&T	NISSAT/ DSIR, New Delhi
iv.	Library & Information Centers	Indian Lib. Association, New Delhi
	Database Services/EEC/NISSAT	
v.	An Indian Model	NISSAT/ DSIR, New Delhi
	Networking: Feasibility Study	
vi.	Delhi Libraries (DELNET)	IIC, New Delhi
vii.	Madras Libraries (MALIBNET)	INSDOC Reg. Centre, Madras
viii.	Pune Libraries (PUNE NET)	Univ. of Poona, Pune
	NISSAT CARD: Feasibility Study	
ix.	NISSAT CARD - A Feasibility Study	CASAD, Pune
	Marketing: Information Products	
x.	Marketability of Information Products	INSDOC, New Delhi
	Software: Library Automation	
xi.	Software packages developed for lib. automation in India and their appl. in library	Univ. of Poona Pune
	Software: CDS/ISIS	
xii.	Survey of CDS/ISIS Applications in India	NISSAT/ DSIR, New Delhi
	Use: S&T Information	
xiii.	Study of the Scientific & Technical Information use in India: Information needs and behaviour of scientists	Instt. of Social Analysis & Communication New Delhi
	Use: S&T Periodicals	
xiv.	Use of Scientific and Technical Periodicals in Research and Academic Libraries with special reference to Institutional attitudes to sharing of such periodicals in India	Instt. of Social Analysis & Communication New Delhi
	User: Survey	
xv.	Survey of the Information needs of Textile Exporters/ Importers	NICTAS/ ATIRA, Ahmedabad

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 coordinated with those of NISSAT. The NISSAT Advisory Committee also functions as the National Advisory Committee of UNISIST and the National Advisory Group for ASTINFO.

The activities under ASTINFO are given below:

a. The Regional node as well as the national node of Asia and Pacific Information Network for Medicinal and Aromatic Plants (APINMAP) located at CSIR-Publication and Information Directorate, New Delhi. India contributes about 30% to the APINMAP database with its 33000 recordes. Activities on information dissemination are picking up; the number of queries served is about 600 through mail and another 200 per year through personal contact. Services include preparation of bibliographies, supply of photocopy of documents, provision of abstracts etc. A token pricing has also been introduced. Considerable progress has been made for the development of an Oceanographic Information System at National Institute of Oceanography, Goa. A PC/AT, ASFA database on CD-ROM, a CD-ROM drive have been acquired and staff members were provided suitable training.

b. At the request of PGI/UNESCO, information specialists of the NICHEM at NCL, Pune undertook a detailed survey of existing databases and software for storage and retrieval of chemical reaction data and prepared a feasibility report for creation of a micro-computer-based chemical reactions database within the framework of the International Chemical Information Network (ChIN). The recommendations are being actively followed up by PGI/UNESCO.

c. NISSAT is coordinating the ASTINFO document supply service promoted and supported by UNESCO, ASTINFO and National Library of Australia. The user - Library/Information Centres pay for this services in Indian Rupees only.

d. The NISSAT Secretariat has been given a contract to prepare standard course materials and teaching aids on the following topics:

- CCF: the Common Communication Format.
- CDS/ISIS, and
- Management Information System (MIS)

e. A Regional Workshop on 'New Information Technologies: Machine Translation' was organized on Dec. 16-20, 1991 at New Delhi to identify:

— Machine Translation Systems needed for the countries in the Asia and Pacific region.

— Coordinated R&D projects in this important area.

This workshop was supported by UNESCO under its Participation Program and jointly organised by NISSAT and NISTADS.

11.1 Document Supply Services

ASTINFO/UNESCO has set up a regional document supply service for its member States. Under this scheme, the National Library of Australia would service overseas document requests at a cost of $ 2 irrespective of the number of pages as compared to Rs. 200/- charged by an international document delivery service for 10 pages or part thereof. The service is open only to the ASTINFO member countries.

To handle the Indian requests for the services, NISSAT-as the ASTINFO national coordinating unit in India, has identified a set of institutions on considerations of logistics. These participant institutions are as indicated below:

S.N.	Place	Institution/Association
i.	Ahmedabad	NICTAS/ATIRA
ii.	Bangalore	NICMAP/CMTI
iii.	Calcutta	NICAC/CGCRI
iv.	Delhi	DESIDOC
		IARI
v.	Hyderabad	IICT
vi.	Lucknow	NICDAP/CDRI
vii.	Madras	NICLAI/CLRI
viii.	Pune	NICHEM/NCL
ix.	Shillong	NEHU

The service is priced on cost-recovery basis.

12. PROMOTION OF NISSAT ACTIVITIES, PRODUCTS & SERVICES

In order to reduce the dependence on government investments for the development of scientific & technical information infrastructure in the country, the NISSAT products and services are to be marketed aggressively. In this regard several measures have been taken for market promotion. For example, operative level personnel from the various NISSAT information centres have been given orientation courses on information marketing. The NISSAT supported centres are being encouraged to generate revenue and to plough back this revenue for infrastructural development. As an incentive, NISSAT provides a matching grant for the revenue earned.

In collaboration with the Science Communication Unit of the CSIR, a video presentation on NISSAT and its activities has been produced. Another video on Online access would be ready by June, 1992. A Compendium of activities of NISSAT Centres has also been drafted. Besides, brochures highlighting various aspects of NISSAT e.g. CDS/ISIS, NLA-ASTINFO-NISSAT Document Supply, NISSAT CARD and Rationalisation of Periodicals Acquisitions - An Appeal from NISSAT and a poster on Online Access have been brought out. NISSAT would also display and demonstrate products and services generated by SICs, NACIDs and through NISSAT several short/long term projects in the exhibition during IFLA Conference, New Delhi 1992.

13. NEWSLETTER

NISSAT, in cooperation with the Society for Information Science (SIS) has been publishing its quarterly NISSAT Newsletter. The Newsletter covers wide ranging issues relating to information and the development of information services networks and centres. Individuals and professional bodies are invited to contribute features and news items on new concepts and services, seminars and training courses, new products, status of information systems both national & international and trends in their development. All the four issues of this quarterly were published in time in the calendar year 1991. With a present circulation list of over 4000 recepients - institutions and individuals, NISSAT Newsletter enjoys user appreciation and professional esteem in India.

XIII. ADMINISTRATION AND FINANCE

1. ADMINISTRATION

The Department of Scientific & Industrial Research was created through a Presidential Notification of January, 1985. The Administrative functions of recruitment of personnel, provision of general facilities, redressal of grievances of employees, Parliament work and use of Hindi jobs are being performed by the Department of Scientific and Industrial Research. Other house keeping jobs are being performed by Department of Science & Technology for both the Departments.

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 Implementation Committee were held regularly in DSIR.

(b) From 16th to 19th September, 1991, the Hindi Week was observed in the Department. To promote the use of Hindi in the official work, essay, noting and drafting and speech competitions were organised in the Department during this period and officers and officials of the Department were given prizes.

(c) The Hindi Souvenir was brought out in the Department to promote Hindi conciousness in the Department. It was released by the Joint Secretary (Admn). Hindi articles/poems written by the officers/officials were published in the Souvenir.

(d) A message signed by secretary, DSIR was issued during Hindi Week to encourage the officers/employees of the department to do their maximum official work in Hindi.

(e) The Quarterly Progress Reprot regarding use of Hindi in the Department was sent to the Department of official Language regularly and in time.

(f) 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 training in Hindi Stenography and Hindi Typing.

(g) To review the progress of use of Hindi, the subordinate offices; Central Electronics Ltd., Sahibabad, National Research Development Corporation, New Delhi and Consultancy Development Centre, Qutab Hotel, New Delhi were inspected during this period.

(h) A cash award Scheme for encouraging officers who give dictations in Hindi was introduced in the Department.

(i) During December, 1991, Hindi Workshop was organised for encouraging the officers/employees who possess the working knowledge of Hindi for using in their official work.

(j) Hindi version of Annual Report, Performance Budget, Parliamentary Assurance, routine correspodence, orders, notifications, Quarterly journal of In-house R&D in industry and standard drafts were provided.

The number of Employees in the different groups in the Department of Scientific & Indus-

trial Research as on 1.1.92 is given below:

Groups of Post	Number of Employees			
	General	SC	ST	Total
Group A (Gazetted)	33	3	-	36
Group B (Gazetted)	10	1	-	11
Group B (Non-Gazetted)	10	-	-	10
Group C (Non-Gazetted)	10	3	2	15
Group D (Non-Gazetted)	10	1	-	11

2. FINANCE

The total Budget Estimates 1991-92 Revised Estimates 91-92 and Budget Estimates 92-93 of the various plan and non-plan schemes including provision for CSIR are shown below:

Rs. in Crores

Budget Estimates 1991-92			Revised Estimates 1991-92			Budget Estimates 1992-93		
Plan	Non-plan	Total	Plan	Non-plan	Total	Plan	Non-plan	Total
118.68	153.30	271.90	109.32	150.66	259.98	127.66	152.60	280.26

ANNEXURES

LIST OF CSIR INSTITUTIONS

Physical and Earth Sciences Group

National Physical Laboratory, New Delhi	(NPL)
Central Electronics Engineering Research Institute, Pilani	(CEERI)
Central Scientific Instruments Organisation, Chandigarh	(CSIO)
National Geophysical Research Institute, Hyderabad	(NGRI)
National Institute of Oceanography, Dona Paula, Goa	(NIO)

Chemical Sciences Group

National Chemical Laboratory, Pune	(NCL)
Central Electrochemical Research Institute, Karaikudi	(CECRI)
Central Salt & Marine Chemicals Research Institute, Bhavnagar	(CSMCRI)
Indian Institute of Chemical Technology, Hyderabad	(IICT)
Regional Research Laboratory, Jorhat	(RRL-Jorhat)
Indian Institute of Petroleum, Dehradun	(IIP)
Central Leather Research Institute, Madras	(CLRI)
Central Fuel Research Institute, Jealgora	(CFRI)

Biological Sciences Group

Central Food Technological Research Institute, Mysore	(CFTRI)
Central Drug Research Institute, Lucknow	(CDRI)
National Botanical Research Institute, Lucknow	(NBRI)
Indian Institute of Chemical Biology, Calcutta	(IICB)
Central Institute of Medicinal & Aromatic Plants, Lucknow	(CIMAP)
Industrial Toxicology Research Centre, lucknow	(ITRC)
Centre for Cellular and Molecular Biology, Hyderabad	(CCMB)
Regional Research Laboratory, jammu	(RRL-Jammu)
Institute of Microbial Technology, Chandigarh	(IMTECH)
CSIR Complex, Palampur, HP	Palampur
CSIR Complex, for Bichemicals	(CFB)

Engineering Sciences Group

Central Building Research Institute, Roorkee	(CBRI)
Central Road Research Institute, New Delhi	(CRRI)
Central Glass & Ceramic Research Institute, Calcutta	(CGCRI)
National Metallurgical Laboraotry, Jamshedpur	(NML)
Central Mining Research Station, Dhanbad	(CMRS)
Central Mechanical Engineering Research Institute, Durgapur	(CMERI)
National Environmental Engineering Research Institute, Nagpur	(NEERI)
National Aeronautical Laboratory, Bangalore	(NAL)
Structural Engineering Research Centre, Madras	(SERC-M)
Structural Engineering Research Centre, Chaziabad	(SERC-G)

Regional Research Laboratory, Bhubaneswar	(RRL-Bhu)
Regional Research Laboratory, Trivandrum	(RRL-Triv)
Regional Research Laboratory, Bhopal	(RRL-Bhopal)

Information Science Group

Publications & Information Directorate, New Delhi	(PID)
Indian National Scientific Documentation Centre, New Delhi	(INSDOC)
National Institute of Science, Technology and Development Studies, New Delhi	(NISTADS)

Industrial Research Associations

Tocklai Experimental Station of TRA, Jorhat	(TESTRA)
Electrical Research & Development Association, Vadodara	(ERDA)

ANNEXURE - III.1

LIST OF ASSOCIATIONS APPROVED BY THE SCREENING COMMITTEE DURING 1991

A. U/s 35(1)(ii) of Income Tax Act

S.No.	Name of the Institution	Approval valid upto
1.	Narendra Deva Krishi Evam Prodyogik Vishwa Vidyalya, Faizabad	31.3.93
2.	Gujarat Energy Development Agency, Vadodara	31.3.92
3.	Vipassana Research Institute, Bombay	31.3.92
4.	Environmental Resources Research Centre, Thiruvananthapuram	31.3.93
5.	National Instt. of Training & Industrial Engg.	31.3.93
6.	Saurashtra University, Rajkot	31.3.93
7.	Centre for Development of Advanced Computing, Pune	31.3.93
8.	Electronic Research & Development Centre, Trivandrum	31.3.93
9.	Computer Society of India, Bombay	31.3.92
10.	National Ship & Design Research Centre, Vishakhapatnam	31.3.93
11.	Rajiv Gandhi Foundation, New Delhi	31.3.93
12.	National Institute of Advance Studies, Bangalore	31.3.93
13.	Materials Research Society of India (MRSI), Hyderabad	31.3.93
14.	Paramount Academy of Technology, Calcutta	31.3.93
15.	M.S. University of Baroda	31.3.94
16.	Standard Research Centre, Hyderabad	31.3.93
17.	Gulbarga University, Gulbarga	31.3.94
18.	National Council of Applied Economic Research, New Delhi	31.3.93
19.	Packaging Research Centre, Calcutta	31.3.93
20.	Technology Nursery Optics Research & Development, New Delhi	31.3.93
21.	B.M. Birla Heart Research Centre, Calcutta	31.3.92
22.	Mahendra Eye Research Centre, Kanpur	31.3.92
23.	Bangalore Kidney Foundation, Bangalore	31.3.93
24.	BYL Nair Hospital & Topiwala National Medical College Research Society, Bombay	31.3.92
25.	Jamia Hamdard, New Delhi	31.3.93
26.	Indian Medical Scientific Research Foundation, Rajkot	31.3.93
27.	The Gujarat Research & Medical Institute, Ahmedabad	31.3.93
28.	Hyderabad Eye Research Foundation, Hyderabad	31.3.93
29.	Sankara Research Foundation, New Delhi	31.3.93
30.	Divyajyot Ayurvedic Research Foundation, Ahmedabad	31.3.93
31.	Thakur Hari Prasad Instt. of Research & Rehabilitation for the Mentally Handicapped, Hyderabad	31.3.93
32.	The Nagri Eye Research Foundation Trust, Ahmedabad	31.3.93

B. U/s 35(1)(iii) of Income Tax Act

S. No.	Name of the Institution	Approval valid upto
1.	Indian Statistical Institute, Calcutta	31.3.92
2.	Krishnamacharya Yoga Mandiram, Madras	31.3.93
3.	Indian Institute of Management Ahmedabad Society, Ahmedabad	31.3.94
4.	National Insurance Academy, Bombay	31.3.93
5.	Indian Institute of Management, Bangalore	31.3.93
6.	T.A. Pai Management Institute, Manipal	31.3.93

STATEMENT OF RECOGNITION OF IN-HOUSE R&D UNITS

Month		Receipt	Cumulative Receipt	Disposal	Cumulative Disposal	Cumulative Pendency at the end of month
December,	1990	—	—	—	—	20
January,	1991	10	10	8	8	22
February,	1991	11	21	13	21	20
March,	1991	10	31	5	26	25
April,	1991	16	47	8	34	33
May,	1991	11	58	Nil	34	44
June,	1991	10	68	24	58	30
July,	1991	5	73	19	77	16
August,	1991	6	79	5	82	17
September,	1991	7	86	10	92	14
October,	1991	5	91	3	95	16
November,	1991	6	97	7	102	15
December,	1991	12	109	9	111	18

ANNEXURE - IV.2

STATEMENT ON RENEWAL OF RECOGNITION BEYOND 31-3-1991

Month		Receipt	Cumulative Receipt	Renewals granted/ rejected	Cumulative Renewals granted rejected	Cumulative Pendency at the end of month
December,	1990	215	215	—	—	215
January,	1991	148	363	—	—	363
February,	1991	71	434	160	160	274
March,	1991	34	468	74	234	234
April,	1991	38	506	73	307	199
May,	1991	26	532	151	458	74
June,	1991	6	538	41	499	39
July,	1991	1	539	16	515	24
August,	1991	—	—	21	536	3
September,	1991	—	—	3	539	Nil

ANNEXURE IV.3

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE MORE THAN Rs. 100 LAKHS

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
1.	Altos India Limited	107
2.	Armour Chemicals Private Limited	119
3.	Asea Brown Boveri Limited	101
4.	Ashok Leyland Limited	430
5.	Asian Paints (India) Limited	179
6.	Associated Cement Co. Ltd.	327
7.	Atic Industries Limited	102
8.	Atul Products Limited	130
9.	Bajaj Auto Limited	446
10.	Bajaj Tempo Limited	157
11.	Bata India Limited	157
12.	Bharat Earth Movers Limited	1217
13.	Bharat Electronics Limited	3309
14.	Bharat Heavy Electrical Ltd. (Pollution Control Res. Instt.)	184
15.	Bharat Heavy Electricals Ltd. (High Pressure Boiler Plant)	1058
16.	Boots Pharmaceuticals Ltd.	183
17.	Brakes India Limited	293
18.	Bush Boake Allen (India) limited	147
19.	CMC Limited	436
20.	Cable Corporation of India Ltd.	434
21.	Cadila Laboratories Limited	193
22.	Central Electronics Limited	104
23.	Cibatul Limited	104
24.	Colour Chem Limited	154
25.	Crompton Greaves Limited	728
26.	Dunlop India Limited	300
27.	Eicher Goodearth Limited	181
28.	Electronic Research and Development Centre	374
29.	Electronics Corp. of India Ltd.	450
30	Engineers India Limited	373
31.	English Electric Company of India Limited	245
32.	Escorts Limited Corporate R&D Centre	270
33.	Escorts Limited (Motor Cycle & Scooter Division)	111
34.	E.I.D Parry (India) Limited	168
35.	Garware Plastics & Polyester Limited	155
36.	Gharda Chemicals Limited	330
37.	Glaxo India Limited	169
38.	Godrej Soaps Limited	140
39.	Godrej & Boyce Mfg. Company Limited	574
40.	Grauer & Weil (India) Limited	109
41.	Gujarat Ambuja Cements Ltd.	159

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
42.	Gujarat Communication & Elictronics Limited	296
43.	Gujarat State Fertiliser Company Limited (Polymer Unit)	450
44.	HCL Limited (Communication & Computer Division)	200
45.	HMT Limited R&D Centre (Metal Cutting Division)	472
46.	HMT Limited (Agricultural Machinery Group)	164
47.	Heavy Engineering Corporation Ltd. (Heavy Machine Tools Plant)	500
48.	Hindustan Aeronautics Limited	314
49.	Hindustan Aeronautics Limited (Hyderabad Division)	482
50.	Hindustan Aeronautics Limited (Design & Engg. Department)	212
51.	Hindustan Antibiotics Limited	200
52.	Hindustan Cables Limited	122
53.	Hindustan Ciba-Geigy Limited	280
54.	Hindustan Insecticides Limited	103
55.	Hindustan Lever Limited	471
56.	Hindustan Organic Chemicals Limited	135
57.	Hindustan Photo Films Manufacturing Company Ltd.	156
58.	Hndustan Zinc Limited	468
59.	Hoechst India Limited	1150
60.	Hyderabad Allwyn Limited	170
61.	ICI India Limited	167
62.	ICI India Limited (Explosives & Fertilisers Division)	117
63.	ICI India Limited (Fibres Division)	157
64.	IDL Chemicals Limited	140
65.	IOL Limited	120
66.	ITC Limited	246
67.	Indian Aluminium Company Limited	229
68.	Indian Drugs & Pharmaceuticals Limited	202
69.	Indian Oil Corporation Limited	1000
70.	Indian Organic Chemicals Ltd.	112
71.	Indian Telephone Industries Limited	2945
72.	Instrumentation Limited	125
73.	Johnson & Johnson Limited	104
74.	Jyoti Limited	100
75.	J.K. Industries Limited	136
76.	J.K. Synthetics Limited	255
77.	Kegg Farms Limited	108
78.	Kelvinator India Limited	238
79.	Kirloskar Brothers Limited	112
80.	Kirloskar Cummins Limited	323
81.	Kirloskar Electric Company Ltd.	122
82.	Kirloskar Oil Engines Limited	101
83.	K.C.P. Limited	424
84.	Larsen & Toubro Limited	588
85.	Lubrizol India Limited	233
86.	Lucas-TVS Limited	121
87.	MRF Limited	1676

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
88.	Madras Refineries Limited	300
89.	Maharashtra Hybrid Seeds Company Limited	320
90.	Mahindra & Mahindra Limited (Tractor and Automotive Division)	277
91.	Malladi Drugs & Pharmaceuticals Limited	145
92.	Maruti Udhyog Limited	239
93.	Metallurgical & Engineering Consultants (India) Limited	148
94.	Modi Rubber Limited	101
95.	*Motor Industries Co. Limited*	*357*
96.	Mysore Kirloskar Limited	281
97.	National Mineral Development Corporation Limited	181
98.	National Organic Chemical Industries Limited	410
99.	National Thermal Power Corporation Limited	221
100.	Oil India Limited	126
101.	Oil & Natural Gas Commission (O.N.G.C.)	1294
102.	Padmashri Dr. Vithalrao Vikhe Patel Sahakari Sakhar Karkhana	304
103.	Peico Electronics & Electricals Limited	1482
104.	Pfizer Limited	159
105.	Premier Automobiles Limited	322
106.	Procter & Gamble India Limited (Formerly: Richardson Hindustan)	140
107.	Projects & Development India Limited	760
108.	Punjab Tractors Ltd.	120
109.	Rallis India Limited (Agricultural Division)	172
110	Ranbaxy Laboratories Limited	312
111.	Reliance Petrochemicals Ltd.	611
112.	SRF Limited	143
113.	Sandoz (India) Ltd.	165
114.	Semiconductor Complex Limited	871
115.	Siemens India Limited	795
116.	Steel Authority of India Limited (R&D Centre for Iron & Steel)	3830
117.	Steel Authority of India Limited (Bokaro Steel Plant)	105
118.	S.D. Technical services Pvt. ltd.	150
119.	TVS-Suzuki Limited	104
120.	Tata Chemicals Ltd.	117
121.	Tata Engineering & Locomotive Company Limited	1354
122.	Tata Hydro-Electric Power Supply Company Limited	358
123.	Tata Iron & Steel Company Ltd.	600
124.	Tata Tea Ltd.	187
125.	Venco Research & Breeding Farm Limited	125
126.	Venkateshwara Research & Breeding Farm Limited	107
127.	Voltas Limited	411
128.	Widia (India) Limited	124
129.	Wipro Infotech Limited	336
130.	Wockhardt Limited	130
131.	Zandu Pharmaceuticals Works Limited	102

LIST OF IN-HOUSE R&D UNITS IN INDUSTRY REPORTING ANNUAL EXPENDITURE IN THE RANGE OF Rs. 25 LAKHS TO Rs. 100 LAKHS

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in lakhs)
1.	Advani-Oerlikon Limited	39
2.	Aegis Chemical Industries	26
3.	Afco Industrial & Chemicals Limited	27
4.	Alembic Chemical Works Company Limited	81
5.	Alembic Glass Industries Limited	25
6.	Alfa-Laval (India) Limited	52
7.	Ambalal Sarabhai Enterprises Limited	49
8.	Andhra Sugars Limited (Sugarcane Dev. Division)	46
9.	Andrew Yule & Company Limited	51
10.	Apollo Tyres Limited	56
11.	Applied Electronics Limited	52
12.	Arlabs Limited	34
13.	Asian Cables Ltd.	60
14.	Assam Electronics Development Corporation Limited	43
15.	Astra IDL Limited	27
16.	Audco India Limited	'27
17.	Automatic Electric Limited	40
18.	BASF India Limited	65
19.	BPL Sanyo Utilities and Appliances Limited	35
20.	BPL Systems & Projects Limited	44
21.	BPL-INDIA (British Physical Laboratories)	43
22.	Bajaj Electricals Ltd.	48
23.	Bakelite Hylam Limited	48
24.	Ballarpur Industries Limited	45
25.	Balmer Lawrie & Company Ltd.	45
26.	Baroda Rayon Corporation Limited	60
27.	Bayer India Limited	73
28.	Berger Paints India Limited	44
29.	Best & Crompton Engineering Ltd.	25
30.	Bharat Aluminium Company Ltd.	25
31.	Bharat Dynamics Limited	30
32.	Bharat Forge Limited	26
33.	Bharat Heavy Electricals Ltd. (Industrial Systems Group)	72
34.	Bharat Heavy Electricals Ltd. (Electroporcelains Division)	30
35.	Bharat Heavy Plate & Vessels Limited	42
36.	Bharat Pumps & Compressors Limited	30
37.	Bharat Refractories Limited	29
38.	Bharatia Electric Steel Company Limited	29
39.	Bharatia Cutter-Hammer Limited	25
40	Bhilai Engineering Corporation Limited	31
41.	Bhoruka Gases Ltd. (Formerly Karnataka Oxygen Ltd.)	33
42.	Bhoruka Steel Limited	28

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
43.	Bicycle & Sewing Machine Research & Development Centre	84
44.	Bihar Alloy Steels Limited	50
45.	Blue Star Limited	39
46.	Bombay Tyres International Ltd.	42
47.	Britannia Industries Limited	45
48.	Bush India Limited	30
49.	Cadbury India Limited (Formerly Hindustan Cocoa)	65
50.	Camphor & Allied Products Limited	56
51.	Carborundum Universal Limited	51
52.	Castrol India Ltd. (Formerly Indrol Lub. & Specialities Ltd.)	35
53.	Ceat Limited	54
54.	Century Textiles Industries Limited	35
55.	Chloride Industries Limited	78
56.	Cipla Limited	42
57.	Coats of India Limited	38
58.	Cochin Refineries Limited	53
59.	Continental Device of India Limited	25
60.	Control & Switchgear Co. Ltd.	31
61.	Coromandal Prodorite Limited	39
62.	Cosmo Ferrites Limited	51
63.	Coventry Spring & Engineering Company Limited	39
64.	Cynamid India Limited	80
65.	DCM Data Products (Unit: D.C.M.) Limited	83
66.	Dai Ichi Karkaria Pvt. Ltd.	35
67.	Daurala Sugar Works (Unit of Shriram Industries Ltd.)	31
68.	Dey's Medical Stores (Mfg) Limited	37
69.	Dharamsi Morarji Chemicals Company Limited	49
70.	Digital Electronics Limited	34
71.	Digital Equipment (India) Limited	34
72.	Dr. Beck & Company (India) Limited	27
73.	Dr. Reddy's Laboratories Ltd.	40
74.	Duphar Interfran Limited	52
75.	ESAB India Ltd.	75
76.	EWAC Alloys Limited	68
77.	East India Pharmaceutical Works Limited	27
78.	Eddy Current Controls (India) Limited	46
79.	Eimco Elicon (India) Limited	32
80.	Electronic Research Pvt. Ltd.	28
81.	Elgi tyre & Tread Limited	25
82.	Elpro International Limited	43
83.	Emco Electronics	32
84.	Ennore Foundries Limited	28
85.	Escorts Tractors Limited (Research & Development Centre)	54
86.	Eskayef Limited	69
87.	Etermit Everest Ltd. (Formerly Everest Building)	39
88.	Ethnor Limited	31

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
89.	Eureka Forbes Limited	30
90.	Excel Industries Limited	27
91.	Fedders Llyod Corporation Private Limited	38
92.	Fertilizers & Chemicals Travancore Limited	37
93.	Ficom Organics Limited	25
94.	Fort Gloster Industries Limited (Cable Division)	67
95.	Franco-Indian Pharmaceuticals Private Limited	26
96.	Galaxy Organics (P) Limited	29
97.	Garware Paints Limited	31
98.	Garware-wall Ropes Limited	65
99.	Godfrey Phillips India Limited	25
100.	Goodlass Nerolac Paints Limited	90
101.	Graphite India Limited	33
102.	Greaves Foseco Limited	54
103.	Grindwell Norton Limited	77
104.	Guest Keen Williams Limited	27
105.	Gujarat Alkalies & Chemicals Limited	38
106.	Gujarat Insecticides Limited	56
107.	Gujarat Narmada Valley Fertilizers Company Limited	35
108.	HMM Limited	41
109.	HMT Limited (Watch Directorate)	92
110.	Haryana State Electronics Development Corporation Limited	54
111.	Hawkins Cookers Limited	61
112.	Herdillia Chemicals Limited	37
113.	Hico Products Limited	54
114.	High Energy Batteries (India) Limited	32
115.	Himalaya Machinery Pvt. Ltd.	34
116.	Hinditron Computer Systems & Consultants Private Limited	31
117.	Hindustan Aeronautics Limited (HAL-Corporate Office)	67
118.	Hindustan Dorr-Oliver Limited	28
119.	Hindustan Motors Limited (Auto Divsion)	77
120.	Hindustan Teleprinter Limited	25
121.	Hyderabad Batteries Limited	40
122.	Hyderabad Industries Limited	60
123.	IBP Company Limited (Engineering Division)	58
124.	IPCA Laboratories Pvt. Ltd.	72
125.	ITI Equatorial Satcom Limited	51
126.	IVP Limited	37
127.	Incab Industries Limited	38
128.	Indchen ATL Limited	27
129.	Indchem Electronics Limited,	45
130.	India Carbon Limited	30
131.	India Pistons Limited	35
132.	India Tele-Comp Limited	25
133.	Indian Dyestuff Industries Limited	61
134.	Indian Hume Pipe Company Ltd.	49

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
135.	Indo National Limited	25
136.	Indofil Chemicals Company (A Division of Modipon Limited)	29
137.	Indo-American Hybrid Seeds	34
138.	Infar (India) Limited	53
139.	Infocom Digital Systems (P) Ltd.	33
140.	International Computers Indian Manufacturers Limited	48
141.	International Data Management Limited	60
142.	Ion Exchange (India) Limited	75
143.	Jagatjit Cotton Textiles Mills Limited	37
144.	Jamna Auto Industries	25
145.	Jaya Hind Industries Limited	26
146.	Jaysynth Dyechem Private Limited	43
147.	Jenson & Nicholson (India) Ltd.	42
148.	KSB Pumps Limited	28
149.	Kasila Farms Private Limited	73
150.	Keonics Magnavision Computers Limited	56
151.	Kerala Electrical & Allied Engineering Co. Ltd.	40
152.	Kinetic Engineering Limited	77
153.	Kirloskar Pneumatic Company Limited	62
154.	Klockner Windsor (India) Limited	35
155.	Kolhapur Steel Limited	67
156.	K.E.C. International Limited	30
157.	K.G. Khosla Compressors Limited	43
158.	Lakhanpal National Limited	27
159.	Lakshmi Machine Works Limited	47
160.	Lawkim Limited	27
161.	Lona Industries Pvt. Limited	49
162.	Lupin Laboratories Limited	52
163.	Lyka Labs Private Limited	37
164.	Machine Tools Aids and Reconditioning	53
165.	Maharashtra Electronics Corporation Limited	60
166.	Maize Products	25
167.	Marine & Communications (I) Limited	83
168.	Mc Dowell & Company Limited	36
169.	Merind Limited	30
170.	Mirc Electronics Ltd.	65
171.	Modern Malleable Casting Works Limited	41
172.	Modern Woollens Limited	35
173.	Modi Xerox Limited	81
174.	Modipon Limited	61
175.	Mukund Limited	54
176.	Murphy India Limited	29
177.	M.P. Electricity Board (R&D Cell)	58
178.	NGEF Limited	30
179.	National Insulated Cable Company of India limited	31
180.	National Peroxide Limited	56

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
181.	National Radio & Electronics Company Limited	73
182.	National Rayon Corporation Limited	38
183.	Navin Flourine Industries	33
184.	Network Limited	77
185.	New Shorrock Mills (Div. of Mafatlal Ind. Ltd.)	29
186.	Neyveli Lignite Corporation Limited	38
187.	Nippon Denro Ispat Limited	35
188.	Nirlon Limited	56
189.	Nuchem Plastics Limited	30
190.	OMC Computers Ltd.	71
191.	Orient Paper Mills	51
192.	Orissa Cement Limited	27
193.	Orissa Industries Limited	27
194.	Orissa State Electronics Development Corporation Limited	69
195.	Otis Elevator Co. (India) Ltd.	65
196.	PSI Data Systems Limited	81
197.	Paper Products Limited	25
198.	Parke-Davis (India) Limited	40
199.	Pennwalt India Limited	27
200.	Petrofils Co-operative Limited	49
201.	Phillips Carbon Black Limited	55
202.	Pidilite Industries Ltd. (Formerly PDI Chemicals Ltd.)	25
203.	Polyolefins Industries Limited	87
204.	Pond's (India) Limited	30
205.	Pratap Steel Limited	25
206.	Premier Cable Company Ltd.	36
207.	Premier Instruments & Controls Limited	99
208.	Priyaraj Electronics Pvt .Ltd.	30
209.	Proagro Seed Company Limited (Formerly Pioneer Seed Co. Ltd.)	66
210.	Prototype Development Training Centre	45
211.	Punjab Anand Batteries Ltd.	80
212.	Punjab Wireless Systems Ltd.	43
213.	Rainbow Ink & Varnish Manufacturing Co. Limited.	28
214.	Rajasthan Electronics and Instruments Limited	79
215.	Rallis India Limited (Pharmaceutical & Chemical)	55
216.	Ralliwolf Limited	54
217.	Rane (Madras) Limited	30
218.	Rashtriya Chemical & Fertilizers Limited	95
219.	Raymond Woollen Mills Ltd.	28
220.	Reckitt & Colman of India Ltd.	66
221.	Reliance Industries Ltd.	77
222.	Roche Products Limited	26
223.	Ruston & Hornsby (India) Ltd.	25
224.	R.G. Ispat Limited	60
225.	Samtel (India) Limited	26
226.	Sandvik Asia Limited	79

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
227.	Savita Chemicals Ltd.	28
228.	Searle (India) Limited	60
229.	Shalimar Paints Limited	29
230.	Shree Synthetics Limited	37
231.	Shriram Refrigeration Industries Limited	33
232.	Simbhaoli Sugar Mills Ltd.	34
233.	Simco Engineering Limited	35
234.	Simpson & Company Limited	37
235.	Siris Limited (Formerly: South India Research Institute)	27
236.	Sirpur Paper Mills Limited	26
237.	Southern Petrochemical Industries Corporation Limited	60
238.	Sponge Iron India Limited	47
239.	Standard Industries Limited	27
240.	Standard Research Centre	39
241.	Sun Pharmaceutical Industries	82
242.	Sundram Fastners Limited	25
243.	Swadeshi Polytex Limited .	37
244.	S.A.J. Froude Test Plant Private Limited	26
245.	S.H. Kelkar & Company Limited	32
246.	TIL Limited	45
247.	TVS Electronics Ltd.	46
248.	TVS Whirlpool Ltd.	92
249.	Tamil Nadu Dadha Pharmaceuticals Limited	55
250.	Tamil Nadu Newsprint and Papers Limited	54
251.	Tamil Nadu Petroproducts Ltd.	27
252.	Tata Oil Mills Co. Ltd.	41
253.	Tata Refractories Limited	79
254.	Tata-Yodogawa Limited	46
255.	Teletube Electronics Pvt. Ltd.	55
256.	Television & Components (P) Ltd.	27
257.	Thermax Limited (Chemical, Computer & Engg. Div.)	82
258.	Titan Watches Limited	29
259.	Titanium Equipments & Anode Manufacturing Company Limited	30
260.	Tractor Engineers Limited	29
261.	Transpek Industry Limited	38
262.	Tube Products of India	38
263.	T. Stanes & Company Limited	73
264.	Unichem Laboratories Limited	67
265.	Unique Chemicals (Div. of J. B. Chemicals & Pharmaceuticals Ltd.)	29
266.	Unique Pharmaceuticalss Laboratories Private Limited	27
267.	United Catalysts India Ltd.	28
268.	United Phosphorous Pvt. Ltd.	40
269.	Universal Biochemicals	30
270.	Universal Cables Ltd.	59
271.	Uptron India Limited	38
272.	Usha Telehoist Limited	26

Sl. No.	Name of the Unit	R&D expenditure (Rs. in lakhs)
273.	U.S. Vitamin (India) Limited	57
274.	VXL India Limited	32
275.	Vidyut Metallics Limited	27
276.	Vijay Wires & Filament (P) Limited	70
277.	Vikrant Tyres Limited	27
278.	Walchandnagar Industries Limited (Copper Group)	60
279.	West Bengal Electronic Industry Development Corporation Limited	27
280.	Weston Electroniks Limited	40
281.	Wheels India Limited	43
282.	Worthington Pump India Limited	49
283.	Wyeth Laboratories Limited	53

ANNEXURE V.1

CERTIFICATE FOR ACCELERATED DEPRECIATION ALLOWANCE ISSUED UNDER RULES 5(2) OF I.T. RULES VIDE NOTIFICATION NO. 133/342/86-TPL DATED 1.4.1988.

S. No.	Name of the Company	Lab where know-how developed	Rs. in lakhs	Items of manufacture
1.	Kaprecon Sleeper Works Pvt. Ltd., Bombay	RDSO, Lucknow	20	Pre-stress concrete sleepers
2.	INDCHEM Electronics Ltd. Madras	C-DOT	4	128 Port Electronic Pvt. Automatic Br. Exchange EPABX and Rural Automatic Exchange (RAX)
3.	Gharda Chemicals Ltd. Bombay	In-House	9	Oxyclozanide
4.	Gharda Chemicals Ltd. Bombay	In-House	36	Insoproturon Technical Isoproturon 50% & 75% W.P.
5.	Gharda Chemicals Ltd. Bombay	In-House	11	Cypermethric Acid Chloride & Cypermethric technical
6.	ARLEM Electronics, Goa	C-DOT	31	128 Electronics PABX
7.	Gharda Chemicals Ltd. Bombay	In-House	22	Cypermethric Acid Chloride Cypermethrin Technical
8.	Punjab Communications Ltd., SAS Ngr	C-DOT	36	EPABX and RAX
9.	Vijay Lakshmi Engg. Works Pvt. Ltd. Coimbatore	SITRA	57	Two for one twister
10.	Punjab Tractors Ltd., Ropar	In-House	730	Swaraj Agri. Tractors, Grey Iron Castings, Indl. Fork lifts, Harvestor Combine
11.	Webel Electronics Communication System Ltd., Calcutta	In-House	6	Automatic Message Account Equipment (AMA), Electronic Detector (ED)

S. No.	Name of the Company	Lab where know-how developed	Rs. in lakhs	Items of manufacture
12.	Isotrack Sleeper Pvt. Ltd., Bombay	RDSO	32	Prestressed concrete Sleepers
13.	Punjab Communications Ltd, Ropar	C-DOT	17	EPABX and RAX
14.	Bharat Electronics Ltd. Trade Centre, Bangalore	In-House	1480 1717	Professional Electronics & equipments, viz:Booster amplifier (transistorised), Regulator, Power Meter etc.
15.	BASF India Ltd. Bombay	In-House	2	Agro-Chemicals
16.	Gharda Chemicals Ltd., Bombay	In-house	152	Oxyclozanide.
17.	Gharda Chemicals Ltd., Bombay	In-House	42	Isoproturon Technical Isoproturon 50% & 75% WP
18.	Jyoti Ceramic Industries Pvt. Ltd. Bombay	In-House	34 95	High density high Aluminia ceramic grinding material and wear registering material
19.	Gharda Chemicals	In-House	13	Oxyclozanide
20.	Gharda Chemicals	In-House	83	Orthro Phenylene Diamine (OPDA)

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
CEERI	Central Electronics Engineering Research Institute
CEL	Central Electronics Limited
CFTRI	Central Food Technological Research Institute
CFRI	Central Fuel Research Institute
CGCRI	Central Glass & Ceramic Research Institute
CLRI	Central Leather Research Institute
CMERI	Central Mechanical Engineering Research Institute
CMPDIL	Central Mine Planning & Design Institute Limited
CMRS	Central Mining Research Station
CRRI	Central Road Research Institute
CSIO	Central Scientific Instruments Organisation
CSIR	Council of Scientific and Industrial Research
CSMCRI	Central Salt & Marine Chemicals Research Institute
CSTT	Centre for Studies on Technology and Trade
DGTD	Directorate General of Technocal Development
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
ICSSR	Indian Council of Social Science Research
IICB	Indian Institute of Chemical Biology
IIFT	Indian Institute of Foreign Trade
INSDOC	Indian National Scientific Documentation Centre
IPCL	Indian Petrochemical Corporation Limited
ISRO	Indian Space Research Organisation
ITI	Indian Telephone Industries
NAL	National Aeronautical Laboratory
NCAER	National Council of Applied Economic Research
NCL	National Chemical Laboratory
NEERI	National Environmental Engineering Research Institute
NGRI	National Geophysical Research Institute
NICMAR	National Institute of Construction Management and Research
NIDC	National Industrial Development Corporation
NISSAT	National Information System for Science and Technology
NML	National Metallurgical Laboratory
NPL	National Physical Laboratory
NRDC	National Research Development Corporation

NRFC	National Register of Foreign Collaborations
OCCI	Overseas Construction Council of India
RRL	Regional Research Laboratory
TAAS	Technology Absorption and Adaptation Scheme
TATT	Transfer and Trading in Technology
TPIC	Technology Policy Implementation Committee
UNCTAD	United Nations Conference On Trade And Development
UNDP	United Nations Developmet Programme
UNIDO	United Nations Industrial Development Organisation
WIPO	World Intellectual Property Organisation