ANNUAL REPORT
1992-93

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

CONTENTS

LIST OF FIGURES AND PHOTOGRAPHS

I. AN OVERVIEW

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

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

1.2 Among the major industry/economy oriented programmes of CSIR laboratories, those relating to drugs, agrochemicals, including pesticides, catalysts, chemicals and intermediates and leather constituted a sizeable chunk. Centchroman, developed by CDRI, was launched in the market. IICT transferred technologies for some important drugs such as AZT (for AIDS), Etoposide (anti-tumor agent) and Keterolac (analgesic); NCL exported technology for the production of Encilite-3, a catalyst; the seal and sink technology of CLRI for upgrading lower ends of leather having grain defects has received worldwide attention.

CEERI Pilani has made a mark in the area of application of microprocessor based electronic control systems in manufacturing industries. The sugar industry has already derived benefits due to this development. A consortium of industries has signed up an agreement with CSIO for the manufacture of Linear Accelerator (NINAC), earlier designed and built by CSIR and SAMEER.

A new machine for making large Aggregate Concrete Blocks has been designed by CBRI. It is now being commercially produced in Delhi. NAL's process for in-situ growth of SiC whiskers in Aluminium and Silicon Nitride matrices has found application in INSAT-2 satellite of ISAC. NEERI completed Environmental Impact studies for a wide range of industries.

CSIR continued to provide valuable services and guidance in the fulfillment of missions and completion of societal programmes. Some of the achievements during the year were: development and installation of a hand pump attachable fluoride removal plant (NEERI); and designs of CBRI for construction of temporary shelters for earthquake affected people.

CLRI demonstrated appropriate techniques for finishing of leathers in rural areas. Agrotechnologies for cultivation of aromatic plants and supply of planting materials were provided by CIMAP to farmers in Uttar Pradesh. Social/public awareness compaigns for disinfection of water were conducted by NEERI and ITRC in different locations, by involving men, women and children. Dissemination of scientific information and popularization of science were continued by INSDOC and PID.

CSIR continued to offer different kinds of support, including consultancies, over a wide spectrum of science and technology, to Government departments/institutions and industries. These were in the nature of design parameters relating to construction of tunnels for hydro-electric projects (CMRS); seismicity studies for the Kudamkulam Nuclear Project (NGRI); investigation of the launcher structure for Project Agni-02 and tower testing services (SERC-M); resource quality assessment of coal/lignite (CFRI); traffic and transportation planning (CRRI); designs for setting up of mini cement plants (RRL-Jorhat) and development of zero-defect (ZD) welding process for BHEL (RRL-Bhopal)

In the year (1991-92), CSIR observed the fiftieth year of its service to Indian Science by rededicating itself to the goals and pursuits that it had set for itself at the time of establishment. The year was thus spent in preparing to meet the new challenges of industrial development through science and technology and pushing back the frontiers of Science. The Golden Jubilee year was marked by the holding of conferences, lectures, exhibitions and release of books and films.

1.3 The major programmes of the Department of Scientific and Industrial Research have now been grouped as under:

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

a) In-house R&D in Industry
b) Scientific and Industrial Research Organisations (SIROs)
c) Fiscal Incentives for Scientific Research

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

a) Technology Absorption and Adaptation Scheme (TAAS), including:
- Technology Evaluation and Demonstration Scheme (TED)
- Talented Indian Engineers and Scientists (TIES)

b) Indigenous Development of Capital Goods

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

a) National Register of Foreign Collaborations (NRFC)
b) Industrial Technology
c) Transfer and Trading in Technology (TATT).
d) Linkages with International Organisations including Asian and Pacific Centre for Transfer of Technology (APCTT)
e) Promotion and Support to Consultancy Services (PSCS) which also include the Consultancy Development Centre (CDC).

IV National Information System for Science and Technology (NISSAT)

V Public Enterprises include:

a) National Research Development Corporation (NRDC)
b) Central Electronics Limited (CEL).

1.4 Research and Development by Industry (RDI)

Under the Scheme of granting recognition to In-house Research and Development Units, there were 1224 units having valid recognition as on 31st December, 1992. 147 In-house R&D centres incurred an annual expenditure of over Rs. 1.00 crores each. During the year 1992, the inter-departmental Screening Committee accorded recognition to 60 In-house R&D Centres. During the year 433 units were accorded renewal; several of these In-house centres are having sophisticated facilities and their scientists have made impressive contributions. During the year 1992-93, four issues of In-house R&D in Industry update were broughtout.

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, 25 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, either approvals granted are reviewed or withdrawn. During the year, review of 204 such institutions was made. Similarly, institutions engaged in social science research were also examined. 7 institutions were recommended for approval; the Research Review Group in the area of social science examined the return of 47 institutions.

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 higher rate on the cost of plant and

machinery installed after 1st April, 1987. During the year 27, certificates involving Rs. 5175 lakhs as cost of plant and machinery were issued.

1.5 Programmes Aimed at Technological Self-Reliance (PATSER)

The Technology Absorption and Adaptation scheme provided partial financial support to 31 firms involving over 50 Research, Design, Development and Engineering projects in absorption and upgradation of imported technology. Out of these, so far 35 projects have been completed. The projects in progress include those of MECON concerning import substitution of hydraulic AGC (Automatic Gauge Control) system, Mining and Allied Machinery Corporations concerning development of side discharge loaders, Keltron Controls concerning indigenous development of custom built IC's used in computer, HCL's projects concerning Plasma enhanced MCVD process and recovery of raw material used in Fiber Optic Cables, Hindustan Organic Chemical's project concerning simulation studies for the distillation train in the Phenol plant, Swaraj Mazda's project concerning improvement of fuel consumption and emission reduction in Diesel Engine and Bharat Heavy Plates and Vessels Ltd's project concerning development of flexible super insulated piping. In addition, a Roster/Directory of Research & Design Experts in Technology Absorption has been completed in this year.

Technology evaluation studies relating to various sectors have been completed and these include the sectors such as Fire fighting equipment, Pumps, Medical electronics equipment, Packaging Industry, Furnaces, Flour & Rice Milling, HT Fasteners, Fero Alloys, and Cement. Support has been given to ERDA for a technology evaluation and demonstration project concerning Energy Efficient Motors.

Under Talented Indian Engineers and Scientists Scheme, a total of 82 preliminary industry profiles have been completed.

The Scheme on Promotion and Support to indigenous Development of Capital Goods was launched in 1990-91 with the aim at promotion of indigenous development of capital goods, which are either imported or which have a substantial export potential. The directories of imported capital goods cleared for import during the year 1989 to 91 and a catalogue on machine tools have been brought out in the printed form. The reports of capital goods requirements by food processing industry, naphtha and gas cracker projects and dies & moulds sector were prepared and evaluated by expert committees. Some development projects pertaining to the special purpose machines for manufacture of conical steel barrels, CNC tool and cutter grinder, process technology and capital goods package for synthetic rutile and side arm charger are considered.

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

The Department intensified its activities relating to the scheme on National Register of Foreign Collaboration. A compilation of primary data on FCs for the year 1991 was brought out. Computerisation of data collected on foreign collaborations 1981-91 has been completed. During the year reports on technology status of various sectors/products like Ethylene oxide/Ethylene Glycol, Charge Chrome, Polypropylene, Xylene, New Drug Delivery Systems, Titanium Dioxide, High Voltage Transformers etc. were printed. Technology Status studies have been commissioned on various products which include Laser Printers, Butyl Acrylate, Gears, Methyl Ethyl Ketone, Springs, Phenol, Industrial Robots, Electronic Connectors, Acetone etc.

Interaction meetings with manufacturers, users, Government Departments, R&D organisations, Technology Institutions, Industrial Associations and others were organised to finalise the reports.

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. Technology export potential studies on Mini Steel, Packaging, Veterinary Pharmaceuticals, Two Wheeler Industry etc. were undertaken. Technology profile studies of Mauritius and Zaire were conducted during the year. Technology profiles of eight developing countries were discussed in the Interaction on technology transfer among developing countries. 9th International Congress on Chemistry of Cement and International Rubber Conference were co-sponsored during the year.

Close linkages were maintained in the area of Technology Transfer with international organisations such as UNCTAD, ESCAP, WIPO and UNIDO. The matters pertaining to the Asian and Pacific Centre for Transfer of Technology (APCTT) under ESCAP, were dealt with in cooperation with Ministry Commerce. The DSIR continued to be the focal point for the APCTT.

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 industrial sectors and at State levels; Providing institutional and programme support to CDC; Associations and other promotional agencies; Registration scheme for consultants is being implemented; An ESCAP regional meeting 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 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 revenues to the extent possible, through specialised programmes and activities. The Chairman of CDC is the Secretary in the Ministry of Science and Technology or his representative, and the Governing Body includes representatives from Consultancy (Private and Public) Organisations, Government Departments, Industry, and R&D Organisations. CDC is implementing programmes such as Consultancy Development Promotion Assistance (CDPA), computerised databases, training and human resources development for consultancy, and programmes sponsored by other agencies. DSIR is providing recurring and non-recurring support to CDC.

1.7 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 established three metropolitan library networks in Bombay, Calcutta and Delhi and taken initiative to establish in Pune, to ensure better utilisation of S&T information resources through resources sharing. Three generalised software for library automation were developed, various courses on information technology were organised. Quarterly NISSAT newsletter for dissemination of information activities was published.

1.8 Two public enterprises 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: Spirulina Alga Protein Concentrate; Spice Oleroresins; Flexible Graphite Tapes and Sheets; Rice Husk Particle Board; Cyclosporin "A" Immuno Suppressive Drug; Artificial Heart Valve; Alcrotan and Aluton Leather Processing Chemicals; Fly Ash Bricks; Thick Film Hybrid Micro Circuits; Synthetic High Alumina Aggregate; and Sand lime bricks. Under its programme, Development and Promotion of Rural Technology, Corporation set up six new rural Technology

Demonstration cum training Centres at Shaktifarm (Uttar Pradesh); Rajur (Maharashtra); Dhule (Maharashtra), Pilani (Rajasthan). NRDC has been successful in promoting several projects based on their technologies in Bangladesh, Brazil, Egypt, Indonesia and Vietnam.

Central Electronics Limited (CEL) holds a unique position among the family of Public Sector Enterprises in Electronics, with its emphasis on indigenous technology inducted both from its in-house developments and from the country's National Laboratories for its production programmes in diverse hi-technology areas of National relevance. The activities of CEL are Sharply focussed in three thrust areas:

i) Solar Photovoltaic Cells, Modules and Systems for variety of applications.

ii) Selected Electronic Systems - Equipment for Railway Signalling and 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 area 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.

1.9 During the year 1992-93, there was an alround growth in the activities of different programmes of DSIR.

II. COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

1. INTRODUCTION

1.1 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 observed the period 28 September 1991 - 26 September 1992 as the Golden Jubilee Year.

During the last half a century of its existence, the Council of Scientific & Industrial Research (CSIR) has emerged as a premier national science & technology (S&T) agency with a vast network of National Laboratories, Extension & Regional Centres and Complexes spread through the length and breadth of the country. Over these years, CSIR has made major contributions to the industrial and socio-economic development of the country besides achieving excellence in basic research and creating a strong infrastructure in terms of S&T manpower in the country. In general, these contributions encompass three important sectors of the national fabric, viz. industrial progress, socio-economic development and generation of export potential for the country's products.

1.2 CSIR's involvement in accelerating the industrial development of the country has been in terms of providing technical know-how for upgradation of existing technologies, improving efficiencies of existing processes and generating indigenous technologies in response to emerging needs of the industry. The major areas of CSIR's R&D activity have been: agro-chemicals including pesticides, catalysis, drugs, petroleum processing, electronic control systems for agro-industries and natural products.

The formulation of the Eighth Five Year Plan (1992-97) of CSIR during the last quarter of 1991 marked the beginning of a reorientation of the R&D programmes of national laboratories in accordance with the new industrial and trade policies of the Government of India. The total R&D plan was categorised into four major groups viz. industry/economy oriented programmes, societal programmes, basic research programmes and research support activities and technical services. The achievements of CSIR laboratories are categorized as:

- Industry & Economy - oriented
- Societal
- Rural Technologies and Extension Activities
- Technical Services, Support Activities and Consultancies
- Basic Research

2. INDUSTRY/ECONOMY - ORIENTED PROGRAMMES

2.1 Among the major Industry/Economy-oriented programmes of CSIR laboratories, those relating to drugs, agrochemicals including pesticides, catalysts, chemicals and intermediates and leather constituted a sizeable chunk. Centchroman, developed by CDRI, was launched in the market. IICT transferred technologies for some important drugs such as AZT (for AIDS), Etoposide (antitumor agent) and Keterolac (analgesic); NCL ex-

ported technology for the production of Encilite-3, a catalyst; the seal and sink technology of CLRI for upgrading lower ends of leather having grain defects has received worldwide attention.

2.2 Drugs, Diagnostics, Pharmaceuticals

Centchroman, developed by CDRI, has been commercialised by Hindustan Latex under the trade name 'Saheli', at selected outlets. It has also been licensed to a Private Sector Company, Torrent Pharmaceuticals, Ahmedabad. Trial productions have been initiated by both the Companies. Secrecy agreements have been signed with Pharmaceutical Companies of six (6) other countries (Bangladesh, Chile, France, Spain, S. Korea, Turkey) for its marketing and/or manufacture. In the meanwhile extended Phase III trials have been successfully concluded and mechanism evolved for its Phase IV surveillance. Its Phase III trials in advanced cases of breast cancer are progressing.

The process know-how for pyrithioxin (a drug for geriatric disorders) earlier released by CDRI has been successfully commercialized by Themis Chemicals Ltd., Bombay. The drug is marketed under the trade name Cerebol.

New process technologies for the following known drugs were developed and released by IICT for commercialization: AZT, Etoposide, Pyrazinamide, Metoprolol and Nadolal, and Keterolac.

AZT, or 3' - azido - 3' - deoxythymidine, is the only approved (but expensive) drug for the treatment of Acquired Immune Deficiency Syndrome (AIDS). AZT is a monopoly drug of M/s Burroughs - Welcome (USA). IICT starting with thymidine has developed an innovative approach for producing AZT, modifying and optimizing every step.

The innovative process for the manufacture of AZT developed by IICT is being implemented by CIPLA, Bombay and the product will soon be introduced in the domestic market. The indigenous manufacture is expected to bring down the cost of a vial of AZT to about Rs. 15/-, less than a third of the price of an imported vial.

AZT, produced on the basis of IICT process, holds adequate promise for export to other countries, particularly those in Africa.

Etoposide is a semisynthetic anti-tumor agent widely used in the treatment of lung and testicular cancers and, in combination with other anticancer antibiotics, is used for treating other solid tumors. The technology for producing Etoposide was released by IICT in 1990-91 to CIPLA which has commercialized it in August 1991. Each month CIPLA distributes between 10,000 and 20,000 vials to various cancer hospitals. Each vial is sold at Rs. 150 as against the sale price of Rs. 550 per imported vial. CIPLA has also started exporting the drug to other countries.

Armour Chemicals, Bombay are planning indigenous production of 100 TPA (valued at Rs. 15 crore) of Pyrazinamide, an anti-tuberculosis drug, based on technology developed by IICT. In combination with other drugs, Pyrazinamide reduces the total therapy period from 1 1/2 years to three months. The country is totally dependant on imports, for this drug.

Metoprolol and Nadolal are beta-blockers extensively used as cardio-vascular drugs. IICT has developed technologies for producing 5 TPA each of both the drugs from basic intermediates and transferred the technologies to Lupin, sponsors of the project. Lupin is now exporting Metoprolol to developed countries.

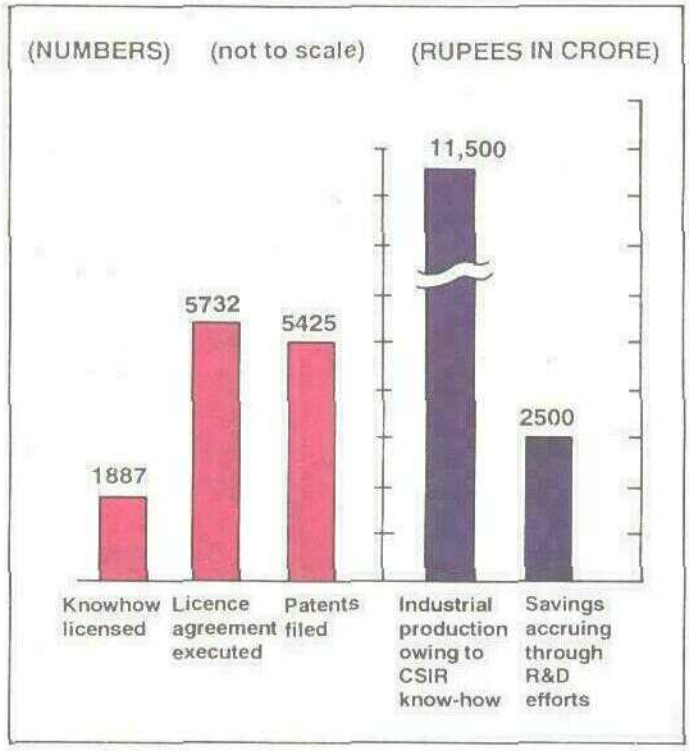
Keterolac is an effective analgesic recently introduced in the USA. This drug is imported. A process for the manufacture (20 TPA-valued at Rs. 50 crore) of Keterolac has been developed and released by IICT to Lupin, Cadila and Standard Organic Chemicals, who are now commercializing the process.

IICT has started export of drug technologies. Agreements have been entered into, through NRDC, with parties in Egypt and Brazil for supply of technologies for the production of 12 drugs in a phased manner at a premium of $25000 per drug and royalty at the rate of one per cent for a period of five years. Agreements have also been finalized with

RESEARCH OUTPUT INDICATORS

	1991-1992	Cumulative
Knowhow licensed (No.)	39	1887
Licence agreements	200	5732
Industrial production based on CSIR knowhow (Rs. crore)	1600	11,500
Saving in productivity accruing through CSIR R&D efforts (Rs. crore)	200	2500
Patents filed (No.)	238	5425
Contract value (Rs. crore) (of projects in hand)		
(a) Contract Research	150	
(b) Consultancy	24	
Cash flow (Rs. crore) through		
(a) Contract Research	61	
(b) Consultancy	10	

RESEARCH OUTPUT CUMULATIVE



II.1 Research Output indicators in 1991 (table) and Cumulative Research Output

companies in Philippines and Thailand for export of technology for three drugs. Lupin, a licencee of IICT technology for AZT, is planning to undertake production of AZT in Bangkok.

2.3 Agro-chemicals

The Indian Institute of Chemical Technology (IICT), Hyderabad, continued to play on important role in developing new processes for agrochemicals. An improved process for the manufacture of chlorpyriphos, a versatile insecticide, has been developed by IICT. At present the requirements of the country for this insecticide are met by imports. The IICT technology has been licensed to six firms in the country and one of them has started trial production.

2.4 Catalysts

Para Dimethyl Benzene (p-DEB) is a high value solvent used in the PAREX process for the adsorption and separation of hydrocarbon mixtures. At present Universal Oil Products (UOP) is the only supplier of p-DEB in the world. The total demand in the country is expected to be about 500 tonnes per annum, by 1994-95. Hindustan Polymers (HP) Ltd. are likely to put up a 350-TPA plant (estimated product value Rs. 15 crore per annum) for manufacturing p-DEB by the NCL-HP technology. After successful pilot plant trials, the catalyst developed at NCL, is to be loaded in the commercial reactor of the company.

NCL developed a process for manufacturing a new hydrodewaxing catalyst composite based on Encilite-3 and the process has been licensed to an European firm. This is the first time that such a sophisticated technology has been transferred from India to a developed country. United Catalysts India Ltd., (UCIL) manufactures this catalyst by utilizing the NCL technical know-how and exports it to Europe.

Gujarat Alkali & Allied Chemicals (GAAC) Ltd., Ahmedabad, are setting up a semi-commercial pilot plant for the manufacture of acetic acid (product value Rs. 1.32 crore per annum) based on Encicarb an NCL carbonylation catalyst. GAAC's design of a 2000-3000 TPA propionic acid plant for installation in Gujarat State is nearing completion. The estimated product value is Rs. 18 crore per annum.

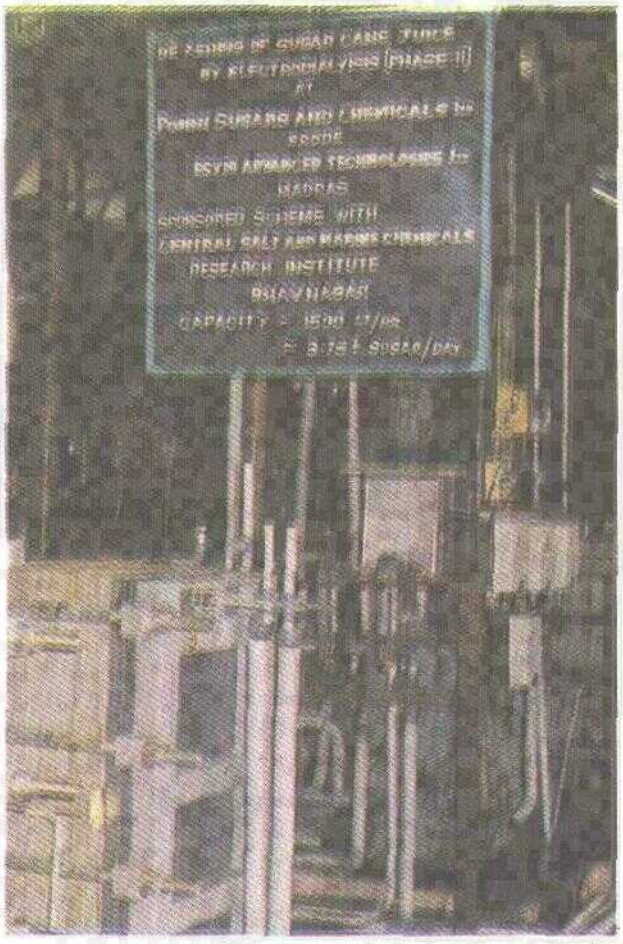
2.5 Chemicals & Intermediates

NCL has developed a process for the continuous fermentation of molasses to ethanol using a special yeast strain called Encilium. Encilium technology was first utilized by Dhampur Sugar Mills (DSM), Dhampur, UP with a production capacity of 50 KL/day. Another plant (18 kL/day) is being commissioned by Belganga Sahakari Sakhar Karkhana, Chalisgaon. The technology has also been licensed to Ugar Sugar Works Ltd., Sangli, Maharashtra, (35 kL/day). The Encilium technology is now available on a turnkey basis with guarantees of performance.

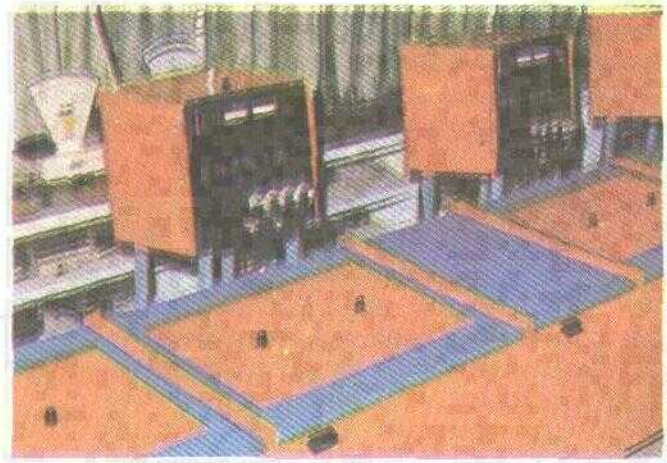
CSMCRI had earlier transferred to M/s Navin Industries, Bhestan, Surat, the know-how of recovering bromine from the bittern left after harvesting of salt from sea water. The bittern contains potassium bromide which, when chlorine is passed through, yields bromine. The firm has now been provided with technical guidance at CSMCRI to instal a glass unit to recover bromine from its halon plant. This work has helped the industry recover about 200 to 250 kg. of bromine per day. The current price of bromine is over Rs. 100/- per kg.

Clarified sugar-cane juice contains about 3-7 gm/lit. of inorganics. Removal of these inorganic salts from sugar-cane juice (know as deashing) results in recovering additional quantity of sugar. The treatment by electrodialysis is better than that using the conventional ion-exchange process. The work for the second phase (1200-1500 lit/hr of juice flow rate) is in progress at M/s. Ponni Sugars and Chemicals Ltd., Erode. The work has been taken up by CSMCRI under the Sponsored Research & Development (SPREAD) programme of the Industrial Credit and Investment Corporation of India (ICICI), Ltd., with M/s. ESVINTECH, Madras as the engineering consultancy firm.

NAL has successfully developed a process for heavy nickel plating of stainless steel discs used as



II.2 Deashing of Sugarcane Juice by Electrodialysis - CSMCRI



II.3 NAL Plant for the Manufacture of SS Discs for NPC

seals against the leakage of heavy water in nuclear reactors. The seal disc has been a critical item for the Nuclear Power Corporation (NPC). After the development of a process that yielded a seal accepted by NPC, NAL went on to design and commission a plant for the manufacture of these discs on behalf of a contractor to NPC. This plant, located at NAL, has already produced more than 7000 seal discs and supplied them to the customer. The imported value of the discs produced to-date is Rs. 10.5 crore.

2.6 Biotechnology, Agrotechnology

Pilot scale culture of Artemia - a live feed organism required in the aquaculture industry - was successfully carried out by NIO, at Jamnagar. A total of 700 kg dry cysts of Artemia was harvested, processed and marketed by M/s Ballarpur Industries Ltd. under the brand name "Sunshine". As a result of this success, M/s Ballarpur Industries Ltd. propose to go in for large scale commercial production of Artemia, at new sites.

A process technology for production of standardised oleoresin of pyrerthrum flowers has been developed by CIMAP. The process was optimised in a pilot-plant with a capacity of 40 kg per batch and satisfactorily demonstrated to two clients. The Institute also provided them the designs of a commercial plant with a capacity of 1 tonne flowers per batch. Pyrethrum oleoresin, a safe and natural pesticide, is in great demand in our country. Commercialisation of the process would help the country not only meet the country's requirement, but also save foreign exchange.

2.7 Leather

CLRI has transferred the Seal and Sink Technology to four tanneries in India. This is a special finishing technique suitable for upgrading lower ends of leather having grain defects. Normally, such leathers do not fetch high value in the local and the international markets. The technology, exhibited in the Paris Fair in which CLRI participated for the first time, attracted attention. Negotiations concerning the transfer of this technology to M/s. Incoma, Milan, Italy, are at an advanced stage.

2.8 Instrumentation and Electronics

CEERI Pilani has made a mark in the area of application of microprocessor-based electronic control systems in manufacturing industries. The sugar industry has already derived benefits due to this development. A consortium of industries has signed up an agreement with CSIO for the manufacture of Linear Accelerator (LINAC), earlier designed and built by CSIO and SAMEER.

A flow stabilization system for mixed juice was designed, and developed to stabilize flow of mixed juice within 5% from 30% variations with manual control. A PC based control system software for juice evaporation control was developed by CEERI for data acquisition of 16 channels. Know-how of the system was transferred to M/s Simbhaoli Sugar Mills (UP), M/s Scientific Instruments Company Ltd., Allahabad (UP), M/s Satwik Electric Controls Ltd., Nasik (Maharashtra), M/s Elecot, Madras (Tamil Nadu) and M/s Digital Utilities, Calcutta (WB). - Expected annual return from modernisation using CEERI equipment for 200 Sugar factories is over Rs. 18 crores.

Besides fabrication of W-band millimeter wave impatt diodes, packaging of the devices was taken up separately in parallel because mm-wave packages for W-band devices are not available commercially throughout the international market. Parts and components were fabricated by CEERI and the entire package was assembled by optimizing the bonding sequence of dissimilar material components, keeping in view the bonding parameters of

II.4 Oxygen Analyzer Developed by CEERI

II.5 Zirconia Cell for Oxygen Analyzer, CEERI

the diode chip. CEERI has supplied to DRDO W-Band Impatt Diodes valued in International market at Rs. 70 lakh.

Know-how of the Oxygen Analyser was transferred by CEERI to M/s Keltron Ltd. Trivandrum, M/s Instrumentation Ltd. Kota and M/s CMP Controls, Bombay.

In January 1992 NPL successfully operated its hybrid superconducting magnet up to a field of 11 T. The back field (7.8 T) is provided by a wide bore superconducting Nb-Ti magnet and the inner insert of Nb_3Sn provides an additional field of about 3.2 T. The Nb_3Sn insert is a coil fabricated by the 'wind and react' technique. This is perhaps the first time that a Nb_3Sn magnet has been fabricated and successfully operated in the country; also a field of 11 T has been produced for the first time by the magnet fabricated by a laboratory in the country.

The agreement for the transfer of technology for the manufacture of Linac machine was signed between the Department of Electronics (DOE) and the five public sector units in May, 1991 at New Delhi.

The first machine designed and built indigenously by CSIO and Sameer and christened 'Jeeven Jyoti' has been installed at the Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh and is successfully treating patients since March 1990. This generated keen interest amongst industrialists who wanted to take up the CSIO know-how for the manufacture of LINAC. Five public sector undertakings (PSUs), namely, M/s Andrew Yule & Co, M/s Bharat Electronics

Ltd., M/s Bharat Heavy Electricals Ltd., M/s Electronics Corpn., of India, and M/s Instrumentation Ltd., have floated a consortium for the manufacture of indigenously designed high-tech cancer therapy units currently being imported. The technology has been transferred to the consortium for a token fee of Rs. 5 lakh, shared equally by all the five members. Besides this amount, the consortium members are contributing Rs. 12 lakh each to a common fund, which would be used for further technology development.

2.9 Petroleum

IIP in collaboration with Engineers India Ltd. (EIL) and Hindustan Petro-Chemicals Ltd. (HPCL) has developed an energy efficient and environment-friendly technology for the production of aviation turbine fuel (ATF)/superior kerosene (SK) through solvent extraction. After successful completion of the demonstration run for the production of ATF/SK in the pilot plant of HPCL, Bombay, the Indian Oil Corporation (IOC), has accepted the technology for its Digboi unit.

IIP has developed know-how for the production of tetramethylene sulfone, also known a Sulpholane, used as a selective solvent for the extraction of aromatics from various refinery streams and removal of acid gases from natural gas. The technology (one tonne per day, value of annual turnover being about Rs. 5 crore) has now been transferred to a firm in Gujarat.

2.10 Coal

CFRI has developed a method for the solvent purification of crude anthracene (containing 18-20% anthracene) by a two-stage extractive crystallisation process and identified a potent catalyst for oxidation of pure anthracene to anthraquinone. The process was referred to NRDC for technology transfer to M/s Bhilai Engg. Corporation (BECO).

2.11 Building Materials, Special Materials, Environment

A new machine for making Large Aggregate Concrete Blocks has been designed by CBRI. It is now being commercially produced in Delhi. NAL's process for in-situ growth of SiC whiskers in Aluminium and Silicon Nitride matrices has found application in INSAT-2 satellite of ISAC. NEERI completed Environmental Impact Studies for a wide range of industries.

The stone and solid concrete blocks developed by CBRI are made with concrete having bigger

II.6 Concrete Block Making Machine, CBRI

aggregates, 40 mm and above, and therefore, the available block making machines could not be effectively utilised for casting these blocks. A different type of block making machine was, therefore, developed by CBRI to promote and popularise its low cost concrete blocks.

The machine is under commercial production by M/s. Victor Electrical & Machinery Manufacturers, New Delhi.

2.12 Transportation

NAL concluded an agreement with Taneja Aerospace and Aviation Limited (TAAL) on the development of the two-place aircraft (NALLA) that NAL has designed. The NAL-TAAL agreement is a landmark in the history of Indian civil aviation.

Much progress has been made on the Light Transport Aircraft (LTA) project. Three wind tun-

nel test campaigns have resulted in the incorporation of several aerodynamic refinements to the basic configuration of the aircraft. The keen interest shown by Myasischev Design Bureau (MDB) of Russia and the Indian industry has led to several purposeful multi-party discussions on the project with promise of further encouraging developments.

2.13 Engineering

CMERI has successfully developed and tested a Surface Grinding Machine Bed, a Lathe Bed, a Centrifugal Pump and a Non-corrosive Tank with epoxy concrete as the material. M/s. Praga Tools Ltd., (PTL), Secunderabad has signed an agreement with CMERI, for commercialisation of the Epoxy Concrete Surface Grinding Machine Bed. The epoxy concrete bed has already been integrated with an existing surface grinding machine and successfully tested at PTL. CMERI is also negotiating with other industries for commercialisation of Epoxy Concrete Centrifugal Pump, which has domestic and industrial applications, including handling of chemicals.

2.14 Special Materials

A process for in-situ growth of SiC whiskers in aluminium and silicon nitride matrices has been developed by NAL. A finish coat of nanometer sized metal deposit has been developed; this facility is being used for work on the sunshield panels of the passive cooler for the very high resolution radiometer of INSAT-2 satellite being built at the Indian Space Application Centre (ISAC).

RRL Bhopal has developed Ceramic Fibre Preforms used for manufacture of Metal Matrix Composites (MMCs) which find special application in Defence and Automobile sectors. The laboratory entered into collaboration with M/s Orient Cerawool Ltd. (a licencee of M/s Premier Refractories and Chemicals, USA), for the development of a semi-commercial process for the manufacture of porous ceramic fibre preforms.

2.15 Environment

NEERI developed an air pollution control package for the Cupola foundries of M/s Rita Mechanical Works, Agra. The unit saves 27 kg/hr of coke feed with an investment pay back period of 3.5 years for the air pollution control system with an efficiency of 90 per cent dust collection and 50 per cent SO_x removal.

A Basic Engineering Package for a Common effluent treatment plant (CETP) at Vapi industrial estate has been prepared by NEERI on behalf of the Ministry of Environment and Forests (MEF). It details 11 feasible options for the treatment of combined wastewater and deals with physico-chemical, aerobic, anaerobic procedures and combinations thereof for a wastewarer flow of 55 MLD.

In consultation with MEF, the Institute developed guidelines for the evaluation of CETPs and evaluated 39 CETP feasibility reports received from different States.

NEERI completed 18 EIA studies for: the Oil Exploration and Petroleum Refining Industry, Nuclear and Thermal Power Projects, Ports and Harbours, Mining and Chemical Projects, as also four risk assessment studies of the fertilizer, refinery, and oil exploration projects.

3. SOCIETAL PROGRAMMES

CSIR continued to provide valuable services and guidance in the fulfilment of missions and completion of societal programmes. Some of the achievements during the year were - development and installation of a hand pump attachable flouride removal plant (NEERI); and designs of CBRI for construction of temporary shelters for earthquake affected people.

3.1 Drinking Water

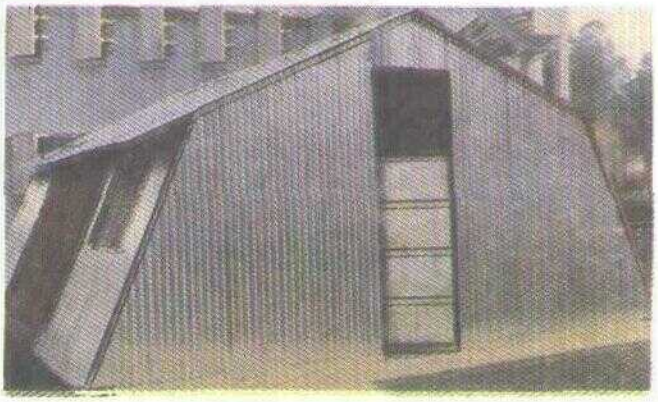
NEERI has designed a compact Defluoridation Plant based on the Nalgonda Technique and comprising a cylindrical system with in-built arrangement for regulated chemical dosing, mixing, flocculation, sedimentation and filtration with provisions for filter backwash and desludging. The Plant is made out of reinforced concrete and high duty non-pressure pipes readily available in the market.

The plant was installed in Khapanipani village in Nagpur District and operational details were tested.

RRL Jorhat has extended an area of 45 hectares under Java citronella cultivation in Tartelangsang in Karbi Anglong (Assam), Dadam Village in Tirap District (Arunachal Pradesh) and in Mizoram. Utilization of such Jhum land has provided rural people with employment besides restricting soil erosion in hilly terrain.

3.2 Housing Techniques

In order to provide temporary shelter to the homeless in Uttarkashi after the October-91 earthquake, CBRI prepared two designs of prefab shelters, namely, Kedar Kuti and Gauri Kuti. Although based on the classical 'Mansard' truss, Kedar Kuti is made of steel structurals whereas Gauri Kuti is composed of timber components. Roofing and



II.7 Prototype of Kedar Kuti (Designed by CBRI)

cladding of sides and facades are done with CGI sheets. Kedar Kuti has been designed to withstand earthquake loads specified for Zone V (maximum seismic coefficient 0.08 with a wind velocity of 130 km/hr and a snow load of 100 kg/m^2). This can provide a temporary structure as a house, for cattle, for school, for hostel, for office or even a health centre.

The State Government has adopted the design for construction of two thousand huts; 500 have already been constructed at different locations in the earthquake affected areas in and around Uttarkashi.

4. RURAL TECHNOLOGIES, EXTENSION ACTIVITIES AND SCIENCE COMMUNICATION

CLRI demonstrated appropriate techniques for finishing of leathers in rural areas. Agrotechnologies for cultivation of aromatic plants and supply of planting materials were provided by CIMAP to farmers in UP. Social/Public awareness compaigns for disinfection of water were conducted by NEERI and ITRC in different locations, by involving men, women and children. Dissemination of scientific information and popularization of science were continued by INSDOC and PID.

4.1 Rural Technologies and Extension Activities

It has been shown by CLRI that by adopting suitable reprocessing and finishing techniques, a variety of value-added finished leather products like bags, wallets, and small leather goods could be developed out of leathers tanned in rural areas. Six practical demonstrations have been carried out by CLRI for the benefit of rural tanners; over 165 tanners have benefited. A manually operated tanning drum has also been developed for the use of rural tanners.

To promote the use of labour intensive techniques and utilisation of locally available materials for rural road construction, training programmes were organised by CRRI at Patna, Ratlam and Vidisha with the help of audio and video aids. With this approach, it will be possible to bring about a reduction in the cost of road construction in rural areas.

Technology for the cultivation of spearmint and bergamot mint was extended by CIMAP to more than 1500 farmers of different districts of U.P., such as, Barabanki, Bahraich, Rae Bareilly, Sitapur and Unnao. This includes the supply of planting material of a newly developed variety of bergamot mint (Kiran) to about 500 farmers. Large scale cultivation of bergamot mint would ensure the continuous supply of linalool-rich oil used extensively in perfumery industry. This would enable us to save foreign exchange to the tune of about 1 crore of rupees every year.

In order to communicate information on toxicity problems, two major Public Awareness Compaigns and Multimodel Pollution Monitoring camps were organised by ITRC at various locations of Lucknow. Water, food and air samples were collected and analysed for assessing the pollution load of the city.

4.2 Science Communication

Public access to INSDOC database host system was formally inaugurated on INSDOC's Foundation Day on 20th March, 1992. At present, seven indigenous databases are available for public access on subscription basis. In order to automate various library activities NSL has already converted all its 45,000 catalogue records into machine readable form. A low cost Library Management Software Package has been developed for helping the smaller libraries in the counter to automate their functions. The software runs under MSDOS and is suitable for handling upto 50,000 catalogue records.

INSDOC has started providing a new service entitled CAPS (Contents, Abstracts and Photocopies Service). Under this service, on annual subscription, the customer can get the contents of 40 journals selected by him/her from about 5000 core Indian and foreign periodicals pertaining to different disciplines, either in the form of a hard copy or a diskette or through electronic mail. On browsing the contents, order for the abstracts and/or photocopies of full articles can be placed at an extra cost.

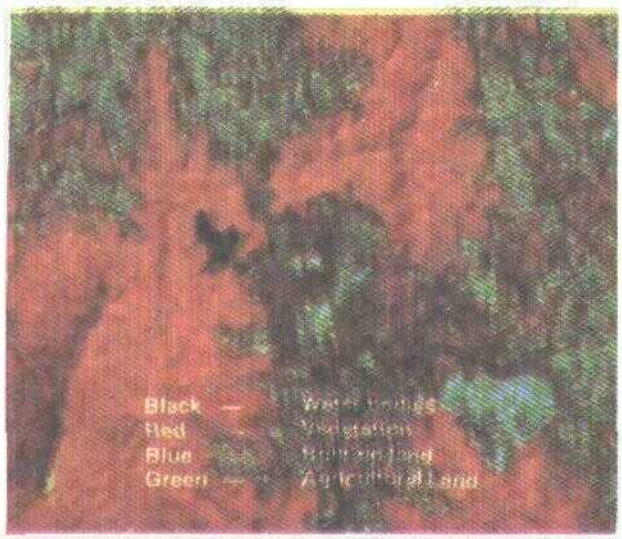
As a part of the CSIR Golden Jubilee celebrations, PID brought out several popular science books. The titles published are: Body's Battles, Mining the Ocean, His Master's Slave, Inside Stars, Plastic Feast, Ceramics are Forever and Artificial Intelligence. In addition, five Hindi titles, viz. Sharir Ek Samarbhumi, Sagar Se Sampada, Hukam ka Gulam, Sitaron ka Sansar and Plastic hi Plastic were published.

5. SUPPORT ACTIVITIES & CONSULTANCIES

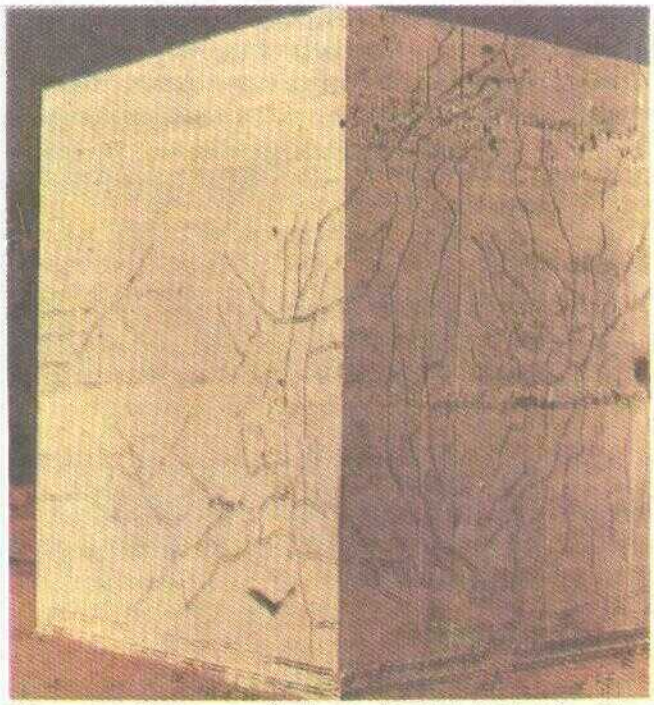
CSIR continued to offer different kinds of support, including consultancies, over a wide spectrum of science and technology, to government, departments/institutions, and industries. These were in the nature of design parameters relating to construction of tunnels for hydro-electric projects (CMRS); seismicity studies for the Kudamkulam Nuclear Project (NGRI); investigation of the launcher structure for Project Agni-02 and tower testing services (SERC-M); resource quality assessment of coal/lignite (CFRI); traffic and transportation planning (CRRI); designs for setting up of mini cement plants (RRL-Jorhat) and development of a zero-defect (ZD) welding process for BHEL (RRL-Bhopal).

Remotely sensed data from various sensors on board different satellites are being used extensively by NEERI for the study of vegetation cover, hydrogeomorphology, and land use pattern. Linearly stretched false colour composites have been employed to delineate land use pattern in the catchment area of Teesta hydroelectric project. The output was used to evolve a treatment plan to minimize environmental degradation.

With a network of six seismic stations, seismicity around the proposed Kudankulam Nuclear Power Plant near Kanyakumari is being monitored by NGRI for the last two years under a project sponsored by the Nuclear Power Corporation. The low level of seismicity attests to the suitability of the site for construction of a nuclear power plant, from the point of view of possible seismicity.



II.8 Land Use Pattern Around HOCL, Rasayani, (Area 18 x 18 sq. km)



II.9 Crack Pattern of a Typical LRC Cubicle After Blast Loading (Blast Face and Side) -- SERC, Madras

The research project Application of Laced Reinforced Concrete Construction Techniques to Blast Resistant Structures - Phase II was taken up by SERC (M). Full scale blast tests were conducted on two cantilever walls and two cubicles. The test data have been fully analysed and recommendations suggested for application of LRC in blast resistant construction.

The experimental investigation of the Launcher Structure for Project AGNI-02 was completed by SERC(M). The launcher structure was instrumented at the test site at Balasore. The instrumentation included strain gauges at critical members, dial gauges to measure the base defection, theodolite targets to measure the displacement of the tower and sensors to measure the free vibration response. The measured values were analysed and a draft report was prepared.

A total of about 15,600 metre length of cores from 772 boreholes covering 163 blocks/areas over 36 coal/lignite fields over various tracts of the country have been processed and about 30,500 borehole core samples analysed by CFRI. The results have been communicated to drilling organisations like the Geological Survey of India (GSI), the Central Mine Planning & Development Institute (CMPDI), subsidiaries of Coal India Ltd. (CIL), and the different State departments of Geology and Mining, and the Oil & Natural Gas Commission (ONGC).

The newly formed Aerospace Electronics and Systems Division of NAL has undertaken several new projects. A quick access recorder (QAR) readout system for the Airbus A320 aircraft has been designed and fabricated, and installed at Delhi for Indian Airlines. An integrated flight data system for Air India has been configured. Following extensive discussions with the Gas Turbine Research Establishment (GTRE) and Hindustan Aeronautics Ltd., (HAL), Bangalore, NAL has proposed a project that envisages a significant role for NAL in the development of a Full Authority Digital Engine Control System for GTRE's Kaveri engine. Work on the first phase of this development has already started.

With a view to suggesting remedial measures of the traffic problems, the Directorate of Town Services under the Tata Iron & Steel Co., (TISCO), Jamshedpur, assigned a study to CRRI to identify the current traffic problems, and suggest short term measures for their solution and recommend a road development plan for the year 2001.

Under the DNES programme on Energy Plantation Demonstration Projects (EPDP), the Biomass Research Centre of NBRI is providing technical inputs for over ten years now to seven organisations covering about 200 hectares. It is proposed to extend this programme to 2000 hectares in the near future. Apart from technical guidance the centre also provided the seed material of several fuelwood tree species (FWTS). Of particular interest is the selected germplasm of prosopis juliflora which has given a very good performance at many centres. The future programme involves free distribution of nearly 50,000 seedlings to the end-users.

West Bokaro Colliery, TISCO, sought the assistance of CMRS to deal with a fire problem in their coal rejects stacks. About 70 per cent of the stack of

dimension 60 x 60 x 7-10 m was under active fire. The fire combat measures applied by CMRS were (a) phase-wise cooling of the stack with profuse water to bring down the temperature to ambient level, (b) dozing the stack to reduce the height of the stack and compact it and (c) making thin coating over the cooled mass with a mixture of diammonium phosphate and sodium silicate to stop reignition.

RRL Jorhat rendered extensive services to M/s Udayana Cement (P) Ltd, Lanka; M/s Prag Shiva Cement (P) Ltd., Guwahati; M/s Bomber Cement Plant (P) Ltd., Meghalaya; M/s Karbi Anglong Chemicals, Diphu for the setting up of mini/tiny Vertical Shaft Kiln (VSK) cement plants. At present 36 VSK mini cement plants are in commercial production based on RRL technology and they produced cement worth of Rs. 20 crore during the year 1991-92.

Bharat Heavy Electricals Ltd. (BHEL), Bhopal, faced the problem of weldment rejections of copper short-circuit rings used in AC machines. RRL (Bhopal) investigated the problem and found that the rejections arose due to the poor weldability of the copper used. The Laboratory developed a new process based on a modified weld-joint design. The new process, targeted to achieve Zero Defect Welding (ZDW), has proved successful. BHEL is now utilizing the same.

6. BASIC RESEARCH

6.1 Superconductivity

In the beginning of 1991, considerable excitement was generated with the STM observation of growth spirals in epitaxially grown thin films of YBa CuO. The origin of such spirals is intimately linked with screw dislocations. The results motivated NPL scientists to investigate bulk single crystals of a host of different high Tc. cuprate systems, using high resolution STM. As a part of the collaboration, high quality single crystals were produced from different centres. The STM investigation of YBa CuO and Bi-2122 single crystals revealed similar spirals and associated screw dislocations of density comparable to YBa CuO thin films.

6.2 Ocean Science

Analysis of hydrographic data collected along four sections in the north western Bay of Bengal shows the presence of coastal upwelling which is mainly caused by local winds (alongshore wind stress component). The derived circulation at the surface layers is weak and shows a net eastward transport of 2.0×10^6 m^3 s^{-1}.

3-D circulation models of the northern Arabian Sea and Equatorial Indian Ocean have been developed with the objective of simulating the seasonal and monthly mean circulation characteristics.

Extensive measurements of nitrous oxide in the Arabian Sea have revealed high degrees of surface saturation and consequently a large atmospheric flux indicating that the Arabian Sea could be a significant source of nitrous oxide to the atmosphere. The results also suggest a high rate of nitrous oxide losses to the reducing zones implying a much higher rate of gross production than believed so far. A novel nitrification-denitrification couple (NH_4 --> NH_2OH --> NO --> N_2O) has been proposed as the dominant mechanism of nitrous oxide production at low oxygen concentrations based on the available information on the isotopic composition of nitrous oxide dissolved in sea water.

6.3 Synthesis of Organic Compounds

FK-506 isolated from Streptomyces tsukubaensis by Fujisawa group has attracted worldwide attention owing to the immunosuppressive activity. Work on synthesis of FK-506 was continued at IICT. IICT achieved an efficient synthesis of C-27 to C-30 fragment of FK-506, the synthesis beginning with (2S, 3R)-epoxide of 4-benzyloxy-cis-2-buten-1-01, a versatile synthon for many natural products.

Attempts have been successfully made by IICT for an efficient partial synthesis of taxol from an easily and permanently accessible taxol congener. Taaxol is one of the most promising of Yew species, a very slow-growing plant. The isolation procedure is difficult, low-yielding and obviously fatal to the source which is threatened.

A total synthesis of cervinomycin has been done at IICT. Cervinomycin is an antibiotic possessing strong inhibitory activity against anaerobic bacteria and mycoplasmas. IICT developed an expedient synthetic route. The first synthesis of cervinomycin was made in the USA; IICT is the second laboratory to synthesize it.

6.4 Chloroplast Genome Organisation and Function in Populus

The chloroplast DNA from populus was isolated, purified and partially characterized at NBRI. A genomic library of chloroplast DNA which was prepared using short gun method was screened to identify clones containing genes responsible for herbicide binding reaction centre polypeptide of photosystem II. The clone containing this gene (psb A) was used for studying the physical map of the DNA fragment containing the gene. In order to undertake nucleotide sequencing studies of the gene, nested deletion mutants containing decreased length of the DNA fragment were generated.

6.5 Molecular Aspects of Cataractogenesis - The Smoke: Cataract Connection

Cataract, or opacification of the eye lens, occurs due to environmental, genetic and even behavioural factors. It has been shown earlier, at CCMB, that the increased insolation in the tropics, as compared to that in more temperate regions, leads to earlier direct as well as phytodynamic damage to lense proteins, leading to both cataract and opacification of the lens. It has also been shown that photo-oxidation induces non-disulphide crosslinking in lens crystallins, leading to the formation of high molecular weight products. Epidemiological studies have indicated that smokers as well as people who use cheap, smoky cooking fuels run an increased risk of cataract. Work at CCMB has been focused on the effect of smoke condensates on the intact eye lens, both in vitro and in vivo.

6.6 Hot Spots in Oncogenes

Predominant genetic alterations that occur during malignant transformation are those that lead to aberrations of cellular oncogenes and tumour suppressor genes. CCMB has been studying alterations in the c-erb B2, int-2, c-myc p53 genetic loci and attempting to determine correlations between such alterations and clinicopathological parameters, such as tumour metastasis and long term prognosis, in human breast and hepato-cellular cancers. Novel rearrangements (possibly translocations) have been found at the int-2 and c-erb B2 loci in some primary breast cancers. These alterations appear to play an important role in the development of these tumours, although they may not serve as significant prognostic indicators. Evidence has also been found of a mutation hot spot in the p53 gene in one hepatocellular cancer.

6.7 Protein Phosphorylation as a Molecular Switch

A protein tyrosine phosphatase (PTS-S) DNA binding property may allow this phsophatase to act on DNA - was expressed in E coli by constructing an expression vector. The bacterially expressed enzyme was found to be enzymatically active and bound to DNA with a fairly high affinity, the binding domain being localised in the C-terminal 57 amino acid region. The DNA binding property may allow this phosphatase to act on DNA-bound phosphotyrosine containing proteins. Expression of PTP-S mRNA was shown to increase on mitogenic stimulation of T-lymphocytes, while cycloheximide, an inhibitor of protein synthesis, increased the mRNA level in resting lymphocytes. CCMB observations suggest that postranscriptional regulation of mRNA stability is an important factor in controlling the level of PTP-S during mitogenic stimulation of T-lymphocytes.

6.8 Transport of Proteins Across the Nuclear Membrane

The selective transport of a nuclear protein requires signal dependent binding prior to translocation across the pores in the nuclear membrane. Monoclonal antibodies have been obtained to a class of novel pore protcins. These antibodies affect signal binding and subsequent protein import and would be invaluable tools for further studies

on nuclear transport. Studies at CCMB on the nuclear lamina indicate a differential expression of the lamin proteins during development. The rat lamin A gene has been cloned and partially sequenced and would be used to determine lamin gene expression in embryonic development.

7. GENERAL

A meeting of the CSIR Society, presided over by the Prime Minister (President CSIR) was held on 27th March 1992. The Governing Body of CSIR met on 24.9.1991 (124th meeting) and 8.1.1992 (125th meeting).

The Advisory Board of CSIR met on 21.3.1991 and 2.2.1992.

Two Conferences of Directors of CSIR Laboratories were held at New Delhi as follows:

- *in October 1991 to discuss the draft Eighth* Plan (1992-97) of CSIR.
- on 24 and 25 February 1992 to discuss the strategy of CSIR in the wake of the declaration of the new industrial and trade policies by the Government of India.

7.1 Planning

On the basis of the declaration of the new industrial and liberalized trade policies of the Government of India and in order to project the role of CSIR in meeting the challenges posed in the context of the changed scenario, the 8th Five Year Plan (1992-97) of CSIR was reformulated.

The Plan was brought out in two volumes - the first containing the approach/strategy and thrust areas and the second detailing major coordinated programmes and laboratory profiles. The Annual Plan 1992-93 was a sub-set of the Eighth Plan.

The Division continued to coordinate programmes relating to Missions such as provision of drinking water and technology mission on oilseeds. Monthly and quarterly reports on the progress of important projects were sent regularly to the Cabinet Secretariat and the Prime Minister's Office. The Division coordinated the bibliometric analysis of research papers published by laboratories during 1991. Two publications - Significant Achievements 1990 and Research Output 1990 were brought out on the CSIR Foundation Day, on 26 September, 1991.

7.2 Human Resources Development

The number of Research Fellows and Associates receiving financial assistance during 1991-92 was 4435. The awards made during the year numbered 1992 JRF's, 753 SRF's and 249 RAs. The number of Pool Officers working as on 31 March 1992 was 679. These were 53 VAs in the year 1991-92, 45 of them from the universities and the rest 8 from the industries.

A total of 860 projects were supported this year in five broad areas of science and engineering. *During 1991-92, 151 scholars were provided travel* grants for participation in international meetings. The support to popular science journals in Indian languages was continued. At present 18 journals in 8 languages are receiving grants, ranging from Rs. 10,000/- to Rs. 35000/- per year.

7.3 Exhibitions

CSIR participated in four international exhibitions - (New Delhi November; Windhoek, Namibia, September; Luanda, November; and Ho-Chi-Minh city, N-Korea, November-December 1991). An exhibition was organized at Vadodara in Jan. 1992 during the Indian Science Congress Session. An exhibition on CSIR technologies was organized in Jan. 1992 in the Parliament Annexe for the benefit of parliamentarians from Commonwealth countries.

8. CSIR GOLDEN JUBILEE ACTIVITIES

In the year (1991-92) the Council of Scientific and Industrial Research (CSIR) observed the fiftieth year of its service to Indian Science by rededicating itself to the goals and pursuits that it had set for itself at the time of establishment. The year was thus spent in preparing to meet the new

challenges of industrial development through science and technology and pushing back the frontiers of Science. The Golden Jubilee year was marked by the holding of conferences, lectures, exhibitions, and release of books and films.

8.1 Inauguration

Inaugurating the Golden Jubilee Celebrations on 26 September 1991, Prime Minister Shri P.V. Narasimha Rao called upon scientists to reorient the R&D programmes to make them need-based for the benefit of the larger sections of the society. Harnessing solar energy, mechanization of agriculture for meeting the needs of smaller farmers, and provision of health services to every one at affordable cost were some of the key areas which needed immediate attention, said the Prime Minister.

8.2 Conferences

The first lead conference on Management of Change was held at the India International Centre, New Delhi on 27 September 1991. The second lead conference on Science in India: Prospect and Retrospect was held at the Indian Institute of Chemical Biology, Calcutta from 29 September to 1 October 1991. Thought-provoking discussions took place in the sessions on materials sciences, engineering sciences, earth system sciences, space and astrophysics, global environment, and biotechnology. The third lead conference on Technology and Industry was held at the National Aeronautical Laboratory, Bangalore on 12 November 1991. The subjects discussed included globalization and international competitiveness; technical implications for India and strategic technology upgradation and its management, mechanisms for strategic alliance among academia, R&D institutions, industries and consultants; and venture capital and innovative funding schemes for technology development and commercialisation. Another lead conference on Science & Society was held at the Regional Research Laboratory, Bhopal on 21, 22 December 1991. The discussions at this conference were spread over five sessions: science & technology and sustainable development; S&T inputs for rural development; innovative educational approaches; science & technology and decentralised planning; and a panel discussion on the role of S&T in rural development. A national symposium on Research-University-Industry-Interface was held at the Nehru Science Centre, Bombay on 20, 21 January 1992. The Conference discussed how best to reinforce productive interaction between industry, research laboratories and universities for bringing India in the technological forefront to face challenges of the global market. A Conference on Vistas in S&T Communication was held at the Central Leather Research Institute, Madras on 23, 24 March 1992. The informal format of the conference provoked lively debate on; the print media; lasting value publications; the electronic media; science through interactive media; and a panel discussion on 'place of science and the Indian societal response'. About sixty editors, scientists, science communicators and technologists deliberated at length as to how science communication in our country could be improved.

As a part of the Golden Jubilee Programme five scientific conferences were also held. The first, a National Symposium on Substitute for Wood in Buildings was held at the Central Building Research Institute, Roorkee on 12, 13 December, 1991. An exhibition of the products available and those being developed as alternatives to wood was also put up. The second scientific symposium was on Tropical Diseases; Molecular Biology and Control Strategies. It was held at the Central Drug Research Institute, Lucknow from 17 to 20 February, 1992. The discussions covered the development of new diagnostic aids, host-parasite interactions and eradication of tropical diseases. A National Symposium on Organic Chemistry; Focus on Emerging Interfaces was held at the National Chemical Laboratory, Pune on 2, 3 March 1992. The topics covered in technical sessions included photon promoted reaction in chemistry; stereochemistry control in organic synthesis; organometallic chemistry; molecular recognition phenomena - theory and practice.

The Second Congress on Toxicology in Developing Countries was held at Hotel Ashoka, New Delhi on 24-28 November 1991. An International Symposium on Fatigue and Fracture in Steel and Concrete Structures was held at the Structural

Engineering Research Centre, Madras during 19-21 December 1991. It discussed fracture mechanisms; crack growth; fatigue behaviour and testing; life prediction and reliability.

8.3 Publications

In accordance with one of its aims and objectives viz. dissemination of scientific information to the general public, CSIR (PID) brought out ten popular science books on frontier areas of science and technology both in English and Hindi. The titles are: Body's Battles; Mining the Ocean; His Master's Slave; Inside Stars; Plastic Feast; Ceramics Are Forever; Artificial Intelligence; Mind Master; Man in Space; and Hardy Composites. In addition an illustrated encyclopaedia entitled the Golden Treasury of Science & Technology, has also been brought out on this occasion. It is a unique single volume treasure house of information having around three thousand entries covering biographies, India's S&T achievements and also definitions of scientific and technical terms. To recapitulate the glorious history of CSIR, a volume called 'The CSIR Saga' was also brought out.

8.4 Films

Many eminent visionaries have contributed to the rich tapestry of scientific achievements in India. As a tribute to such pillars of modern Indian Science, two video documentaries on S.S. Bhatnagar and Homi J. Bhabha were brought out. The twenty-one minute film on S.S. Bhatnagar highlights the role he played in the setting up of national laboratories and his varied personal interests in Urdu poetry and Indian culture. The thirty-eight minute film titled 'Quest for Excellence, Homi J. Bhabha Through his Contemporaries' is an interview-based documentary.

8.5 Lectures

As a part of the Golden Jubilee celebrations, a lecture was organised at the National Aeronautical Laboratory, Bangalore on 'What is Happening in the Centre of our Galaxy' by Prof. Charles H. Townes of the University of California, Berkeley, U.S.A. The second lecture in the series was delivered by Prof. Debiprasad Chattopadhyaya on 'National Science and the Indian Cultural Tradition' on 22 November 1992 at the Indian Institute of Technology, Delhi.

8.6 Awards

During the year, CSIR instituted two awards called the Golden Jubilee prizes, one each for Life Sciences and Physical Sciences. These awards consist of a medallion and a cash amount of one lakh rupees. The prize in Life Sciences was awarded to Dr. G.N. Ramachandran a pioneer in the field of biomolecular structure - function relationship. The prize in Physical Sciences was given to Prof. C.N.R. Rao, an outstanding solid state chemist.

Goals and achievements of CSIR were on display at the science museums across the country. The exhibition was also organised during various symposia and conferences.

III. RESEARCH AND DEVELOPMENT BY INDUSTRY

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

A) In-house R&D in Industry
B) Scientific Research Associations/ Institutions
C) Fiscal Incentives for Scientific Research

Activities and achievements in each of the above are presented here.

III.(A). 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 academic 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 improvements, 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 resources, 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 fulltime Head for the R&D who would have direct access to the Chief Executive or to the Board of Directors de-

pending 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 1224 as on 31 December, 1992. The growth is also represented in Figure III A.1. Of these 1224 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, 1992.

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, ICMR, DRDO, IITs and local educational and Research Institutions before they are taken up for consideration. The applications along with comments from outside agencies, visit reports, discussion reports along with the Department's 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 1992 has been much within a small number.

During the year 1992, the Screening Committee met 12 times and considered 93 applications for recognition; 60 R&D Units were granted fresh recognition, 4 R&D Units were endorsed on the existing letters of recognition in respect of other R&D units of their company and 29 applications were rejected.

The pendency at the end of December 1992 was 17. A statement giving monthwise receipt, disposal and pendency of applications for recognition of R&D Units is given at Annexure III A.1.

138 Units were visited till the end of December 1992 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 100 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 1992, 470 In-house R&D Units were due for renewal of recognition beyond 31 March, 1992. Based on the evaluation of the performance of the R&D Units, renewal of recognition was granted to 433 Units. All applications received for renewal were dealt with and there was no pendency by end of August, 1992. A statement showing monthwise receipt, disposal and pendency of the cases of renewal of recognition of the R&D Units is given at Annexure III A.2.

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

The In-house R&D Units are distributed

In-house R&D in Industry

Major Activities

To Recognise and
To Renew Recognition

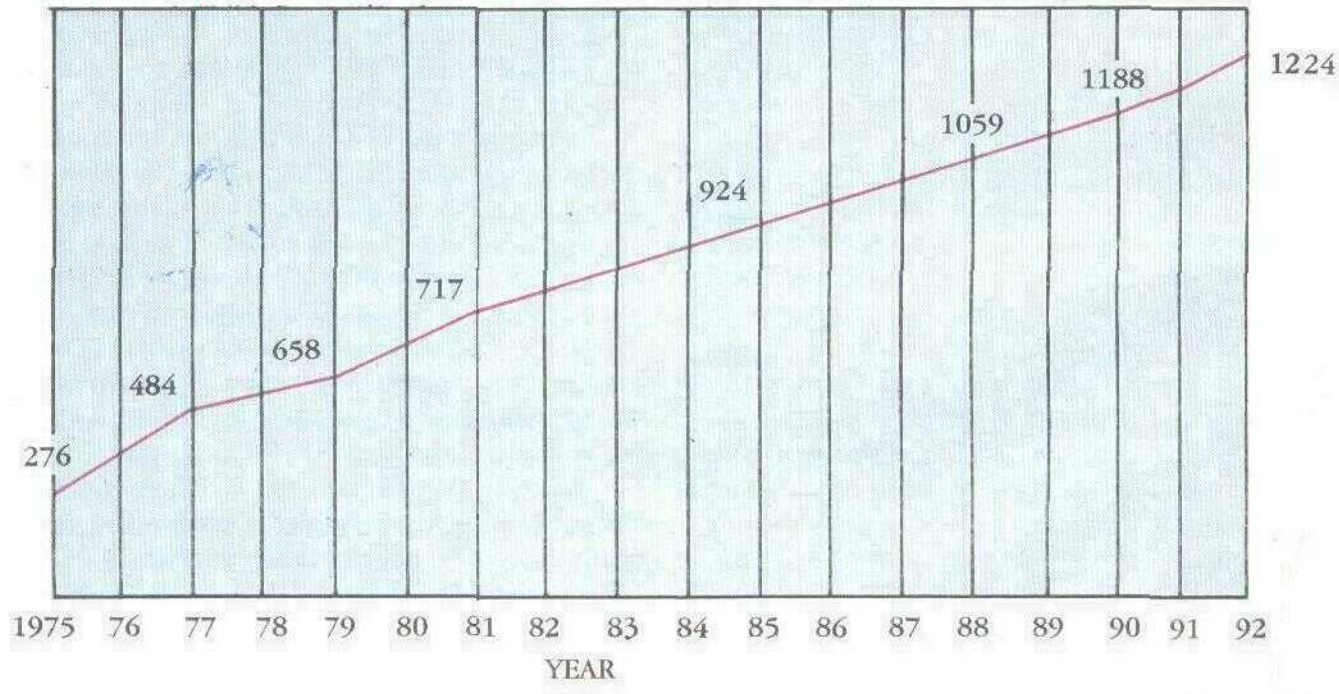
Facilities Provided

Import of Equipment
and Materials on OGL
for R&D

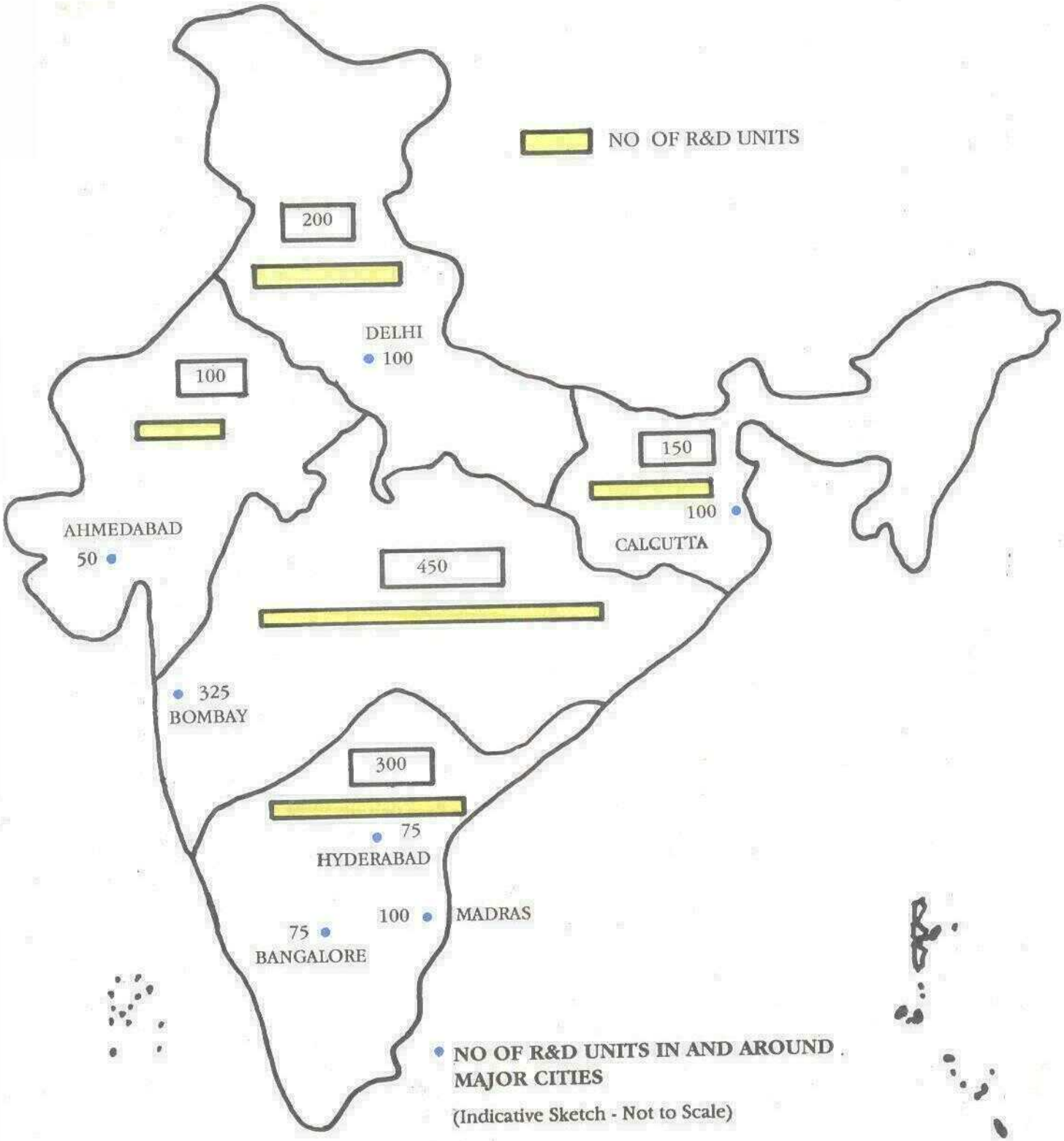
Fiscal Incentives

All R&D Expenditure
Qualifies for Tax
Exemption

No. of Recognised R&D Units



III A. 1 Growth of In-house R&D Units



III A. 2 In-house R&D Units - Zonal Distribution

throughout the country. A zonal distribution of the Units is given in Figure III A.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; over 450 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 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 1224 recognised R&D Units is of the order of Rs. 900 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. 147 R&D Units spend over Rs. 1 crore each on R&D, 296 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 III A.3 and III A.4 respectively.

The major R&D Units in public sector undertaking 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., Projects 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., Hindustan Lever Ltd., Hoechst India Limited, J.K. Synthetics Ltd., Kirloskar Cummins Ltd., Larsen & Toubro Ltd., MRF Ltd., National Organic Chemicals Ltd., Pieco 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 instruments 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. 1000 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; 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 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 1224 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 technology transfer/negotiations.

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

Chemical and Allied Industries

Development of technology to produce immunologicals like Polyclonals, Secondary antibodies, purified immunoglobulins and conjugates with enzyme and floroscent dyes.

Development of Detection Kit for Narcotic Drugs.

Development of process for the manufacture of drug intermediate parahydroxyacetophenone.

Development of process for commercial scale manufacture of yeast extract using endogenous enzymatic complex.

Development and commercialisation of process for the manufacture of a broad spectrum synthetic pyrethroid insecticide - Flucythrinate.

Commercial Scale plant standardisation carried out for the manufacture of Methyl Diethanolamine (MDEA).

Development of process/manufacturing technology and application engineering for Dipolymerised Rubber, Super Finishing Sticks, Fused Monocrystalline Alumina Abrasives, Nitride Bonded SiC Ceramics (SN-SiC), PVA Wheels for Watch Case Polishing.

Development of textile radar scattering camouflage nets, PVC camouflage nets with all the properties of visual, infrared and radar scattering.

Development of Electrical igniters, Tracer flares and propellant's compositions for use in anti-tank missile application

Developmment of commercial scale process for Enzymatic Hydrolysis of Osein to Gelatine.

Development of technology to utilize waste from Sodium Cyanide Plant for the Production of Sodium Ferrocyanide resulting in cyanide free effluent.

Development of Pilot Hi-tec point ink, solvent based permanent marker ink, fluorescent, Non corrosive fine liner ink fot microtip and liner pens, fibre tip for colour pens.

Development of process for special compounds

and bonding agents for pressure vulcanisation of vessels on site.

Development of base metal catalyst for abatement from Nitric acid plant tail gas; low energy ethyl Benzene Dehydrogenation Catalyst for manufacturing styrene.

Electrical and Electronics Industries

Development of 1 KW TV Transmitter Mobile Observation Flight/SMART-AS 7306; Communication Receiver - HS 434; 1MW Peak Power S-band Magnetron; Tone Ringer Integrated Circuit; low level detection transportable radar (Indra-I); Navigational Radar-1 Band; 7.5M TVRO Antenna.

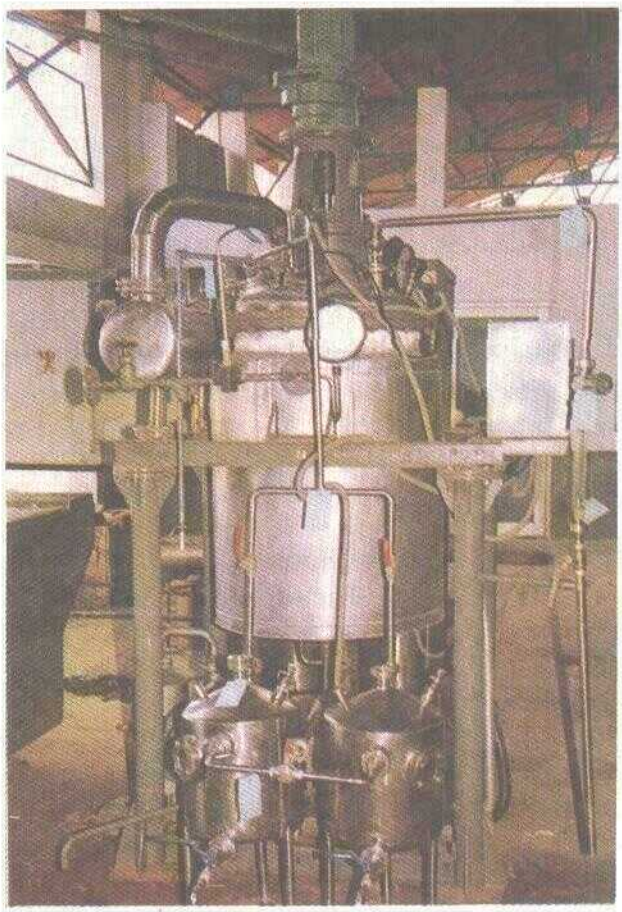
Development of lead acid battery for remote area solar photovoltaic application; dual bank charger; electronic water topping device; solar lantern; SPV based village electrification.

Development of high efficiency solar cell and module; industrial automation systems; 85L Refrigerator for photovoltaic supply.

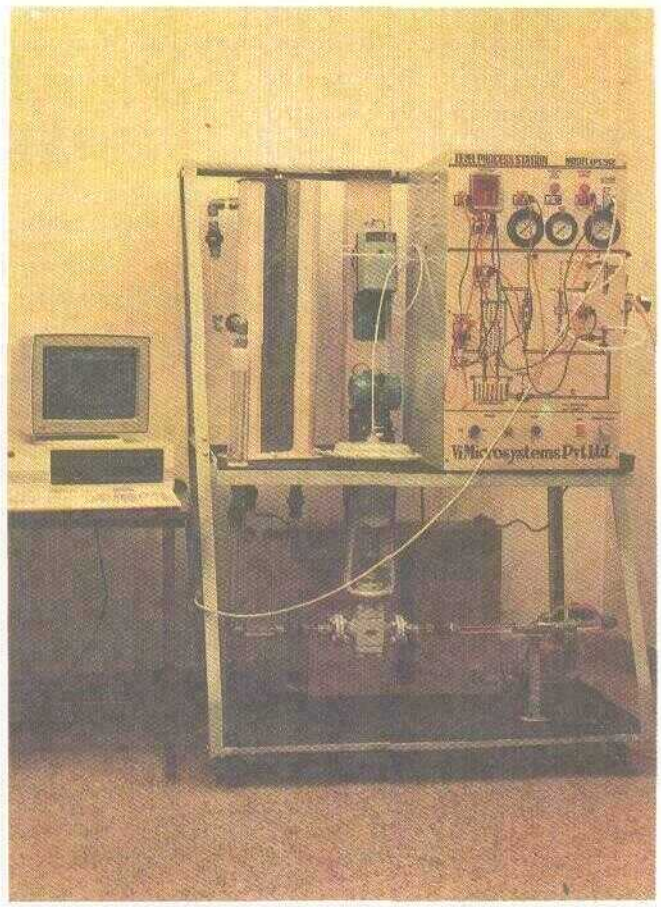
Development of programmable communication system for naval ships; onboard power supply unit for SS11 B1 Missile battery pack for Decoy applications; batteries for Sonobouy and Mine applications.

Development of Computer aided training system; Bilingual Character Generator; TDM/TDMA System; Development of Driver Hybrid for phase shifter radar (C-Band); DR223; DR628 high export potential set; DL015 MW receiver and sleek speaker encloser.

Development of TX-30 VDU Electronic Teleprinter; CONTEL; RMT concentrator or telegraph transmit terminal (TTT); Charge indicator; Time Division Multiplexer; CEPT Modems; Line Jack Unit



III A. 3. Pilot Scale Thin Film Evaporator

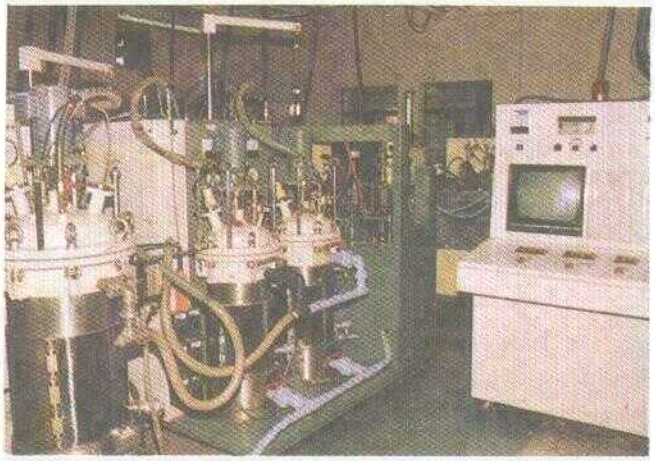


III A. 4. Computer Based Process Control Trainer

and 2 pair D.P. Box; Packet Assembler Disassembler; RAX-128 PORT/ILT-512 PORT/PCM-30 CHL. equipment.

Development of subscriber end telephone call metering; DOT EPABX Software; flight delay announcement system; interactive voice response system; tele-conferencing with privacy and auto disconnect and billing; computerised directory enquiry; dual automatic trunk ticketing system.

Development of "XMP8-40" programmable logic controller; "PG-208" hand held programming terminal; "PG-108" diagnostic aid; "DOX-1000" programming package; "XMP8-20" mini programmable logic controller; "PG-308" hand held programming terminal; "DOX-Mini" programming package.

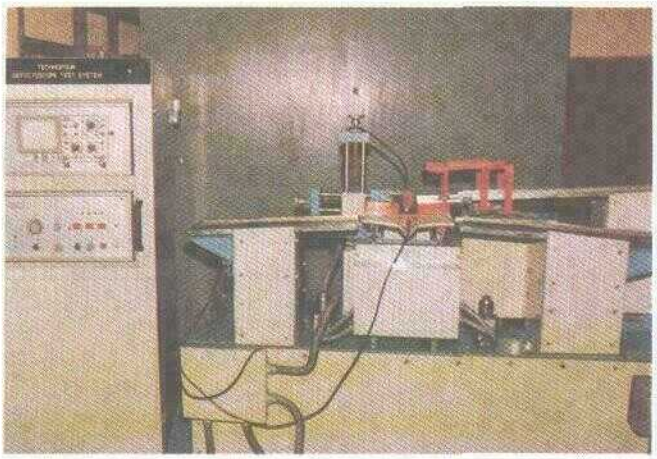


III A. 5 FBT Potting Plant

Development of microprocessor based temperature programmer for fully automatic operation of Yarn/Jet/Beam dyeing machine; controller based autozeroing EMT; micro controller based milk collection station.

Development of AC immunised relay and control groups for railway signalling; reactors for harmonic filters and frequency converters; 25 KV loco mounted Vacuum Circuit breaker with Single interrupter; dry-type Air-core Reactor; protective Spark Gap for 132 KV/220 KV Series Compensation Systems.

Development of electrostatic precipitator management system (EPMS); microprocessor based Sub-Station supervisory system; wind electric generators; Thyristor convertors for Mercury Arc Rectifier units in Steel Mill Drives.



III A. 6 Crack Detector Using Eddy Current Probe & Oscilloscope

Development of ST-3 Cross-Armless Deflection Yoke for 14" CTV; Miniature multiplier type Flyback Transformer for 14" CTV; Split diode bleeder type Flyback Transformer with improved HV regulation; 140L Compression Type Chest Deep Freezer; Hollow Cathode Lamp X-ray baggage inspection system including X-ray generator; Shipborne public address and audio communication equipment for Indian Navy.

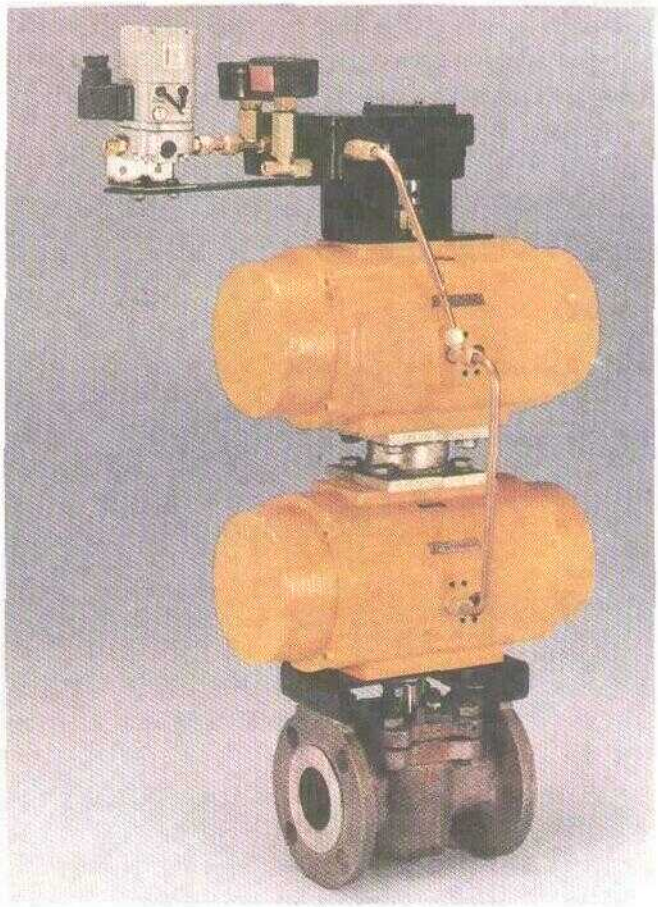
Development of flameproof Horn Driver units and public address stations for hazardous areas; Dip coated polypropylene capacitors; acrylic prelacquer for standard film resistors.

Development of PC based atomic absorption Spectrophotometer.

Mechanical Industries

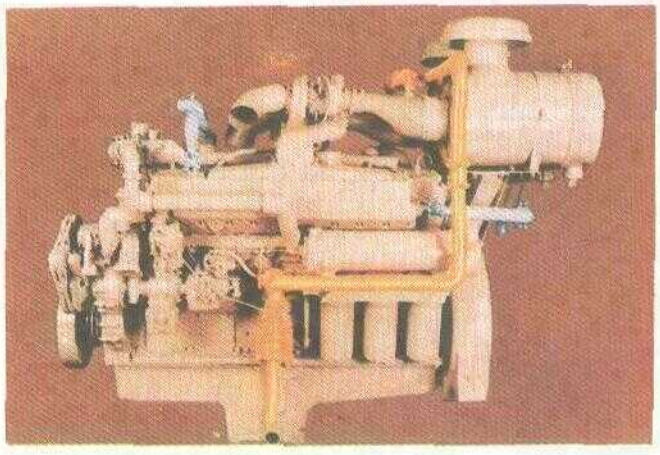
Development of Aerospace castings and forgings; Technology for manufacture of Precision Blade Forgings for Aero Engine; Jet Power 400; YD Sr. III; YD Mk. II; MWM 232; YWA engines.

Design and Development of special purpose machine model SPM42 (gear box testing rig); spe-



IIIA. 7 Elomatic Pneumatic Actuator with Plug Valve System

cial purpose machine model SPM43 (Oil hole drilling machine for A-12 Cam Shaft); CNC valve seat cutting and valve seat guide reaming SPM44; special purpose hook milling machine, inspection devices of simulation test on watches.



III A. 8 VTA-1710-G Dual Fuel Engine

Design and development of double action mechanical press 1000T; machine tending robot; single colour sheetfed offset printing machine SOM 125; train master machine centre VMC 200T; heavy duty lathe L60 CNC; precision case turning machine PCT-6; linear transfer machine LTM sheetfed-18.

Design and development of HMT 7511 tractor; HMT 4511S tractor; HMT 2522 tractor; HMT 2511 tractor; 2 Cyl 100 bore engine.

Development of Microprocessor based computer controlled electronic universal testing machine of 10 tonnes capacity; water resistance tester for checking water resistance property of watches for high pressures (20 ATM); Oscillating Weight for Automatic Day Date Watches; Indigenisation of components of portable Fire Pump KPF-1600.

Development of Cerametallic clutch for T-72 Tank; LCV clutch for T-206 TELCO; bogie castings for sub-zero temperature applications; low weight bogies for Indian Railways; Computerised methoding of steel castings; cold heading quality wire rods; 7.50-16 lug Tyres for Light commercial vehicles.

Development of 12-roll Servicer for Truck Tyre Building Machines; Helicopter Landing Grid for Warships; High accuracy vertical chuck loaders for radial passenger car/light truck tyres; 7.50-R16 steel king; F-78-15 Grip King; 8.25-20 jet trak; 12.00-24 power king; 11.00-24.5 safe drive tubeless tyre for export market; 10.00R-20 all steel radial tyres.

Design and Development of pipe layer; Positioner for welding of backactor booms of hydraulic excavators; 12 T Hydraulic Excavator; Attachments/Structures of model 170 CK Hydraulic Excavator.

Design and Development of Exhauster for Railway Brake Application; Single state high pressure screw compressor for drilling of higher depth bores of water well; Sea Water cooled high pressure air compressor; high efficiency pump for agricultural use for conservation of energy; Single package airconditioning unit, Model - 50 BL 015 Capacity

(Nominal) 15 TR; Control System for 4 Wheeler Overhead Electric Maintenance Car for Indian Railways.

Development of Hard Coating of Polycarbonate Goggles; Chemical Splash Protective Goggle; Welding Helmet; Chemical Protective Suit.

Development of Cold Form Rolling Machines; CNC Cutter & Tool Grinders; Surface Grinders with micro-processor based controls for grinding in auto cycles; CNC gear hobbing machine model PE-150.

III A. 9 Special Purpose Machine for M/s Maruti Udyog Ltd.

Design, Development and commercialisation of various sizes of tandem master cylinders for export; aluminium anodized tandem master cylinder for Premier Padmini and Maruti Cars; slave cylinders with 2 seal arrangement for Tatamobile; mechanical type FLWI for Tata LCV, non asbestos lining for 'S' cam brakes; 25.4mm tandem master cylinder for Swaraj Mazda vehicle.

III A. 10 Portable Fire Protection Pump KPF 1600

Processing Industries

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

- Development of special Mn Steel Castings for Cryogenic use.

- Development of moulded spacers made in combination of Aluminium and Silicon Rubber to prevent scratches and damages of aluminium extruded sections while handling.

- Development of process for production of high purity cadmium metal, eliminating impurities like nickel and thallium; Roasting of concentrate to remove antimony at different temperatures.

- Development of process for production of gallium metal from Bayer's Process liquor on pilot plant scale upto 4 N purity; special alumina.

- Development of process for production of High Purity Gold and Silver; Platinum and Palladium.

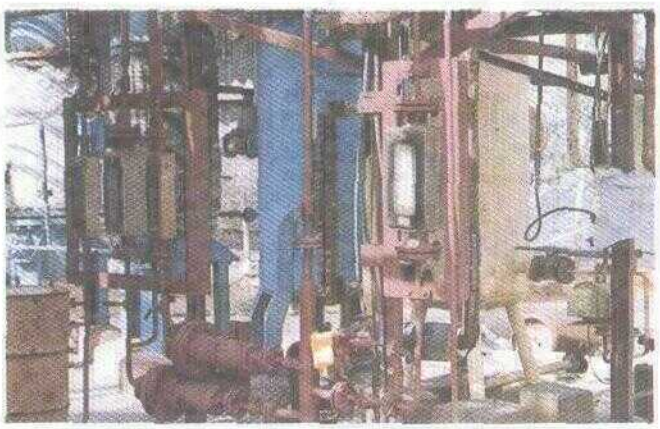
- Development of Cast Engine Components in High-Carbon High-Chromium (Chromium in excess of 30% alloy) and in High-Carbon-Molybdenum alloy with case hardness of RC 60 plus.

- Development of High tensile tubes for automobile industries; Close tolerance cylinder bore tubes for shock absorbers.

- Development of Magnaflux quality Spring Steel for Railways and Axle Quality Steel for Automobile Industry.

- Development of Boron Carbide abrasive grains in various mesh sizes; Natural Diamond grits from Boart in various mesh sizes for Dressing, Sawing and Grinding applications; Resin bonded Diamond impregnated segments and polishing

discs for mirror polishing of granites; Rounding machine for Natural Diamond grits; Hydraulic Press (40-Tonnes) for Diamond grinding wheels; Special purpose machines for lapping and polishing of ferrite magnets, optical glasses and polycrystalline diamond inserts.



III A. 11 Fumed Silica Pilot Plant

- Development of analytical methods for estimation of sodium by emission atomic absorption spectroscopy; Estimation of antimony by stripping voltametry.

- Development of adhesive coated Paper Printed Circuit Boards; Adhesive and bleached Kraft paper (for high temperature application along with fire retardancy); Adhesive coated copper foil.

- Development of low porosity High Strength bricks, and low Cement Castables.

- Development of new varieties in 135/32 and 65/24 Denier polypropylene yarn; High Tenacity FDY yarn and Fancy Super Bulk Yarn.

- Development of low profile heavy duty tyres for Indian Army.

Agro Industries and Others

- Development of hybrid seeds of sunflower, cotton, maize, bajra.

- Development of drip irrigation systems for banana, sugarcane and other crops.

- Development of "spot antibiotic sensitivity test" for the diagnosis and treatment of devastating bacterial diseases like colisepticaemia, fowltyphoid, fowlcholera and infectious caryza; "Mycotoxin Bioasay" in the diagnosis of Mycotoxicoses.

- Development of uterine irrigation pump, a device for embryo flushing, and vagino-cornual cannulator.

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 include: Perkin-Elmer model 3100 double beam atomic absorption spectrophotometer, Bleached Softwood Sulphate pulp, Shimadzu Model LC-10AD High performance Liquid Chromatography system, various tools required for testing fuel pumps and related parts, EG&G Priceton Applied Research Corrosion measurement system consisting of various components and spare parts, Perkin Elmer FTIR & HPLC system includes: FTIR Spectrophotometer, HPLC system with various types of parts, Solderability test system, VXI Bus system, Perkin Elmer Lambda-3B UV/VIS Double Beam Spectrophotometer, Ozone Analyser with Spares, Correvit L3, Rotary Storage Recorder, Nunc-Immuno Plates (2) Minimax feeding & swish drinking bridomat feeding system for breeder house, Micro Processor Dévelopment System Model 68000, Strain gauge & accessories, Multichannel Monitors, Surgical Laser Parts, Gate Turn Off Thyristor type 1201 PGA120E, Laboratory Two-Roll Mill Model LRM 150, Laboratory Hydraulic Press Model LP 50, Spectrolite Light Cabinet Model LS70.

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 request 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 1992, certificates of indigenous development of technology/process for manufacture of bulk drugs for claiming exemption from Price Control were issued in respect of 7 bulk drugs viz. Amitriptyline (Merind Ltd.), Timolol Maleate, Salbutamol Sulphate (FDC Limited), Sodium Ampicilin Crystalline and Lyophilised, Cloxacillin Sodium (Armour Chemicals), Roxithromycin (Alembic Chemicals), Glipizide (U.S. Vitamines (I) Ltd.).

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 RESEARCH AND DEVELOPMENT BY INDUSTRY

DSIR has a plan scheme on Research and Development by Industry. The EFC Memorandum for this plan scheme for the Eighth Plan Period (1992-97) was recently approved with an allocation of Rs. 4 crores. The broad objectives of the scheme are:

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

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

a) Computerization 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, 1992, there were 1207 In-house R&D units recognised by DSIR, whose data are entered in the computer.

b) In-house R&D - DSIR Interaction

The Department of Scientific and Industrial Research (DSIR) in association with the Federation of Indian Chambers of Commerce and Industry (FICCI) organised a one day Workshop on Impact of New Policies on R&D by Industry on 7th May, 1992 in New Delhi. Attended by over 50 senior representatives from Industry, Government Departments, Research Organisations, In-house R&D units and Scientific and Industrial Research Organisations (SIROs), and Consultancy Organisations, the Workshop dwelt upon a number of issues having a bearing on Research and Development by Industry in the new environment. Keynote presentations were made by eminent personalities from Government Departments, Industrial Units, Financial Institutions, R&D Units and other Research Organisations.

There were several points on which discussions took place. The Suggestions and Recommendations that arose out of the Workshop are:

- Indigenous technology development has be-

come more important in view of the new liberalised fiscal, industrial, trade and exim policies and Research and Development by Industry has a major role to play to make Indian industry global and sustain world competition.

Support measures for R&D are essential to enhance investments in R&D. Duty structure on import for R&D by recognised In-house R&D units needs to be rationalised. Foreign Exchange at official rate for R&D imports and for international R&D collaboration programmes approved by DSIR is necessary.

There is a strong need to restore single prescribed authority for approval of Scientific and Industrial Research Organisations u/s 35(i)(ii)/(iii) of I.T. Act and for single window clearance in line with the Government desire for simplification of procedures and removal of bottlenecks.

R&D should become an integral part of corporate planning and management. Close linkages between R&D, production centres, and commercial units are essential; linkages between industry, national laboratory system and university system are essential to maximise the output at optimum input levels. Protection of R&D results is also essential in the changed scenario.

c) Sixth National Conference on In-House R&D in Industry

Department of Scientific and Industrial Research (DSIR) organised the Sixth National Conference on In-house R&D in Industry jointly with the Federation of Indian Chambers of Commerce and Industry (FICCI) during 26-27 November, 1992 in New Delhi. Attended by over 500 delegates from industry, National Laboratories, IITs and Universities, Scientific and Industrial Research Organisations (SIROs), Consultancy Organisations, Government Departments, the Conference was inaugurated by Shri P.R. Kumaramangalam, Hon'ble Minister of State for Science and Technology in the Conventional Hall, Hotel Ashok, New Delhi. Shri Kumaramangalam also presented the 1992 DSIR National Awards for Outstanding In-house R&D Achievements to nine industrial units. The Hon'ble Minister also released the DSIR publications "Special Compendium on 100 In-house R&D Centres - 1992" and "Compendium on In-house R&D Centres - 1992". The Valedictory address was delivered by Prof. P.J. Kurien, the then Hon'ble Minister of State for Commerce and Industry.

Suggestions and recommendations arising out of the Conference are as under:

i. Technology is crucial to the economic development of the country. Technology management at the national and enterprise level are vital. Technology management should be integrated with corporate planning and management; personnel involved should be trained and retrained in technology management. In the first half of 1993, DSIR and FICCI may organise a meeting with industry to evolve strategies for action.

IIIA. 12 Shri P.R. Kumaramangalam, Minister of State for Science and Technology delivering the Inaugural Address

ii. DSIR may prepare a document relating to issues on Technology Management at various levels, for the guidance and further discussion on the subject.

iii. To make the Research and Development by Industry (RDI) system more effective, linkages and interactions among the industry, R&D institutions, university system, consultants and financial institutions must be strengthened. Knowledge of experience elsewhere

are useful. As a step in this direction, DSIR may bring out:

- Directories of experts, specialists and consultants available in important fields of interest to the industry.
- Status report on the industry sponsored research programmes.
- Status report on co-operative research in India.
- Status reports on RDI systems in developed and developing economies.
- Status reports on production management research in selected sectors in developed economies like Japan.

iv. Our exports of technologies and goods are very low. Steps must be taken to encourage our industry to produce quality goods acceptable in international markets. Concept of Total Quality Management (TQM) has to be inbuilt in all enterprises. DSIR may support action oriented programmes in this direction; DSIR and FICCI should support screening of Video films on TQM and ISO 9000 at appropriate forums.

v. Adequate finances for R&D are essential for making technological impact on the domestic and global scene. Government support alone is not adequate; industry must raise its investments in R&D substantially. Industry's share should rise from the present level of 23% of total R&D expenditure in the country to at least 50% by the turn of the century and sectoral R&D investments should be on the lines of developed economies. FICCI and DSIR will organise a special meeting during the second half of 1993 to evolve strategies to achieve this.

vi. An industrial R&D fund by industry for industry may be setup; suitable modifications in Tax laws to encourage such an initiative will be studied and DSIR will present such a study to the Finance Ministry for further consideration.

vii. Protection of environment is of utmost importance to the Nation. Technologies which are polluting the environment have to be re-looked immediately from the R&D angle. Cleaning of technologies shall be the immediate and short range goal. R&D leading to pollution control and environment protection should be encouraged. DSIR may institute an award for best In-house R&D efforts leading to pollution control and environment protection.

d) National awards for R&D Efforts in Industry

In order to provide recognition to the efforts of the industry towards innovative research and technological development, the DSIR 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 presented along with citations at the inaugural session of the Annual National Conference on In-house R&D in Industry. During 1988, National Awards were presented to 7 firms; in 1989 to 9 firms; in 1990 to 12 firms; in 1991 to 8 firms and in 1992, 9 industrial units were selected for presenting the DSIR National Awards for Outstanding R&D Achievements.

Shri P.R. Kumaramangalam, Hon'ble Minister of State for Science and Technology gave away the DSIR 1992 National Awards for Outstanding R&D Achievements to the following 9 industrial units at the Inaugural Session of the Sixth National Conference on In-house in Industry on 26th November, 1992:

III A. 13 National Award Winners with Shri P.R. Kumaramangalam, Minister of State for Science and Technology

Chemical and Allied Industries

1. Dr. Reddy's Laboratories Ltd., Hyderabad

Electrical and Electronics Industries

2. Bharat Heavy Electricals Ltd. (Corporate Research & Development), Hyderabad
3. Central Electronics Ltd., Sahibabad

Capital Goods Development

4. Ruston & Hornsby (I) Limited, Pune
5. Kirloskar Brothers Limited, Kirloskarvadi

Energy Conservation

6. Hindalco Industries Limited, Renukoot

Technology Absorption

7. The Kerala Minerals and Metals Ltd., Quilon

Successful Commercialisation of Public Funded R&D

8. Bharat Electronics Ltd., Ghaziabad
9. FDC Limited, Bombay

e) Special Compendium on 100 In-house R&D Centres - 1992 and Compendium on In-house R&D Centres - 1992

At present there are 1224 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. The seventh one covering 439 In-house R&D Units in two volumes was brought out in 1991.

The DSIR has compiled and brought out two publications viz., Special Compendium on 100 In-house R&D Centres - 1992 and Compendium on In-house R&D Centres - 1992, covering the activities and achievements of about 400 In-house R&D units whose renewal of recognition was due beyond 31.03.1992. The Special Compendium on 100 In-house R&D Centres - 1992 covered 100 units whose annual R&D expenditure was above Rs. 25 lakhs. All the remaining units whose annual R&D expenditure was less than Rs. 25 lakhs are covered in the Compendium on In-house R&D Centre - 1992. These were released during the Sixth National Conference on In-house R&D in Industry on 26th November, 1992 by Shri P.R. Kumaramangalam, Hon'ble Minister of State for Science and Technology.

f) 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 1992-93, four issues of In-house R&D in Industry were brought out in April, July, October,

1992 and January 1993. These have been well received by the Industry, and all other concerned agencies.

g) Support for R&D Conferences/Workshops/ Seminars/Studies

As a part of the planned activity of strengthening linkages between the National Laboratory System and the industrial units, the Department of Scientific and Industrial Research (DSIR) and Central Electronics Engineering Research Institute (CEERI), Pilani jointly organised an Interaction Meeting with the representatives of the Electronics Industry at Pilani on Thursday the 9th April, 1992 to identify the specific R&D needs of the industry.

The Department of Scientific and Industrial Research (DSIR), Regional Research Laboratory, Bhopal and M.P. Council of S&T organised a one day interaction meeting between Industry and RRL Bhopal on 27 August, 1992 at RRL, Bhopal. Attended by over 100 industrialists, scientists, technologists, engineers, government officials and others, the interaction meeting was inaugurated by Shri Kailash Joshi, Hon'ble Minister of Industries, Madhya Pradesh. Arising out of the meeting, the establishment of consortium of industries with RRL, Bhopal found ready acceptance from all the participants.

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) respectively.

h) Publications

Following 12 publications were brought out during the year 1992-93:

i) In-house Research and Development in Fertilizer Industry in India

ii) Special Compendium on 100 In-house R&D Centres - 1992

iii) Compendium on In-house R&D Centres - 1992

iv) National Awards for R&D Efforts in Industry (1992)

v) Research and Development by Industry (1992)

vi) Directory of Recognised In-house R&D Centres, September, 1992

vii) In-house R&D in Industry - Information Update - April 1992

viii) In-House R&D in Industry - Information Update - July 1992

ix) In-house R&D in Industry - Information Update - October 1992

x) In-house R&D in Industry - Information Update - January 1993.

xi) Promotion and Support to Indigenous Technology - December 1992

xii) Proceedings of the Sixth National Conference on In-house R&D in Industry - 1992.

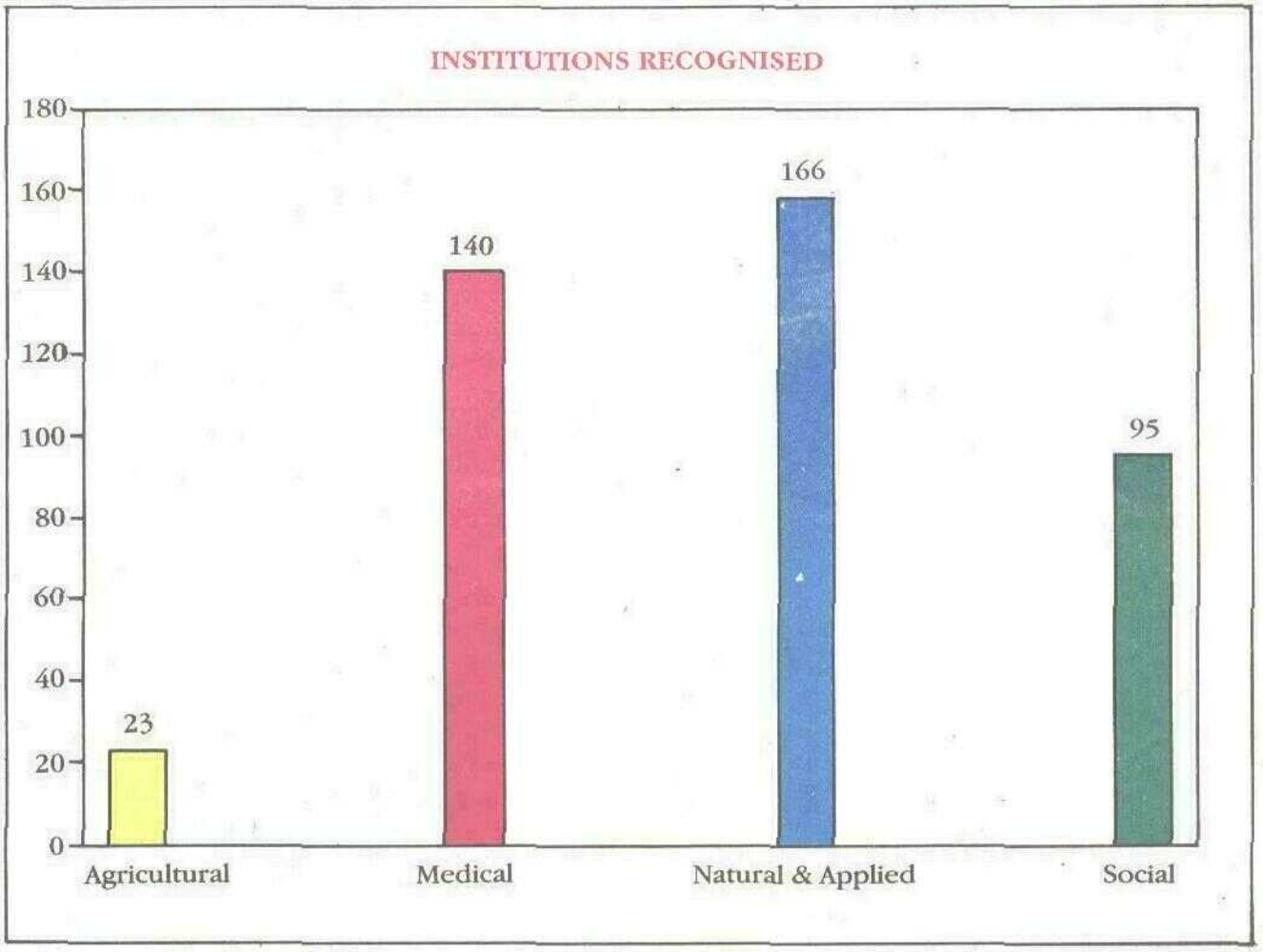
III (B). SCIENTIFIC RESEARCH ASSOCIATIONS/INSTITUTIONS

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, 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 ex-



III B. 1 Institutions Recognised

empted 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 and 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 committtee 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 Sub-groups which make 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 50 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 Recog-

III B.2 Aspee Tractor Mounted Mist blower with Multinozzle Heads for Vegetable Crops

nition 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 1992, the aforesaid committee met 12 times, approved 25 fresh cases and reviewed 204 cases. A list of 25 fresh cases approved under the scheme in the area of Natural and Applied Sciences and Medical Sciences is given in Annexure-III B.1.

At present there are 140 research organisations in the area of medical sciences, 166 in natural and applied sciences and 23 in agricultural sciences, thus making a total of 329 research organisations in

various categories. Fig. III.B 1 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. Subclauses (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 TPI. 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 4 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 and the 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.

III B.3 Pedal Operated Loom Developed for the Decentralised Sector

The DSIR will examine the applications according to the norms laid down and after obtaining approval of 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, 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.

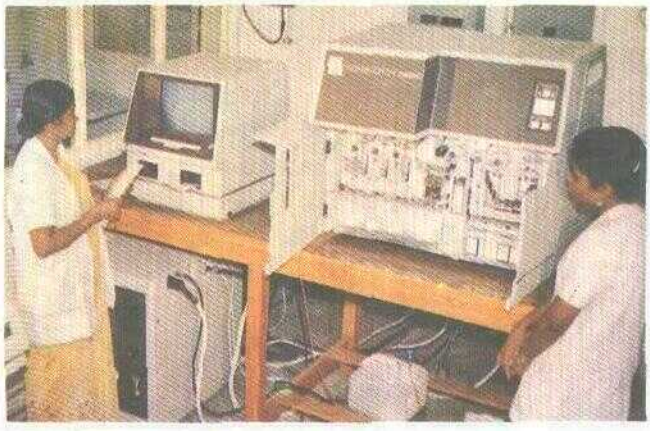
Till June 1, 1982, the Indian Council of Social Science Research was the Prescribed Authority for

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 a 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 7 new cases as given in Annexure III-B.2. and reviewed 47 cases. At present there are 95 research organisations in the area of social sciences.



III B.4 Haematology Analyser

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.

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. A fourth volume covering 321 institutions is under print.

III (C). 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 III A of this report. Similarly contributions made to approved scientific research organisations are also entitled to 100% deduction and indications of such Associations and Institutions are detailed in Section III B 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. 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 higher rate of depreciation is to be allowed for the plant and machinery using indigenous know-how. Guidelines have been issued for making applications for obtaining the aforesaid certificate.

During the year 1992, 27 certificates involving Rs. 5175 lakhs as cost of plant and machinery were issued. Details of these cases are given at Annexure III C.

3. CUSTOMS DUTY EXEMPTION

The Scientific Research and Development Laboratories and Institutions of non-commercial character are eligible for Customs Duty Exemption on the import of scientific equipment, instruments, spares as well as consumables for research and development activities and programmes. Customs 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(1)(ii) of the I.T. Act 1961.

The procedure for issuing the customs 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.

Consumable Items

i) Import upto Rs 20.00 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.

(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. upto Rs. 1.5 crores through the Pass Book Scheme. Essentiality Certificate and NMI are not required.

During the year, a total of 590 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. 40 crores.

Some of the major equipment imported were: Ultracentrifuge, tunable interferometer, blood cell counter, ultrasound systems, colour flow imaging systems, High resolution NMR spectrophotometer, Gas chromatograph, polaroid films, blood gas analyser, freeze dryer, microprocessor controlled water bath, Hybridisation incubator, HPLC, Minifluorometer, green house exhaust fan and fiber glass, trinocular, biopsy probe (ultrasound scanner), Smoke detectors, FTIR, microsyringe holder, Zoom microscope, Electron Microscope, High pressure dosing pump, Graphic recorder, UV/Vis Spectrophotometer, Nitrocellulose membranes enzymes, Note book computer, Infrared thermographic systems, Endoscopy Camera Systems, PCBs, ICs, HPLC Columns, Sirecust, Differential scanning calorimeter, TI Semiconductors, and Dry bottling kit.

4. SCIENTIFIC RESEARCH ASSETS AND ACTIVITIES UNDER SECTION 35(3) OF I.T. ACT

In the implementation of various incentive schemes for the promotion of science and technology, the Income Tax *inter alia* provides that expenditures made on capital equipment and related to research activities should be written off 100% in the year in which the expenditures are incurred. The Government however, provided that in complex cases where the Income Tax Department of the Government is unable to appreciate the technical activity involved in research or the equipment are sophisticated and intricate and the Department is unable to appreciate the use of equipment regarding research, then the matter should be referred to the technical authority referred to as the Prescribed Authority (Secretary, DSIR) through CBDT/DG (ITE).

On receipt of the reference, the office of the Prescribed Authority collects information/background regarding the description of the activity claimed as scientific research, date of commencement of the relevant projects, date of completion of research work as also the results obtained from the specific project. After obtaining all these details, the matter is examined in DSIR. In case where it is considered necessary, a team of technical experts is constituted for on the spot appreciation of the research work done at the premises of the company.

After receiving the appreciation from the technical team, a discussion is also normally held so that the point of view of the company is taken into account before arriving at a decision. After completing the processing of the case in the above fashion, the case file is placed before the Secretary for giving a decision. The Secretary in his capacity as the Prescribed Authority gives a final decision duly signed by him setting out a reasoned order.

During the year 1992, 4 cases pertaining to M/s International Marketing Pvt. Ltd., Jalandhar, M/s Lakhani Rubber Udyog (P) Ltd., Faridabad, M/s Lakhani Foot Wear (P) Ltd., Faridabad and M/s Lubrizol India Limited, Bombay referred by CBDT/DG (ITE) were considered by Secretary, DSIR as the Prescribed Authority and were communicated to the Director General (Income Tax Exemption) Calcutta.

IV. PROGRAMMES AIMED AT TECHNOLOGICAL SELF RELIANCE

The Scheme on "Programmes Aimed at Technological Self-Reliance (PATSER)" covers the following activities:

A) Technology Absorption and Adaptation Scheme (TAAS) including, Technology Evaluation and Demonstration (TED), Talented Indian Engineers and Scientists (TIES)

B) Indigenous Development of Capital Goods

Activities and achievements in each of the above are presented here.

IV (A). TECHNOLOGY ABSORPTION AND ADAPTATION SCHEME

1. INTRODUCTION

The Technology Absorption & Adaptation Scheme (TAAS), 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.

Activities and achievements for the Technology Evaluation and Demonstration (TED) and Talented Indian Engineers and Scientists (TIES) are also given alongwith TAAS.

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 dur-

ing 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 31 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 completed/in progress, are as follows:

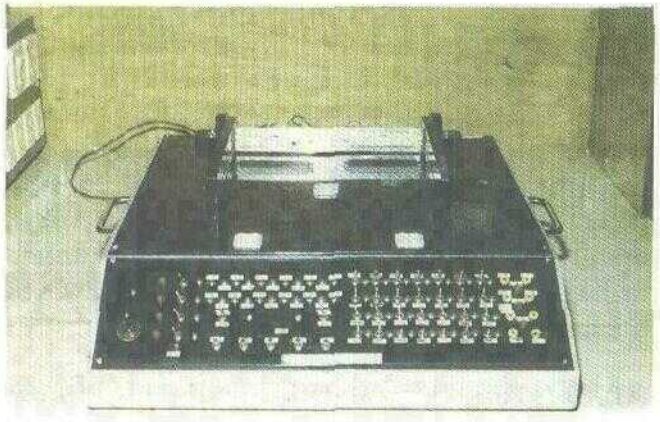
(i) Southern Pesticides Corporation Ltd., Hyderabad

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 also strengthened their R&D facilities by installing a 50 litre distillation vessel. The firm is being assisted by IICT, Hyderabad for reactor design and assistance in pilot plant work and debottlenecking. Work concerning pilot plant studies is completed.

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

The project related to Rural Radio Telephone System (collaborator 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. Both the projects were successfully completed.



IV A.1 Test Jig # 3 for DVE (Digital Video Effects)

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

The project related to advanced CNC system (collaborator 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. Specification for the advanced CNC Systems have been formulated and prototype development has been done. The project is completed.

(iv) M/s Uptron India Limited, Lucknow

Two projects related to Distributed Digital Process Control System (DDCS), (collaborator M/s Leeds & Northrup, USA) and Coal Washery System (collaborators M/s Hawker Siddeley Dynamics Engg. Ltd., UK) were approved in 1988 with partial support of Rs. 30 lakhs each, at of 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. Export systems were designed and demonstrated to Bokaro Steel Plant. In Coal Washery System, the system design has been completed. Project for DDCS is completed. Coal Washery Project is closed.

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

The project related to manufacture of heavy duty industrial fans (collaborator 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, Madras. Prototype development and testing/user trials are under-way. Detailed engineering has been undertaken by the firm based on design support given by IIS and IIT. The project is progressing well.

(vi) M/s Hindustan Machine Tools Ltd., Pinjore

The project approved in 1989 concerns development/upgradation of fuel efficiency diesel engines for 3511, 4511 and 5911 tractors based on technology imported for 25 HP diesel engine from M/s AVL, Australia. The project involves a partial support of Rs. 7 lakhs out of total project cost of Rs. 33 lakhs and is progressing. The design engineering and prototype development are completed and pilot batch will be taken up.

(vii) M/s Hidustan Teleprinters Ltd., Madras

The project related to adaptation and upgradation of Electronic Teleprinters (collaborator 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 dialing, VDU, add on FDD and adapting the ruggedised version for military application. TX 30 has been upgraded with add on features. The project is in progress.

(viii) 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-how 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.

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

The project related to Development of Side Discharge loaders, based on 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.

(x) Keltron Controls, Aroor

The project related to indigenous development of custom built 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 in progress.

IV A. 2 Sub Cooler Vessel Under Fabrication for the Project Development of Flexible Super Insulated Piping BHPV: Visakhapatnam

(xi) 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.

(xii) Hindustan Organic Chemicals, Rasayani

The project related to simulation studies for the distillation train in the Phenol plant at Cochin set up in collaboration with Universal Oil Product 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.

(xiii) 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.

(xiv) 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.

(xv) Bharat Earthmovers Ltd., Bangalore

The projects related to development of 50 ton dumpers and upgradation of 200 HP Front End Loader based on technology received from Westing house Air Brake Co., USA and Komatsu, Japan respectively was approved in Nov., 92 with partial support of Rs. 35 lakhs out of total project cost of 205 lakhs. The project is in the initial stages.

3.2 Roster/Directory of Research & Design Experts

A Roster/Directory of Research & Design Experts in Technology Absorption has been completed 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 completed.

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 related to all the 18 States have been finalised. Meetings were organised by DSIR in collaboration with Confederation of Indian Industry at Bombay, Calcutta, Delhi and Bhopal and were participated by the industrial units of the States. State Governments and others concerned with import of technology. In the meetings, the draft reports of profiles were discussed and there were presentations of experiences of industrial units and research labs on absorption of imported technology. Similar Interaction meetings had earlier been held in other States in early 1992.

3.4 Video Film on Technology Absorption

A video film on technology absorption has been completed. The film covers highlights of technology absorption projects supported under TAAS.

4. TECHNOLOGY EVALUATION AND DEMONSTRATION

4.1 Technology Evaluation and Norms Studies

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

4.1.2 The reports on Electric Lamp, Non Ferrous Castings, Aluminium, Mini Steel, Fertilizer (Phosphatic) and Fertilizer (Nitrogenous), Boilers, Forged & Portable Tools, Paper & Pulp Machinery, Steel, Drug Formulations, Ferrous Castings and Steel Forgings, Plastic Processing, Ceramics, Caustic Soda, Fire Fighting Equipment/System, Pumps, Medical Electronics Equipment, Packaging, Industrial Furnaces, Flour & Rice Milling, HT Fasteners, Cement and Ferro Alloys Industry have been finalised and printed. The draft reports on Railway wagons, Leather Tanneries, Bicycle, Rubber, Edible Oils, Paints, Secondary Steel Refining, Refractories industry, Glass, Waste Recycling, Home Appliances, Fertiliser Granulation, Plastic Ferrules, Textile Processing have been finalised, while the draft reports on Sulphuric Acid, Industrial alcohol, Soda Ash, Marble Granites, Fruit Juices, Secondary Aluminium Sector, Pesticides, Industrial Oils, Fatty Acids are being finalised. The studies which are under progress include those covering Spinning and Weaving technology in Textile Sector, Dye stuff and intermediates, Paper Mills, Hosiery & Knitting, Bakery Industry, Plastic Tank, Decorative Laminates, Industrial and Control Valves, Garments, Galvanising, Calcium Carbide, Soap and Detergents and Leather Products industry.

4.2 Interaction Meetings

Six Interaction meetings concerning Technology evaluation in Medical electronics equipment/systems, HT Fasteners, Industrial furnaces, Flour and Rice Milling, Ferro Alloys and Cement Industry were organised. Five interaction meetings on Absorption of imported technology in Gujarat, Maharashtra, West Bengal, Orissa, Bihar, Assam, Meghalaya, Delhi-HP-Haryana, Punjab-Rajasthan-UP and Madhya Pradesh were organised in collaboration with Confederation of Indian Industry to review the draft reports on technology profile of foreign collaborations in various States. These reports are under finalisation taking into account the deliberations of the Interaction meetings.

4.3 Technology Evaluation and Demonstration Project of Electrical Research Development Association, (ERDA), Vadodara

The project of ERDA relates to evaluation of

parameters of Indian and foreign energy efficient electric motors with an objective of having an insight of improved designs and manufacturing process for energy efficient motors. This project was approved with partial support of Rs. 8 lakhs out of total project cost of Rs. 10 lakhs, and is expected to assist the small and medium manufacturers of motors. The project is progressing.

5. TALENTED INDIAN ENGINEERS AND SCIENTISTS (TIES)

The "Talented Indian Engineers and Scientists Scheme (TIES)" of the Department of Scientific & Industrial Research aims to streamline and coordinate all activities in providing assistance to talented Indian Engineers and Scientists including those abroad, in areas such as: ascertaining the TIES expertise and intentions; assistance by commissioning pre-industry feasibility reports, etc.

During the year, DSIR has completed preparation of preliminary industry profiles of items considered to be of interest to TIES. 82 reports were completed 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, Teracycline/Oxy tetracycline, Poly vinyl alcohol, Chloroquine diphosphate, Trimethoprim, Food yeast, Boric acid, Acivated carbon, Magnesium trisilicate, Glass making machinery, Tartaric acid from sugar molasses, Tetrahydro-furan, Citral and derivatives from lemon grass, Silicone rubber, Nicotine sulphate from tobacco waste, Hexachloro cyclopentadine (HCCP). Diethylmaleate, Buta chlor, Carbo furan, Ceramic colours, Acephate, Vinyl sulfone, Resuscitators/ Ventilators, Soft ferrites, Acid proof cement, Acid proof bricks, Artificial heart 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.

IV (B). PROMOTION AND SUPPORT TO INDIGENOUS DEVELOPMENT OF CAPITAL GOODS

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 1991-92, were Rs. 11,200 crores on C.I.F. basis. The share of imports in the total demand on landed cost basis was higher.

The ratio of payment 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 importing countries, is similar.

Export 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 neglibible despite the fact that India with its low wage rates of skilled and trained manpower has an advantage in production of industrial capital goods, whose manufacture is mostly labour intensive.

Though, manufacturing infrastructure in India, 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.

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 many 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 sector, to integrate various stand-alone equipments into complete plants.
- Inadequacy of human resources for, design and engineering, of advanced capital goods.

3. 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 a wide

support from members of the working group as well as the Planning Commission. The scheme was approved under the Programmes Aimed at Technological Self-Reliance of DSIR. The outlay of the scheme approved is Rs. 3.80 crores for the VIII Five Year Plan out of the total outlay of Rs. 12 crores for the Programmes Aimed at Technological Self-Reliance.

The scheme aims to promote indigenous development of capital goods by removing some of the identified constraints. The scheme will provide capital goods development support for commercialisation of indigenously developed technologies and absorption of imported technologies. 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 of capital goods, to help in formulation of policies, for further growth of capital goods industry.

In accordance with the 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.

- Providing assistance, to users of imported capital goods, to develop design and engineering, infrastructure. Such users familiar as they are, with user's aspects of capital goods are in the best position to undertake systems engineering of capital goods for which there is no manufacturing base at present 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. This will be followed by the initiating development efforts for capital goods, which, otherwise, may have to be imported.

- Carrying out studies in focussed areas 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.

4. Activities

Directories of capital goods approved for import during 1989 and 1990 and 1991 by the CG Committee have been prepared and brought out in the printed form.

Directory in the area of machine tools, containing the information on indigenous capabilities in collaboration with IMTMA has been brought out in the printed form.

Studies of CG requirements of man made fibre sector, mouldable polymer sector, metal forming industry and electronic industry are in the process of finalisation. Printed reports are likely to be available in 1993-94.

Reports of the following studies on demand of capital goods by some more major sectors have been commissioned and draft reports have become available. These draft reports have been evaluated by expert committees:

- Requirement of capital goods for food processing industry.
- Requirement of capital goods for dies & moulds sector.
- Requirement of capital goods for gas & naphtha cracker projects.

The studies brought out: 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.

4.1 Food Processing Industry

The report mentions that the production of processed food products has increased several folds in last 10 years. It has increased from 29,000 crore in 1980 to 1,12,000 crores in the year 1989-90, covering the products, such as wheat flour confectionery, processed food & vegetables, instant foods, milk based products, soft drinks, meat & fish products, coffee, high protein foods, etc. The processed foods are the high value added products. The major exports of processed food products include the marine products and meat & poultry products, which together amount to about Rs. 1080 crore out of total food processing products exports of Rs. 1200 crore. It is observed that during the 1990-91, the CG import for food processing sector was about Rs. 45 crore. During the period 1992-2000 the requirement of capital goods by the food processing industry is likely to be Rs. 980 crore consisting of imported CG, indigenous CG and replacement and export demand of CG.

Main reasons for import of capital goods by food processing industry are: proprietary nature of some of the equipment, for which the design varies, from product to product to be manufactured and also with the type of materials to be processed; the process licensor's conditions to provide guarantees only with the imported equipment; long delivery schedule for the indigenous equipment and tendency of bringing certain new food products from abroad. The report has also indicated some of the limitations, faced by CG manufacturers which come in the way of indigenisation such as: *lack of design engineering capabilities; patented* design to be used in manufacture of newer processed food items; lack of testing facilities with the Indian CG fabricators; low volumes because of diversified demand of CG except for material handling and storage equipment; and non availability of detailed specifications of the equipment needed by the user industry. The report has identified some of the equipment which have been repetitively imported in past few years such as: aseptic filling machines, automatic canning machines, vacuum concentrators, positive displacement pumps, disintegrators for fruits & vegetable processing; pneumatic knives, electric saws, feather removing machine for meat/poultry processing; vacuum evaporator, spray dryer, milk clarifier for dairy industries; filling machines, plate filters, plate heat exchangers for soft drink industries; magnetic drum separators; aspiration machines, chocolate moulding machines for confectionery industry, etc.

The report recommended some measures for promoting indigenous development of CG, which include: allowing import of samples of certain CG's by CG manufacturers, which are continuously being imported without duty for development of similar machines; creation of information bank for both CG manufacturers and user industries; rationalisation of the duty structure; more coordination among the CG manufacturers and food processing industries; providing complete offer of plant and machinery by CG manufacturers to the user industry through consortium approach; strengthening design engineering capabilities; and providing complete specification of capital goods

by user industry to the CG manufacturers.

4.2 Dies & Mould Industry

The report mentions that in India, Dies & Moulds industry has grown in terms of number of units but the production has been more or less stagnant for the past several years although demand has increased considerably. Demand pattern in terms of monetary value of dies & moulds, in Indian industry, shows that plastic moulds contribute about 40-50% of the total demand, press tools contribute about 20%, whereas forging dies and jigs & fixtures amount to 10% each. During the year 1990, the requirement of all types of dies & moulds was about Rs. 500 crores, out of which the demand for plastic moulds contributed about Rs. 250 crores. The indigenous production excluding captive production during the same period was about 25 crores only. With the present rising trend in the application of plastic products/components, in most industries, the demand for dies & moulds is also likely to show a corresponding growth. Considering the 15% growth rate and current demand of Rs. 550 crores, the projections for dies & moulds industries is expected to be about 9000 crores during the period 1992-2000. Since the indigenous industry, till now has not geared up to meet this requirement of user industry the bulk of this demand will likely to be met through the imports.

Major problems & limitations which are faced by the dies & moulds industry in the indigenisation are: non-availability of raw materials and precision sophisticated machines, which are necessary for intricate shaped dies & moulds; high cost of development, high investment, long gestation period and low rate of return as compared to other industries. The report recommended: facilitation of import of die steel; development of indigenous raw material base on long-term basis; encouragement for development and use of standard components; acquisition of precision sophisticated equipment such as, CNC die sinking machines, special plating equipment, CAD/CAM systems; encouragement for obtaining latest technology through foreign collaborations; development of vendor based manufacturing system; and improvement in design & development capability of the tool rooms.

4.3 Gas & Naphtha Cracker Projects

Report states that the current production of ethylene, propylene and butadiene in India is 604,000; 313,000 and 67,000 tonnes respectively. Nine additional plants (4 Naphtha based, 4 Gas based and 1 NGL based) have been planned, thereby increasing the capacities to 35,04,000; 12,99,000 and 3,89,000 tonnes of ethylene, propylene and butadiene respectively. This amounts to an increase in the existing capacities by 480% (Ethylene); 315% (Propylene); and 480% (Butadiene). Based on the consumption patterns of various end-products, detailed analyses have been carried out on the demand of these items. Using the consumption co-efficients of end-products vs. intermediates vs. feed-stock, the demand pattern of each of the major outputs of the cracker projects (Ethylene, Propylene and Butadiene) has been estimated. To this the probable exports based on past trends and the future expectations have been added to arrive at the total demand. The basic supply scenario has also been studied by adding the existing capacities of the Naphtha and Gas Cracker projects to the capacities for the projects which have been planned. The total potential supply was then compared to the total projected demand to arrive at the demand supply gap. It is observed that the capacities planned are in excess of the demand projections. The excess capacities planned, work out to 13,62,000, 3,39,000 and 1,84,000 tonnes of Ethylene, Propylene and Butadiene respectively.

The capital goods account for about 73% of the cost of the project: of this the foreign currency portion is about 18%, and the rupees part is 55%. Classification wise, the mechanical equipment constitutes 34%, piping 14%, electrical 7%, instrumentation 15%, and other misc. items 3%. The total cost of capital goods required for the additional capacities is estimated to be around Rs. 11,000 crores, out of which the cost of mechanical equipment and piping works out to Rs. 7,200 crores. Plant and equipment worth Rs. 2,500 crores may have to be imported, at the current level of indigenisation.

The report has identified the major imported equipments which can be taken up for indigenisation by the Indian CG manufacturers with the present

infrastructural facilities available with them.

The report has identified some problems and limitations of Indian CG industries, such as: non availability or long delivery schedules of special and high grade materials of construction varying from basic metals to special alloys; long delivery schedule and high cost of brought out components; lack of design facilities available with the most of small and medium size CG manufacturers; inability of domestic CG manufacturers to offer complete package, due to lack of coordination among various manufacturers; lack of quality control and adequate testing facilities; and proprietary design of some of the equipments.

The report recommended some measures for greater indigenisation and higher exports such as: providing design and engineering facilities including adequate software support to the Indian CG manufacturers; need to adopt integrated export promotion efforts to make a dent in the international market; need to have Indian CG manufacturers registered in the approved vendor list of international user companies as well as the reputed international engineering companies, so that the enquiries are forwarded to them as and when the requirements come in; providing information on demand to assist the manufacturers in planning their modernisation and expansion; encouraging adoption of the latest quality standards, viz. ISO 9000 series, by CG manufacturers.

4.4 Development Projects and Studies in Progress:

Development projects in the area of packaging machines and electrical motors which were commissioned during 1991-92 are in progress. Brief description of the projects are given below:

(i) Development of Packaging Machine

Indian Institute of Packaging, Bombay was assigned a project for the development of 3 packaging machines, viz. High speed flow wrap machine, Form-fill seal machine for odd shaped articles and special blister packaging machine with partial financial support of Rs. 14.50 lakhs from DSIR and in financial collaboration with industry. High speed flow wrap machine will not only be comparable to imported machine but would be also suitable to the Indian conditions. It will produce the same quality of wrapping but will be cheaper than imported machine, making it economically viable for the Indian industry. The Form-fill seal (FFS) machine will be developed for the odd shaped products like nails, screws etc. The special blister packaging machine will have a preprinted backing card of large size for display. Presently, the industry depends on imports for such machines and competitiveness of certain exportable product groups suffers due to non-availability of such machines. Indigenous development of special blister packaging machines would not only help to bridge the void but will also have export potential. The indigenous development of all three machines is likely to be completed in 18 months time.

(ii) Development of Switched Reluctance Motor

The development project related to indigenous development of 7.5 KW Switched Reluctance motor drive system for varjable speed applications upto 3000 rpm was entrusted to Electrical Research Development Association (ERDA), Vadodara, with partial support of Rs. 10 lakhs from DSIR. Balance amount of Rs. 13 lakhs will be met through the financial participation of industry. The demand of such a system is presently met by import only. Development of prototype of the 7.5 KW SR motor will facilitate development of such systems of other power ratings upto 50 KW. The project would result not only in import substitution, but also in export promotion. The project is likely to be completed in three years.

(iii) CG Studies

Studies of CG requirement of packaging industry and secondary steel sector are in progress and draft reports of these sectors are likely to be available shortly.

Studies of CG requirement of readymade garments & hosiery; pharmaceutical industry; biotechnology sector; automobile ancillary industry

are in progress. Reports are likely to be available in the draft form, in the year 1993-94.

4.5 Development Projects Under Consideration

Development projects under consideration during the year 1992-93 are as follows:

(i) Development of Machines for manufacture of Conical open top steel drums

Balmer Lawrie & Co. Ltd., Calcutta is under consideration for assignment of a development project for the indigenous development of a set of machines for manufacture of Conical Open Top Steel Drums. A partial financial support of Rs. 18 lakhs has been requested from DSIR, against an estimated total development cost of Rs. 72 lakhs. The Conical open top steel drums have been recently introduced in the global market and are, so far, not produced within the country. These drums will be extremely useful for aseptic filling of liquid and semi-liquid food products. When returning empty drums for recycling after use, the Conical drums can be stacked one above the other, thus facilitating cost effective transportation as they occupy, roughly one eighth of the space, compared to the conventional cylindrical steel drums. The cost of indigenous development of a set of machines viz., conical expanding machine; flanging and curling machine; bead forming machine; material handling conveyer system; Blanking & forming dies; air line and electrical instrumentations will be around Rs. 72 lakhs as compared to about Rs. 100 lakhs on c.i.f. basis. The indigenous development of these machines will benefit the country in terms of saving of foreign exchange, development of technology at par with foreign technology, thus eliminating dependence on foreign sources for spare parts and after sales service.

(ii) Development of CNC Cutter & Tool Grinder

The development project of CNC cutter and tool grinder submitted by Praga Tools Ltd., Secunderabad, is also under consideration for a partial financial support of Rs. 15 lakhs from DSIR, as against a total development cost of Rs. 65 lakhs. The indigenous development of CNC cutter and tool grinder will reduce the need for import of such machines. The likely requirement is about 15 to 20 machines per year and the machine is likely to fetch a price of about Rs. 30-40 lakhs, thus giving an additional turnover of about Rs. 6 to 8 crores per annum to the firm. The project is expected to be completed in 18 months time.

V. SCHEME TO ENHANCE THE EFFICACY OF TRANSFER OF TECHNOLOGY

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

A) National Register of Foreign Collaborations (NRFC)

B) Industrial Technology

C) Transfer and Trading in Technology (TATT).

D) Linkages with International Organisations including Asian and Pacific Centre for Transfer of Technology (APCTT)

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

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

VI (A). NATIONAL REGISTER OF FOREIGN COLLABORATIONS

1. PREAMBLE

The on-going Plan Scheme, "National Register of Foreign Collaborations" (NRFC), continued its operations during the year 1992-93 with greater efforts and achievements. An inter-departmental Technical Advisory Committee (TAC) advised and guided the functioning of the scheme during the year. 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

To gainfully facilitate the further acquisition of technology needed in the country, through following major activities:

- Compilation and analysis of data on foreign collaborations approved and progress of their implementation.
- Undertake financial, economic and legal analysis of set of data on Foreign Collaborations.
- Carry out technology status studies covering state of the art technology in use in the country, international trends and other related issues.
- Provide assistance in the effective transfer of technology process.
- Provide the basis for a 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.

- Coordinate with Ministries of Industry, Commerce, Finance and others by providing technology data inputs.

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

Continuing the work of In-house compilation of primary data on FCs beginning with year 1981, the compilation for the year 1991 was brought out, in the year under report. The data includes 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 1992 has been computerised and is being prepared for printing.

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 Machine Manufacturing industry

c) Transformer industry

d) CNC Machine Tool industry

The study was entrusted to National Council of Applied Economic Research (NCAER). The draft report was discussed by an inter-departmental evaluation committee comprising of representatives from concerned Government Departments, 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 for 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 of economic liberalisation on exports in Indian Engg. Industry relating to the period 1976-85 which was commissioned to NCAER, has 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 under finalisation.

4.3 A project of 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 pertaining 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 approval by the Government. The report has been completed.

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 at analysing implications of applicable laws of India, as well as USA, UK and Germany (West), 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 Applicable laws of India and UK have since been received. 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. The report in respect of other two countries is under preparation.

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 distribution as well as manufacturing components of 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. The report has been 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 a compendium 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 technology from Australia. The compendium has been finalised.

4.9 A project to study the "System of Intellectual Property and Transfer of Technology including its Global Challenges and Problems" have been taken up. This is a four phased project. Phase '1' 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 emerg-

ing 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 to 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, demerits, limitations, etc.

4.11 A project on "Techno Economic Study of Synthetic Fibre Industry in India" was commissioned to 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 in spite 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 ancillaries 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.

4.12 A project to study trade related laws of France and Japan with special reference to technology transfer has been commissioned on the National Law School of India University, Bangalore. The study would include analysis and implications of the various laws in these two countries vis-a-vis Indian laws. The special emphasis would be on the laws relating to technology transfer agreements between the Indian, French and Japanese companies. The work on the project has commenced.

5. TECHNOLOGICAL 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 in use 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 experts/organisations/professionals/consultants in the respective fields.

5.2 During the year, reports on technology status of 20 sectors/products were discussed by their respective evaluation committees. These are:

1. Alpha Olefin and Alpha Olefin Sulphonates
2. BOPP/Polyester Films
3. Ceramic Capacitors
4. Shuttleless Looms
5. SBR and PBR
6. Seamless Steel Tubes
7. Shock Absorbers
8. Waste Heat Boilers .
9. Dimethyl Formamide
10. TDI/MDI
11. Welding Equipments
12. Microwave Ovens
13. Electronic Weighing Machines
14. Uninterrupted Power Supply Systems
15. Inverters and AC Drives
16. Electronic Watches and Clocks

17. Dump Trucks, Tipping Trucks, Loaders and Dozers
18. Servo Motors
19. Printed Circuit Boards
20. Zinc

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 reports which have been discussed by their respective evaluation committees/completed.

Alpha Olefin and Alfa Olefin Sulphonate: The study concludes that besides the use of AO in the manufacture of detergents, it is also used as a co-monomer in LLDPE and HDPE, in the manufacture of lubricants and industrial chemicals and plasticisers. AOS is an anionic surfactant with almost 100% biodegradability and superior performance in hard water. The first unit for AO is under implementation. The Gujarat Godrej Innovative Chemicals is setting up a 35,000 TPA AO and 12,000 TPA AOS plant at Bharuch. For AOS, there are three plants at present, they are 5,000 TPA plants of Godrej Soaps and Dharamji Morarji Chemicals and 12,000 TPA plant of Nirma. The units which are in the pipeline are 100,000 TPA AO plant of IPCL and 10,000 TPA AOS plant of IPCL and 10,000 TPA AOS plant of Tata Vishist Detergents.

The demand of AO is expected to be 88,000 TPA by 1994-95 and 1,44,000 TPA by the turn of the century, while for AOS, it is expected to be 64,000 TPA by 2000. Shell and Chevron are the world's largest producers of AO as well as primary technology suppliers. The global demand of AO is put at 900,000 TPA.

For production of AO, three different feedstocks e.g. petrochemicals based ethylene, ethanol or industrial alcohol based ethylene or natural fatty oil, needs critical examination for long-term economy and sustained activity by the industry. For short and long carbon chain AO products, ethylene may get priority as feedstock. Development of market may be undertaken for various AO fractions which are likely to be used in the near future, specially the heavier fractions.

BOPP/Polyester Films: The report concludes that Indian plants are smaller as compared to overseas plants due to infrastructural weaknesses, high cost of maintenance & spares, and end user requirements. In industry, technology gaps exists in the area of raw material, equipment, process, film application, consumption norms, conversion and end use. Indian plants have lesser degree of automation such as computerised controlled and automatic reprocessing of scrap. There is also a need to develop Indian standards for this industry.

A major component for indigenisation and technology absorption could be development of manufacturing plants by any existing BOPP manufacturer through replicating the plant for the diversification and expansion. There is also a need to develop wider range of homo and copolymers, which could be undertaken by IPCL. Public research institutions could be involved through sponsored research in the area of product development, material development and process development.

Ceramic Capacitors: Single layer ceramic capacitor technology in the country has been reasonably absorbed and manufacture is today restricted to only two major units. The Multi-layer Ceramic Capacitor (MLCC) market is just developing, there are two manufacturers in the country and two more are in the process of implementing production. Worldwide, the single layer ceramic capacitor technology has reached a mature and stable level,

whereas MLCC technology is continuously being improved in respect of materials, process innovations and machinery. The report stresses that MLCC technology is likely to replace other types of capacitors and is poised to become the capacitor technology of the future, as MLCC makes ultra miniature chip component manufacture possible, enabling surface mount technology (SMT), a method of assembling, which is becoming increasingly popular. As the effect of scale on cost is substantial, the report suggests restructuring of existing disc ceramic capacitor units, undertaking of product specialisation and production of synergetic products like thermistors and varistors whose production techniques are similar to those of ceramic capacitors.

Waste Heat Boilers: The report brings out that there are eight units spread all over the country for manufacture of Waste Heat Boilers. Indian industry have absorbed know-how for design and manufacture of waste heat boilers upto 275 t/h capacity. There is no major technological gap between India and other advanced countries in the design and manufacture. Waste heat boilers are natural and forced circulation type. The circulation in case of natural circulation waste heat boilers is maintained by the density difference between the cold feed water supplied through a downcomer to the evaporator tubes and the water/steam mixture to the steam drum. In forced circulation type, feed water is pumped through tubes. With the increase in India's reserves of natural gas and the availability of same for the power generation, the combined cycle power plants are being installed at a rapid rate.

The report further reveals that for conversion of existing thermal power station into combined cycles by topping with suitable size gas turbines and waste heat boilers the existing horizontal waste heat boiler technology may not be sufficient and the know-how on vertical waste heat boiler would be required.

Dimethyl Formamide (DMF): The study concludes that till late 1992, the entire DMF requirement in the country was met by imports. Presently, only RCF Ltd. has the capacity to produce DMF in India, they have put up a 2,500 TPA plant at Thal, based on AAT technology. They are likely to go into commercial production by end of 1992. Vam organic chemicals has initiated work on 3,000 TPA DMF projects at Gajraula with technology from UCB. Alkyl Amines chemicals is also setting up a plant to manufacture 3,000 TPA of DMAC/DMF.

The percentage consumption of DMF by Acrylic Fibre industry is 44%, Drugs and Pharmaceutical 38%, Polyurethane processing 8% and Miscellaneous 10%. The DMF demand in India is expected to nearly double from the level of 2,150 Tons in 1991-92 to 4,100 Tons by 1995-96. The increase in demand is mainly due to upward trend in acrylic fibre production capacity. The total world wide installed capacity is estimated around 3.0 lakh tonnes. Globally, demand is shrinking or at least stagnant especially in Europe and USA due to environmental reasons.

While sufficient expertise is available for fabrication of equipments like vessels and heat exchangers in the country, capabilities of vendors for proper design of package units like gas dryers and low temperature chilling plants are limited. Detail engineering contractors, should properly evaluate such designs and advise the vendors in the overall interest of indigenisation.

Chloroflorocarbons/Refrigerants and their substitutes: The study concludes that, in the country there are six manufacturers of CFC's and they expect to increase their production by at least 10% per annum. In India, total production of CFC's is about 7000 MT/year and global production is approximately 1.14 million MT/year. The ideal physical and chemical properties of CFC's have rendered them suitable for many versatile applications but after their use they remain in the atmosphere until transported to stratosphere where they are photolysed releasing chlorine atoms which catalyse conversion of stratospheric ozone into oxygen depleting its concentration. Regulatory initiations have been taken to discourage the use of ozone depleting chemicals in the industry.

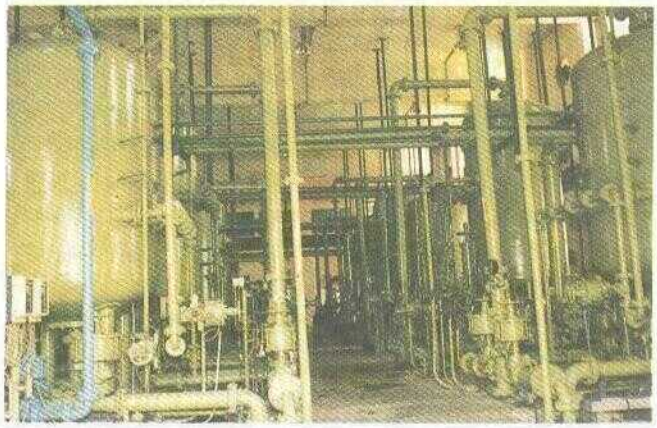
The option for CFC's could be categorised as (a) Chemical substitutes (b) Engineering control

and (c) product substitutes. As such HCFC-22 have the lowest ODP value which is almost zero. It is recommended that research and development efforts should begin in this direction, before it is too late. International Scientific community should be joined in identifying and evaluating potential substitutes.

Water and Effluent Treatment Plant: The study concludes that, the potable water treatment technology is available within the country, but the process for treatment of high grade water required for semiconductor industry needs import of technology.

The status of technology of ETPs is different for each industry, as the effluents are different for different industries. Tanneries in the country are not meeting the PCB standard and they hardly have the ETPs in operating condition, 50% of the synthetic fibre industry do not have ETPs, 70% of sugar factories have ETPs, but only primary treatment facilities exist in most of them.

The growth rate of the industry is 15% and the growth rate envisaged for the industry is 21%. Out of the 25 manufacturers contacted for the study, 18 have the foreign collaborations agreement for technology. Technology gap exist with regards to economically viable treatment of brackish water, filtration media, reverse osmosis, equipment for chlorination and others. There is a need for adopting new technologies for treatment of industrial effluents, use of microbes for digestion of organic waste from effluents and others.



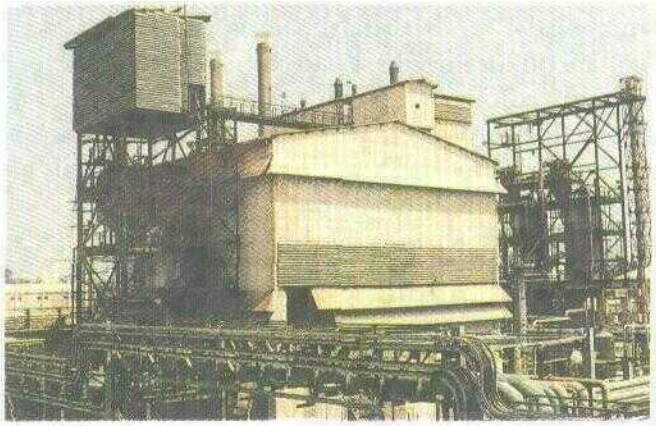
V A. 1 DM Water Plant

V A. 2 Waste Water Settling Tank

Titanium Dioxide: The study indicates that there are three companies in the country who are manufacturing Titanium dioxide. The production of titanium dioxide by these three companies in the year 1990-91 was 21,800 tons, where as the present demand is 46,000 tons. This demand is expected to reach 90,000 tons by the turn of the century. A new project of 15,000 tons capacity is being pursued presently. It is anticipated that another plant of 15,000 tons capacity shall be set up before the turn of the century.

Titanium dioxide is produced and marketed in two grades. These are Rutile and Anatase. Rutile has closed packed structure while Anatase has more open structure. For the manufacture of Titanium dioxide, both sulphate process plant as well as chloride process plant are operating in the country. The Travancore Titanium products Ltd. are the oldest manufacturers of Titanium dioxide and has a sulphate process plant of installed capacity of 24,500 TPA. The Kerala Minerals and Metals Ltd., has set up a chloride process plant of installed capacity 22,000 TPA, but their production is around 9,000 TPA. M/s Kolmac has a small plant at Kalyani and they produce about 1,300 TPA of Anatase grade pigment. The world demand for Titanium dioxide is growing at the rate of 4-5%. The industry is growing at the rate of 2-3%. In the world scenario there are around six companies which are responsible for 67% of world production.

T.V. Picture Tubes: The study indicates that of the two technologies, viz., the Black & White Picture Tube (BWPT) and Colour Picture Tube (CPT),



V A. 3 Oxidation Plant, KMML

the former is obsolete internationally in spite of there being a large market in India while the latter is a mature technology internationally. New innovations in CPT are still emerging. Local manufacture of CPT has started quite recently, gun assembly has started in a small way but glass shells and shadow masks are still being imported. BWPT is almost fully indigenous and glass shells, guns, chemicals and other components are all being manufactured within the country. There are around 13 companies producing about 1 million BWPTs per year and 3 companies producing about 1.2 million CPTs per year. The demand for picture tubes is constrained by the production of TV receivers. The report stresses that India must gain control over its raw materials, manufacturing processes and technology and that resources like money, technology and people should be concentrated in suitable organisations by restructuring existing capacities. The scope for development of ancillarisation is limited. New technologies for the manufacture of glass shells, guns, phosphors and shadow masks need be developed. A special thrust to improve BWPT exports need be made by exporting BWPTs to BW TV manufacturers abroad both directly and through tie-ups as well as by indirect exports to Indian manufacturers who export BW TV receivers.

High Pressure Boilers: The report indicates that the two major manufacturers of the items in the country, through various collaborations, R&D feed back and their own R&D efforts, have acquired complete know-how for the design and manufacture of high pressure boilers upto 500 MW capacity. The technology in India has kept pace with the international technology and there are no major technology gaps between the technology status in India and the technology status abroad. The report further states that in view of abundant availability of coal and with scarcity of oil and gas in country, coal will continue as source of power generation in future and as such coal based technologies like fluidised bed combustion, stagging combustor, magnetohydro-dynamics etc. is to be given greater stress. Coal available in the country has 45 per cent ash content and is more abrasive in nature. This results in problems like higher erosion of the heat transfer surfaces, milling system, pulverised fuel pipelines, increased combustion of supporting oil due to low volatile matter in coal etc.

Presently, all the boilers in India are subcritical and the general limits of pressure in the subcritical range has already been reached. The higher cycle efficiency in high pressure boiler is possible by increase of steam pressure and temperature conditions. The report suggests that import of technology on supercritical boiler may be considered.

Acrylonitrile: The study mentions that in the country, there is only one manufacturing unit for Acrylonitrile which is IPCL, Baroda and uses Sohio's process involving Ammoxidation of propylene. In this process, Ammonia and air are reacted over a catalyst in fluidised bed reactor to form Acrylonitrile. IPCL plant started with a installed capacity of 24,000 TPA. Later, it has been increased to 33,000 TPA. Two more companies have been issued letter of intent for manufacture of Acrylonitrile which are M/s Reliance Inds. Ltd., 74,000 TPA and Haldia Petrochemicals Ltd. 50,000 TPA. The performance of IPCL plant is reported to be satisfactory and is operating at about 87% capacity utilisation. The technology has been fully absorbed and there is continuous process update from Sohio (BP).

There has been no major research activity in Indian industries and research institutes on Acrylonitrile manufacture/process. For this, an organised effort is required and a proper interaction between National laboratories and industries is very desirable. The technology absorption effort at IPCL, Baroda has been with respect to change of operational features in small steps. But there has been no

effort for change in level of technology or indigenisation of catalysts. The world production capacity of Acrylonitrile in 1991 was about 4.2 million tonne. The capacity utilisation is about 85%. Process technology available world wide are Sohia (Now BP) UGINE, Montedison - UOP NITTO, and OSW, most widely used process is that of Sohio. Neither any major break through in the form of use of new feedstock, nor any new process operating parameters, or new equipment design have been reported in the last decade on the international arena. However, M/s BP Chemicals are already far ahead now in their plans on Acrylonitrile manufacture using propane as feedstock. This new feedstock would reduce product cost and may result in larger production of Acrylonitrile.

Polypropylene: *The report indicates that the* Indian polypropylene industry would continue to depend on import of certain special plant and machinery such as extrusion/pelletization, fluidized bed dryers, process instrumentation & control systems, etc. The gas phase technology for the manufacture of polypropylene needs to be evaluated for implementation in the country.

The report emphasises the need to establish a polymer research institute to carry out research for catalyst development, product applications such as composites and alloys of polypropylene, and grade development for textile, blow moulding, high melt flow and high impact.

Efforts need to be made in the direction of export to neighbouring countries in view of implementation of world scale plants (100,000 tpa) in the country.

High Pressure Sodium Vapour Lamp: The study brings out that the technology of High Pressure Sodium Vapour Lamp is confined to only few international lighting companies. Most of the Indian companies have by and large been dependent on technologies from abroad. The technology acquired by Indian companies has been for High Pressure Sodium Vapour Lamp making and testing with all basic components largely being imported. Leading foreign High Pressure Sodium Vapour Lamps manufacturers are producing lamps in five categories - (i) standard lamps (ii) HPSVL with enhanced luminous efficacies (iii) Lamps with enhanced colour rendition properties (iv) plug in type - for direct replacement of mercury vapour lamps (v) White HPSV Lamps with colour rendition index Ra > 85. Indian industry is producing four standard watt sizes of 70, 150, 250, 400 wattage in tubular and elliptical shape only and these are comparable to standard type lamps produced abroad for each wattage.

A major component for high pressure sodium vapour lamp is polycrystalline alumina tube. The indigenous development of this tube is necessary for making Indian industry self reliant. Central Glass and Ceramics Research Instt., Calcutta and National Physical Lab., Delhi have jointly put a proposal for development of Polycrystalline alumina tube and related technology.

Charge Chrome: The report indicates that the manufacturers of charge chrome in the country are limited to only four major producers, who have acquired the basic technology through foreign collaborations. The few other small size units, which possess completely indigenous equipment, have lower product quality standards. India has about 2% of the world's chrome ore reserves and has made substantial progress in installing charge chrome facilities. On the basis of installed capacity, India stands sixth in the world. The industry faces major constraints like non-availability of uninterrupted power, trained manpower, optimally designed furnaces and service equipments. It would be necessary on the part of the manufacturers, to bring down the cost of production, in order to make the product competitive in the international market. They should also employ adequate measures to beneficiate and agglomerate the low grade ores and fines of all grades as well as introduce optimum automation, adopt suitable waste heat recovery systems and introduce pollution control measures.

Sulphamoxole: Sulfamoxole is one of the sulfonamide group of drugs, belonging to the pharmaceutical category of antimicrobials, covering both gram positive and gram negative organisms. Sulfamoxole in combination with trimethoprin has a wide spectrum of effectiveness. The study reveals

that M/s German Remedies is the sole Indian manufacturer. Sulfamoxole formulations are not having as large a market share as sulfamethoxazole formulations, leading to unutilised capacity of the sole manufacturer. The net production in the country is around 80 tons out of which only about 30 tons is used for formulations in the Indian market. It has been indicated that major countries like USA, UK, Canada do not use this product nor is it listed as an essential drug in the WHO list. Hence, a big future for this drug cannot be immediately envisaged. One of the main raw materials butynol, which is used to derive acetonin from which sulfamoxole is ultimately obtained, is the monopoly of BASF, Germany. Therefore, development of a process for the manufacture of acetonin from diacetyl instead of butynol, as well as for the manufacture of diacetyl, is recommended. The limiting factor for the growth of this drug appear to be more due to its lack of availability as compared to other formulations, rather than its lack of effectiveness.

Semi-conductors - LSI ICs: The study highlights that the technology level of the Indian industry enables it to fulfil only those demands required largely for the consumer industry and for simpler instrumentation. The advanced versions involving higher technology and capable of higher reliability need to be imported. In the case of germanium semi-conductors, the levels of integration in the Indian industry are high and the products lag behind by one generation (4 to 5 years) in terms of technology. The manufacturing units are capable of working from basic raw materials. In terms of developments of application circuit designs, device processors and production volumes, the progress of the industry in the country has not been very marked. 40% of the home demand is met through imports. There are around 20 manufacturing units in the country, the prominent among them being Bharat Electronics Limited (BEL), Bangalore; Semiconductors Limited (SCL), Pune. Several more units are at various stages of implementing capacities. The world semi-conductor industry is dominated by gaint multi national and multi product conglomerates and the smaller companies thrive only by specialising and innovating. Some of the key reasons for limited performance are low volumes per type per run, start-stop operations due to requirement of varities of products, shut-downs due to lack of materials and poor infrastructure, limited purity of chemicals and gases, inadequate care, insufficient cleanliness, older levels of technology and machines. It is concluded that consolidation, concentration, integration and updation of existing units is needed to serve as a profitable base to newer technologies.

5.4 Status report on the technology studies of 19 more sectors/products have been commissioned during the year. These are:

1. Dicyndiamide
2. Laser Printers
3. Butyl Acrylate
4. Formaldehyde
5. Mechanical Seals
6. Gears
7. Methyl Ethyl Ketone
8. Toluene
9. Polyacetal Resin
10. Electric Arc Furnace
11. Springs
12. VCPs and VCRs
13. Printing Inks
14. Phenol
15. Soda Ash
16. Industrial Robots
17. Acetone
18. Electronic Connectors
19. Vitamin B

6. FINAL REPORTS

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

1. Ethylene Oxide/Ethylene Glycol
2. Charge Chrome
3. Electrostatic Precipitators
4. High Pressure Sodium Vapour Lamps

5. Polypropylene
6. Semi-conductor Devices-ICs and LSIs
7. Purified Terephthalic Acid
8. Styrene and Polystyrene
9. High Voltage Transformers
10. ABS, SAN and AES
11. Sulphamoxole
12. Xylene
13. New Drug Delivery Systems
14. Chloroflourocarbons
15. Fuel Injection Equipments
16. Resin Bonded Fibre and Particle Boards
17. Water & Effluent Treatment Plants
18. Titanium Dioxide
19. T.V. Picture Tubes
20. Electrolytic Manganese Dioxide
21. High Pressure Boilers
22. Ceramic Capacitors
23. Acrylonitrile
24. SBR and PBR
25. Waste Heat Boilers

7. *INTERACTION MEETS*

During the year 1992-93 interaction meets were organised to finalise the following technology status reports:

- Intellectual Property on 3rd April, 1992.
- Chloroflourocarbons in association with Shriram Institute for Industrial Research, Delhi on 29th April, 1992.
- Water & Effluent Treatment Plants in association with Indian Institute of Ecology and Environment, New Delhi on 5th June, 1992.
- Titanium Dioxide on 14th July, 1992.
- Applicable Law on 28th July, 1992.
- T.V. Picture Tube on 25th August, 1992.
- Ceramic Capacitors on 30th November, 1992.
- Seamless Steel Tubes in Association with Central Metal Forming Institute, Hyderabad on 21st January, 1993.
- Shuttleless Looms in association with the Textile Association (India) - Delhi on 5th February, 1993.
- Two for One Twisters in association with The Textile Association (India) - Delhi on 5th February, 1993.

V (B). INDUSTRIAL TECHNOLOGY

1. INTRODUCTION

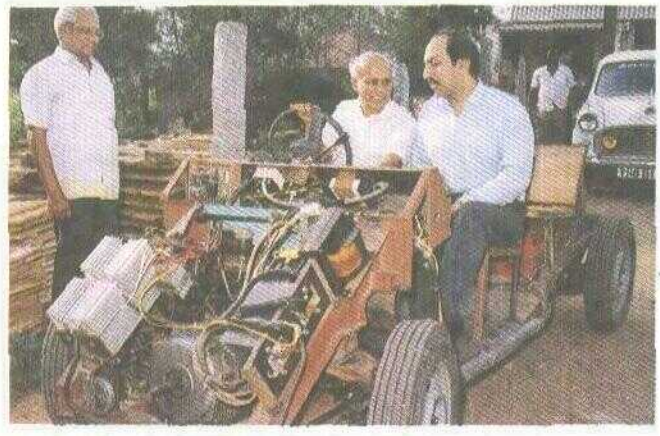
The Industrial technology group deals with the proposals received from Secretariat for Industrial Approvals (SIA) for grant of Letter of Intent, foreign collaboration from Indian entrepreneurs, foreign entrepreneurs/organisations, from NRIs and those willing to set up 100% export oriented project. It brings out a product-wise compilation of Foreign Collaborations approved by the Government.

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 Project Approval Board.

2. INDUSTRIAL LICENSING

Above 663 proposals for grant of Letter of Intent were received during the year as compared to 1800 in the last year. The group attended 49 meetings of Licensing Committee held by SIA. The following is an illustrative list of products approved for grant of Letter of Intent based on indigenously developed technology.

1. Electronic quartz/digital/combination watches
2. Battery operated electric passenger car
3. Passenger car powered by 350 CC diesel engine
4. Sulbactum sodium bulk drug
5. Famotidine
6. Terfenadine bulk drug



V B. 1 EDDY Electric Car, Road Test in Progress

7. Pentazocine bulk drug and formulations
8. Norfloxacine
9. Paravarine HCl and Noscapine tablets

3. FOREIGN COLLABORATIONS

The number of foreign collaboration and composite proposals increased marginally from 430 in the previous year to about 550 in the present year. The proposals involved technology transfer and/ or foreign equity participation. The proposals of those entrepreneurs proposing to set up 100% EOU were of the order of 950.

During the year, the Department participated in the Technical Evaluation Committee, which held 49 meetings, for consideration of the above proposals and to send recommendations to Project Approval Board and Board of Approvals for 100% EO Undertakings.

The Department also participated in the following meetings of the Approval Boards/Committees:

	No. of Meetings
Project Approval Board (PAB)	17
Board of Approvals for 100% EOU	15

4. 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 *(for II. & FC/CG)*	1989 onwards
b)	Foreign Collaboration *approvals*	1981 onwards

These databases were updated for the year *1992.*

The Department has also developed software for updating, preparing summary, processing and quick retrieval of the desired information on all the above databases. 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.

During the year, the Department has been allotted a User ID, Password and Account No. on the NIC's NEC S-1000 Computer system and DSIR has now access to the NIC network, by virtue of which, it will be possible to receive and send information to other Departments through the 'NICNET'. Most important of these is that the agenda of meetings convened in DSIR can be sent to the *member Departments through the network. The* Department can also receive details of proposals received by SIA for grant of Letter of Intent, Foreign Collaboration, etc.

5. PUBLICATIONS

A Series of compilations on country-wise analysis of foreign collaborations approved during the period 1981-90 were brought out during the year. The following compilations have been completed.

(i) Foreign Collaborations Approved with Germany

(ii) Foreign Collaborations Approved with France

(iii) Foreign Collaborations Approved with UK

(iv) Foreign Collaborations Approved with USA

(v) Foreign Collaborations Approved with Japan

V (C). 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 technology export capabilities and experiences in select industrial sectors;
- Publicity and dissemination of Indian capabilities through workshops, trade fairs, delegations and video-films;
- 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;
- Assistance for export of technology based services, such as: setting up R&D institutions; R&D collaborations; operation and maintenance of plants; hospital and telecommunication services.

1.2 Activities

The TATT Scheme 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 its objectives. Eleven meetings of the Technical Advisory Committee on TATT were held during 7th Five Year Plan. Three meetings were held during the period April 1990 to March 1992. Since reorganisation of the schemes, when TATT scheme became a part of SEETOT scheme, the Technical Advisory Committee was reconstituted and one meeting took place during 1992-93. 15 new projects/programmes were approved & initiated in addition to about 70 projects undertaken during 1985-1992. The thrust of the projects during the 1985-1992 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 of Developing Countries:**

(i) Draft report on Technology Profile of Mauritius prepared by M/s WEBCON was received and discussed in an Evaluation Committee Meeting, wherein suggestions for improvement of the report were offered. The final draft report shall highlight availability of raw materials and natural resources, Mauritius Governments' future plans, details of budget sanctioned for various industrial sectors, thrust areas of development, specific technological requirements and names & addresses of organisations in Mauritius connected with trade and commerce. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Government organisations as well as industry.

(ii) Studies on Technology Profiles of Egypt, Zaire, Ghana & Singapore are in the advance stages

of completion.

(b) Technology Export Capabilities and Experiences:

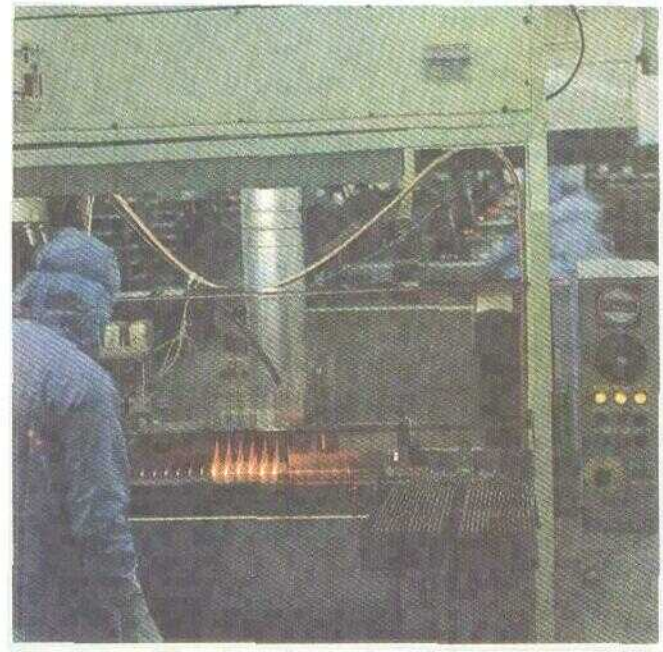
Several projects primarily aimed towards assessing and projecting our technological activities and experiences through preparation of reports, video films, and disseminating the same to the concerned organisations including Ministries/Departments, Indian/Foreign missions were completed or are in various stages of completion. Some of these projects/activities are indicated below:

(i) Technology Export Potential of Mini Steel *Industry*

A study on the subject was conducted by M/s UPICO. The draft report submitted was discussed in an Evaluation Committee Meeting, wherein suggestions for improvement of the report were offered. The final draft shall present an overview of the development and indigenisation of product technologies such as production of billets and ingots, manufacture of auxiliary equipment for mini steel plants, process technologies such as dephosphorisation, scrap preheating, continuous charging etc., technology for Mini blast Furnance and technology for production of Stainless Steel, Direct Reduced Iron and Hot Briquitted Iron. Details of Mini Steel Plants and related technologies which can be exported and addresses of its suppliers shall be given. Potential markets shall also be indicated. The final draft report is slated for discussion in an interaction meeting of more than 100 participants from various Government departments and industry.

(ii) Export of Technology for Veterinary Pharmaceuticals

A study on the subject was conducted by M/s Eastern Enterprises. The draft report submitted was discussed in an Evaluation Committee Meeting, wherein suggestions for improvement of the report were offered. The final draft shall present an overview on the level of production and export of Veterinary Formulations, Biologicals and Feed Supplements, machinery in use, experiences of joint ventures in the area, etc. Specific technologies and machinery which can be exported and addresses of its suppliers shall be clearly identified. Potential markets for export shall be also indicated. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Government Organisations as well as industry.



V C.1 Filling and sealing of ampoules in sterile chambers.

(iii) Capabilities of Indian Packaging Industry to Export Technology

Indian Institute of Packaging (IIP) conducted a study on the above subject and submitted a draft report which was discussed in an Evaluation Committee Meeting. Several suggestions for improvement of the report were offered. The final draft report shall highlight conversion technologies available for paper and paper board, glass, tin, aluminium and plastics packaging. Production and export figures of packaging machinery shall be given. Specific technologies and machinery available for export alongwith the sources shall be identified. Potential markets shall also be indicated. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Govern-

ment Organisations as well as industry.

(iv) **Technology Export Potential of Two Wheeler Industry**

M/s M.M. Suri & Associates Pvt. Ltd. conducted a study on the subject and submitted a draft report which was discussed in an Evaluation Committee Meeting. Several suggestions for improvement of the report were offered. The final draft will contain data on production and export of Two Wheelers, technology transfer experiences of companies, experiences of Indian Joint Ventures Abroad and profiles of organisations having potential and willing to export technology. Potential markets abroad shall be also indicated. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Government organisations as well as industry.

(v) **Technology Export Potential of Computer Software Industry**

Tata Consultancy Services (TCS) conducted a study on the above subject and draft report submitted was discussed in an Evaluation Committee Meeting. Several suggestions for improvement of the report were offered. The final draft shall discuss the global information technology industry, technology trends in Software and Hardware, emerging markets, kinds of services and infrastructural facilities which Indian Software industry can provide, manpower training facilities, Quality Assurance, activities of industry forums/associations, export scenario and projections. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Government organisations as well as industry.

(vi) **Technology Export Potential of Agro Based Industry**

M/s UPICO Conducted a study on the above subject and draft report submitted was discussed in an Evaluation Committee Meeting. Several suggestions for improvement of the report were offered. The final draft shall discuss the status of Indian Agro Based Industry, identify specific technologies ripe for transfer to other countries as well as industrial units having potential to export. It will also include the capabilities of machinery manufacturers. The final draft is slated for discussion in an interaction meeting of more than 100 participants from Government organisations as well as industry.

(c) Seminars/Wokshops/Meetings:

The following Seminars/Workshops/Technical Meetings were sponsored/organised during the period.

(i) **Interaction Meeting on Technology Transfer among Developing Countries, New Delhi**

The interaction meet was organised in association with "Indian Institute of Foreign Trade (IIFT)" during June 18-19, 1992 and was inaugurated by Shri K.R. Narayanan, Hon'ble Vice President of India. In his inaugural speech, Shri Narayanan emphasized that utilization and commercialisation of CSIR technologies and active meaningful cooperation among developing as well as developed world is required, since in this situation of interdependence, developing countries seek state-of-the-art technologies from developed countries and they in turn depend upon the market available in developing countries. The meeting was attended by around 200 delegates, including Ambassadors/High Commissioners/Secretaries of around 30 countries in India. Agenda for the meeting included discussions on "Technological Cooperation among Developing Countries", "Technology Profiles of developing countries" and "Strategy for Promoting Technology Co-operation". There was active participation from the representatives of various countries during the Business Sessions. Major recommendations which emerged out of the meeting are: Updating of country technology profiles on a regular basis, organisation of training programmes and information exchange programmes, promotion of technology demonstration projects and Government financing of technology transfer initiatives.

(ii) **Interaction on Civil Engineering and Construction Management Consultancy Services in India, New Delhi**

NICMAR organised the interaction meet on

July 23, 1992 and the department supported it. Dr. N.K. Sengupta, Secretary, Planning Commission delivered the keynote address. A draft report on the subject, prepared by NICMAR was discussed during the first technical session of the meeting. It was brought out that responsibilities of project designer, contractor and construction manager should be clearly defined, role of retired engineers to be properly reflected and all consultants in the civil engineering profession should be listed in the report. In the second technical session, few papers were presented by experts in the field. Salient features of FIDIC contract documents were discussed. Need for aggressive marketing, adoption of consortium approach and improvement of In-house capabilities were stressed to boost India's consultancy export.

(iii) Interaction on "Technology export potential of Rice Milling Industry"

A meeting to discuss the draft report was organised on July 29, 1992. It was inaugurated by Shri S.L. Kapoor, Secretary, Ministry of Food Processing. Deliberations suggested inclusion of specifications of plant and machinery required by SAARC and other countries, training facilities available in Post Harvest Technology Centre, IIT Kharagpur and technology of Par-Boiling. It was also pointed out that the statistical data and figures should be updated.

(iv) Technology Export Potential of Select Industrial Sectors, New Delhi

An interaction meeting was organised in association with ASSOCHAM on Oct 13, 1992 to discuss the draft reports on Technology Export Potential of Electrical Industry, Chemical Process Industry, Dairy Industry and Agricultural Machinery Industry. The meeting was inaugurated by Hon'ble Minister of State for Science & Technology Shri P.R. Kumaramangalam in absentia and keynote address was delivered by Shri A.V. Ganesan, Secretary, Ministry of Commerce. Around 150 participants attended the meeting and the deliberations resulted in useful inputs for updating the draft reports.

(v) VI International Congress and Exhibition - ENVIRO-2000

The above congress, organised by National Foundation of Indian Engineers (NAFEN) and co-sponsored by the department was held during Nov 20-21, 1992. The congress was inaugurated by Shri K.C. Pant, Chairman of the Finance Commission and keynote address was delivered by Dr. V.L. Chopra, Director General, ICAR. It was attended by over 100 participants from India & abroad and around 50 papers were presented by experts during the four technical sessions. The issues discussed were Energy Conservation, Environmental Pollution, Management of Clean Technologies and Technology Transfer.

(vi) 9th International Congress on Chemistry of Cement

DSIR co-sponsored this International Congress organised by National Council of Cement and Building Materials (NCCBM) in New Delhi during Nov. 23-28, 1992 after the last congress took place at Rio de Janciro in 1986. The congress was inaugurated by Smt. Krishna Sahi, Hon'ble Minister of State for Industry. It was attended by over 500 participants including delegates from more than 50 foreign countries. The congress had four Generic Themes and 15 specific Themes on which more than 400 papers were presented during the 6 day conference, in parallel sessions.

(vii) International Rubber Conference - Rubber Con '93, New Delhi

Indian Rubber Institute, New Delhi organised the above conference during Feb. 8-10, 1993 and the department co-sponsored it. The conference aimed at providing exposure to Indian Rubber Industry towards the latest technologies. The subjects covered were: Polymer & Polymer blends, Rubber Chemicals and Ingredients, Fillers and Reinforced Mechanism, Compounding and Vulcanisation, Developments in Tyre Technology, Rubber Products, Processing and Developments in Machinery, Quality Assurance, Ecology & Recycling etc. Besides the conference, an exhibition Rubber Expo '93 was also organised.

(d) Indian Joint Ventures:

The study on experience of Indian Joint Ventures in Technology Transfer to Thailand, Malaysia, Singapore and Indonesia was done in association with the Indian Institute of Foreign Trade (IIFT). The study involved field investigation of joint venture units in survey countries during Oct-Nov, 1991 preceded by visits to Indian units of Joint Ventures within the country. As many as 22 industrial units and 10 organisations/consultants were contacted within India. In addition, 32 Joint Venture units and 15 organisation/missions were visited in the survey countries. The major findings of the study are: Indian brand names and trade marks have not been transferred and are not promoted by the Joint Venture units; India's strength lies in design engineering and consultancy, plant operation and maintenance, management of enterprise, trading and marketing and India has not been able to develop the strength in machine embodied technology. The major recommendations are: R&D efforts to adapt imported technology to be stepped up; impact of tighter patent laws on technology trade to be studied; and a roster of NRI technological experts to be maintained.

(e) Live Demonstration of Exportable Indian Technologies:

Assisted by Department's partial financial support, M/s Balmer Lawrie & Co. Ltd., Calcutta successfully erected the Pilot Plant for demonstration of technology for Re-refining of used Lubricating Oils based upon Non-Acid process and trails are in progress.

(f) Industrial Mission:

Confederation of Indian Industry undertook an Industrial mission to Nigeria, Ivory Coast and Ghana and the department provided partial financial support. The objective of the mission was to

V C.2 M/s Balmer Lawrie's Pilot Plant for Rerefining used lube oil -- Rotary Vacuum Filter

project India's capabilities in various sectors of engineering industry and to identify specific areas where India's experience could be useful to Nigeria, Cote d'Ivoire and Ghana. The mission comprised of seven senior executives of industry and a co-ordinator from CII. The mission report has been brought out which identifies project opportunities for India in three countries. According to the report, Nigeria offers opportunities for petrochemical plants, oil exploration, agricultural equipment, machine tools, mini cement plants etc., Ivory Coast for small scale and cottage industry, textile industry, sugar mills, pulp and paper plant and food processing plant and Ghana for furniture manufacturing units, autoparts, edible oil processing, electric transformers, pumps etc.

1.3 List of Reports Printed under TATT:

(i) Directory of Small and Ancillary Industry's Technology
(ii) Handbook of Statistics - 1991
(iii) Technologies Available for Transfer
(iv) Technology Export Potential of Basic Drugs and Pharmaceutical Formulations.

V (D). 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.

APCTT and ESCAP

The matters pertaining to the Asian and Pacific Centre for Transfer of Technology (APCTT) under ESCAP, were dealt with in cooperation with 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 Indian delegation to the 48th Annual Session of ESCAP held at Beijing during April, 1992.

The construction of the APCTT building was 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 1993 and the Centre is likely to start functioning from Delhi after that. Adviser, DSIR participated in the Eighth Technical Advisory Committee Meeting of APCTT which was held in Guangzhou, People's Republic of China, on 8th November, 1992. Government of India hosted the 7th Session of the Governing Board of APCTT which was held during 27-28, November, 1992 at New Delhi and all the arrangements related to this were undertaken by DSIR. The 7th 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, Vietnam. Senior officials attended the meeting from ESCAP, UNDP and UNESCO. Observers from Afghanistan, Australia, Republic of Korea, Malaysia and Sri Lanka also attended the meeting. The Secretariat was provided by APCTT. Dr. K.V. Swaminathan, the then Adviser, DSIR was unanimously elected as the Chairman of the Governing Board for the year 1992-93. A brief covering the issues of APCTT was prepared in connection with this meeting for the use of Indian delegation.

VD 1. Shri P R Kunaramangalam, Hon'ble Minister of State for Science and Technology delivering the Inaugural Address at the Seventh Session of the Governing Board of Asian and Pacific Centre for Transfer of Technology, New Delhi

Senior Officers of DSIR participated in Working Group meeting for Master trainers for Mechanism for Exchange of Technology Information (METI) and other meetings arranged by APCTT.

V (E). PROMOTION AND SUPPORT TO CONSULTANCY SERVICES

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

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 and commercialisation of indigenous technology.
- Organise Seminars, Workshops, etc.
- Create awareness among users of consultancy.

2. ACTIVITIES

Sixteen meetings of the Technical Advisory Committee (TAC) including two during the year 1992 have been held till Dec. 1992 in which about 125 programmes/projects including 25 in the current year were recommended. About one hundred programmes have been completed and 25 were at various stages of implementation. 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 sectorwise, and Statewise 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) which is functioning from Qutab Hotel, New Delhi.

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

(a) Documentation of Experience

(i) 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 printed and disseminated.

(ii) Three studies on consultancy capabilities in the states of Madhya Pradesh, Bihar, Maharashtra and Goa were completed. The reports assess and evaluate the consultancy capabilities of consultants in the state, consultancy gaps and suggest measures to strengthen their services besides profiles of consultancy organisations, R&D/academic institutions, foreign consultants operating in the state and other concerned agencies, similar reports in the states of U.P., Rajasthan and Delhi were broughtout earlier.

(iii) Proceedings of the Interaction Meeting on Consultancy Needs for Industrial Rehabilitation was brough out. The meeting was aimed

at identification and assessment of consultancy capabilities commensurate with the needs of the sick industry and evolving measures to bridge the gap between the needs and availability of the consultancy services. The proceedings recorded the views of the industry, consultants, technologists, and concerned govt. departments and other agencies. It has come out with a set of recommendations to provide support services to the ailing sector from technological angle.

b) Fellowships/Training

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

i) One year consultancy training for young Engineers in India: Eleven Engineering graduates were given one year training at CDC and another batch of nine 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 Contact Programmes: Six programmes in the form of workshops and expert lectures were organised through CDC in which about 150 consultants and users of consultancy participated.

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) An Interaction Meeting on consultancy capabilities in civil engineering and construction management was organised to discuss and finalise the draft report on this subject.

ii) An Interaction Meeting on Consultancy capabilities in the State of Rajasthan & Delhi was organised in which the draft reports on the subject were discussed.

iii) An Interaction Meeting on Consultancy Needs for Industrial Rehabilitation was organised to identify the problems of the sick units from technological angle and to evolve measures to provide consultancy services to them.

iv) An Interaction Meeting to discuss and finalise the draft report on consultancy capabilities in pollution control was held. The report was prepared by NACE, New Delhi.

v) Three Interaction Meetings were separately held at Calcutta, Bhubaneswar & Pune to discuss and finalise the draft reports on consultancy capabilities in the States of West Bengal, Orissa & Maharashtra/Goa respectively.

vi) An Interaction Meeting was held on consultancy capabilities in Fertilizer Industry to discuss and finalise the draft report on the subject prepared by PDIL, 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. To guide the implementation and review the programme of TBI in India an Advisory Committee is constituted, and its first meeting was held. Based on the recommendation of feasibility studies, the following TBIs have been setup:

(i) TBI at Shri Ram Institute for Industrial Research (SRI), New Delhi

Operative infrastructure has been created and the concept of TBI was publicised. Enquiries received from various clients were being examined. The TBI at SRI is attached model of TBI, and will deal with the area of chemicals & fine chemicals.

(ii) TBI at CEERI, Pilani

This is an "attached model" of TBI and will deal with the area of Electronics operative infrastructure is being created, and potential incubates are being identified.

(iii) TBI at MITCON, Pune

The TBI at MITCON is an "Independent Model" of incubators related to general areas of industry and consultancy services. The facilities available at this incubator have been publicised, and operative infrastructure is being created.

DSIR has received proposals from various other agencies for setting up of TBIs, and were being examined.

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 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 REPORTS/PUBLICATIONS

Reports/publications on the following have been brought out during 1992.

i) Consultancy capabilities in Electronics, Telecommunication and computer industry in India.

ii) Consultancy guide for upgradation of pump and foundry small scale industries in Gujrat.

iii) A compendium of foreign consultants.

vi) A report on "Technology Business Incubators - A compilation of feasibility studies and related documents.

v) Member directory of ACE (I), New Delhi.

vi) Proceedings of ESCAP regional meeting of Directors/Heads of consulting firms on the provision of technology management and other services, held in Sept., 1991.

4. OTHER ADVISORY SERVICES

Advisory services were made available to various Ministries and Departments in relations 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.

4.1 Committees

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

ii) Consultancy Committee of FIEO.

iii) Programme Committee of WASME.

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

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

vi) Advisory Committee of TBICs in India.

vii) Management Committee of ACCE for international conference on value engineering.

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

4.2 Proposals

Following proposals received from various

Departments/Organisations were examined:

i) A proposal from Engineering Management Centre for Energy Conservation and audit for *UNDP* support was examined and comments given.

ii) An ESCAP proposal relating to development and cooperation in Technical Consultancy in the ESCAP region was examined.

4.3 Other Seminars/Workshops/Meetings etc.

- ESCAP Seminar on effects of new technologies on the life of working people, held in China.

- ESCAP workshop on application and extension of Technology Atlas methodologies, Bangkok, Dec. 92.

5. 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. 280 lakhs till Dec., 1991. CDC has been allotted 1000 sq. mtrs. build-up 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 India Habitat Centre (IHC) Rs. 130 lakhs till Nov. 92. The accommodation is likely to be occupied by the Centre some time in the middle of 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 as well as export capabilities of consultants, interactions with international organisations - (World Bank, Asian Development Bank, African Development Bank), International Trade Centre (ITC), UNIDO, ESCAP, have 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 identified to be an Apex body for Technical Consultancy Development Programme for Asia and the Pacific (TCDPAP) by ESCAP. 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 Technology (TATT), and other organisations.

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

(a) Under the 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, the following activities were continued in operation:-

- National Awards for Consultants: Applications for Awards for 1992 were received and were scrutinised. Necessary action was being taken for presentation of annual awards.

- Use of Approved Consultants: Six 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/Workshops/Conferences: Support was provided to nine consultants/Consultancy organisations to attend various overseas workshops, seminars, etc.

- Support for participation in Trade Fairs/Exhibitions: Support was provided to two consultants/consultancy organisations to attend overseas Trade Fairs and Exhibitions.

- Trainee Consultants: Nine engineers completed their one-year consultancy training at CDC during 1991-92 and another batch of eleven trainees was under going training at CDC during 1992-93 and more training programmes are being planned on continuing basis. Also, the number of trainees is likely to be increased.

- Regional Training/Contact Programmes: Four programmes on "Cement plants of the Twenty First Century", Energy Conservation & Audit", "Dispute Resolution between client & Consultants" and "Consultancy for Global Competitiveness" were organised in association with consultancy organisations/agencies.

(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 studies on compendium of Australian Technologies Relevant to India, and Technology Status Study on Shock Absorbers.

(d) CDC has been designated as the coordinating agency for the implementation of networking of the Data Base Programmes of the Asian and Pacific Centre for Transfer of Technology (APCTT) and local consultants for the UNFSTD supported Project on Technology Incubation Centres in India.

(e) A scheme for Registration of Consultants and Referral Services to help consultants and users was operationalised.

(f) According to an IDBI report on Technical Consultancy Organisation (TCOS), CDC has been identified to play a major role in their functioning.

VI. 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 those have come up to serve the needs of different industries and R&D units, require to be coordinated and organised into an 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.

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. INFORMATION CENTRES

The major instrument for information resources development and dissemination is information centre which provides bibliographic as well as factual and numeric information on a product, discipline or mission. Following information centres were established with the objectives to create information awareness and to meet information needs of academicians, scientists, technologists, enterpreneurs, management executives and decision makers.

2.1 Information Centres

No.	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 Engineering (NICMAP)	Central Machine Tools Institute,, Bangalore
iv.	Drugs and Pharmaceuticals (NICDAP)	Central Drugs Research Institute, Lucknow
v.	Textiles & 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

2.1.1 Sectoral Information Centres

Sectoral Information Centres (the first seven) were built around the existing information resources and facilities. They maintain extensive collections of published and unpublished documents in the form of books, periodicals, research reports, development and trade reports etc., pertaining to the relevant subject areas. Besides providing documents and preparing bibliographies on request, they offer SDI, CAS, reprographic, micrographic, industrial and technical enquiry, translation and other services. They conduct training programmes for their staff and organise workshops and seminars to create awareness of modern tools and techniques. They also participate in exhibitions. In respective cities, they function as focal points for resource sharing.

Regular monthly publications from these centres include Current Awareness, Industry Highlights, Current Highlights, Patent Awareness, Current Indian Titles in respective sectors and also semi-technical and popular ones in the form of digests. The centres have also developed information management tools like Thesauri, Data input procedures and so on.

These centres maintain several databases to cater to the information requirements of their clientele. For example, NICDAP maintains databases on Natural Products, Folklore database, Letters of Intent & Industrial Database, Research Projects database, Union Catalogue of periodicals in Lucknow city etc., NICLAI maintains database on Leather Science Abstracts (LESA), Periodical Holdings (PERHOL), Leather Thesaurus (LETHAS), Leather Catalogue (LEACAT) etc; NICFOS maintains Food Science & Technology Abstracts (FSTA), Indian Food Technology Abstracts (IFTA), Food Patents; NICMAP maintains databases like metal working abstracts, Patents, World Machine tool production statistics & Import/Export statistics; NICTAS maintains World Textile Abstracts and NICHEM publishes Monthly Indian Chemical Patents.

2.1.2 Information Analysis Centres & Data Centres

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

The National Information Centre for Crystallography (NICRYS) is the first hard data centre established at the University of Madras in 1981. The centre receives the Cambridge Crystallographic data on organic & organometallic compounds on magnetic tape. Presently, The University Grants

Commission (UGC) provides complementary support to NICRYS activities.

The National Centre for Bibliometrics (NCB) established in 1988 has been creating a S&T citation database on Indian contribution appearing in Indian periodicals. The NICDROM centre established in 1988 supplies information on CD-ROM hardware and their suppliers, reference tools and databases available on CD-ROM and information from LISA.

3. 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 established five NISSAT Access Centres to international database Services - NACIDS.

NISSAT Access Centres to International Database Services (NACIDS)

S.No.	Place	NACIDs Host Institution
i.	Bangalore	National Aeronautical Laboratory
ii.	Calcutta	Indian Association for Cultivation of Science
iii.	Madras	Central Leather Research Institute
iv.	New Delhi	Indian National Scientific Documentation Centre
v.	Pune	National Chemical Laboratory

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 increasing number of users and full search costs are 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/NAL, 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.

In order to assess the present situation, to promote the technology in the country and to facilitate exchange of notes, the first National Meet of CD-ROM/ONLINE Users and Service Providers was organised during July 16-17, 1992 in Technology Bhavan, New Delhi.

4. 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 area are being networked. The necessary hardware, software, and sites are now ready. Meanwhile, in collaboration with the 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, Calcutta and Bangalore. Activities related to database creation and retrospective conversion have been initiated.

On similar lines, the Delhi Library Network (DELNET) aims at connecting about 30 libraries in

Delhi. In DELNET Phase-O, 24 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.

Development of Pune Library Network (PUNENET) and Bombay Library Network (BONET) have been initiated. The feasibility study for Madras Library Network (MALIBNET) has been completed.

Similar metropolitan networks are contemplated for Ahmedabad and Bangalore in the immediate future.

NISSAT has further taken initiatives for providing E-Mail facilities to the various NISSAT information centres dispersed in the country. This connectivity would greatly enhance the resource sharing capabilities among NISSAT information centres and also the provision of user services more efficiently. The ERNET group of the Department of Electronics, Government of India provides the overall know-how in these ventures.

5. 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 vesion, SUPERDOC and IDAMS (Statistical package) from UNESCO. On behalf of UNESCO-PGI, Paris, NISSAT has official rights for the distribution of CDS/ISIS and IDAMS in India.

At present, CDS/ISIS ver. 3.0 is distributed to libraries, information centres and non-profit institutions along with adequate training support. There are 815 installations in India (*as on 31st December, 1992*). 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 statewise and yearwise distribution of Micro-ISIS is given in Figure VI.1 & VI.2 respectively.

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 housekeeping activities. SANJAY is implemented in the DST Library, Technology Bhavan, 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.

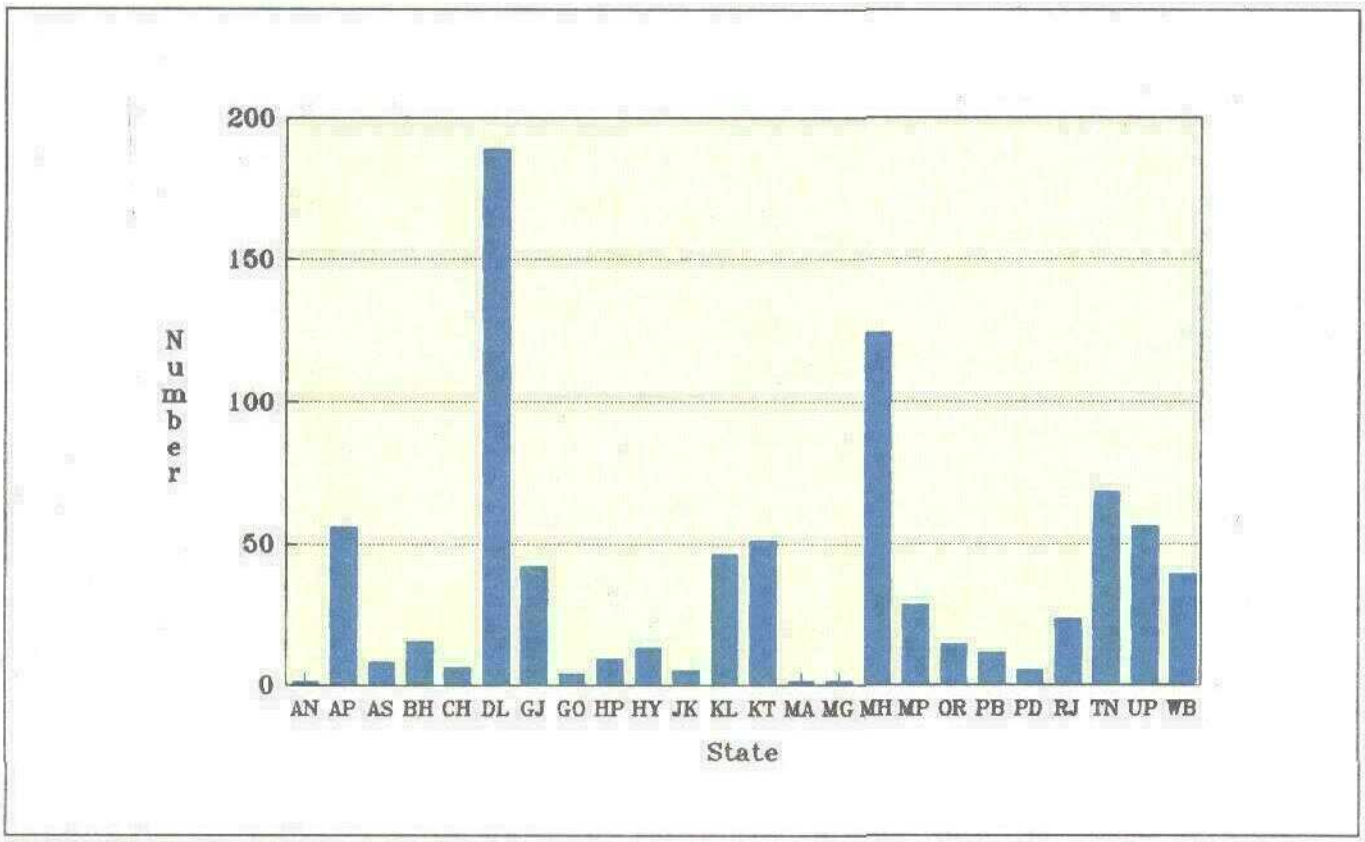
Another CDS/ISIS based package known as TRISHNA has been developed in collaboration with National Institute of Science Technology and Development Studies (NISTADS), New Delhi. TRISHNA supports database in Devnagri and several other Indian scripts using a GIST CARD.

A National Meet of CDS/ISIS Users was organised during January 6-8, 1993 at NCL, Pune, to assess the status of the package in the country, to provide technical solutions to the problems faced by the users and to facilitate the exchange of experiences.

6. UNION CATALOGUE

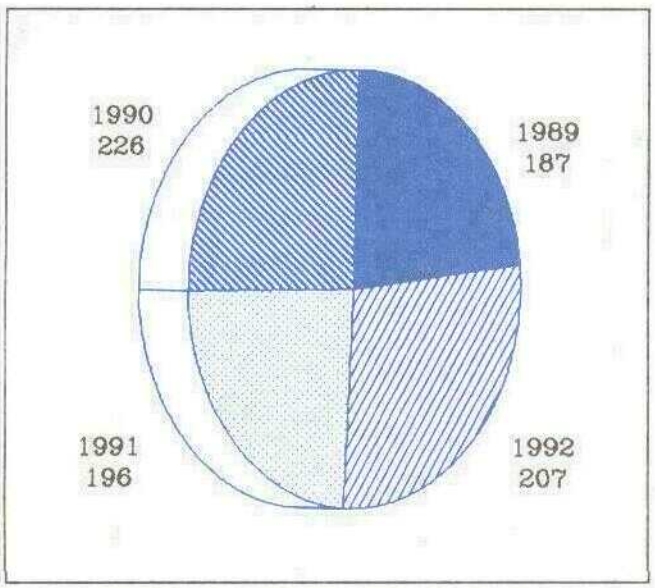
In view of the high potential of the National Union Catalogue of Scientific Serials in India (NUCSSI) as an access tool to support various information programmes, NISSAT has incorporated a plan of action for updation and maintenance of NUCSSI. The NUCSSI data has been converted into a database with a view to making it appropriate for online searching and online ordering for journal articles. Production of secondary databases, namely holdings of libraries is 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 data-



VI.1 Distribution of Micro-ISIS (Statewise)

base may be loaded on CALIBNET, INDONET, NICNET etc. for Online search & retrieval. Efforts are being made to prepare catalogues on specific type of materials, cover-to-cover translated periodicals and Indexing & Abstracting periodicals in India.



VI.2 Distribution of Micro-ISIS (Yearwise)

7. RATIONALISATION OF PERIODICALS THROUGH CONSULTATIVE COMMITTEE

The cost of S&T periodicals increases at a rate of 15-20%. 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.

Such mechanisms are already operational in Ahmedabad (NICTAS/ATIRA), Bangalore

CGCRI), Delhi (DELNET), Lucknow (NICDAP/CDRI), Mysore (NICFOS/CFTRI), Nagpur (NEERI), Pune (NICHEM/NCL) and Trivandrum (KLA). Efforts are underway to set up these mechanisms in Bhopal, Chandigarh, Cochin, Hyderabad, Kanpur and Visakhapatnam.

8. NISSAT CARD

It is extremely difficult for an end user to access or use resources located outside the library of her/his own institution. An information/literature search therefore 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 Library Card System that would facilitate utilisation of external library resources with due safeguards for protection of the interests of cooperating libraries. A feasibility study on this concept is completed.

9. DOCUMENT SUPPLY SERVICE

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.

Institutions Handling ASTINFO Document Supply Service

S. No.	Place	Institution/Association
i.	Ahmedabad	NICTAS/ATIRA
ii.	Bangalore	NICMAP/CMTI
iii.	Calcutta	NICAC/CGCRI
iv.	Delhi	DESIDOC, NISSAT, 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.

10. 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. The list of courses is given below.

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 Pune, Pune.

Subject	Place	From	To
Bibliometrics	New Delhi	12.10.92	23.10.92
CD-ROM Technology	Madras	12.10.92	16.10.92
CDS/ISIS & Computer Applications	Bangalore	11.05.92	19.05.92
	Calcutta	30.03.92	10.04.92
		13.04.92	24.04.92
		16.11.92	20.11.92
Subject	Place	From	To
Midnapore	18.05.92	27.05.92	
	New Delhi	13.04.92	15.05.92
		25.05.92	16.06.92
		02.11.92	04.12.92
		04.01.93	29.01.93
		08.02.93	12.03.93
	Pune	16.09.92	19.09.92
		02.12.92	15.12.92
		17.02.93	02.03.93

	Trivandrum	15.07.92	11.08.92
DBMS & dBase	New Delhi	13.07.92	07.08.92
Information Consolidation	Burdwan	22.06.92	27.06.92
Information Handling: Computer Aided	Bangalore	09.11.92	11.11.92
Information S&T: Recent Developments	New Delhi	22.03.93	02.04.93
Visual Communication	Madras	11.05.92	16.05.92

11. STUDIES/DIRECTORIES

NISSAT promotes and supports studies, preparation of directories, databases, basic and applied research in information science. The list of such projects/efforts is given below.

S. No.	Activity	Institute
	Database Creation	
i.	Generation of Earth Science	Geological Society of India, Bangalore
ii.	Library & Information Centers	Indian Lib. Association, New Delhi
iii.	Union Catalogue of S&T Conference Proceedings in Calcutta & North East Region	INSDOC Regional Centre, Calcutta
	NISSAT Card: Feasibility study	
iv.	NISSAT CARD - A Feasibility Study	CASAD, Pune
	Software: Library Automation	
v.	Software packages developed for library automation in India and their applications in library	University of Poona, Pune
	Software: CDS/ISIS	
vi.	Survey of CDS/ISIS Applications in India	NISSAT/DSIR, New Delhi
	State of the Art Report	
vii.	Optical Character Recognition	DRTC, Bangalore
	Use: S&T Periodicals	
viii.	Study of the Scientific and Technical Information use in India: Information needs and Behaviour of Scientists	Institute of Social Analysis & Communication, New Delhi
	User: Survey	
ix.	Survey of the Information needs of Textile Exporters/ Importers	NICTAS/ATIRA, Ahmedabad

11.1 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. A Compendium of activities of NISSAT Centres has also been brought out. Besides, brochures highlighting various aspects of NISSAT e.g. CDS/ISIS, NISSAT CARD, NLA-ASTINFO-NISSAT Document Supply, Rationalisation of Periodicals Acquisitions, SANJAY, TRISHNA, NALANDA and a poster on Online Access have been brought out.

11.2 Exhibition Stall in IFLA 1992

NISSAT participated and setup an Exhibition Stall during 58th Annual General Conference of the International Federation of Library Associations

VI.3 NISSAT Exhibition Stall in IFLA 1992

and Institutions held in New Delhi during 30th August-5th September, 1992 for promotion/sale/exhibit/exchange of the NISSAT publications, Databases & Software and activities of Sectoral Information Centres & NACID's. About 1250 delegates including librarians, information scientists, publishers information technology personnels, media persons, etc. from all over the world participated.

12. 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 records. 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.

b. 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.

c. 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)

d. Similarly NISSAT Secretariat has been given another contract to develop teaching aids and course materials for introducing modern computer communication concepts to librarians and information scientists.

13. NISSAT NEWSLETTER

NISSAT, in cooperation with the Society for Information Science (SIS) has been publishing its quarterly NISSAT Newsletter. This effort is an expression of the sincerity behind NISSAT's intention to mobilize the technical expertise available with professional bodies. 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. With a present circulation list of 5000 institutions and individuals, the NISSAT Newsletter enjoys user appreciation and high professional esteem in India.

VII. PUBLIC ENTERPRISES

VII (A). NATIONAL RESEARCH DEVELOPMENT CORPORATION

The Corporation continued to improve its performance since the introduction of "New Approach" in the Corporation's activities a few years back. The performance of the Corporation has further improved during 1991-92 in almost all area of its operation. The highlights of the performance of the Corporation at a glance are:

(Rs. in lakhs)

	1991-92	1990-91
Lumpsum Premium	96.00	58.92
Royalty	93.85	65.44
FE Earning	127.92	98.72
Gross Profit	68.44	63.67

1. INCOME FROM LICENSING OF INDIGENOUS KNOW-HOW, TECHNOLOGIES

(a) Lumpsum Premium

The Corporation maintained its record of surpassing the previous year's income by way of lumpsum premium from licensing of indigenous knowhow. During the year, the Corporations' income from lumpsum premium increased to a record level of Rs. 96.00 lakhs compared to Rs. 58.92 lakhs in the previous year, an increase of 62%. In addition, an amount of Rs. 29.75 lakhs is payable to the Corporation during 1992-93 as deferred lumpsum premium against licence agreements executed during 1991-92.

(b) Royalty

The royalty income from the Corporation's licensees has increased to a record amount of Rs. 93.85 lakh as against Rs. 65.44 lakhs in the previous year.

2. PROFIT

Due to the sustained efforts and hard work put in by its officers and staff, the Corporation earned a record gross profit before tax of Rs. 68.44 lakhs as compared to Rs. 63.67 lakhs during 1990-91.

3. PROCESSES ASSIGNED AND LICENCE AGREEMENTS CONCLUDED

The Corporation continued its efforts to widen its technology resource base. A Memorandum of Understanding was signed on 24th October, 1991 with the Foundry & Forge Division of Hindustan Aeronauties Ltd., Bangalore for the commercialisation by the Corporation of HAL's technologies.

As a result of such efforts, 49 new processes were assigned to the Corporation for commercialisation as compared to 42 processes in the previous year. Some of the commercially important processes assigned to the Corporation during the year were:

* Jojoba Body Cream
* Investment Casting for aluminium & steel
* Special Sand Casting Processes in Aluminium and Magnesium Alloys.
* Mini Rolling Mill for Aluminium Sections.
* Maintenance Free Lead Acid Batteries.
* Special Centre Lathe Attachement for the Blind.

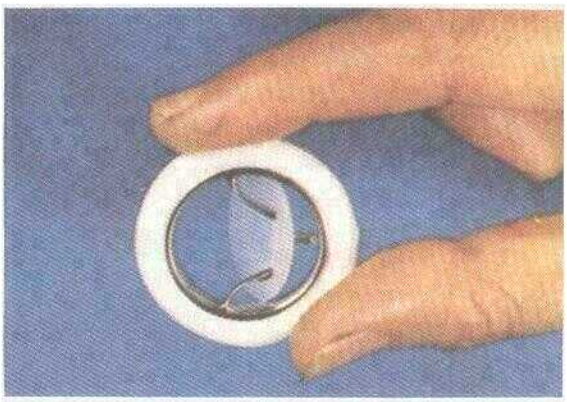
The Corporation signed 73 licence agreements during the year 1991-92 as against 78 in the previous year. Despite this marginal decline in the number of licence agreements concluded, the average lumpsum premium secured for the processes licensed, increased significantly to Rs. 1.30 lakhs as compared to 0.75 lakh in 1990-91.

4. MAJOR TECHNOLOGIES LICENSED

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

* Spirulina Alga Protein Concentrate
* Spice Oleroresins
* Flexible Graphite Tapes and Sheets
* Rice Husk Particle Board
* Cyclosporin 'A' Immuno Suppressive Drug
* Artificial Heart Valve
* Alcrotan and Aluton Leather Processing Chemicals
* Fly Ash Bricks
* Thick Film Hybrid Micro Circuits
* Synthetic High Alumina Aggregate
* Sand lime bricks

The licensing of these technologies involved payment of lumpsum premia amounting to Rs. 68.00 lakhs. Substantial royalties are also expected from these technologies in the coming years.



VII A.1 Artificial Heart Valve-Technology Licensed by NRDC

5. TECHNOLOGY DEVELOPMENT PROJECTS

5.1 Completed Projects

(a) Spirulina Alga: Spirulina is a high quality food supplement containing vitamin B1, B2, B6, B12, C&E besides Beta Carotene which is the precursor for Vitamin A. It has tremendous potential for use in health foods, cosmetics and health care applications. The process was developed at the Murugappa Chettiar Research Centre (MCRC), Madras on a pilot plant scale. However, it was found that the pilot plant needed considerable process optimisation and standardisation to attain its rated capacity of 7.5 TPA. Recognising the potential of Spirulina for a range of end uses in food supplements, pharmaceuticals, cosmetics etc., the Corporation provided a conditional grant of Rs. 13.2 lakhs to MCRC for the process engineering and optimisation. The project was satisfactorily completed in 1990 and the upscaled process was subsequently licensed to M/s New Ambadi Estate Pvt. Ltd., Madras in 1991. The firm has since commenced production and is marketing the product on a commercial scale.

(b) Rice Husk Particle Board: The laboratory scale process for the manufacture of Rice Husk Particle Boards was developed at the Indian Plywood Industries Research Institute (IPIRI), Bangalore under funding from the Department of Science & Technology and the process was assigned to the Corporation for commercialisation. Recognising the importance of the product as a suitable substitute for wood, the Corporation licensed the process, and provided an interest free technology development loan of Rs. 12.00 lakhs, to M/s Padmavathy Panel Boards Ltd., Bangalore for setting up a demonstration plant of 600 TPA capacity.

The project was commissioned in 1989 with significant financial and technical inputs from NRDC. It is now producing approximately 2 tonnes of various types of Rice Husk Board per day. These boards have already been introduced by our licencee in the market and have been readily accepted by the customers. The process has now been licensed to 7 other parties.

5.2 On Going Projects

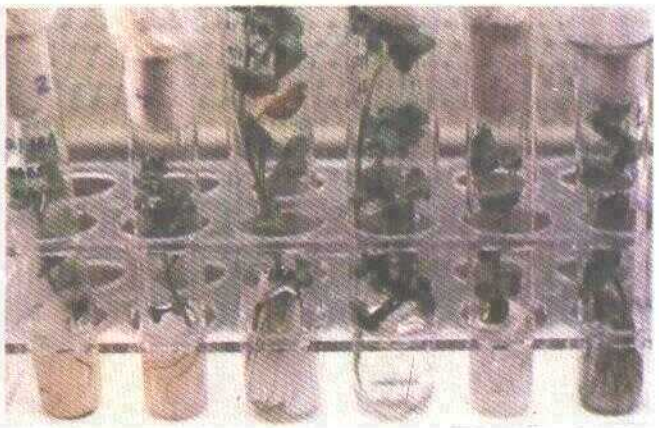
(a) Electrolytic Manganese Dioxides: The process for the manufacture of Electrolytic Manganese Dioxides (EMD), a raw material for Dry Cells was developed by the National Metallurgical Laboratory of CSIR. Since over 3000 TPA of EMD are being imported, the Corporation identified M/s Magno Mining Co. Ltd. (MMCL) for setting up a demonstration plant having a capacity of 300 TPA at a cost of around Rs. 4.23 crores. The Corporation decided to provide suitable equity assistance of upto 26% of the total equity of Rs. 100.6 lakhs. Towards that end the Corporation has so far invested Rs. 15 lakhs as equity. MMCL have ordered to major items of plant & machinery. Some of the items of plant and machinery have been received at site and the civil works are nearing completion. There has, however, been steep escalation in the project cost and financing of the increased cost is being considered by IDBI.

5.3 New Projects

(a) Low Cost Plant Tissue Culture Media: The Indian Institute of Technology, Kharagpur has developed a laboratory process for production of low cost plant tissue culture media, a natural substitute for the conventional tissue culture media like Murashige-Snoog (MS), B5 etc. The product is widely used for in *vitro* regeneration of plantlets. In order to optimise the various parameters involved in the process and to upscale the process to a level of 1.5-2.0 Kg. per batch, the Corporation provided a financial grant amounting to Rs. 50,000 to IIT, Kharagpur.

The work is progressing satisfactorily and is expected to be completed in the beginning of 1993. In the meantime the Corporation has already identified a major company for licensing of the upscaled know-how.

(b) Sand Lime Bricks: Sand Lime Bricks or Calcium Silicate Bricks are considered to be advanced building materials having a number of advantages over conventional bricks. The Central Building Research Institute, Roorkee of CSIR had carried out extensive research and development work to produce good quality sand lime bricks. However, no party was interested in taking up the know-how due to the low cost of conventional bricks. With financing from HUDCO in the form of Rs. 10.00 lakhs as equity and Rs. 340 lakhs by way of term loan and equity participation to the extent of Rs. 30 lakhs by the Corporation, it has been possible to licence the process to M/s Periwal Bricks Pvt. Ltd., Sri Dungargarh (Raj.). The plant is to have a capacity of 415 crores bricks/annum and to cost Rs. 5.50 crores. The work on the project is progressing satisfactorily and the plant is expected to be commissioned by March, 1993. Since there is potential to set up several such plants, the Corporation is ensuring that the complete technology package of its first licencee is available to the Corporation to facilitate licensing of the upscaled



VII A.2 A Futuristic Biotechnology - Plantlets grown on New 'Low Cost Tissue Culture Media', Developed by IIT, Kharagpur

VII A.3 A new Building Material - Calcium Silicate Bricks in Assorted Colours-Knowhow Licensed by NRDC.

process to other parties in future.

6. INVENTION PROMOTION

Through its Invention Promotion Programme the Corporation has been endeavouring to stimulate the spirit of inventivity among not only scientific and technical personnel but also amongst industrial workers, craftsman, artisans etc.

During the year, the Corporation received 114 proposals for Prize Awards and 36 proposals for providing financial assistance for prototype development.

The Corporation announced Cash Awards amounting to Rs. 2.15 lakhs to 18 Inventors for 9 Inventions on Independence Day 1991 and Cash Awards amounting to Rs. 2.30 lakh were awarded to 24 Inventors for 8 Inventions on Republic Day 1992.

Some of the notable inventions recognised through awards given during the year were:

* Spirulina Alga
* Glass Reinforced Gypsum Board
* Flexible Graphite
* W-Band Monopulse Antenna System for Missile Seeker Application.
* Submerged Arc Welding Flux for Narrow Gap Application
* Digital Micro Meter for roll gap measurement in continuous casting steel plant.

The Corporation also provided Financial Assistance amounting to Rs. 33,500/- to 5 inventors for prototype development.

7. MARKET SURVEY

Detailed market information makes the technology package more attractive to entrepreneurs. With this end in view, the Corporation commissioned professional market surveys in respect of the following technologies:

Special Automotive items like bullet-proof Car, Axle differential lock, 3-way tipping gear, GRP fuel tanks for vehicle application.

- Ceramic Colours
- Industrial Burners with special reference to Acoustic Liquid Fuel Burners.
- Magnesium Metal
- Magnesia from Sea Bitterns
- Aluminium Hydroxide (IP Grade)
- Activated and Precipitated Calcium Carbonate
- Jojoba Body Cream
- Polyester Resin (Eleaste Polymer)
- Ethyl Cellulose
- Gallic Acid
- Sacrificial Anodes

8. DEVELOPMENT & PROMOTION OF RURAL TECHNOLOGY

The Corporation continued to pursue its programme of Development and Promotion of Rural Technology. During the year the Corporation set up six new Rural Technology Demonstration cum Training Centres at an expenditure of Rs. 2.50 lakh at the following locations.

* Shaktifarm (Uttar Pradesh)
* Nadwa Sarai (Uttar Pradesh)
* Rae Bareilly (Uttar Pradesh)
* Rajur (Maharashtra)
* Dhule (Maharashtra)
* Pilani (Rajasthan)

The Corporation also reviewed the performance of the 9 existing RTDT Centres to determine their additional needs in terms of new technologies. As a result, 8 RTDT Centres were strengthened by providing equipment for demonstration of additional rural oriented technologies.

9. EXPORT

The Corporation continued its concerted and

energetic efforts to export Indian Technologies to other developing countries. In doing so, the Corporation is not only banking on the technologies available from its own reservoir, but is also drawing on proven, operating, technologies in both Public and Private Sector Industry.

During the year under review, the Corporation completed the following export projects:

		Project Cost (Rs.)
(a)	Triacontanol, Indonesia	14.43 lakhs
(b)	Dehydrated Green Pepper, Indonesia	27.01 lakhs
(c)	Chlorine Tablets, Bangladesh	7.75 lakhs

The work on implementing the following projects progressed satisfactorily:

(i)	Synthetic and Natural Dyes Projects in Vietnam for UNIDO	Rs. 101.45 lakhs
(ii)	Basic Drug Know-how in Brazil	Rs. 6.50 lakhs

The Corporation signed an agreement with M/s EL-NASR Pharmaceutical and Chemicals Company, Cairo for setting up a Blood Bag manufacturing plant having a capacity of 2 million bags per annum. The total cost of the project is about Rs. 8 crores. The Corporation has also licensed to Know-how for 12 basic drugs to EL NASR. The Corporation was also successful in licensing the Know-how for the manufacture of a basic drug to a company in Brazil.

10. FOREIGN EXCHANGE EARNINGS

The foreign exchange earnings of the Corporation amounted to Rs. 127.92 lakhs in 1991-92 as against Rs. 98.72 lakhs in the previous year. The total foreign exchange spent during the year amounted to Rs. 3.76 lakhs.

11. PATENT ASSISTANCE

The Corporation provides technical, legal and financial assistance to individual inventors and R&D Institutes in filing patent applications at home and abroad and processing them till the stage of scaling of the patent. Before advising the inventors and R&D institutions to file patent applications abroad, a complete State-of-the-Art search is being provided to the applicants, which is being done with the help of the World Intellectual Property Organisation, Geneva and the European Patent Office, Munich. Towards this end, during the year, the Corporation provided financial assistance to 15 individual inventors for filing patent applications on their inventions in India and to five inventors to file patent applications abroad, viz. U.S.A., U.K., Japan, EPO, etc. The Corporation also filed 8 patent applications on various inventions developed by DRDO, IISc. etc.

12. TRAINING PROGRAMMES

To create awareness in R&D institutions and industry of the various facets of technology transfer, the Corporation organised training programmes on: "Management of Technology Transfer", "Patents and Information System" at Aurangabad, Bombay and Pune. The participants in these programmes were drawn from Public and Private Sector industries, Research Institutions, Govt. Department etc.

13. PUBLICATIONS

Dissemination of information on new processes to industry, entrepreneurs and the general public plays an important role in the process of technology transfer. One of the means of doing so is through publications of various types. During the year, the Corporation continued to bring out the following regular publications:

- Awishkar - Monthly in Hindi
- Invention Intelligence - Monthly in English

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

- Process Diary
- Technology on Sacrificial Anodes
- Golden Book on Management of Technology Transfer, Information and Patents

14. EXHIBITIONS AND PUBLICITY

Participation in Exhibitions, Seminars, Workshops, Entrepreneur Development Programmes etc. are of vital importance for the popularisation of new processes and creation of awareness about the role of the Corporation in technology transfer. With this end in view, the Corporation participated in a number of exhibitions, seminars, get-togethers etc.

Exhibitions

* Glimpses of India Exhibition - 37th Commonwealth Parliamentary Conference in New Delhi
  (19th Sept. to 22nd Oct., 1991)

* I.I.T.F. in collaboration with CAPART & CSIR in New Delhi
  (14-29th November, 1991)

* Entrepreneurs' Project idea & Catalogue Fair organised by Communication Research Consultants in Calcutta
  (25-30th November, 1991)

* The Indian Ceramic Society, Calcutta
  (13-16th December, 1991)

* *Buyers-Sellers-cum-Entrepreneurs' Meet 1991* organised by Maharashtra Centre for Entrepreneurship Development, Aurangabad
  (27-28th December, 1991)

* WISITEX 92, 7th World Instrumentation, Industrial Electronics & Mfg. Aids Symposium and Exhibition in New Delhi
  (4-10 February, 1992)

* Rotary Fair in Collaboration with MITCON in Pune
  (16-19 February, 1992)

Tech-Trans Seminars

* Tech-Trans. '91: Tech Seminar on Communication, Electronics & Environment Protection in Bangalore
  (20-25 August, 1991)

* Tech.-Trans, '92: An Exposition-cum-Seminar on NRDC Technologies in Collaboration with Vidarbha Industries Association, Vidarbha in Nagpur
  (8-9th January, 1992)

* Tech-Trans. '92: An Exposition-cum-Seminar on NRDC Technologies in Collaboration with Sigma Sysbase Information Pvt. Ltd., Vadodara
  (11-12th March, 1992)

TV Programmes

The Corporation also arranged a morning TV Programme on Fly Ash Bricks technology by one of the licencees of the Corporation which was telecast on 5th June, 1991. The programme titled 'Raakh Se Lakh' was viewed by million of people all over the country and was widely appreciated. Similarly, a TV Programme on Rice Husk Particle Board was telecast on 8th March, 1991.

15. HUMAN RESOURCE DEVELOPMENT

The Corporation's efforts towards human resource development to achieve individual growth with corporate growth continued by giving high priority to the training and development needs of its employees. During the year 24 executives and 34 staff of the Corporation were deputed for training in Computer Applications, Database Management etc. at reputed institutions.

VII (B). CENTRAL ELECTRONICS LIMITED

1. INTRODUCTION

Central Electronics Limited (CEL) holds a unique position among the family of Public Sector Enterprises in Electronics, with its emphasis on indigenous technology inducted both from its in-house developments and from the country's National Laboratories, for its production programmes in diverse hi-technology areas of National Relevance. The activities of CEL are sharply 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 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 1991-92

2.1 Operating Results

The details of division-wise production & sales achieved during the year as compared to the previous year are given below:

(Rs. in Crores)

	1990-91 ACTUALS	1991-92 R.E.	1991-92 ACTUALS
PRODUCTION	18.79	34.95	39.52
SALES	15.60	37.00	39.76

The Company achieved a record production and sales of Rs. 39.52 crores and Rs. 39.76 crores respectively exceeding the Revised Estimates for the year of Rs. 34.95 crores and Rs. 37 crores respectively.

The Company also achieved a net profit of Rs. 2.55 crores on the operations for the year 1991-92.

2.2 HIGHLIGHTS OF OPERATIONS:

2.2.1 Solar Photovoltaics:

In the Solar Photovoltaics Group, the major programme of improvement of the technology of solar cells launched in October 1991 with the help of the Bhabha Atomic Research Centre (BARC) succeeded. As a result substantial improvements in the efficiency and yield of solar cells and in the efficiency of the Company's solar photovoltaic modules were achieved by March 1992. What is more, over 530 KWp of these high efficiency solar cells were produced in the last quarter of the year (January-March 1992). Module power outputs (36 circular cells) rose to over 35 Wp consistently.

Another major feature of the operations in the

SPV area this year has been the large volume supply of SPV Power Sources for the VHF rural communication network of the DOT. During the year over 8000 systems have been supplied to DOT of which 5000 were supplied in the last quarter of the year. A further 5000 of these systems, which remained as orders in hand as on 31.3.1992 will be produced and supplied by the end of September 1992. The Company exp· ts further orders of these SPV power sources from DOT for supply during 1992-93 and it is well placed to execute large volume orders for these systems. The Company also supplied nearly 250 KWp of SPV modules to DNES.

2.2.2 Systems Group:

The turnkey project on Colour Light Signalling was successfully completed during the year. A major operation of the Systems Group involved the production and supply to the SPV Group of nearly 10,000 Electronic Charge Controllers needed for the SPV Power Sources to be supplied to DOT against their major orders received during the year. What is more, the Systems Group has streamlined its operations so as to produce these Charge Controllers to the extent of over 10,000 Nos. in a year. A vigorous sales drive was undertaken with the help of the Electronics Trade & Technology Development Corporation (ET&T), Bangalore branch for the sale of CEL's Projection Television (PTV) systems in the Southern region and, as a result, close to 50 Nos. of PTVs were sold during the year. This drive will continue during 1992-93 also.

2.2.3 Components Group:

During the year, an operating group of suitably qualified young engineers was formed for completing the development and establishing the necessary infrastructure for batch production of Phase Shifters to meet the recurring demands from the Defence Services for Phased Array Radars. This group has standardised the process and inspection techniques and methodology for the batch production of C-Band Phase Shifters and the first batch was supplied to the Defence R&D Organisation. Presently the Company's first commercial order for a substantial quantity of X-Band Phase Shifters is in hand and same is being executed for supply. In the Ferrite Division RM-8 Cores with AL value of 8000 and permeability in the range of 5000 to 6000 were developed and approval obtained from ITI. The RM-8 Cores are high value cores which are likely to have increasing off-take from ITI, Mankapur.

2.2.4 Memorandum of Understanding (MOU) with the Government (for 1992-93)

For the first time, CEL was included among the public sector companies signing Memoranda of Understanding (MOU) with the Government for the year 1992-93. The company had prepared the MOU for 1992-93 as per the guidelines of the DPE and the draft MOU agreed by CEL and DSIR was submitted to DPE and the same was discussed with the Ad hoc Task Force (ATF) syndicate formed by the Government for scrutiny and advice on MOUs. The final draft including a few suggestions made by ATF was submitted to DPE through DSIR on 18th March, 1992 and on clearance by DPE the MOU was signed by CEL and DSIR on 7 May 1992. The MOU target for production for 1992-93 has been set at Rs. 42 crores (corresponding to the "very good" rating).

2.2.5 PVSEC-6:

The Sixth International Photovoltaic Science and Engineering Conference was held at Hotel Taj Palace Intercontinental, New Delhi, from 11th to 14th February, 1992. CEL was a co-sponsor of the conference, which was mainly organised by the Department of Non-Conventional Energy Sources (DNES), National Physical Laboratory (NPL) and

VII B.1 Computerised Solar Cell Tester and Sorter in CEL's Solar Cell Plant

Solar Energy Society of India (SEST). An Invited lecture entitled "Small Solar Photovoltaic Systems in the Indian Context" - CEL's experience" by Brig MR Narayanan and a paper on "Development of Efficient and Reliable Charge Controllers" were presented at the Conference. CEL also put up an impressive stall at the exhibition of SPV products held concurrently with the conference. CEL's SPV activities received wide coverage in the Press during the Conference.

3. ROLE IN NATIONAL TECHNOLOGY MISSIONS

The Company's SPV group supplied about 8000 SPV Power Sources (valued at Rs. 20 crores) for the DOT's VHF Rural Telecommunication Network. Special Refrigerators meeting WHO specifications are being developed for operation on SPV power. These refrigerators are required for storing vaccines in village health centres as part of the National Mission on Immunization.

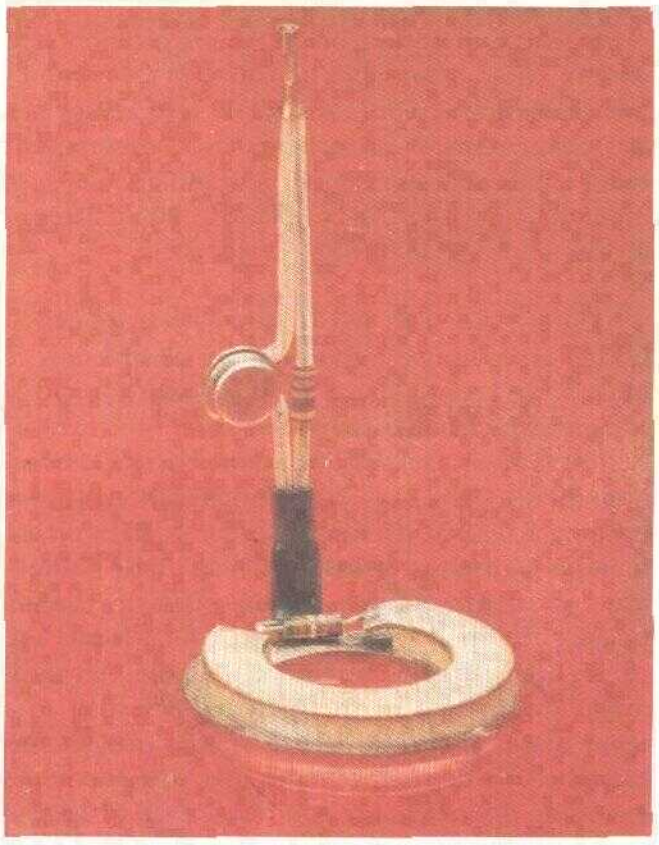
4. TECHNOLOGY ABSORPTION ADAPTATION AND INNOVATION

The development project on the Ultra High Efficiency (UHE) Single Crystalline Silicon Solar Cells is being pursued in collaboration with the University of New South Wales (UNSW), Australia with whom the Company has already concluded an S&T Agreement for the transfer of their laboratory technology and also collaboration for establishing a Bench Scale Process for the UHE Solar Cells at CEL and carrying out the necessary further development for converting the same into a production-worthy and commercially viable technology for induction into the Company's commercial SPV plant. This programme is now in progress.

5. 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 ongoing activities as also against specific projects funded through Grants-in-Aid from DSIR and other government agencies.

In the SPV area, the development group carried



VII B.2 P_2T Electric System for Defence Ammunition

out several improvements in the solar cell production process and successfully transferred these improvements onto the commercial plant of the Company. As a result the efficiency & yield for the solar cells and modules produced went up steeply in the second half of the year. This in turn, made a major contribution to improving the cost effectiveness of the Company's solar cell and module production. Work on the UHE Solar Cell development also continued during the year as a part of which a CEL team from the SPV Plant visited UNSW's laboratories for hands-on experience on the bench scale process available at UNSW.

A special SPV module for an SPV Charger for charging of sintered plate Nickel-Cadmium batteries used in radio communication equipment of the Defence Services developed by the Company, was approved after extensive evaluation by CQAP, Bangalore. Following the approval, the Company is likely to receive bulk orders for this SPV product from the Defence Services.

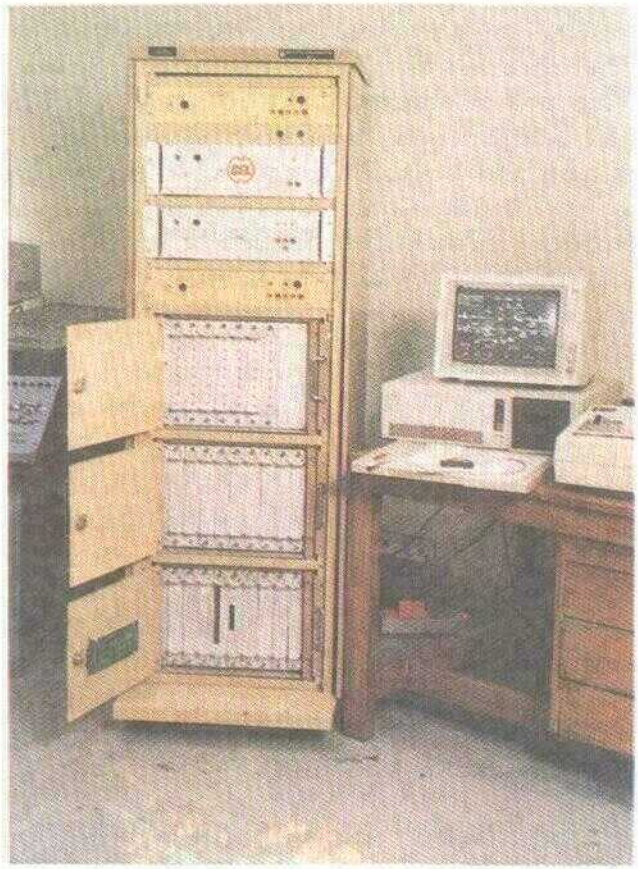
A data acquisition system was set up for on-line

measuring and logging various parameters like pressure, temperature, sun intensity and flow rate with the help of suitable transducers for continuous evaluation of a number of SPV systems such as SPV water pumps, street-lights etc. Development work continued on evaluation of indigenous submersible pumps for SPV operation, high efficiency inverters for use in our SPV systems etc.

During the year, the Company started establishing an in-house facility for the production of Microwave Ferrite Phase Shifters (both C-band & X-band) which had earlier been developed in association with IIT, Delhi & Solid State Physics Laboratory (SPL), Delhi and other organisations under funding from the Defence Research & Development Organisation (DRDO). These phase shifters are critical components of Phased Array Radars being developed by DRDO and which forms the centre piece of the Integrated Missile Development Programme of the Defence Services. The team working on the phase shifter project has carried out a number of innovative developments including the designing and fabrication of special jigs and fixtures and developing special computer software, all with the objective of reducing the inspection and testing time which forms a predominant part of the production process of these phase shifters. With these developments, the total production cycle time of the phase shifters is considerably reduced thereby increasing not only productivity but also the Company's annual production capacity for these phase shifters.

Work on the development of High Permeability Ferrite Materials and Components was carried out using facilities available within the Company as also those with a foreign company for establishing the required process parameters for these specialised materials. Suitable equipment required for this project have also been identified.

In the System Group, the prototype of the Solid State Interlocking System (SSI) being developed in association with IIT, Delhi and the Research, Development and Standards Organisation (RDSO) of the Railways at Lucknow was submitted to RDSO for evaluation, testing and field trials. The equipment was also successfully demonstrated later to Chairman, Railway Board & other senior officials from the Railways. Work is ongoing on Microprocessor based Axle Counters and upgradation of the Unmanned Level Crossing Radio Warning System.



VII B.3 Solid State Interlocking System Under Development for Railways

5.1 National Award for R&D:

CEL was selected for the National Award for R&D in Industry in the Electrical & Electronics Industries Sector for the year 1991-92. The award was in recognition of two major in-house R&D achievements - Solar Cell Technology Improvements and the Development and Establishment of Batch Production Facility for Microwave Ferrite Phase Shifters required for the Phased Array Radars of the Defence Services.

6. WELFARE OF WEAKER 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 1992, the total number of employees in these categories was 255 which represents about 27% of the total strength of the Company.

7. USE OF HINDI

In accordance 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.

8. INDUSTRIAL RELATIONS AND HUMAN RESOURCES DEVELOPMENT

The Company had fairly cordial industrial relation during the year as a result of the Management's continuous dialogue with the recognised Workers Union and with the Officers/Executives Associations.

Employees' participation in management continued through the forums of Shop Level and Plant Level Committees constituted for the purpose. 26 Meetings of the Shop Floor Committees and three of the Plant Level Committees of the different divisions of the Company were held during the year as against 16 and 3 respectively in the previous year.

9. REVISED PLAN FOR 1992-93 AND TARGETS FOR 1993-94

The Revised Plan targets for 1992-93 are Rs. 50 crores of Production and Sales. The corresponding targets Budgeted for Production and Sales for 1993-94 are Rs. 60 crores for both.

VIII. 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 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 Language Implementation Committee were held regularly in DSIR.

(b) The Quarterly Progress Report regarding use of Hindi in the Department was sent to the Department of Official Language regularly and in time.

(c) Under Hindi Teaching Scheme, non-Hindi knowing employees of the department were nominated for Prabodh, Praveen and Pragya courses. Employees of the Department were also nominated for training in Hindi Stenography, Hindi Typing and Hindi Computer.

(d) In April, 1991 Committee of Parliament on Official Language inspected this Department. The assurances given to the Committee have been fulfilled.

(e) From 14th to 21st September, 1992, combined Hindi Week was observed in the Department of Science & Technology and Department of Scientific & Industrial Research at Technology Bhavan. 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.

(f) In November, 1992 Hindi Workshop was organised for encouraging the Officers/Employees who possess the working knowledge of Hindi for using Hindi in their official work.

(g) Hindi version of Orders, Notifications, literature of In-house R&D in Industry, Standard Drafts, Annual Report and Performance Budget were provided.

(h) To review the progress of the use of Hindi, the Subordinate Offices; Central Electronics Ltd., Sahibabad, National Research Development Corporation, New Delhi and Consultancy Development Centre, Qutub Hotel, New Delhi were inspected during the period.

The number of Employees in the different

groups in the Department of Scientific & Industrial Research as on 1.1.93 is given below:

Groups of Post	Number of Employees			
	General	SC	ST	Total
Group A (Gazetted)	30	3	-	33
Group B (Gazetted)	8	1	-	9
Group B (Non-Gazetted)	15	1	-	16
Group C (Non-Gazetted)	13	3	2	18
Group D (Non-Gazetted)	10	1	-	11

3. FINANCE

The total Budget Estimates 1992-93, Revised Estimates 92-93 of the various plan and non-plan schemes including provision for CSIR are shown below:

Rs. in Crores

Budget Estimates 1992-93			Revised Estimates 1992-93		
Plan	Non-Plan	Total	Plan	Non-Plan	Total
127.66	152.60	280.26	118.34	164.12	282.46

ANNEXURES

ANNEXURE II.1

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 Biochemicals	(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 Laboratory, 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, Ghaziabad	(SERC-G)

Regional Research Laboratory, Bhubaneswar	(RRL-Bhu)
Regional Research Laboratory, Trivandrum	(RRL-Triv)
Regional Research Laboratory, Bhopal	(RRL-Bhopal)

Information Sciences 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-A.1

STATEMENT OF RECOGNITION OF IN-HOUSE R&D UNITS

Month		Receipt	Commulative Receipt	Disposal	Cummulative Disposal	Cummulative Pendency at the end of month
December	1991	-	-	-	-	18
January	1992	9	9	5	5	22
February	1992	6	15	10	15	18
March	1992	13	28	8	23	23
April	1992	10	38	14	37	19
May	1992	3	41	6	43	16
June	1992	6	47	10	53	12
July	1992	2	49	10	63	4
August	1992	8	57	3	66	9
September	1992	11	68	5	71	15
October	1992	9	77	8	79	16
November	1992	3	80	5	84	14
December	1992	12	92	9	93	17

ANNEXURE III-A.2

STATEMENT OF RENEWAL OF RECOGNITION BEYOND 31.03.1992

Month		Receipt	Cummulative Receipt	Renewals granted/ rejected	Cummulative Renewals granted	Cummulative Pendency at the end of month
December	1991	245	245	-	-	245
January	1992	95	340	-	-	340
February	1992	23	363	-	-	363
March	1992	38	401	107	107	294
April	1992	12	413	128	235	178
May	1992	13	426	145	380	46
June	1992	7	433	22	402	31
July	1992	-	433	24	426	7
August	1992	-	433	7	433	Nil

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	187
2.	Armour Chemicals Private Limited	119
3.	Asea Brown Boveri Limited	165
4.	Ashok Leyland Limited	430
5.	Asian Paints (India) Limited	204
6.	Associated Cement Co. Ltd.	481
7.	Atic Industries Limited	102
8.	Atul Products Limited	130
9.	BPL Systems & Projects Ltd.	213
10.	Bajaj Auto Limited	1216
11.	Bajaj Tempo Limited	606
12.	Balmer Lawrie & Co. Ltd.	208
13.	Baroda Rayon Corporation Ltd.	151
14.	Bata India Limited	157
15.	Bharat Earth Movers Limited	1023
16.	Bharat Electronics Limited	3309
17.	Bharat Heavy Electricals Ltd.	4250
18.	Boots Pharmaceuticals Ltd.	183
19.	Brakes India Limited	293
20.	Bush Boake Allen (India) Limited	147
21.	CMC Limited	436
22.	Cable Corporation of India Ltd.	434
23.	Cadila Laboratories Limited	193
24.	Central Electronics Limited	104
25.	Cibatual Limited	145
26.	Cochin Refineries Limited	120
27.	Colour Chem Limited	201
28.	Crompton Greaves Limited	728
29.	Dhampur Sugar Mills Ltd.	290
30.	Dr. Reddy's Laboratories Ltd.	103
31.	Dunlop India Limited	442

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in lakhs)
32.	Eicher Goodearth Limited	181
33.	Electronic Research and Development Centre	437
34.	Electronics Corp. of India Ltd.	446
35.	Engineers India Limited	373
36.	English Electric Company of India Limited (Madras)	318
37.	Escorts Limited Corporate R&D Centre	270
38.	Escorts Limited (Motor Cycle & Scooter Division)	105
39.	E.I.D. Parry (India) Limited	168
40.	Gharda Chemicals Limited	330
41.	Glaxo India Limited	169
42.	Godrej Soaps Limited	176
43.	*Godrej & Boyce Mfg. Company Limited*	574
44.	Goodlass Nerolac Paints Limited	136
45.	Grauer & Wail (India) Limited	109
46.	Grindwell Norton Limited	112
47.	Gujarat Communication & Electronics Limited	296
48.	Gujarat State Fertiliser Company Limited, (Polymer Unit)	503
49.	HCL Limited (Communication & Computer Division)	200
50.	HMT Limited R&D Centre (Metal Cutting Division)	1498
51.	Haryana State Electronics Dev. Corp. Ltd.	190
52.	Hindustan Aeronautics Limited	314
53.	Hindustan Aeronautics Limited (Hyderabad Division)	482
54.	Hindustan Aeronautics Limited (Design & Engg. Department)	212
55.	Hindustan Antibiotics Limited	200
56.	Hindustan Ciba-Geigy Limited	280
57.	Hindustan Copper Limited (Khetrinagar)	188
58.	Hindustan Insecticides Limited	103
59.	Hindustan Lever Limited	471
60.	Hindustan Photo Films Manufacturing Company Ltd.	156
61.	Hindustan Teleprinters Limited	132
62.	Hindustan Zinc Limited	468
63.	Hoechst India Limited	1150
64.	Hyderabad Allwyn Limited	170
65.	ICI India Limited (Rishra)	173

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in lakhs)
66.	ICI India Limited (Explosives & Fertilisers Division)	117
67.	ICI India Limited (Fibres Division)	157
68.	IDL Chemicals Limited	113
69.	IOL Limited	120
70.	ITC Limited	113
71.	Indian Aluminium Company Limited	290
72.	Indian Drugs & Pharmaceuticals Limited	202
73.	Indian Oil Corporation Limited	1580
74.	Indian Organic Chemicals Ltd.	112
75.	Indian Telephone Industries Limited	2945
76.	Indo-American Hybrid Seeds	110
77.	International Computers Indian Manufacturers Ltd.	150
78.	Johnson & Johnson Limited	104
79.	Jyoti Limited	100
80.	J.K. Industries Limited	136
81.	J.K. Synthetics Limited	255
82.	Kegg Farms Limited	108
83.	Kelvinator of India Limited	238
84.	Kirloskar Brothers Limited	278
85.	Kirloskar Cummins Limited	359
86.	Kirloskar Electric Company Ltd.	122
87.	Kirloskar Oil Engines Limited	123
88.	Khandelwal Ferro Alloys Limited	229
89.	Kolhapur Steel Limited	879
90.	K.C.P. Limited	424
91.	L&T-McNeil Limited	190
92.	Larsen & Toubro Limited (Bombay)	636
93.	Lubrizol India Limited	355
94.	Lucas-TVS Limited	325
95.	Lupin Laboratories Limited	765
96.	MRF Limited	1676
97.	Madras Refineries Limited	300
98.	Maharashtra Hybrid Seeds Company Limited	239
99.	Mahindra & Mahindra Limited (Tractor and Automotive Division)	277
100.	Maruti Udhyog Limited	239

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in lakhs)
101.	Merind Limited	120
102.	Modi Rubber Limited	696
103.	Modi Xerox	149
104.	Motor Industries Co. Limited	357
105.	Mysore Kirloskar Limited	281
106.	National Mineral Development Corporation Limited	181
107.	National Organic Chemical Industries Limited	476
108.	National Rayon Corporation Ltd.	194
109.	National Thermal Power Corporation Limited	221
110.	Neyveli Lignite Corporation Limited	121
111.	Oil India Limited	126
112.	Oil & Natural Gas Commission (O.N.G.C.)	1294
113.	Padmashri Dr. Vithalrao Vikhe Patel Sahakari Sakhar karkhana	317
114.	Peico Electronics & Electricals Limited	1482
115.	Pfizer Limited	159
116.	Polyolefins Industries Limited	127
117.	Premier Automobiles Limited	322
118.	Procter & Gamble India Limited (Formerly: Richardson Hindustan)	140
119.	Projects & Development India Limited	272
120.	Punjab Tractors Ltd.	307
121.	Rallis India Limited (Agrochemicals Division)	280
122.	Ranbaxy Laboratories Limited	534
123.	Reliance Petrochemicals Ltd.	611
124.	SRF Limited	143
125.	Sandoz (India) Ltd.	318
126.	Sandvik Asia Limited	112
127.	Semiconductor Compex Limited	871
128.	Shukla-Manseta Industries Pvt. Limited	148
129.	Siemens India Limited	795
130.	Steel Authority of India Limited (R&D Centre for Iron & Steel)	3898
131.	Steel Authority of India Limited (Bokaro Steel Plant)	105
132.	Steelsworth Limited	297
133.	S.D. Technical Services Pvt. Ltd.	150

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in lakhs)
134.	Sudarshan Chemical Industries Limited	141
135.	Tata Chemicals Ltd.	117
136.	Tata Engineering & Locomotive Company Limited	1354
137.	Tata Hydro-Electric Power Supply Company Limited	258
138.	Tata Iron & Steel Company Ltd.	600
139.	Tata Tea Ltd.	282
140.	Venco Research & Breeding Farm Limited	131
141.	Venkateshwara Research & Breeding Farm Limited	107
142.	Vidyut Metalics Limited	310
143.	Vikrant Tyres Limited	168
144.	Widia (India) Limited	242
145.	Wipro Infotech Limited	499
146.	Wockhardt Limited	130
147.	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.	Advanced Micronic Devices Pvt. Ltd.	48
2.	Advani-Oerlikon Limited	52
3.	Aegis Chemical Industries	26
4.	Afco Industrial & Chemicals Limited	27
5.	Alembic Chemical Works Company Limited	81
6.	Alembic Glass Industries Limited	32
7.	Alfa-Laval (India) Limited	52
8.	Ambalal Sarabhai Enterprises Limited	49
9.	Amphetronix Ltd.	41
10.	Andhra Sugars Limited (Sugarcane Dev. Division)	46
11.	Andrew Yule & Company Limited	37
12.	Anil Starch Products Ltd.	35
13.	Apollo Tyres Limited	82
14.	Applied Electronics Limited	52
15.	Arlabs Limited	34
16.	Assam Electronics Development Corporation Limited	43
17.	Astra IDL Limited	34
18.	Audco India Limited	41
19.	Aurelec Trust	29
20.	Automatic Electric Limited	40
21.	Autometers Limited	26
22.	BASF India Limited	89
23.	BPL Sanyo Utilities and Appliances Limited	20
24.	BPL-INDIA (British Physical Laboratories)	43
25.	Bajaj Electricals ltd.	29
26.	Bakelite Hylam Limited	46
27.	Ballarpur Industries Limited	45
28.	Baroda Rayon Corporation Limited	60
29.	Bayer India Limited	73

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
30.	Berger Paints India Limited	50
31.	Best & Crompton Engineering Ltd.	25
32.	Bharat Aluminium Company Ltd.	41
33.	Bharat Dynamics Limited	84
34.	Bharat Forge Limited	26
35.	Bharat Heavy Plate & Vessels Limited	64
36.	Bharat Refractories Limited	26
37.	Bharat Starch & Chemicals Limited	26
38.	Bharatia Electric Steel Company Limited	29
39.	Bharatia Cutter-Hammer Limited	25
40.	Bhoruka Gases Ltd. (Formerly Karnataka Oxygen Ltd.)	33
41.	Bhoruka Steel Limited	23
42.	Bicycle & Sewing Machine Research & Development Centre	84
43.	Bihar Alloy Steels Limited	50
44.	Biological E. Limited	25
45.	Blue Star Limited	39
46.	Bombay Tyres International Ltd.	37
47.	Britannia Industries Limited	45
48.	Bry-Air (India) Pvt. Ltd.	25
49.	Burroughs Wellcome (India) Limited	76
50.	Cadbury India Limited	85
51.	Camphor & Allied Products Limited	56
52.	Carborundum Universal Limited	51
53.	Castrol India Ltd. (Formerly Indrol Lub. & Specialities Ltd.)	35
54.	Catvision Products Limited	31
55.	Ceat Limited	54
56.	Century Textiles Industries Limited	35
57.	Chemfab Alkalis Limited	71
58.	Chemicals and Plastics India Ltd.	34
59.	Chloride Industries Limited	79
60.	Cipla Limited	42
61.	Citurgia Biochemicals Limited	32
62.	Coates of India Limited	42
63.	Continental Device of India Limited	25

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
64.	Control & Switchgear Co. Ltd.	31
65.	Coromandal Prodorite Limited	39
66.	Cosmo Ferrites Limited	51
67.	Coventry Spring & Engineering Company Limited	39
68.	Cynamid India Limited	80
69.	DCM Data Products (Unit: D.C.M.) Limited	89
70.	DCM Shriram Industries Limited	26
71.	Dai Ichi Karkaria Pvt. Ltd.	35
72.	Daurala Sugar Works (Unit of Shriram Industries Ltd.)	31
73.	*Dey's Medical Stores (Mfg.) Limited*	61
74.	Dharamsi Morarji Chemical Company Limited	57
75.	Digital Electronics Limited	34
76.	Digital Equipment (India) Limited	34
77.	Drachem speciality Chemicals Limited	44
78.	Dr. Beck & Company (India) Limited	27
79.	Duphar Interfran Limited	52
80.	ESAB India Ltd.	75
81.	EWAC Alloys Limited	38
82.	East India Pharmaceutical Works Limited	27
83.	Eddy Current Controls (India) Limited	46
84.	*Electronic Research Ltd.*	50
85.	Electronica Machine Tools Ltd.	62
86.	Elgi Equipment Limited	64
87.	Elgi Tyre & Tread Limited	25
88.	Elpro International Limited	43
89.	Emco Electronics	32
90.	Engel India Machines & Tools (1987) Limited	69
91.	English Electric Company of India Limited (Hosur)	42
92.	Escorts Tractors Limited (Research & Development Centre)	52
93.	Eskayef Limited	69
94.	Etermit Evest Ltd. (Formerly Everest Building)	57
95.	Ethnor Limited	31
96.	Eureka Forbes Limited	57

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
97.	Excel Industries Limited	27
98.	Fedders Llyod Corporation Private Limited	38
99.	Ferro Alloys Corporation Ltd.	73
100.	Fertilizers & Chemicals Travancore Limited	38
101.	Ficom Organics Limited	25
102.	Fort Gloster Industries Limited (Cable Division)	74
103.	Franco-Indian Pharmaceuticals Private Limited	26
104.	Fuel Instruments and Engineers Pvt. Ltd.	24
105.	Galaxy Organics (P) Limited	29
106.	Gammon India Limited	25
107.	Garware Paints Limited	31
108.	Garware Plastics & Polyster Ltd.	54
109.	Garware-wall Ropes Limited	87
110.	Godfrey Phillips India Limited	25
111.	Goodricke Group Limited	45
112.	Graphite India Limited	46
113.	Greaves Foseco Limited	54
114.	Guest Keen Williams Limited	27
115.	Gujarat Alkalies & Chemicals Limited	38
116.	Gujarat Insecticides Limited	56
117.	HMT Limited (Tractor Division)	96
118.	HMT Limited (Watch Directorate)	92
119.	Haryana Steel & Alloys Limited	37
120.	Hawkins Cookers Limited	51
121.	Herdillia Chemicals Limited	49
122.	Hico Products Limited	54
123.	High Energy Batteries (India) Limited	28
124.	Himalaya Machinery Pvt. Ltd.	34
125.	Hinditron Computer Systems & Consultants Private Limited	31
126.	Hindoostan Spinning & Weaving Mills Ltd.	36
127.	Hindustan Aeronautics Limited (HAL-Corporate Office)	67
128.	Hindustan Cables Limited (Hyderabad)	66
129.	Hindustan Cables Limited (Rupnarainpur)	42
130.	Hindustan Dorr-Oliver Limited	28
131.	Hindustan Motors Limited (Auto Division)	77

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
132.	Hindustan Organic Chemicals Limited	68
133.	Hyderabad Industries Limited	85
134.	IBP Company Limited (Engineering Division)	58
135.	ICI India Limited (Agrochemicals & Phar. Div.) (Ennor)	57
136.	IPCA Laboratories Pvt. Ltd.	46
137.	ITI Equatorial Satcom Limited	51
138.	IVP Limited	37
139.	Incab Industries Limited	38
140.	Indchen ATL Limited	27
141.	Indchem Electronics Limited	45
142.	India Carbon Limited	30
143.	India Pistons Limited	35
144.	Indian Dyestuff Industries Limited	61
145.	India Hume Pipe Company Ltd.	33
146.	Indo National Limited	25
147.	Indofil Chemicals Company (A Division of Modipon Ltd.)	31
148.	Infar (India) Limited	92
149.	Infocom Digital Systems (P) Ltd.	33
150.	Instrumentation Limited	77
151.	International Data Management Limited	60
152.	Ion Exchange (India) Limited	75
153.	Jagatjit Cotton Textiles Mills Limited	37
154.	Jagatjit Industries Limited	25
155.	Jamna Auto Industries	25
156.	Jaya Hind Industries Limited	26
157.	Jaysynth Dyechem Private Limited	29
158.	Jenson & Nicholson (India) Ltd.	42
159.	KSB Pumps Limited	28
160.	Kasila Farms Private Limited	73
161.	Kerala Electrical & Allied Engineering Co. Ltd.	43
162.	Kilburn Engineering Limited	40
163.	Kinetic Engineering Limited	89
164.	Kirloskar Pneumatic Company Limited	62
165.	Klockner Windsor (India) Limited	35
166.	K.E.C. International Limited	30

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
167.	K.G. Khosla Compressors Limited	43
168.	Lakhanpal National Limited	27
169.	Lakshmi Machine Works Limited	74
170.	Lectotrek Systems Pvt. Ltd.	25
171.	Lona Industries Pvt. Limited	49
172.	Lupin laboratories Limited	52
173.	Lyka Labs Private Limited	39
174.	Machine Tools Aids and Reconditioning	53
175.	Maharashtra Electronics Corporation Limited	60
176.	Mahendra Hybrid Seeds Company Pvt. Ltd.	33
177.	Malhotra Shaving Products Limited	33
178.	Malladi Drugs & Pharmaceuticals Limited	48
179.	Marine & Communications (I) Limited	83
180.	McDowell & Company Limited	36
181.	Metallurgical & Engineering Consultants (India) Limited	80
182.	Modern Malleable Casting Works Limited	41
183.	Modern Woolens Limited	35
184.	Modipon Limited	34
185.	Monica Electronics Limited	26
186.	Mukund Limited	54
187.	Murphy India Limited	29
188.	Mytimasters' Engineering Private Limited	37
189.	M.P. Electricity Board (R&D Cell)	58
190.	NGEF Limited	30
191.	National Insulated Cable Company of India Limited	31
192.	National Peroxide Limited	56
193.	National Radio & Electronics Company Limited	73
194.	National Textile Corporation (APKK&M) Ltd.	47
195.	National Textile Corporation (Tamil Nadu & Pondicherry) Ltd.	45
196.	Navdeep Chemicals Pvt. Ltd.	31
197.	Network Limited	77
198.	New Shorrock Mills (Div. of Mafatlal Ind. Ltd.)	44
199.	Nippon Denro Ispat Limited	35
200.	Nirlon Limited	28
201.	Nuchem Plastics Limited	30

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
202.	OMC Computers Ltd.	71
203.	Orient Paper Mills	51
204.	Orissa Industries Limited	33
205.	Orissa State Electronics Development Corporation Limited	69
206.	Otis Elevator Co. (India) Ltd.	74
207.	PSI Data Systems Limited	25
208.	Parke-Davis (India) Limited	40
209.	Penam Laboratory Limited	36
210.	Pennwalt India Limited	27
211.	Petrofils Co-operative Limited	49
212.	Phillips Carbon Black Limited	55
213.	Pidilite Industries Ltd. (Formerly PDI Chemicals Ltd.)	25
214.	Pond's (India) Limited	30
215.	Porritts & Spencer (Asia) Ltd.	28
216.	Praga Tools Ltd.	45
217.	Premier Cable Company Ltd.	36
218.	Premier Instruments & Controls Limited	99
219.	Priyaraj Electronics Pvt. Ltd.	30
220.	Proagro Seed Company Limited (Formerly Pioneer Seed Co. Ltd.)	66
221.	Punjab Wireless Systems Ltd.	43
222.	Purolator India Limited	28
223.	Rainbow Ink & Varnish Manufacturing Co. Limited	28
224.	Ralliwolf Limited	54
225.	Rane (Madras) Limited	77
226.	Rashtriya Chemical & Fertilizers Limited	72
227.	Raymond Woollen Mills Ltd.	28
228.	Reckitt & Colman of India Ltd.	66
229.	Reliance Industries Ltd.	77
230.	Roche Products Limited	26
231.	Rosemount India	40
232.	Ruston & Hornsby (India) Ltd.	38
233.	R.G. Ispat Limited	60
234.	Samtel (India) Limited	26
235.	Searle (India) Limited	60

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
236.	Shalimar Paints Limited	36
237.	Shriram Refrigeration Industries Limited	33
238.	Sieflex Automation & Robotics Co.	51
239.	Simbhaoli Sugar Mills Ltd.	34
240.	Simco Engineering Limited	35
241.	Simpson & Company Limited	37
242.	Siris Limited	46
243.	Smith Kline Beecham Consumer Brands Ltd.	31
244.	Southern Petrochemical Industries Corporation Limited	60
245.	Sponge Iron India Limited	47
246.	Standard Industries Limited	41
247.	Standard Research Centre	39
248.	Sun Pharmaceutical Industries	82
249.	Sundaram-Abex Limited	27
250.	Swadeshi Polytex Limited	37
251.	S.A.J. Froude Test Plant Private Limited	36
252.	S.H. Kelkar & Company Limited	32
253.	S.S. Clonetech Pvt. Ltd.	34
254.	TIL Limited	45
255.	TVS Electronics Ltd.	50
256.	TVS Suzuki Limited	80
257.	TVS Whirlpool Ltd.	26
258.	Tamil Nadu Dadha Pharmaceuticals Limited	89
259.	Tamil Nadu Newsprint and Papers Limited	78
260.	Tamil Nadu Petroproducts Ltd.	53
261.	Tata Elxsi (India) Limited	64
262.	Tata Oil Mills Co. Ltd.	61
263.	Tata Refractories Limited	79
264.	Tata-Yodogawa Limited	30
265.	Teletube Electronics Pvt. Ltd.	55
266.	Television & Components (P) Ltd.	27
267.	Textool Company Ltd.	77
268.	Thermax Limited (Chemical, Computer & Engg. Div.)	82
269.	Titan Watches Limited	29
270.	Titanium Equipments & Anode Manufacturing Company Limited	30

Sl. No.	Name of the Unit	R&D Expenditure (Rs. in Lakhs)
271.	Tractors and Farm Equipment Limited	45
272.	Tractor Engineers Limited	29
273.	Transpek Industry Limited	32
274.	Travancore Titanium Products Limited	34
275.	Tube Products of India	38
276.	Unichem Laboratories Limited	67
277.	Unique Chemicals (Div. of J.B. Chemicals & Pharmaceuticals Ltd.)	29
278.	Unique Pharmaceuticals Laboratories Private Limited	27
279.	United Catalysts India Ltd.	34
280.	United Phosphorus Ltd.	42
281.	Universal Biochemicals	30
282.	Universal Cables Ltd.	59
283.	Uptron India Limited	38
284.	Usha Telehoist Limited	26
285.	U.S. Vitamin (India) Limited	30
286.	Vam Organic Chemicals Ltd.	43
287.	VXL India Limited	32
288.	Vijay Wires & Filament (P) Limited	70
289.	Vintek RF Products Private Ltd.	93
290.	Voltas Limited	29
291.	Walchandnagar Industries Limited	74
292.	West Bengal Electronic Industry Development Corporation Limited	27
293.	Weston Electroniks Limited	40
294.	Wheels India Limited	43
295.	Worthington Pumps India Limited	49
296.	Wyeth Laboratories Limited	53

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS APPROVED DURING 1992*

Agriculture, Natural and Applied and Medical Sciences

S.No.	Name of the Institution	Approval Valid Upto
1.	GSFC Science Foundation, Baroda	31.3.93
2.	Birla Institute of Applied Sciences, Nainital	31.3.94
3.	Auroville Foundation	31.3.94
4.	Electronics R&D Centre, Calcutta	31.3.94
5.	Khosla Medical Institute and Research Society, New Delhi	31.3.93
6.	Centre for Materials for Electronics Technology, New Delhi	31.3.93
7.	K.J.P. Research Foundation, Kanyakumari	31.3.93
8.	Institute for Pesticide Formulation Technology, Gurgaon	31.3.94
9.	Maharashtra Medical Research Society, Pune	31.3.94
10.	Annasaheb Kalyani Foundation, Pune	31.3.93
11.	Kamala Nehru Memorial Hospital, Allahabad	31.3.93
12.	Development Centre for Alternative Policies, Bombay	31.3.93
13.	The Gandhigram Rural Institute, Gandhigram	31.3.94
14.	Chirtrakut Gramoday Vishwavidyalay, Chitrakut	31.3.94
15.	NCSTC Network, New Delhi	31.3.94
16.	Indo Soviet Advanced Research Centre for Powder Metallurgy, Hyderabad	31.3.94
17.	Narinder Mohan Hospital and Research Centre, New Delhi	31.3.94
18.	Society of Pesticides Science, New Delhi	31.3.94
19.	Electronics Research Development Centre, Pune	31.3.94
20.	Asian Energy Institute, New Delhi	31.3.94
21.	Gujarat Methodist Church Cardiothoracic and Vascular Research Society, Nadiad	31.3.93
22.	Institute for Solid Waste Research and Ecological Balance, Visakhapatnam	31.3.94
23.	Enar Foundation Research Centre, Bombay	31.3.94
24.	Bharathidasan University, Tiruchirapalli	31.3.94
25.	Alagappa University, Karaikudi	31.3.95

* These Organisations were also recommended to Director General (Income Tax Exemptions), Calcutta for issue of Notification u/s 35(1)(ii) of the Income Tax Act.

LIST OF SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATIONS APPROVED DURING 1992*

Social Sciences

S. No.	Name of the Institution	Approval valid Upto
1.	Association of India Universities, New Delhi	31.3.93
2.	Centre for the Study of Developing Societies, Delhi	31.3.94
3.	Bharati Samskrata Vidya Niketnam, Bombay	31.3.94
4.	Society of Management Science and Applied Cybernetic, New Delhi	31.3.94
5.	Society for Social Change, Indore	31.3.94
6.	Centre for Advanced Strategic Studies, Pune	31.3.94
7.	Maharashtra Granthotejak Sanstha, Pune	31.3.94

* These Organisations were also recommended to Director General (IT Exemptions) for issue of Notification u/s 35(1)(iii) of the I.T. Act.

ANNEXURE III-C

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	Item of manufacture
1.	Gharda Chemicals Ltd., Bombay	In-House	162	Ortho Nitro Chloro Benzene (ONCB), Para Nitro Chloro Benzene (PNCB)
2.	Iso Track Sleepers Pvt. Ltd., Bombay	RDSO	18	Mono Block Concrete Sleepers
3.	Kaprecon Sleeper Works Pvt. Ltd., Bombay	RDSO	24	Pre-stressed Concrete Sleepers
4.	Gharda Chemicals Ltd., Bombay	In-house	33	Cypermethric Acid Chloride, Cypermethric technical
5.	Pesticides India Ltd., Udaipur	In-house	19	Difuran-34
6.	Punjab Communications Ltd., Chandigarh	Telecommunication Research Centre New Delhi	48	Pulse Code Modulation (PCM)
7.	National Organic Chemical Industries Ltd., Bombay	In-house	698	Monocrotophos
8.	National Organic Chemical Industries Ltd., Bombay	RRL Hyderabad RRL, Johrat	634	Phosphamidon DDVP
9.	National Organic Chemical Industries Ltd., Bombay	Vikram Sarabhai Space Centre of Indian space Res. Organization	119	Hydroxyl Terminated Poly Butadiene (HTBP)
10.	Gharda Chemicals Ltd., Bombay	In-house R&D	432 446	Anilophos
11.	Veejay Lakshmi Engineering Works Pvt. Ltd., Coimbatore	South-India Textile Research Association, Coimbatore	311	Two for one twister

S. No.	Name of the Company	Lab where know-how developed	Rs. in lakhs	Item of manufacture
12.	Gharda Chemicals Ltd., Bombay	In-house	184	Rafoxanide (BP Vet C)
13.	Aluminium Powder Co. Ltd., Madurai	In-house R&D of Metal Powder Co. Ltd.	19	Aluminium Paste
14.	Gharda Chemicals Ltd., Bombay	In-house	49	O-nitro chlorobenzen and p-nitro chloro-benzene
15.	Gharda Chemicals Ltd., Bombay	In-house	33	o-phenylene diamine
16.	Balmer Lamie & Co., Madras	IIP, Dehradun	31	p-tert butyl phenol (PTBP)
17.	BASF India Ltd., Bombay	In-house	14	Agro Chemicals (Pesticides)
18.	BASF India Ltd., Bombay	In-house	4	Agro Chemicals (Pesticides)
19.	Larsen & Toubro Ltd., Bombay	C-DOT	11	E PABX & RAX
20.	ECIL, Hyderabad	TIFR, BARC, TRC, IIT, In-house	457	Electronic Equipment/ Devices Semiconductor Devices
21.	Punjab Tractors Ltd., Chandigarh	In-house	670	Tractors, Harvestors Combine Fork Lifts etc.
22.	Electronics Corporation of India Ltd., Hyderabad	TIFR, BARC, DERL, In-house R&D	276	Dater display systems Test & Measuring Equipment, security system, analytical instruments Nuclear instruments systems, TVRO, Box, Data acquisition system etc.
23.	Renewable Energy Systems (P) Ltd., Hyderabad	DRDL, Hyderabad In-house	38	Thermal Batteries for use with guided missile system

S. No.	Name of the Company	Lab where know-how developed	Rs. in lakhs	Item of manufacture
24.	BASF India Ltd.	In-house	20	Agro Chemicals; Basathrin technical, calixi and Bavistin
25.	Vantech Pesticides Ltd.,	India Institute of Chemical Technology, Hyderabad	345	Monocrotophos Technical and Butachlor Technical
26.	Gharda Chemicals	In-house	30	Oxyclozanide.
27.	Gharda Chemicals	In-house	50	Cypermethric acid chloride, cypermethrin technical, cypermethrin 25% EC.

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 Organisaton
CSIR	Council of Scientific and Industrial Research
CSMCRI	Central Salt & Marine Chemicals Research Institute
CSTT	Central for Studies on Technology and Trade
DGTD	Directorate General of Technological 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 Development Programme
UNIDO	United Nations Industrial Development Organisation
WIPO	World Intellectual Property Organisation