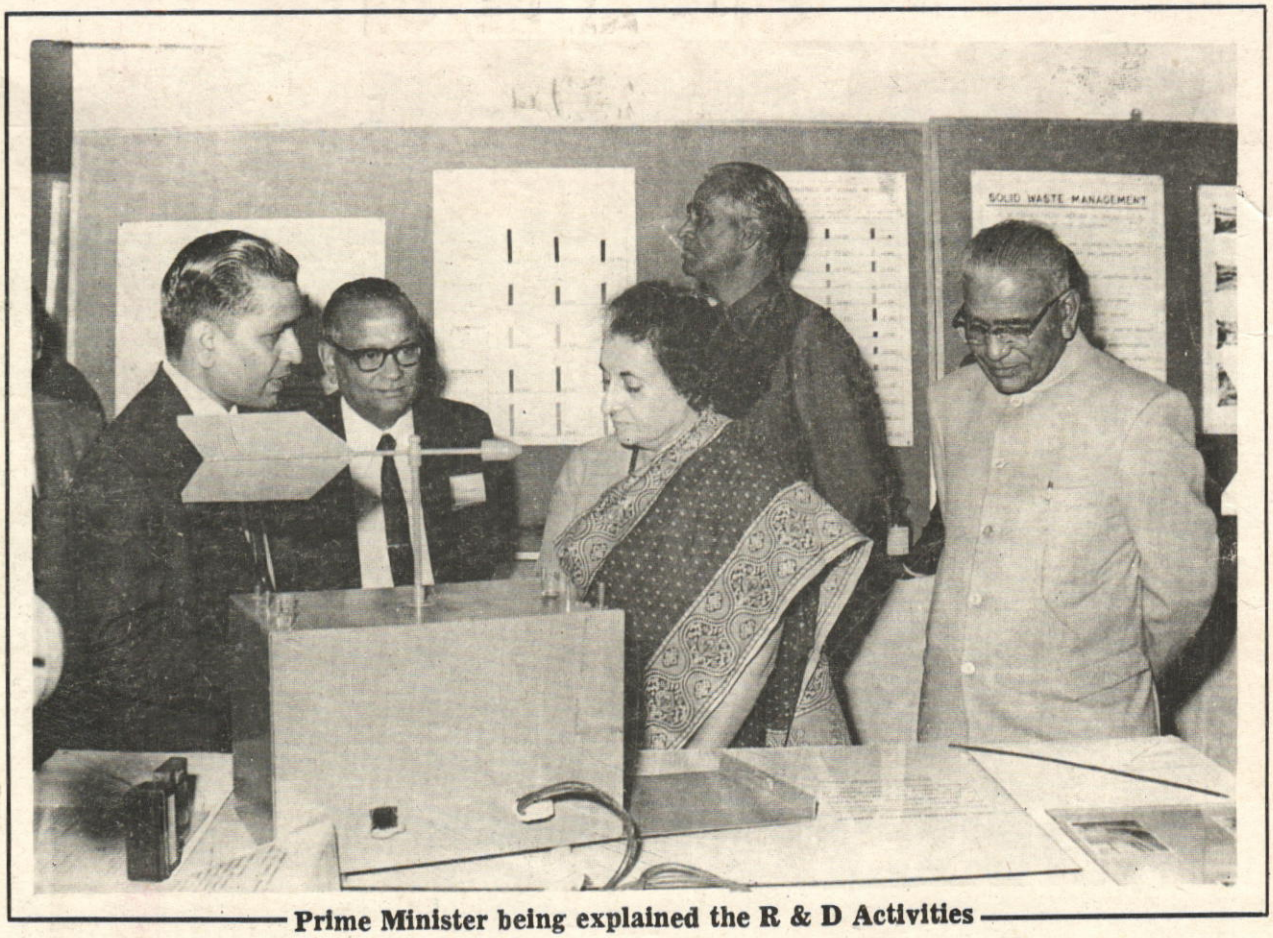
ANNUAL REPORT
1974

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE

NAGPUR 20. INDIA



Prime Minister being explained the R & D Activities

NEERI

ANNUAL REPORT
1974

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
NEHRU MARG, NAGPUR-20 (INDIA)

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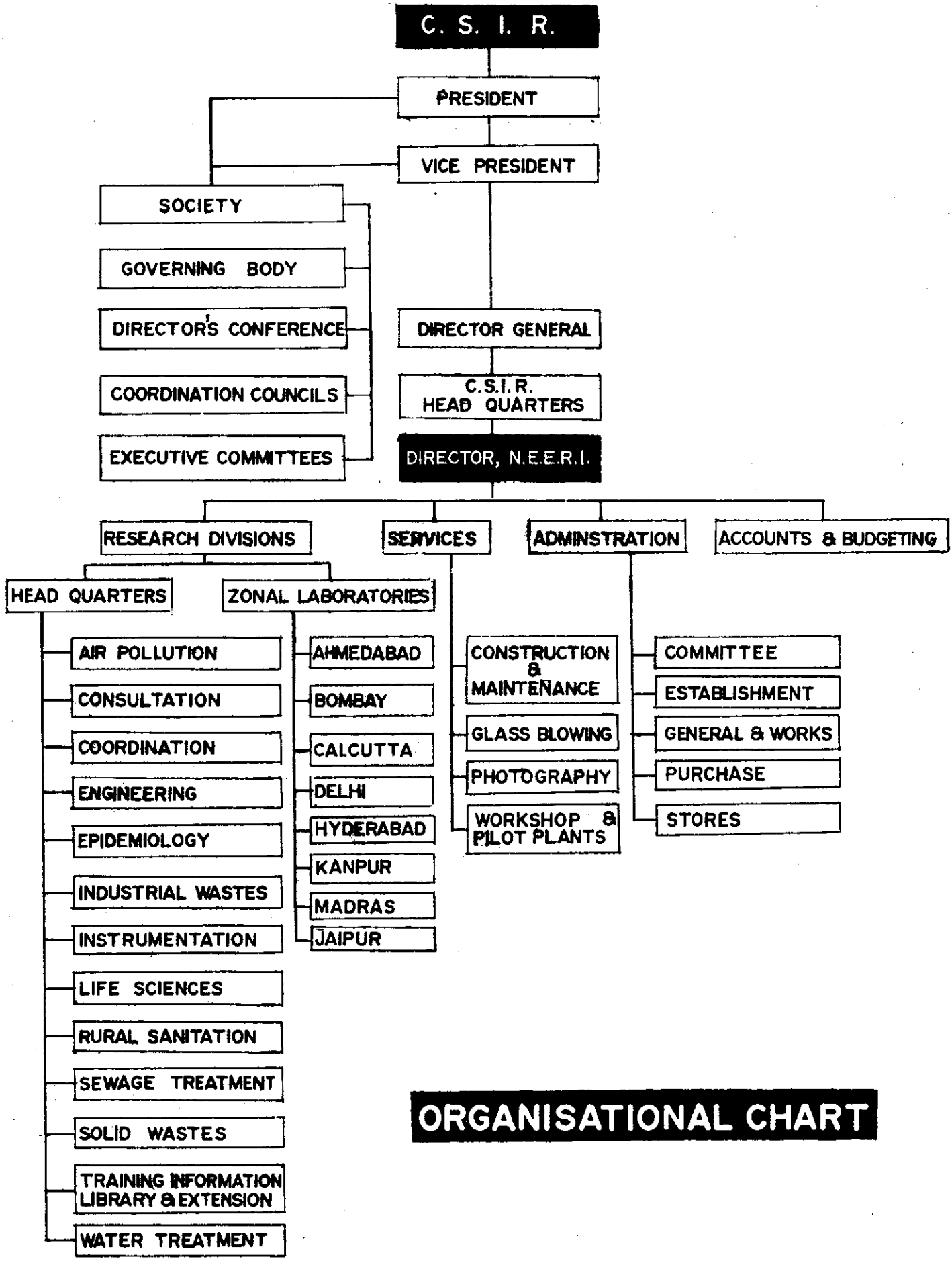


ORGANISATIONAL CHART

DIRECTOR'S REPORT

DIRECTOR'S REPORT

I am happy to present the Annual Report of the Institute for the year 1974. The year has been singularly significant to us since Shrimati Indira Gandhi, Prime Minister of India and President, CSIR visited the Institute at the outset of the year on January 3, 1974. She evinced keen interest in the activities of the Institute. Keenly interested as she is in the promotion of the environment, she, in her address to the Staff of the Institute, suggested that the Institute be renamed as National Environmental Engineering Research Institute in keeping with the enlarged ambit of work. Her visit, although a brief one, has been both auspicious and phenomenal in the life span of the Institute. It has enlarged its scope to encompass entire vistas for R & D work in environmental engineering.

During the year under review, a large number of visitors— national and international—visited the Institute. Many amongst them were reputed Scientists and had addressed the scientific workers on matters of interest to us. These have invigorated the scientists in their activities.

During the year, 170 projects were investigated of which 30 were sponsored schemes. Work on 50 projects was completed.

I take this opportunity to highlight some of the important activities and events of the year.

Air Pollution

National Air Sampling Network programme was continued during the year. Data on common air pollutants were collected at the select sampling stations in Bombay, Calcutta, Delhi, Kanpur and Nagpur.

Air pollution survey of Bombay city on behalf of Bombay Municipal Corporation has been conducted. It is proposed to continue this project and collect more data for a check on increasing pollution trends.

An interim report on air quality survey for Calcutta city has been submitted to the Calcutta Metropolitan Development Authority who sponsored the investigation.

Air quality survey, collection of concommittent meteorological data and emission inventory were in progress for Bombay twin city area on behalf of the City and Industrial Development Corporation of Maharashtra, Bombay.

Mention may also be made of a short-term air pollution survey undertaken to assess the possible effects of air pollutants from the proposed refinery at Mathura on national monuments such as Taj Mahal and Fatehpur Sikri.

CSIR Karimnagar Project

CSIR has adopted Karimnagar in Andhra Pradesh to show applications of Science and Technology for the benefit of communities. Hand in hand with other laboratories, NEERI is contributing its mite in environmental engineering aspects. The works completed during the year under review included: (i) Design of 12 rural water supply schemes; (ii) Solid wastes management proposal; (iii) Construction of 42 Latrines for the Harijan Colony; and (iv) Waste disposal facility for Fertilizer Corporation of India at Karimnagar.

Engineering

Performance studies were undertaken on a roughing filter as a pre-treatment unit before slow sand filtration without any chemical addition.

Five units of field flush latrines as per design of NEERI and approval by DGAFMS were fabricated and sent to the latter for conducting field trials.

Epidemiology

Epidemiological surveys have been carried out around Nagpur. This work is considered as a basis for assessment of improvements due to sanitary provisions.

Industrial Wastes

Laboratory studies on thiolignin modification system were carried out using sunlight and blue-green algae of the species *Ancystis nidulans* as a source of oxygen. About 43 per cent reduction could be attained in 15 days. A unit for photomodification of thiolignin by employing UV radiation in the presence of oxygen is being fabricated for further work.

Flow-sheet furnished earlier for wastewater treatment at J. K. Paper Mills, Rayagada was revised in view of addition of a Rag Digester to the manufacturing process.

Treatability of wastewater from Olefin Plant of Indian Petrochemicals Ltd.; Baroda was studied on simulated wastes and a flowsheet was evolved.

A treatment flow-sheet giving alternatives was also developed for the treatment of wastewaters from Ballarpur Paper and Strawboard Mills Ltd.; Ballarpur.

Instrumentation

Besides the upkeep of various equipments at the Institute, developmental work in respect of the following instruments was taken up. The units have been fabricated and are under test trials: (i) Direction activated air sampler, (ii) Motor aspirated-radiation shielded thermistor probes, (iii) Temperature humidity index meter, and (v) Motor speed and temperature controlling with silicon controlled rectifier.

Life Sciences

Typical microbial cultures of cellulotyic nature have been isolated from soil, compost and refuse dumping sites. Pattern of utilization of cellulose from refuse by these cultures is being investigated.

Cultures capable of growing in the presence of cyanides could be demonstrated, although the mechanism remains yet to be understood. Such cultures will be immensely useful for treatment of toxic wastes. Further work is in progress.

Usefulness of magnetic iron oxide and bituminous coal as virus adsorbants in different stages of water treatment plants was under investigation.

An indigenous medium has been developed for enumeration of coliforms by MF technique. Suitable composition for enumeration of fecal streptococci is being worked out. Attempts are afoot to prepare these media in dehydrated powder forms.

Rural Sanitation

In order to evaluate rural latrines programme a pilot project has been initiated in twelve villages in the district in collaboration with the Zilla Parishad, Nagpur. One of the objectives is to motivate the concerned authorities to take up such work at other locations. About 200 latrines have been constructed. Also, plans for protected water supply to one village together with estimates were submitted.

Sewage Treatment

Surface aerators are one of the acclaimed means of low cost wastewater treatment. Development as well as testing of several surface aerators was under way during the year for this purpose.

Towards effluent farm irrigation, an experimental crop of wheat was grown and soil samples before and after sowing and harvest were analysed for physical and chemical properties to assess the different irrigational and nutritional effects.

Solid Wastes

PL-480 Scheme on "Solid Wastes in India" was completed and a comprehensive project report was submitted.

In Bangalore city, the feasibility study on mechanical composting of city refuse alongwith sewage sludge was completed. A detailed report including the location of the plant was submitted to the sponsors.

Efforts are afoot to derive domestic gas from anaerobic digestion of city refuse and dung mixtures. The preliminary trials appeared to be promising. Work is in progress.

Water

A process termed "Nalgonda Technique" has been evolved for removal of fluorides from water. The operations involved are so simple and cost so less that the technique is well within the reach even on an individual basis.

Various synthetic products, developed to substitute the natural coagulant aids, are being assessed for their toxicity, if any.

Know-how on indigeneous production of membrane filters has been passed on to three entreprenuers for commercial exploitation

An improved filter aid (FA-5) was developed from wood charcoal as a substitute for imported diatomaceous earth. The trials conducted both by NEERI and DGAFMS have borne out its suitability. The filtrate had always a turbidity less than one unit.

Chlorine ampoules of various capacities have been developed. The know-how has been referred to the CSIR for commercial exploitation.

For reverse osmosis, two methods have been standardised for preparation of secondary cellulose acetate. The properties compared well with the imported counterpart. Trials on a 2500 lit/day capacity pilot plant are in progress.

A poison removal kit has been developed. Water, after passing through the kit, gets devoid of toxicants such as arsenic, chromium and copper. Methods for estimation of the toxicants are being standardised.

Consultancy Work

A number of problems were undertaken, upon request, on consultation bais. The following are a few examples : (i) Effluent channel for disposal of wastes from industries in and around Baroda; (ii) Treatment and disposal of wastes from G.I.D.C., Industrial Estate, Vapi (Gujarat); (iii) Waste treatment plant for Hindustan Organic Chemicals, Rasayani; Gaseous emission inventory of Industries in Thana-Belapur area; (v) Baseline studies on Water quality of Hooghly estuary; and (vi) Preventive maintenance of water distribution systems.

Seminars

A one-day seminar on "Sugar Mill Waste Disposal" was organised at Kanpur with collaboration with National Institute of Sugar Technology and Indian Institute of Technology both at Kanpur. About 145 participants attended and took part in the deliberations. Besides, the Institute also co-sponsored and actively participapted in a number of seminars and get-togethers conducted by other organisations at various places.

Workshop on Information Management in CWS and WD

A two-day Workshop on "Information Management in Community Water Supply and Waste Disposal" was organised at Nagpur with the active cooperation of the World Health Organisation, Geneva. Papers invited by NEERI together with the documentation provided by WHO in the form of a draft guide on the subject were discussed by 25 invited participants including a few from overseas. The workshop provided an excellent forum for exchange of views and knowledge on an effective information

management system. A need for establishing a national documentation centre in CWS and WD was stressed.

NEERI As a WHO Regional Reference Centre

Activities as a WHO Regional Reference Centre in Community Water Supply, Waste Disposal and Air Pollution Control were continued during the year.

CSIR Engineering Sciences Group

The Institute worked on three collaborative projects with other national laboratories covered under the Engineering Sciences Group of the CSIR national laboratories.

Training

Eight training/refresher courses were organised during the year at Nagpur, Madras, Kanpur and Baroda. Four of them were organised in collaboration with other organisations such as, National Safety Council, Bombay; Candy Filters (I) Ltd., Bombay; CPHEEO, New Delhi and Institution of Engineers, Baroda Centre. Manuals were prepared for five training courses.

Open-day

An open-day was organised on January 9, 1974 to give an opportunity to the citizens to see for themselves the various activities of the Institute. An exhibition was also arranged on the occasion.

Documentation & Library Services

A fortnightly current awareness service for dissemination of information on the latest trends and practices in the field was continued. Annual Bibliography of Indian Literature in Environmental Engineering for the year 1972 was brought out. "Research in Retrospect 1959-73" was also brought out giving full bibliographical details of the publications of the NEERI scientists ever since the inception of the Institute.

Publication :

The following publications were brought out during the year. (i) Annual Report—1973; (ii) CPHERI-15 Years of Service to the Nation; (iii) Defluoridation (Revised); (iv) Hindi Leaflet "Floreenharan ki Nalgonda Vidhi"; (v) Technical Digest and

(vi) Solid Wastes in India. Besides, a number of training course manuals and documents were brought out.

Other Activities

In view of the coherent relationships of work of the biology, bacteriology and virology cells, these were merged together to form the Division of Life Sciences.

The United Nations Environment Programme (UNEP), Nairobi, initiated the efforts to designate NEERI as a nucleus for stepping up air and water pollution monitoring activities in the ESCAP Region.

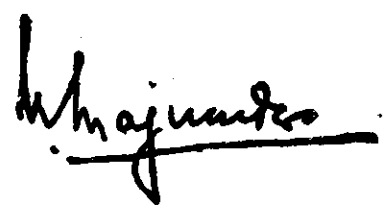
Acknowledgements

I take this opportunity to express on my behalf and on behalf of my colleagues our deep gratitude to Shrimati Indira Gandhi, Prime Minister of India and President, CSIR, for sparing some of her valuable time to visit the Institute. Her visit indeed has given a great impetus to us and new dimensions to our work.

I also express our thanks to the several Municipalities, Corporations, Industries, Central and State Government Departments, to whom we had approached for our work. Many of them have sponsored a number of investigations which has given opportunities to us in developing the much needed technology to suit the local requirements.

I wish to acknowledge grateful thanks to the WHO and to the parent organisation, CSIR, for patronage in the Institute's growth and development. I am particularly grateful to Prof. Y. Nayudamma, DGSIR for his personal guidance and encouragement.

I also thank the members of the Executive Committee and its Advisory Committees and the Officials of the CSIR for their support in the Institute's activities.



Nagpur
April, 1975

(N. MAJUMDER)
DIRECTOR

RESEARCH ACTIVITIES

(DIVISIONS AT HEADQUARTERS)

AIR POLLUTION AND INDUSTRIAL HYGIENE

Continuing Projects

1. National Air Sampling Network

As reported earlier, the Institute has set up air sampling network at places where Zonal Laboratories exist to collect long-term data on common air pollutants. The cities under observation during the year were: Bombay, Calcutta, Delhi, Kanpur and Nagpur. The following common air pollutants were determined together with the concommittent meteorological data.

(i) Gaseous pollutants like SO_2, NO_x, H_2S and Oxidants; (ii) Suspended particulates; (iii) Sulphation rates; and (iv) Dust fall.

The values showed, in general, a rising trend in most of the cities. The long-term data are hoped to yield realistic standards in terms of permissible levels of these pollutants under Indian conditions.

2. City Air Pollution Surveys

(i) Bombay

At the request of the Bombay Municipal Corporation, an investigation on the air quality status of Bombay city was taken up. The two-year study has given rise to certain observations which are being put in the form of a report for submission to the sponsors. The investigation, however, will be continued to collect more data to serve as a check on the increasing air pollution trends.

(ii) Calcutta

A similar air quality survey was taken up for Calcutta city at the request of the Calcutta Metropolitan Development Authority. An interim report has been submitted to the Sponsors.

(iii) New Bombay Region

This project, taken up at the instance of the City and Industrial Development Corporation of Maharashtra, Bombay, comprised of air quality survey, collection of micro-meteorological data and the emissions inventory of the region. While the survey work has been completed, the inventory is in progress.

3. WHO Regional Reference Centre

The Institute continued activity as a WHO Regional Reference Centre on air pollution control. The air quality data for the year 1973-74 collected from various centres under the National Air Sampling Network was transmitted to the WHO under the project—Global Air Pollution Monitoring Programme.

4. Development of a Particulate Sampler

The instrument has been developed and calibrated. Preliminary tests have been encouraging. Further testing is considered necessary before commercial exploitation.

5. Manganese Content in Ambient Air around a Ferro-Alloys Factory

The survey work to monitor the level of manganese in air in and around the factory at Kanhan, Nagpur is in progress. Interpretation of the data and their relationship with the health status of the school children in the region are in progress.

6. Short term Industrial Air Pollution Surveys

Several industries have sought the assistance of NEERI in carrying out short-term air pollution surveys for the respective factories to assess the degree of pollution in the vicinity of the industrial plants and the neighbouring residential areas. The surveys have been carried out with a view to consider and implement control measures to abate the pollution. A few of the industries have also shown keen interest in the assessment of emissions in order to get an idea of the losses of their product as well as raw materials. The problems that have been referred to the Institute during 1974 are given below :

Sr. No.	Name of the party	Nature of the problem
1.	Rohtas Industries Ltd.; Dalmianagar (Bihar)	Testing of flue gases from soda recovery plant at different operational points.
2.	Government Printing Press, Nagpur (Maharashtra)	Survey of lead fumes at the Press.
3.	Baroda Rayon Corporation Ltd.; Baroda (Gujarat)	A short-term survey of the atmospheric pollution from the factory.
4.	Nava Bharat Potteries, Sewri, Bombay (Maharashtra)	Testing of flue gases for elimination of smoke and particulates from kiln stack at potteries.
5.	Mysore Cements Ltd.; Tumkur (Karnataka)	Emissions from cement factory and their effects.
6.	Hindustan Aeronautics Ltd.; Hyderabad (A.P.)	Air-quality survey at HAL premises.
7.	Tata Iron and Steel Co. Ltd.; Jamshedpur (Bihar)	Air pollution survey of Jamshedpur city: A short-term study.
8.	Bagalkot Municipal Council, Bagalkot (Karnataka).	Atmospheric pollution due to kiln dust of the cement factory.

ENGINEERING

Completed Projects

1. Performance Studies on Roughing Filters

Two roughing filters were studied for high turbidity waters as a pre-treatment before slow sand filtration so as to avoid flocculation with coagulants. The performance was studied for influent turbidities ranging from 75 to 200 FTU and filtration rates from 4 to 10 m/hr.

The data are under compilation.

2. Preparation of a Glossary of Terms Applicable to Plumbing

At the instance of Indian Standards Institution (ISI), New Delhi, a preliminary draft "Glossary of Terms Applicable to Plumbing" was prepared and sent to them for consideration of the Terminology, Notations and Drawing Sectional Committee, BDC: 1.

Continuing Projects

1. Development of a Field Flush Latrine

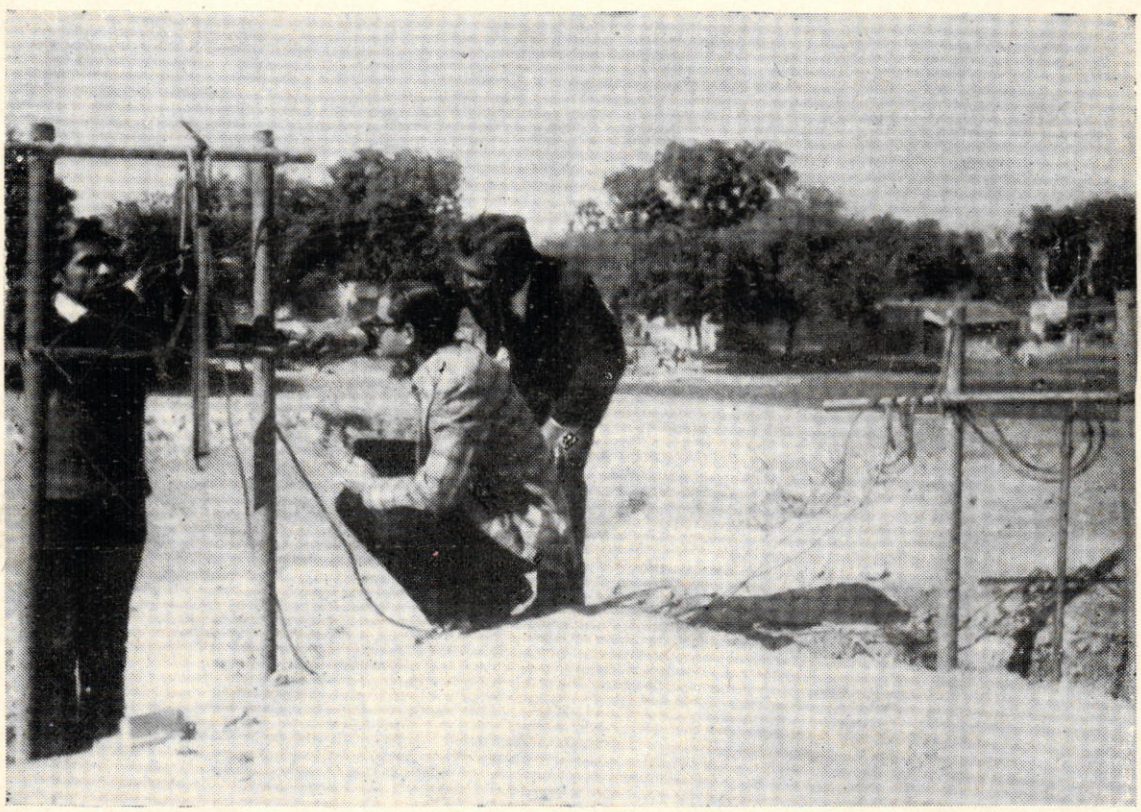
Five units of field flush latrine as per design given by NEERI and approved by DGAFMS were got fabricated and were sent to the Defence authorities for field trials Their report is awaited.

2. Preventive Maintenance of Water Distribution Systems

A large portion of water in the distribution system does not reach the consumers and gets lost through leaks in the distribution system. The Institute has demonstrated in Delhi, Hyderabad, Lucknow and Madras cities various techniques in the field of preventive maintenance of water distribution systems such as waste prevention surveys, pitometer surveys and swabbing. This service is beneficial to the water supply authorities for judicious use of water and thereby avoid to some extent the need for putting up additional treatment units to meet the increased demands for water.

EPIDEMIOLOGY

This cell was created to examine health aspects of the environmental pollution complex. This is necessary to assess the impact of the R & D work on the incidence and multiplicity of diseases in the communities before and after undertaking the research programmes.



Field Studies on Preventive Maintenance of Water Distribution System

Continuing Project

1. Manganese Toxicity Survey

Preliminary health surveys of the area which is likely to be affected by manganese toxicity and of the control area have been carried out.

INDUSTRIAL WASTES

Completed Projects

1. Wastewater Treatment at J. K. Paper Mills Ltd.; Rayagada

The Institute had earlier suggested methods of treatment of wastes from the factory. However, necessity arose to conduct the study of the waste treatment plant afresh because of the addition of a Rag Digester, with no recovery of alkali, for manufacturing speciality paper. Characterisation of the composite wastes have been completed. No significant change was observed in the composition of the combined waste except an increase in pH on the alkalineside.

The following methods of treatment have been suggested: (i) settling of wastewater in a clarifier and using the effluent on land for irrigation after necessary pH adjustments; and (ii) treatment of the clarifier effluent in aerated lagoons.

2. Treatability of Wastewater from the Olefin Plant of Indian Petrochemical Corporation Ltd.; Baroda

Since the plant was yet to be commissioned, actual wastes were not available. Wastes were collected from a similar, but not identical, plant already in operation and characterized. The mixed wastes from butadiene extraction unit and boiler blow-down were found to be biologically degradable. Treatability of the mixed wastes by an activated sludge process was studied in the laboratory.

3. Characterization and Treatment of Wastewater of Ballarpur Paper and Straw Board Mills Ltd.; Ballarshah

Characterisation of the wastewaters has been completed. Flowsheets, capital and running costs, power and land requirements of each of the four treatment alter-

natives have been worked out. Primary settling has been suggested in each method. Biological tratment either by an activated sludge process or an aerated lagoon or a trickling filter was suggested for the settled wastes.

4. Treatment of Wastewaters from Government Opium and Alkaloid Works Undertaking, Neemuch

Characterisation of wastewaters has been completed and chemical treatment with coagulant aids has been studied.

Based on the studies, three treatment alternatives have been recommended with the estimated capital and running costs and the land requirements. First method comprised of equalization and removal of ammonia by air-stripping and treatment by a completely mixed extended aeration system. The treated wastes could be used for irrigation or further treated in a trickling filter. The settled sludge could be dried on sludge drying beds.

The other two methods consisted of evaporation ponds for 365 days and storage lagoon for 240 days respectively and discharge to nullah during rainy season when considerable dilution is available.

5. Disposal of Wastewater from Rani Durgawati Paper and Board Industries Ltd.; Sagar

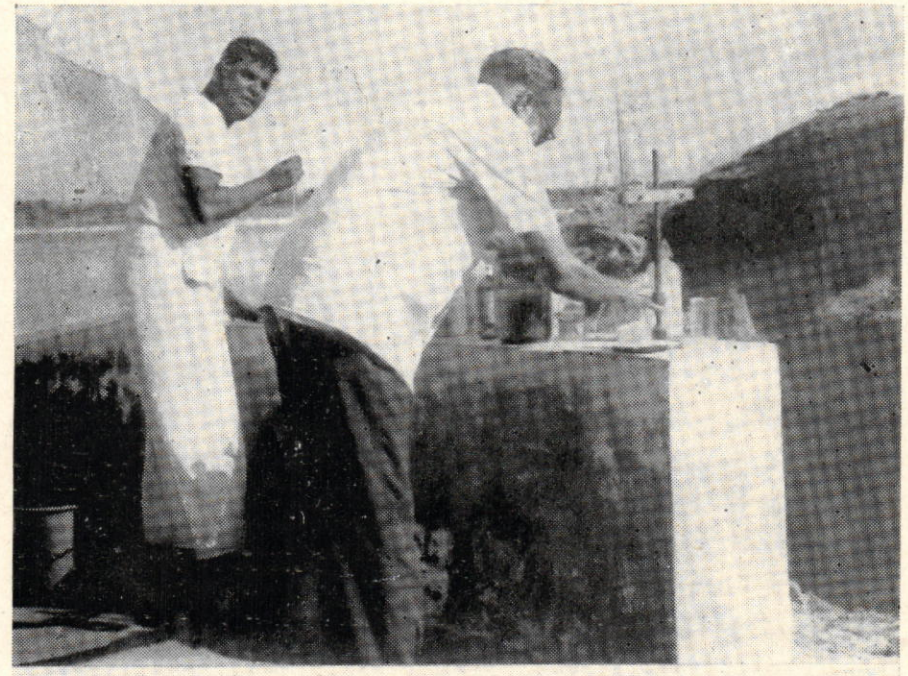
Based on the know-how already available with the Institute, a report giving the expected characteristic of wastes and four alternative methods of treatment has been provided. Estimates of the capital and running costs and the land requirements were also supplied.

6. Treatment and Disposal of Wastewaters from A. P. Paper Mills Ltd.; Rajahmundry

The mills discharge their wastewater (15 mgd) untreated on a shoal in the river bed three miles upstream of the factory.

A river survey was conducted at select 15 sampling points from the source of discharge of the wastes. The river water showed pollution due to the factory wastes only upto a distance of 3 km from the discharge point. The pollution of the river near the town intake appeared to be more due to the discharge of the city sullage.

Based on the studies, four alternative methods of treatment have been recommended. The lime mud in all the cases was proposed to be disposed, after drying, as a landfill.



Top : Chemical Analyses

Bottom : Biological Productivity

Barcda Effluent Channal Project Studies


TRAINING COURSE ON
INDUSTRIAL WASTE TREATMENT
SPONSORED BY
NEERI (CSIR) AND CPHEEO (GOVT OF INDIA)
(16TH DEC. TO 28TH DEC.)

Continuing Projects

1. Processing of Pulp and Paper Mill Wastes by Photo-oxidation with Ultraviolet Light

UV light in the presence of oxygen is known to modify ligno-sulfonates to easily biodegradable compounds. Laboratory studies have been carried out, using sunlight and blue-green algae of the species *Ancystis nidulans* as a source of oxygen, in the thiolignin modification system. Fifteen days detention time was given and thiolignin was estimated from time to time spectrophotometrically at 275 m μ. About 43% reduction was observed in 15 days. Whether the biodegradation is enzymatic or otherwise is yet to be confirmed.

A unit for photomodification of thiolignin by employing UV radiation in the presence of oxygen is being fabricated. The unit will help to standardize the conditions required for the efficient photomodification of thiolignin.

2. Treatment of Slaughter House Wastes

Characterisation of wastes collected from slaughter house has been carried out for chemical and bacteriological parameters. Plain sedimentation experiments have been conducted on the removal of suspended solids, COD and volatile suspended solids. Studies are in progress on the efficacy of anaerobic contact filters for the waste treatment.

3. Anaerobic Digestion of Nightsoil and Cowdung Mixtures

Laboratory studies using nightsoil and cowdung mixtures indicated that admixture of cowdung with nightsoil has a beneficial effect in overcoming the ammonia toxicity. These experiments are being continued at higher loadings in the laboratory digesters.

A fairly large sized nightsoil digester is being set up in the Central Jail, Nagpur, to conduct these studies.

4. Charaterisation and Treatment of Wastewater from Vidarbha Paper Mills Ltd.; Kanhan

Work on characterisation and treatment of the wastewater is in progress.

INSTRUMENTATION

The Division provides facilities for instrumental analysis such as ultraviolet, visible and infra-red spectrophotometry and polarography to research workers both in the Institute and outside.

During the year, developmental work on the following instruments was undertaken :

(i) Direction Activated Air Sampler

One prototype has been fabricated and tested for field operation. Some improvements in the air valves were found necessary.

(ii) Motor Aspirated—Radiation Shielded Thermistor Probes

Such probes are required for temperature inversion studies to avoid the errors from the sun radiation. Three probes have been made and are being tested.

(iii) Temperature and ~~Humidity~~ Humidity Index Meter

One unit has been fabricated and is being tested.

(iv) Motor Speed Controlling and Temperature Controlling using Silicon Controlled Rectifier

This has an edge over other devices especially in controlling the speed of fractional H.P. Motors. One such unit has been made and is being tested for speed control of a jar testing machine.

(v) 'Radiosonde' System for the Measurement of Temperature Inversion

Developmental work is in progress.

(vi) Continuous Sulphur dioxide Recorders with Conductivity System

A simple device is being developed to measure SO_2 continuously.

(vii) Simple Dissolved Oxygen Meter using Dropping Mercury Electrode

The mercury capillaries available in the country were first tried to get waves on the polarograph. Wave current was small. Hence a suitable amplifier is being designed for the study.

(viii) A New Type of Stirrer

A new type of stirrer which will make use of a rotating magnetic field produced in the starter coil is being developed. The rotor part is completely avoided. One unit is under fabrication.

LIFE SCIENCES

During the year, Bacteriology, Virology and Biology Cells were merged to form Division of Life Sciences. This blending was considered desirable to streamline the activities under this important aspect of environmental engineering and sciences.

BACTERIOLOGY

Completed Project

1. M. F. Technique—Development of Media to replace the Imported and Dehydrated Media

A medium containing indigenously available chemicals was developed for enumeration of coliforms by M. F. Technique. The composition of a medium for enumeration of fecal streptococci has also been finalised. The medium is under extensive trials for its efficiency with different types of waters alongwith the imported medium.

Efforts are being made to prepare these media in dehydrated powder form.

Continuing Projects

1. Cellular Protein from City Refuse

Some microbial cultures have been isolated from sources like soil, compost and refuse dumping sites. Those were found to be cellulolytic when pure cellulose was incorporated.

Experiments are being carried out for the effective utilization of cellulose from refuse samples by those cultures.

2. Use of Soil Culture for the Biological Treatment of Toxic Wastes

Cultures capable of growing in the presence of cyanides could be demonstrated. But, the mechanism of utilization is yet to be studied. Work on soil cultures capable of degrading waste containing phenol-formaldehyde was taken up. Isolation of organisms from soil capable of utilising phenol has been carried out.

3. Efficiency of Stabilisation Ponds (Pilot Plant) and Trickling Filter with respect to Removal of Pathogenic Bacteria, Indicator Organisms and Parasites

Studies were carried out on the stabilisation ponds having operational depths of 3', 4' and 5' respectively. Observations so far showed 84 to 95% reduction in *Salmonella* in the effluent and no presence of parasites. Studies are also being carried out on the effect of sedimentation time on the removal of pathogens and indicator organisms. Observations so far showed that the sedimentation time did not influence the removal of these organisms significantly.

4. Occurrence of Bacterial Pathogens in Slaughter House Wastewaters and Their Reduction by Various Treatment Processes

Characterisation of wastes from slaughter house both for chemical and bacteriological parameters has been completed. Laboratory scale studies have been initiated on the various types of treatment methods and few trials have been conducted on sedimentation studies and anaerobic contact filters.

5. Performance of Double Action Tablets

The tablets have been subjected to intensive trials on the removal of turbidity and coliforms from water. Experiments on the optimum dose and contact period are in progress.

VIROLOGY

Completed Projects

1. Virus Removal in Activated Sludge Sewage Treatment Plant at Dadar, Bombay

The overall performance of the plant in terms of average per cent removal of virus for all seasons, was 96.4 and the virus concentration of the final effluent in 90% of times was less than 52 PFU/1 or less.

2. Survey of Healthy Children for Excretion of Enteric Viruses

School samples (310 Nos) from 267 healthy children of the age group 1-15 years were collected from different localities in Nagpur and Bhandak and processed for virus enumeration.

Enteric viruses were detected in 40% of 178 samples from Nagpur and 62% of 132 samples from Bhandak.

Continuing Projects

1. Virus Removal in Facultative Stabilisation Ponds (Pilot Plant)

Single cell pilot stabilisation ponds with operational depths ranging from 3 to 7 ft were taken up to study the extent of virus removal at different depths so as to arrive at an optimum depth suitable for efficient removal of viruses.

2. Survey of Waters for Enteric Viruses

Part-I: Development of Methods for Concentration of Viruses from Large Volumes of Water

Studies are being carried out to examine the potential usefulness of magnetic iron oxide and bituminous coal on virus adsorbants in the different stages of the water treatment plants.

BIOLOGY

Continuing Projects

1. Bio-assay Studies on Chlorinated Hydrocarbons using Fish

Static and continuous bioassay tests are being carried out in the laboratory using chlorinated hydrocarbons like DDT and BHC.

It is also proposed to study the acute and chronic toxicity of five to six chlorinated hydrocarbons to six different freshwater fishes of economic importance and their histopathological effects.

2. Large Scale Pisiculture in Stabilisation Pond Effluent

Physico-chemical, biological and benthic parameters of the large fish pond (120' × 120') fed by stabilisation pond effluent have been analysed from the point of view of fish culture.

Primary productivity measurements have also been carried out.

RURAL SANITATION

Continuing Project

A pilot project was initiated in collaboration with Zilla Parishad, Nagpur to evaluate improvements in sanitation, if any, on account of rural latrine programme of the Institute in twelve villages in the district. The objective is to stimulate interest in the district authorities to carry out this work at other locations.

So far, about 200 latrines have been constructed. A W.C. and urinal block in a village school has been constructed. Plans and estimates for protected water supply for one village have been submitted to Zilla Parishad for necessary fund allocation.

SEWAGE

Continuing Projects

1. Stabilisation Ponds

Stabilisation ponds with 3', 4' and 5' depths have been operated to delineate the influence of liquid depths on aerobic and anaerobic reactions and the treatment efficiency. To complete this study, two more depths of 6' and 7' are proposed to be investigated.

2. Sedimentation Tank

Study on the efficiency of a hopper bottom vertical flow sedimentation tank in removing BOD and suspended solids of raw sewage at various flow rates is in progress.

3. Development of Entrainment type Surface Aerator

In view of the importance of aerators in biological treatment of wastewaters, a sponsored investigation was taken up to develop the design criteria. The surface aerators for 3 hp, 5 hp and 10 hp have been characterized for various speeds and submergences. Studies are in progress with a 15 hp aerator.

4. Sewage Utilization in Agriculture

(i) Raw Sewage Irrigation

In order to study the effects of differentially diluted raw sewage irrigation and nutrient fortifications on crop growth, yield and soil properties, an experimental crop of wheat was grown and soil samples were analysed before sowing and after harvest for physical and chemical properties to assess the different irrigational and nutritional effects

(ii) Sludge Irrigation :

Effects of direct crop irrigation with aerobic sludge slurry on plant and soil have been under investigation. Paragrass pot-cultures were used in the experiment and the frequency of irrigation and aeration were varied to study their effect on growth.

SOLID WASTES

Completed Projects

1. Solid Wastes in India

Solid waste management practices at major cities in India have been studied under a PL-480 Scheme. Characteristics of city refuse from all these cities during various seasons of the year have been worked out. A detailed project report has been submitted to the sponsors.

2. Refuse Characterisation and Feasibility of Mechanical Composting with Sewage Sludge for Bangalore City

A comprehensive study on mechanical composting of city refuse together with the sewage sludge from the treatment plant at Bangalore was undertaken at the re-

quest of the Bangalore Corporation. A detailed project report including the location of the plant has been submitted.

3. Short-term Refuse Characterisation

At the request of Delhi Municipal Corporation, characterisation of city refuse over a period of one year has been carried out and the area which generates compostable refuse has been identified. A feasibility report has been submitted to the sponsors.

Continuing Projects

1. Characterisation of Leachates from Refuse Dumps and Landfills

The quantity of leachates has been estimated during rainy season on a liesimeter and pollution load has been assessed after carrying out a thorough chemical examination of the leachates.

2. Pyrolysis of City Refuse

Laboratory scale experiments have been completed on the basis of which a laboratory scale reactor is being fabricated.

3. Anaerobic Digestion of Refuse

Various percentages of refuse and dung mixture are being studied to get the maximum gas production.

WATER

Completed Projects

1. Synthetic Coagulant Aids

Various synthetic products were developed and tested for their efficacy. Attempts are being made to study their toxicity.

2. Serpentine : Its Limitation as a Defluoridation Medium

Preliminary investigations indicated that yellow variety of serpentine possessed a marginally better defluoridating capacity as compared to green variety when used in columns.

The running cost of defluoridation of water at 50 lpcd varies between Rs. 73 and Rs. 232 per annum depending upon the concentration of fluorides and alkalinity in the raw water.

It is concluded that cost of defluoridation is prohibitive with serpentine.

3. Extension Work

Extension work on the following complted projects has been undertaken :

(a) Natural coagulant aids;

(b) Natural coagulants;

(c) Metal coagulants;

(d) Activated silica solutions;

(e) Iron removal unit for domestic purposes;

(f) Defluoridation of water by "Defluoron-2";

(g) Disinfection tablets; and

(h) Package water treatment plant.

Continuing Projects

1. Nalgonda Technique of Defluoridation of Water

Concerted efforts were made to conclude the study in the laboratory and carry it to the field. The technique comprises of treatment of water with sodium aluminate or lime and alum in sequence followed by flocculation, sedimentation and filtration. Bleaching powder can also be added simultaneously for disinfection. The operations are simple. This technique of defluoridation can be advantageously used in endemic areas of fluorosis either on an individual basis or on a community level. Lime which is far cheaper is recommended instead of sodium aluminate.

The running cost of defluoridation of water for individuals at 50 lpcd varies between Rs. 1.62 and Rs. 12.50 per annum depending upon the concentration of fluorides

and alkalinity in the raw water. The corresponding figures for total operational costs for a community water supply will be from Rs. 5.01 to Rs. 15.73 per annum.

2. Filter Aid

An improved filter aid (FA-5) was developed from wood charcoal, commonly used as a domestic fuel. The optimum weight of the medium required is 1.29 kg/sq m (120 g/sq ft) of filter area and the approximate cost is Re. 1 per kg as against Rs. 10 to Rs. 15 per kg for any of the imported material. The studies at NEERI on a Stellar Filter (Type SW/5/AV; 0.4645 sq m *septum* area) using FA-5, indicated that the filtrate had always a turbidity less than one unit. Based on the trials conducted by NEERI and DGAFMS, FA-5 was considered as a potential substitute for the hitherto imported diatomaceous earth.

Extensive trials are being carried out to study the comparative performance of a few imported filter aids with FA-5 and the results so far indicate that the latter is superior to any of the imported counterparts.

3. Membrane Filter

The know-how on Membrane Filter (MF-B) was transferred to three entrepreneurs. The representatives of the firms were trained on the process in the laboratory. Work is in progress on the development of membrane filters of other porosities.

4. Carbon Chloroform Extraction Method

The process is extremely time-consuming. The column studies were conducted at Kanhan Water Works and filtered water (prior to chlorination) was used in the studies.

The following values were obtained :

	1st test	2nd test
Chloroform extract ...	0.038 mg/1	0.030 mg/1
Alcohol extract ...	0.120 mg/1	0.106 mg/1

Similar tests will be carried out on well and lake waters.

5. Chlorine Ampoules

A few hundred chlorine ampoules of 1, 2, 5 and 10 ml capacity were supplied to various organisations on request. Each ml of solution contains 5 mg of chlorine. The know-how was referred to CSIR for commercial exploitation.

6. Chemical Analysis Kit

The kit is under evaluation for field use by DGAFMS. Based on the experience on the use of the kit and the suggestions received from DGAFMS, the instruction manual on the kit was revised.

7. Reverse Osmosis

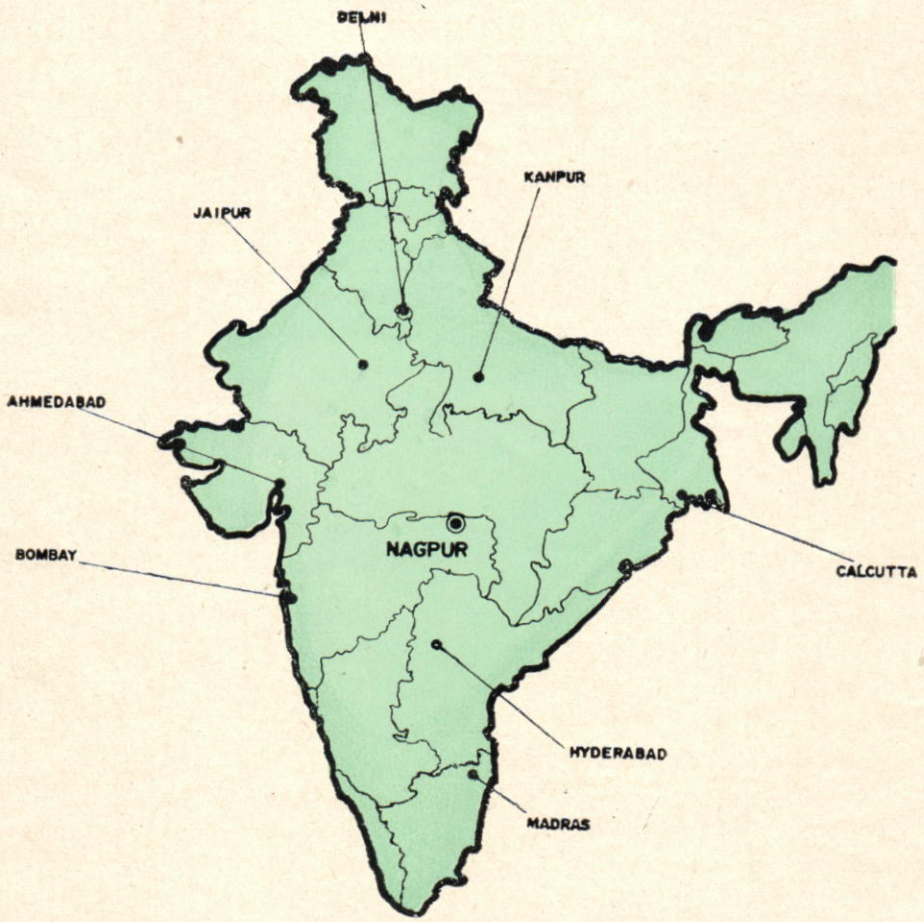
Two methods using different catalysts have been standardised for the preparation of secondary cellulose acetate. The properties of the acetate compare well with the imported cellulose acetate.

A pilot plant of 2500 l/d capacity has been fabricated by the Institute and is under trials. A back pressure regulator has been designed and fabricated at the Institute. It is being used successfully in pressure control of the process. Further studies on membrane life and rejection rates of ions like sulphate and nitrate are being carried out.

8. Poison Removal Kit (Analytical Cell)

Test procedures for the estimation of toxicants like arsenic, chromium and copper were standardised in the laboratory. Water collected after passing through the poison removal kit was found to be without these toxicants. Methods for the estimation of lead and cadmium are also being standardised.

ZONAL LABORATORIES



THE INSTITUTE SERVES THE NATION THROUGH NAGPUR AND 8 ZONAL LABORATORIES

NEERI Ahmedabad Zonal Laboratory
Suburban Sub Pumping Station
Beyond Calico Mills, Sewage Farm Road
Ahmedabad (Gujarat)

NEERI Bombay Zonal Laboratory
89-B, Dr. Annie Besant Road
Worli
Bombay-18 (Maharashtra)

NEERI Calcutta Zonal Laboratory
4th Floor of Premises No. 23
Rajendranath Mukherjee Road
Calcutta-1 (West Bengal)

NEERI Delhi Zonal Laboratory
Chandrawal Water Works No. II
Alipore Road
Delhi-6.

NEERI Hyderabad Zonal Laboratory
RRL Campus
Hyderabad-9 (Andhra Pradesh)

NEERI Jaipur Zonal Laboratory
First Floor Chemistry Block
Malviya Regional Engineering College
Jaipur-4 (Rajasthan)

NEERI Kanpur Zonal Laboratory
633, Civil Lines,
Kanpur (Uttar Pradesh)

NEERI Madras Zonal Laboratory
CSIR Campus
Adyar
Madras-25 (Tamil Nadu)

ZONAL LABORATORIES

Besides the research projects that are listed under each Zonal Laboratory separately, these laboratories took part in the following activities :

1. **Training programmes in various areas of environmental engineering. These included both the Institute's own programmes as well as those conducted in collaboration with outside organisations.**

2. **Meetings of the Planning Boards of the respective States where the Zonal Laboratories are located. The Zonal Laboratories offered assistance in solving the environmental pollution problems faced by the State authorities.**

3. **Meetings of the Advisory Committees of the Zonal Laboratories which were reconstituted in 1973 to formulate guidelines for R & D activities.**

4. **A number of projects sponsored with the Institute by the various State and Central Government Departments, industries and private organisations were undertaken by these Zonal Laboratories. Analysis of water and wastewater samples was also carried out on behalf of several parties.**

5. **Took active part in a number of symposia, seminars and group discussions organised in these regions on different aspects of environmental pollution control.**

The following Zonal Laboratories were shifted to the new premises :

i) **Jaipur Zonal Laboratory shifted to the Chemistry Block of Malviya Regional Engineering College, Jaipur, (Rajasthan).**

ii) **Hyderabad Zonal Laboratory shifted to R.R.L. Campus, Hyderabad.**

iii) **Madras Zonal Laboratory shifted to CSIR Complex, Adyar, Madras.**

AHMEDABAD

Completed Projects

1. Treatment and Disposal of Industrial Wastes in and around Baroda

This project was continued from the previous year and the investigations on the following aspects were carried out during the year :

(i) Hydrographic survey of the estuary in the region of Mahi river; (ii) Bio-assay studies to determine the toxicity and TLm values for the combined wastes; and (iii) Primary productivity of the river.

Based on the studies, a final report is under preparation for submission to the Sponsors.

2. Treatment and Disposal of Wastes from Anil Starch Ltd.; Ahmedabad

Characterisation of wastes and the feasibility studies on their treatment were carried out in the laboratory and an interim report has been submitted.

Continuing Projects

1. Treatment and Disposal of Wastes from GIDC Industrial Estate

A new project on the feasibility studies on the treatment and disposal of industrial wastes from the Gujarat Industrial Development Corporation, Industrial Estate at Vapi has been taken up, sponsored by the Government of Gujarat. The complex comprises of a variety of industries which discharge toxic wastes. So far, characterisation of individual wastes from about 50 factories has been carried out. Further work is planned as follows :

(i) Assessment of the characteristic of the combined wastes; (ii) Assessment of volume of individual and combined wastes by flow measurements; and (iii) treatment and disposal methods of the combined wastes.

BOMBAY

Completed Projects

The following projects have been completed during the year and reports submitted to the concerned agencies :

1. Preventive Maintenance of Water Distribution Systems

A pilot project on preventive maintenance of water distribution system was taken up at Madras, followed by a practical-oriented training course for engineers. This work was sponsored by CPHEEO with NEERI and Madras Corporation.

2. City Air Pollution Survey

A comprehensive air pollution survey of the city of Bombay was sponsored by Bombay Municipal Corporation. An interim report has been submitted.

3. Air Pollution Survey for New Bombay Region

The survey, taken up at the request of CIDCO, Bombay included assessment of air pollutants, collection of micrometerological data and emissions inventory.

Continuing Projects

1. Characterisation of Wastes from Industries in Thana-Belapur Area

Questionnaires were sent and visits made to all the 30 industries in the area to collect the relevant information. Grab and composite samples from these industries have been collected and analysed. Based on the preliminary studies, an interim report has been prepared.

2. Waste Treatment Plant for HOC, Rasayani

A detailed report including specifications for the common neutralisation system including the drawings, has been submitted to the authorities. These studies are being continued to prepare a scheme for the second phase comprising of treatment of wastes from nitro-compounds processing plants.

3. Reuse of Wastewater

Assessment of variation in quality and quantity of domestic sewage in Bombay has been taken up with a view to reuse the wastewater. Work on characterisation of the effluents from the extension plant at Dadar, has been undertaken.

4. Water Supply and Treatment

Work on the following projects was taken up :

(i) Improvements in the water supply to Mahindra Ugine Steel Co. Ltd.; Khopoli, Bombay.

(ii) Identification and culturing of iron bacteria in Water and investigation of incrustations in pipelines from Marud-Janjira, a suburban area.

(iii) Waste assessment and detection in Ville Parle Zone.

CALCUTTA

Completed Project

1. Baseline Studies on Water Quality of Hooghly Estuary

This project, sponsored by CMDA, was completed during the year. A stretch of about 100 km of the Hooghly river between Kalyani and Birlapur was surveyed during different seasons of the year to identify the major sources of pollution and to undertake characterisation. Final report is under preparation.

Continuing Projects

1. Air Quality Survey in Calcutta and Howrah

Frequency of air sampling was increased to four times a month in the four select sampling stations. Compilation of emission source inventory was taken up during the year. Corrosion studies were also carried out to evaluate the effects of air pollutants on ferrous and non-ferrous metallic panels in the areas.

2. Water Pollution Control

During the year the following water courses were surveyed to assess the pollution load : (i) TOLLY'S NULLAH; (ii) CIRCULAR CANAL; and (iii) KULTI RIVER.

DELHI

Completed Projects

1. Water Quality Criteria for Mathura Refinery

At the instance of the Indian Oil Corporation, three sources of water supply to Mathura refinery viz Yamuna river, Agra Canal and Keetham Lake were investigated

for the water quality. Physico-chemical and bacteriological characteristics of the water samples from the above three sources were determined and bioassay studies were carried out.

2. Treatment of Dairy Wastes

Characterisation of the simulated wastes from the proposed dairy of National Dairy Development Board, New Delhi has been done. A flow sheet for the treatment has been supplied.

3. Treatment of Wastewater from Vanaspati Manufacturing Unit, Khanna

Flow sheet for the treatment of wastewater from this industry has been proposed together with recommendations. The final effluent was proposed to be discharged into the sewerage system of the town.

Continuing Projects

1. Long-term Air Quality Survey

Air samples were collected and analysed fortnightly from four select sampling stations. Common air pollutants were determined.

2. Dual Media Filtration

Comparative studies on conventional filtration and declining rate filtration at Chandrawal Water Works No. II showed that the latter gave more output without deterioration in the water qualiy.

3. Water Pollution Survey of River Hindon

This project has been initiated during the year sponsored by the Ministry of Works and Housing. Preliminary survey of the river was carried out with reference to the discharge points of sewage and industrial wastes and sampling stations have been fixed.

HYDERABAD

Completed Project

1. Industrial Waste Treatment

Characterisation of wastes from the following industries has been completed and flow-sheets for their treatment and disposal have been supplied to the parties for implementation.

(i) Pulp and paper mill wastes;

(ii) Chemical wastes;

(iii) Distillery and sugar factory wastes;

(iv) Plating wastes; and

(v) Chemical and fertilizer wastes.

2. Air Pollution Survey at Deccan Chronicle Press, Secunderabad

Air pollution due to lead fumes from the factory was surveyed and a preliminary report is under submission.

Continuing Projects

1. Industrial Waste Treatment

Work on the treatment of wastes from the following industries was continued.

(i) Warner Hindustan Ltd.; Hyderabad;

(ii) Nath Laboratories, Hyderabad; and

(iii) Synthetic Drugs Project (IDPL), Hyderabad.

2. Preventive Maintenance of Water Distribution Systems

Leak detection surveys have been completed in two zones covering about 300 connections. Work in the third zone is in progress. Studies have also been initiated for remodelling the water distribution system of Hyderabad city.

3. CSIR Karimnagar Project

The Zonal Laboratory has prepared an exhaustive report on the various activities that are to be undertaken in this sector alongwith the estimated costs. Some of the major works completed so far under this scheme are: (i) Design of 12 Rural water supply schemes; (ii) Solid waste management (iii) Construction of 42 latrines for the Harijan colony; and (iv) Treatment and disposal of wastes from the Fertilizer Corporation of India at Karimnagar.

JAIPUR

Completed Projects

1. Mechanism of Fluoride Removal from Water

Laboratory studies were conducted to examine the requirements of aluminium salts for regeneration of Defluoron-2. The aluminium thus added hydrolyses to form Al $(OH)_3$ which adsorbs the fluoride ions from water.

2. Reuse of Filter washes at Laxmandoongri Water Works

Pilot plant studies were carried out on the reuse of filter washes from filters and the report has been submitted to Chief Engineer (PHED), Rajasthan.

Continuing Projects

1. Fluorosis Survey

Field surveys are being conducted in the villages around Jaipur city to study the incidence of fluorosis. Based on this data, treatment plants will be suggested to the State Authorities for removal of excess fluorides from water.

2. Wastes from Vegetable Oil Mills

Characterisation of the wastes has been completed. An interim report has been submitted to the Director of Industries, Rajasthan.

KANPUR

Completed Project

1. Pollution Studies on River Pandu

Stream pollution and self purification of river Pandu which receives wastes from fertilizer factory have been investigated.

Continuing Projects

1. Industrial Waste Treatment

Studies on characterisation and treatability of the following industrial effluents were continued :

(i) Organic chemicals;

(ii) Tobacco;

(iii) Straw board;

(iv) Crystal sugar;

(v) Distillery; and

(vi) Fertilizer.

2. Treatment and Disposal of Slaughter House Wastes

Characterisation and treatability of wastes from a slaughter-house have been taken up.

3. Disinfection of Wells by Chlorine Pot Method

Field work to assess suitability of the chlorine pot method has been taken up.

4. Air Quality Monitoring Survey

Data on common air pollutants was collected from four sampling stations.

5. Bio-assay Studies of Organic Insecticides

Studies on toxicity of seven insecticides have been taken up with five different species of test fishes.

MADRAS

Completed Projects

1. H_2S Pollution in Hydel Projects

Studies on H_2S pollution in Kali River Hydel Project and effect of discharge of paper mill wastes from West Coast Paper Mills at Dhandeli on sulphide and sulphate contents in Kali Nadi Works were completed. The final report on H_2S pollution in hydel projects was submitted.

2. Preventive Maintenance of Water Distribution Systems

A programme on preventive maintenance of water distribution system in T. Nagar was conducted in collaboration with NEERI Zonal Laboratory, Bombay. Biological and bacteriological criteria of water quality in the distribution system were studied.

Continuing Projects

1. Industrial Wastes Treatment

Work on treatment and disposal of the following industrial wastes was in progress :

(i) Tannery;

(ii) Distillery and Breweries;

(iii) Dairy;

(iv) Paper; and

(v) Polyfibre.

2. Survival of Pathogens in Treatment of Sewage by Oxidation Ponds

This is a collaborative project with college of Engineering, Guindy. Studies on the survival of bacteria and viruses in stabilisation and fish pond effluents and its effect on ground water recharge were carried out.

3. Coordination Projects with CSIR Laboratories

(i) *Equipment for Monitoring Air and Water Pollution*

In collaboration with the CSIO Regional Centre, fabrication of instruments to be used in analysis of water has been carried out. An indigenous dissolved oxygen probe has been developed and tested.

(ii) *Integration of Services for Pre-fabricated Buildings*

This is a collaborative project with the SERC Regional Centre. Designs on the sanitary and Water supply installations were given for the residential buildings of the Housing Board.

(iii) *Deep Well Hand Pump and Mechanical Equipment for Water and Sewage Treatment Plants*

In collaboration with MERADO, design of deep well hand pump has been finalised and that for Screw pump has been prepared.

OTHER ACTIVITIES

CONSULTATION

The Institute continued to render assistance to Government Departments, Corporations, Municipalities, Industries and Local bodies on problems in the field of environmental engineering and science. Consultancy services were based on the know-how developed by the Institute.

The consultancy schemes attended to during the year are given below :

Sr. No.	Name of client	Nature of problem
1.	Sica Breweries Ltd., Pondicherry.	Effluent treatment.
2.	Bombay Dyeing and Manufacturing Co. Ltd., Bombay.	Characterisation of sewage: (i) from Pandurang Budhkar Marg; (ii) from Dadar sewage treatment plant; and (iii) for reuse purposes.
3.	Municipal Corporation of Greater Bombay.	Analysis of water samples during the monsoon seasons of 1973 and 1974.
4.	Ministry of Works & Housing, New Delhi.	Water pollution survey of River Hindon (Delhi).
5.	Nag Vidarbha Chemicals, Nagpur.	Effluent problem.
6.	Coal Mines Authority, Ltd.; Nagpur.	Disposal of sewage at Kanhan colony.
7.	Tannery and Footwear Corporation of India Ltd.; Kanpur.	Tannery waste treatment.
8.	Gujarat Industrial Development Corporation, Ahmedabad.	Advice on wastewater treatment.
9.	Central Public Works Department, New Delhi.	Pilot survey for leakage detection and cleaning of raw water mains.
10.	Public Health Engineering Department, Hyderabad.	Preventive maintenance of water distribution system.
11.	Archaeological Survey of India, New Delhi.	Air pollution survey around Taj Mahal and other national monuments at Agra.
12.	Deccan Chronicle Press, Secunderabad.	Atmospheric air-borne lead in and around the printing press.
13.	Binny Ltd.; Madras.	Atmospheric pollution due to coal yard operations of the factory.
14.	Tata Electric Co., Bombay.	Impact of pollutants from thermal power station on the surrounding region.

Sr. No.	Name of client	Nature of problem
15.	Fertilizer Corporation of India Ltd.; Bombay.	Air quality and emission inventory studies at F.C.I., Trombay unit.
16.	Chowgule Metal Industries, Goa.	Pollution aspects of the newly coming pelletization plant at Marmugoa.
17.	Khopoli Municipality, Khopoli (Maharashtra).	Air pollution survey at Khopoli.
18.	Navin Fluorine Industries, Udhna, Surat.	Pollution control.
19.	Gujarat Mineral Development Corporation, Ahmedabad.	Assessment of the emissions from Fluorspar plant at Kandipani, Baroda.
20.	National Mineral Development Corporation, Bailadila, Bastar.	Air pollution study on crushing and handling of iron ore at Bailadila.
21.	Indian Drugs and Pharmaceuticals Ltd.; Hyderabad.	Atmospheric pollution aspect due to I.D.P.L. plant.
22.	Indian Oil Corporation, New Delhi.	Air pollution aspect of newly coming refinery at Mathura.
23.	City and Industrial Development Corporation of Maharashtra, Bombay.	Location of industries in New Bombay Area.
24.	Rani Durgawati Paper and Board Industries, Pvt. Ltd.; Jabalpur.	Effluent disposal scheme.
25.	Amravati Sri Venkatesa Paper Mills, Ltd.; Madhathukulam.	Effluent treatment.
26.	Indian Oil Corporation, New Delhi.	Testing of water samples for Mathura Refinery—Additional sampling from Keetham lake.
27.	Alkali and Chemicals Corporation of India Ltd.; Hyderabad.	Treatment and disposal of industrial effluents.
28.	Hero Cycle Industries, Ludhiana.	Characterisation of wastewater.
29.	Indian Detonators Ltd.; Hyderabad-8.	Treatment of cyanide effluents.
30.	Scooters India Ltd.; Lucknow.	Treatment of domestic sewage and industrial effluents.
31.	Madras Synthetics, Madras.	Effluent treatment.

Sr. No.	Name of client	Nature of problem
32.	The M.P. State Industries Corporation Ltd.; Ratlam Alcohol Plant, Ratlam.	Effluent treatment.
33.	Coal Mines Authority Central Mines Planning & Design Institute, Ranchi, Bihar.	Pressure filter in water treatment.
34.	Standard Batteries, Ltd.; Bombay.	Testing of filter elements.
35.	Department of Engineering Ahmadu Bellow University, Zaria, Nigeria, Africa.	Package water treatment plant for rural areas.
36.	National Mineral Development Corporation, Bailadila Iron Ore Project, M.P.	(i) Anti-corrosive tests and measures for water supply. (ii) Slime disposal studies.
37.	Bangalore Municipal Corporation, Bangalore.	Refuse characterisation & feasibility of mechanical composting with sewage sludge for Bangalore city.
38.	Delhi Municipal Corporation, Delhi.	Characterisation of refuse.
39.	A. P. Paper Mills, Rajahmundry, (AP).	The extent of pollution due to discharge of untreated wastewaters, the cause of pollution of water supply intake and to suggest treatment of wastewater.
40.	J. K. Paper Mills Ltd. Jaykaypur (Orissa).	Increased load due to additional speciality paper plant and discharge of highly alkaline cooker liquor.
41.	B. P. & S. B. Mills Ltd.; Ballarpur.	Effluent treatment.
42.	Vidarbha Paper Mills Ltd., Kanhan.	Wastewater treatment and possible utilization of a part for irrigation.
43.	Government Opium and Alkaloid Works Undertaking, Neemuch, M.P.	Treatment of opium and alkaloid wastewater.

COORDINATION

This Cell assisted Director in appraisal of the research programmes of the Institute. In addition, the following activities were undertaken at the national and international levels :

(i) Formulation of Fifth Five Year Plan Proposals for the Institute;

(ii) Coordinated Project with the WHO IRC on Community Water Supply, The Hague, on Slow Sand Filtration;

(iii) Workshop on Information Management in Community Water Supply and Waste Disposal (Organised with the cooperation of Division of Community Water Supply and Waste Disposal, WHO, Geneva);

(iv) Regional Advisory Committees for Zonal Laboratories (These were reconstituted and meetings were arranged);

(v) Coordination of projects with the CSIR Engineering Sciences Group;

(vi) Identification of and participation in R & D activities of the State Planning Boards; and

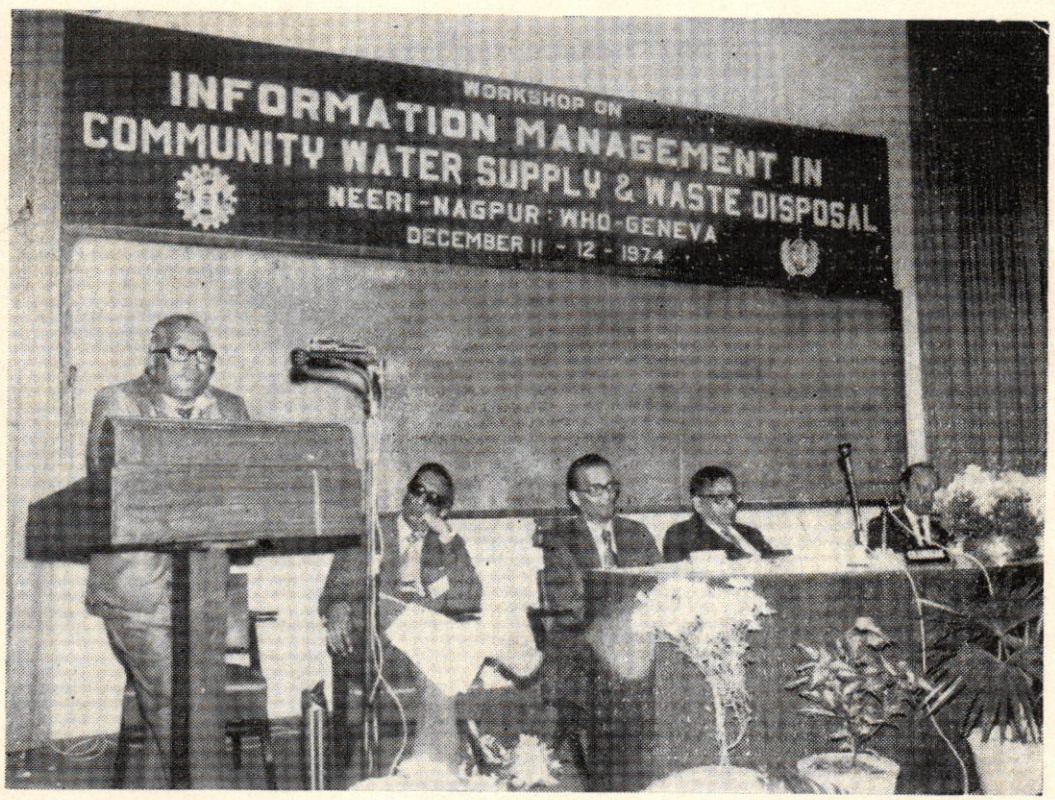
(vii) Collaborative work with State Government Departments and Educational/ Research Institutes.

GLASS BLOWING

Specialised glasswares were fabricated and repairs to glasswares were attended to. The items fabricated during the year included :

(i) Sedgwick Rafter Cell	...	13 Nos.
(ii) Sedgwick Rafter Funnel	...	4 Nos.
(iii) Sintered Glass Diffuser (cyl.)	...	24 Nos.
(iv) Micro-Kjeldahl Distillation Unit	...	9 Nos.
(v) Fume Exhaust Manifold	...	1 No.
(vi) Air Sampling Bubbler (Impinger)	...	2 Nos.

Several enquiries were also attended to from various parties both at Nagpur and outside. Glassware items were fabricated as per their requirements.


WORKSHOP ON
INFORMATION MANAGEMENT IN
COMMUNITY WATER SUPPLY & WASTE DISPOSAL
NEERI - NAGPUR : WHO - GENEVA
DECEMBER 11 - 12 - 1974

"Open day" organised by the Institute

PHOTOGRAPHY

The Institute has a well-equipped Photography Section with facilities for preparation of microfilms, photocopies, slides and other photographic work required for the research work.

The Section prepared a short film covering the visit of the Prime Minister of India to Institute on Jan. 3, 1974.

SYMPOSIA, SEMINARS AND EXHIBITIONS

(i) Workshop on "Information Management in Community Water Supply and Waste Disposal"

The workshop was held on December 11-12, 1974 by the Institute with the active cooperation of WHO, Geneva. A draft Guide prepared by WHO on the subject and the document prepared by NEERI were discussed at the workshop. Besides a few foreign delegates about 25 invitees from different States engaged in the field participated in the discussions. The workshop provided a good forum for establishing a better rapport between scientists, practising engineers, information specialists, planners and administrators.

(ii) Seminar on "Sugar Mill Waste Disposal"

The Institute organised a one-day seminar on "Sugar Mill Waste Disposal" at the Kanpur Zonal Laboratory on January 16, 1974 in collaboration with National Institute for Sugar Technology and the I.I.T., Kanpur. About 145 participants took part in the seminar and papers dealing with different aspects of treatment and disposal of wastes from sugar industries were presented and discussed.

(iii) "Scope for Chemical Industries in Vidarbha"

A one-day seminar was cosponsored by the Institute on "Scope for Chemical Industries in Vidarbha Region", held at Nagpur on March 30, 1974. NEERI was assigned with the responsibility of tackling the various environmental pollution problems associated with the Chemical Industry.

(iv) All India Seminar on "Distillery Waste Disposal Methods"

The Institute actively participated in the above seminar at Walchand College of Engineering, Sangli and papers were presented on the treatment and disposal of distillery wastes.

(v) Seminar on "Environmental Pollution due to Mining Metullurgical and Chemical Industries"

Two technical papers : (a) Pollution Aspect of the Manganese Mines and its Premises and (b) Solid and Liquid Waste Problems in Metallurgical Industry in India were presented.

(vi) Seminar on "Environmental Pollution in the Context of the Present Industrial Development in India"

Technical papers were presented at the two-day seminar held at Trivandrum during October 13-14, 1974.

(vii) Exhibition

The Institute took part in the Science Exhibition organised on the occasion of the 61st Session of the Indian Science Congress and the Golden Jubilee of Nagpur University, held at Nagpur and displayed some of its products and processes.

(viii) Open-Day

An Open-Day was organised on Jan. 9, 1974 at the Institute to give an opportunity to the citizens to see for themselves the various research activities. An exhibition was arranged on the occasion where the various products/processes developed by the Institute were displayed. About 2500 people attended the open-day.

TRAINING, INFORMATION, LIBRARY AND EXTENSION (TILE)

Training

(i) Institute's Programme

The Institute organised eight training/refresher courses during the year. These were held at Nagpur, Kanpur, Madras and Baroda. Some of the training courses were sponsored by CPHEEO, Ministry of Works & Housing; National Safety Council and Candy Filters, Bombay. Manuals were also prepared for some of the training courses for use of the participants.

Training courses organised during the year are given below :

Sr. No.	Name of the course	In collaboration with/venue	Dates	No. of participants
1.	Air Pollution Control	NEERI/Nagpur	12.3.74 to 21.3.74	12
2.	Water and Waste Water Analysis	NEERI/Nagpur	9.7.74 to 13.9.74	11
3.	Environmental Pollution	National Safety Council, Bombay; NEERI/Nagpur	28.10.74 to 2.11.74	31
4.	Chlorination and use of Chlorinators	Candy Filters; NEERI/Madras	10.12.74 to 12.12.74	47
5.	Sewage Farming	IIT/Kanpur	2.12.74 to 5.12.74	3
6.	City Refuse Disposal	IIT/Kanpur	5.12.74 to 7.12.74	2
7.	Industrial Waste Treatment	CPHEEO; Instt. of Engineers/Baroda	16.12.74 to 28.12.74	23
8.	Preventive Maintenance of Water Distribution Systems.	CPHEEO; NEERI/Madras	29.1.74 to 12.2.74	23

(ii) Training Courses conducted by Other Organizations

The following staff members attended the training courses conducted by other organizations.

1. Shri R. K. Saraf, Scientist, attended short-term course on "Forecasting" organised by the Society of Management Science and Applied Cybernetics during January 14-22, 1974, at CSIR, New Delhi.

2. Sarvashri V. Raman, and V. Hanumanulu, Scientists attended a course on 'Distribution System—Analysis using Computers" sponsored by the Ministry of Works and Housing, Government of India, conducted at the College of Engineering, Guindy, Madras, from February 4 to March 1, 1974.

3. Shri T. K. Srinivasan, Scientist, attended "Workshop and Training Course for Scientists in the field of Industrial Liaison, Information and Extension" sponsored by CSIR at SITRA, Coimbatore during December 23-28, 1974.

(iii) Miscellanea

Practical training facilities were provided to a Final Year Civil Engineering student of BITS, Pilani in the various divisions of the Institute from August 12 to October 16, 1974.

Seven trainee officers of 10th Orientation training course for Maharashtra Service of Engineers from Nasik were at the Institute during February, 19-21, 1974 to get acquainted with the various research activities.

Two students of the Visevesvaraya Regional College of Engineering, Bangalore, were trained in Water and Sewage Treatment Divisions respectively.

Publications

(i) Indian Journal of Environmental Health

The journal completed the 16th year of its publication. The subscribers to the journal increased during the year to over 1000, which included various research and educational institutions both in India and abroad. About 45 issues were sent to Foreign and Indian Organizations on exchange basis.

(ii) Technical Digest

This one-page leaflet covering important aspects on Public Health Engineering work in the country was circulated widely. The periodicity was reduced to quarterly.

The following topics were covered during the year :

1. January 1974	...	Textile Mill Wastes.
2. April, 1974	...	Waste Prevention in Water Distribution System.
3. July, 1974	...	Phenol Formaldehyde Waste Treatment.
4. October, 1974	...	Defluoridation of water by Nalgonda Technique.

(iii) Special Publications

The following special publications were brought out :

1. Annual Report, 1973.
2. CPHERI-Fifteen Years Service to the Nation.

"Open day" organised by the Institute

3. Manual on Environmental Microbiology (revised).
4. Solid Wastes in India (PL—480 Scheme).
5. Course Manual on Water and Wastewater Analysis.
6. Course Manual on Environmental Pollution for Managers and Safety Officers.
7. Course Manual on Industrial Waste Treatment.
8. Course Manual on Chlorination and use of Chlorinators.
9. Workshop on Information Management in Community Water Supply and Waste Disposal.
10. Research in Retrospect 1959-74 : A Bibliographical Review.
11. Defluoridation (revised).
12. Hindi leaflet "Floreenharan Ki Nalgonda Vidhi".

In addition, the Unit helped in bringing out a feature article on "Pollute and Die" covered in the Illustrated Weekly of India (Dec. 8, 1974).

Documentation & Library Services

The Institute continued activities as a Regional Reference Centre of the World Health Organization for : (i) Community Water Supply, (ii) Waste Disposal, and (iii) Air Pollution Control and actively worked for effective exchange and dissemination of information in the network of the reference centres. The documentation and library services were intensified with a view to develop good documentation services to cater to the information needs of the scientists and other research workers. Some salient features of the services are highlighted below :

(i) Current Awareness Service

The fortnightly current awareness service entitled "A Guide to Current Literature in Environmental Health Engineering & Science" which served as a medium for dissemination of current information about the latest trends and practices in the field was published regularly. As many as 1975 papers culled from various journals were brought to the notice of the scientists through this service during the year under review. Besides serving the scientists of the Institute, this publication also helped the scientists from outside organizations to keep themselves abreast in the field.

(ii) Indian Literature in Environmental Engineering - Annual Bibliography

Encouraged with the response received for the Bibliography for the year 1971, its counterpart for the year 1972 was also brought out. The publication contained

bibliographical details of 968 papers published in about 100 Indian as well as foreign periodicals besides giving the details of the presented at 43 conferences, symposia and seminars. This comprehensive bibliography provides unique opportunity to take a bird's eye view of the contribution which India has made in this emerging field in a single year.

(iii) Environmental Engineering—News Index

To keep the scientists abreast with the reports in the Environmental Engineering and related subjects, a press-clipping service was provided by scanning important daily newspapers. These clippings were indexed and a publication entitled "Environmental Engineering—News Index" was brought out as a good retrieval tool.

(iv) CPHERI—Research in Retrospect 1959-73 : A Bibliographical Review

Publishing the research findings for the benefit of others is an important function of any research organisation. It also helps in communicating the knowledge from the laboratory to the field. The Institute's scientists have aptly shouldered this responsibility and over 700 publications were brought out by them during the span of 15 years. These publications are, however, scattered in the form of articles in periodicals, symposia proceedings, technical reports, feasibility reports, technical digests and books. The present publication has taken a review of all such documents in retrospect and provided full bibliographical details of these in a consolidated form. It enables a researcher to retrieve information regarding the work done on a particular facet of the field.

(v) Literature Search and Biblographies on Specific Topics

A large number of querries from the Institute's Scientists as well as from outside organisations requiring literature search were answered by locating the information from various sources.

Bibliographical services were also provided in response to the requests from research workers of the Institute as well as from outside agencies.

Following ad-hoc bibliographies deserve a special mention :

1. Water & Waste Water Treatment in Indian Cities.
2. Pyrolisis for Solid Waste.
3. Effects of Air Pollution on Human Health-Select Indian References.
4. Infiltration Wells & Galleries.
5. Treatment of Waste Water by Biological Discs.
6. Pollution Control in Foundries.

(vi) Help for Building-up Collection in Other Libraries

The Institute is often consulted by other organizations on various problems pertaining to library organization, acquisition and procurement of publications in the subject areas falling under Environmental Engineering.

As many as 50 organizations were helped in building up their collection by sending the wanted issues of periodicals which could be spared by the Institute.

(vii) Selective Dissemination of Information

This is a personalised service by which scientists of the Institute are informed about the existence of the most nascent literature which may be of relevance to their needs. For rendering this service, the documents on their receipt are scanned for their contents and matched with the subject interest or profiles of the researchers and notification of relevant references are sent to the users through 'Library Flash'. At present, this service is operated manually.

Increasing number of people are approaching the Institute for allowing them to avail of the facilities in the Library. As many as 180 individuals from Universities, Colleges, research institutions and industries were helped for their literature search.

Similarly, several requests for Inter Library Loan were handled during the year.

Display Room

In order to give a glimpse of the various R & D activities, a display room has been set-up. Working models, charts, transparencies and such other audio-visual aids have been provided with a view to offer a quick glance of the multifarious activities to the visitors at one place.

WORKSHOP

Institute has a well-equipped workshop which undertakes fabrication of gadgets, models, pilot-plants for use of the research workers in their various projects. It also looks after essential services such as water supply and electricity for the Institute and the staff quarters.

The equipment fabricated during the year included :

(i) Surface Aerators of varying sizes;
(ii) Gas Collection Domes; and
(iii) Defluoridation Units.

SPECIAL REPORTS

The following special reports were brought out during the year on different sponsored and consultancy schemes :

1. Treatment and Disposal of Wastewaters from Andhra Pradesh Paper Mills Ltd., Rajahmundry, A.P.
2. Baroda Effluent Channel Project (Interim Report-II).
3. Scheme for Wastewater Disposal for Rani Durgawati Paper and Board Industries Ltd., Sagar (M.P.)
4. Neutralisation Plant for Hindustan Organic Chemicals, Rasayani.
5. A Training Course Manual on Preventive Maintenance of Water Distribution System at Madras.
6. Effluent Treatment for Cadbury-Fry (India) Pvt. Ltd., Thana, Bombay.
7. Design of Neutralization Plant for the Acidic Wastewaters from N.C. & Acid Sections of Cordite Factory, Aravankadu.
8. Water Treatment and Supply at Sirpur Paper Mills Ltd., Sirpur-Kaghaznagar.
9. Survey of Pollution of Hindon River.
10. Sewage Treatment and Disposal for Nangal Township.
11. Survey of Effluent Disposal System at Sahu Chemicals & Fertilizers Factory, Sahupuri, Varanasi.
12. Swimming Pool Water Treatment for C. P. Club, Nagpur.
13. Design of Oxidation Ditch for Hindustan Photofilm Manufacturing Co. Ltd., Ootacamund.
14. Design of Waste Treatment Plant for Ernakulam Central Dairy.
15. Treatment of Sanitary Sewage from the Colony of Fertilizer Corporation of India, Tolcher, (Orissa).
16. Pilot Study of Waste Assessment and Detection in Delhi (New Rajendranagar).
17. Nightsoil Digestion Scheme for Delhi Cantonment Board.
18. Characterisation of Wastewaters of Kapurthala Northern India Tanneries Ltd., Kapurthala.
19. Effluent Disposal of Kanpur Sahakari Milk Board Dairy, Kanpur.
20. Effluent Treatment Scheme for Sica Breweries Ltd, Pondicherry.
21. Algal Problem in MSEB Power Station Canal Waters at Bhusawal.
22. Effluent Treatment Plant for the Distillery of Andhra Sugars Ltd., Tanuku, (A.P.)

23. Sanitary and Water Supply Installations in Large Panel Prefabricated Housing System.

24. Characteristics of Wastewaters from Buckingham and Carnatic Mills, Madras.

25. Performance evaluation of a U.V. Water Purifier for Star Textile Engineering Works, Bombay.

26. Project proposal on "Slow Sand Filtration" for WHO IRC For Community Water Supply, The Hague.

27. Project proposal on "Development of House-hold Hand Pumps" UNICEF, New Delhi.

28. Project proposal for Testing of Sanitary Sewage Disposal Unit for OXFAM, U.K.

29. Solid Wastes in India (PL-480 Scheme).

30. Refuse Characterisation & Feasibility of Mechanical Composting with Sewage Sludge for Bangalore city.

31. Short-Term Refuse Characterisation for Delhi.

32. Feasibility studies for Nagpur Refuse Disposal.

33. Waste Treatment for Ashok Paper Mills Ltd., Darbhanga (Bihar).

34. Treatment of Wastewaters from Government Opium and Alkaloid Works Undertaking, Neemuch (M.P.)

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Indian Journal of Environmental Health, 16 (3); 1974.

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COMMERCIAL EXPLOITATION OF KNOW-HOW

The products and processes on which know-how is available with the Institute are given below :

1. Membrane Filters;
2. Defluoridation Media;
3. Iron Removal Unit;
4. Coagulant Aids;
5. Chlorine tablets;
6. NEERI Chlorosope;
7. Wind Speed Recorder; and
9. Chlorine Ampoules.

Some of them were referred to a number of entreprenuers for commercial exploitation.

The know-how on Membrane Filter (MF-B) has been so far assigned, through N.R.D.C., to three parties. One of them has reported that the production would be commenced soon.

BUDGET

		Rupees in Lakhs	
		1973-74	1974-75
		Actual Expenditure	Revised Estimate
RECURRING	...	41.254	51.368
CAPITAL	...	4.314	3.627
PILOT PLANTS	...	—	—
	TOTAL	45.568	54.995

PILOT / DEMONSTRATION PLANTS

The following plants were in operation during the year :

Mechanical Composting	...	(Nagpur)
Aerated Lagoons with Fixed and Floating Aerators	...	(Nagpur)
Oxidation Ditch	...	(Nagpur)
Effluent Farm Irrigation	...	(Nagpur)
Stabilisation Ponds	...	(Nagpur)
Trickling Filter	...	(Nagpur)
Defluoridation Plants	...	(A. P. and Rajasthan)

MEMBERSHIP OF ORGANISATIONS

Sr. No.	Name of the Committee	Ministry/Govt. Deptt./ Organization constituting the Committee.	Name of NEERI Representative Principal (P) Alternate (A)
(1)	(2)	(3)	(4)
	INDIAN STANDARDS INSTITUTION, NEW DELHI		
1.	Sanitary Appliances & Water Fittings Sectional Committee	BDC : 3 I.S.I., New Delhi	Prof. N. Majumder (P) Shri J. M. Dave (A)
2.	Domestic & Municipal Water Fittings Sub-committee	BDC : 3 : 2 —do—	Shri S. R. Kshirsagar (P) Shri V. Raman (A)
3.	Water Meters Sub-committee	BDC : 3 : 4 —do—	Shri N. M. Narasimhan (P) Shri A. W. Deshpande (A)
4.	Water Works Fitting Sub-committee	BDC : 3 : 5 —do—	Shri A. K. Seth (P) Shri V. Hanumanulu (A)

(1)	(2)	(3)		(4)
5.	Plastic Pipes Sub-committee	BDC : 3 : 8	—do—	Shri J. M. Dave (P) Shri R. Paramsivam (A)
6.	Panel for Water Supply & Plumbing	BDC : 13/P4	—do—	Shri V. Hanumanulu (P)
7.	Fluid Flow Measurements in Closed Conduits Sectional Committee	BDC : 17 : 3	—do—	Shri R. Paramasivam (P) Shri A. W. Deshpande (A)
8.	Dilution Methods Sub-Committee	BDC : 17 : 7	—do—	Shri D. Raguraman (P) Shri A. K. Seth (A)
9.	Water Supply & Sanitation Sectional Committee	BDC : 24	—do—	Prof. N. Majumder (P) Shri J. M. Dave (A)
10.	Water Supply & Plumbing Sub-committee	BDC : 24 : 1	—do—	Shri V. Raman (P)
11.	Drainage Sub-committee	BDC : 24 : 2	—do—	Shri Y. S. Murty (P) Shri R. Paramasivam (A)

(1)	(2)	(3)		(4)
12.	Sanitary Installations Sub-Committee	BDC : 24 : 3	I.S.I., New Delhi	Shri R. Paramasivam (P) Shri N. M. Narasimhan (A)
13.	Soil and Waste Pipes above Ground Sub-Committee	BDC : 24 : 4	—do—	Shri R. Paramasivam (P) Shri N. M. Narasimhan (A)
14.	Waste Stabilisation Ponds Panel	BDC : 24/P3	—do—	Dr. R. H. Siddiqi (P) Shri Y. S. Murty (A)
15.	Panel for Draft Code of Practice for Water Supply and Drainage System at High Altitudes	BDC : 24/P4	—do—	Shri J. M. Dave (P) Shri R. Paramsivam (A)
16.	Building Materials and Components Sampling Sub-committee	BDC : 31	—do—	Shri A. K. Seth (P) Shri S. K. Gadkari (A)
17.	Public Health Engineering Plants and Equipment Sectional Committee	BDC : 40	—do—	Prof. N. Majumder (P) Shri J. M. Dave (A)
18.	Sewage Treatment Equipment Panel	BDC : 40/P2	—do—	Prof. N. Majumder (Convener) Dr. R. H. Siddiqi (P)

(1)	(2)	(3)		(4)
19.	Water Treatment Equipment Panel	BDC : 64/P16	I.S.I., New Delhi	Shri S. R. Kshirsagar (P) Shri S. K. Gadkari (A)
20.	National Building Code - Panel for Plumbing Services	BDC : 64	—do—	Shri V. Raman (P) Shri S. R. Kshirsagar (A)
21.	Civil Engineering Division Council	CEDC	—do—	Prof. N. Majumder (P) Shri J. M. Dave (A)
22.	Chemical Hazards Sectional Sub-Committee	CDC : 18	—do—	Shri J. M. Dave (P) Shri P. K. Yennawar (A)
23.	Industrial Chemical Hazards Sub-committee	CDC : 18 : 4	—do—	Shri J. M. Dave (P) Shri P. K. Yennawar (A)
24.	Disinfectants Sub-committee	CDC : 23 : 1	—do—	Dr. N. U. Rao (P) Dr. N. M. Parhad (A)
25.	Water Sectional Committee	CDC : 26	—do—	Prof. N. Majumder (P) Dr. G. J. Mohanrao (A)

(1)	(2)	(3)	(4)
26.	River Water & Industrial Effluents Sub-committee	CDC : 26 : 1 I.S.I., New Delhi	Dr. G. J. Mohanrao (P) Dr. P. V. R. Subrahmanyam (A)
27.	Panel for Food & Fermentation Industry Wastes	CDC :26 : 1 : 2 —do—	Dr. G. J. Mohanrao (P) Shri M. V. Srinivasan (A)
28.	Paper & Allied Industrial Water Analysis	CDC : 26 : 1 : 3 —do—	Dr. P. V. R. Subrahmanyam (Convener) Shri J. S. Gadgil (A)
29.	Panel for Tanning Industry Wastes	CDC : 26 : 1 : 4 —do—	Dr. C. A. Sastry (P) Dr. K. L. Saxena (A)
30.	Panel for Textile and Allied Industry Wastes	CDC : 26 : 1 : 5 —do—	Shri S. Rajagopalan (Convener) Dr. C. A. Sastry (A)
31.	Panel for Chemical and Allied Industry Wastes	CDC : 26 : 1 : 6 —do—	Dr. G. J. Mohanrao (Convener) Dr. C. A. Sastry (A)
32.	Panel for Fertilizer Industry Wastes	CDC:26:1:12 —do—	Dr. G. J. Mohanrao (P) Dr. C. A. Sastry (A)

(1)	(2)	(3)		(4)
33.	Panel for Steel Mill Wastes	CDC : 26 :1 : 13	I.S.I., New Delhi	Dr. G. J. Mohanrao (P) Shri M. Parabrahmam (A)
34.	Panel for Oil Refinery	CDC : 26 : 1 : 14	—do—	Shri S. Rajagopalan (P) Shri V. Hanumanulu (A)
35.	Methods of Test for Water & Effluents :	CDC : 26 : P1	—do—	
	(a) Physical & Chemical Test Methods			Shri K. R. Bulusu (P) Dr. P. V. R. Subrahmanyam (A)
	(b) Bacteriological and Virological Methods			Dr. N. U. Rao (P) Dr. V. Chalapati Rao (A)
36.	Panel for Treatment of Water for Industry	CDC : 26 : P7	—do—	Shri K. R. Bulusu (P) Shri B. N. Pathak (A)
37.	Panel for Glossary of Terms in Use	CDC : 26/P8	—do—	Dr. G. J. Mohanrao (P)
38.	Water for Industrial purposes Sub-Committee	CDC : 26 : 2	—do—	Shri K. R. Bulusu (P) Shri B. N. Pathak (A)

(1)	(2)	(3)		(4)
39.	Water and Effluent Sub-committee	CDC : 26 : 3	I.S.I., New Delhi	Dr. G. J. Mohanrao (P) Prof. N. Majumder (A)
40.	Panel for Marine Disposal of Effluents	CDC : 26 : 3 : 1	—do—	Dr. G. J. Mohanrao (P) Shri V. Raman (A)
41.	Sewage Panel	—	—do—	Dr. R. H. Siddiqi (P) Dr. G. B. Shende (A)
42.	Air Pollution Sectional Committee	CDC : 53	—do—	Shri J. M. Dave (P) Shri P. K. Yennawar (A)
43.	Terminology Sub-committee	CDC : 53 : 1	—do—	Shri P. K. Yeannwar (P) Dr. V. I. Pandit (A)
44.	Methods of Sampling & Analysis Sub-committee	CDC : 53 : 2	—do—	Shri P. K. Yennawar (P)
45.	Sub-Committee for Quality Standards for Community Air	CDC : 53 : 3	—do—	Shri J. M. Dave (P) Shri P. K. Yennawar (A)

(1)	(2)	(3)		(4)
46.	Sub-Committee for Code of Practice for Control of Air Pollutants	CDC : 53 : 4	I.S.I., New Delhi	Shri P. K. Yennawar (P) Dr. V. I. Pandit (A)
47.	Panel for Emission Standards for Chemicals, Fertilizers & Petroleum Industry	CDC : 53 : P2	—do—	Shri J. M. Dave (P) Shri P. K. Yennawar (A)
48.	Panel for Emission Standards for Cement & Ceramic Industries	CDC : 53 : P5	—do—	Shri P. K. Yennawar (P)
49.	Panel for Emission Standards for domestic sources	CDC : 53 : P6	—do—	Shri P. K. Yennawar (P) Shri V. L. Pampattiwar (A)
50.	Solid Wastes Sectional Committee	CDC : 54/A1	—do—	Prof. N. Majumdar (Chairman)
51.	Sub-Committee on the Health and Hygiene aspects of Welding.	SMDC 14 : 5	—do—	Shri V. Raman (P)

(1)	(2)	(3)	(4)
	OTHER COMMITTEES		
1.	National Committee on Environmental Planning and Coordination	Department of Science and Technology, Govt. of India.	Prof. N. Majumder
2.	Indian National Committee for International Hydrological Decade.	C.S.I.R., New Delhi	Prof. N. Majumder
3.	Scientific Advisory Board of the Indian Council of Medical Research	I.C.M.R., New Delhi	Prof. N. Majumder
4.	Indian National Committee on International Water Resources Association	Central Board of Irrigation and Power, Govt. of India.	Prof. N. Majumder
5.	International Association on Water Pollution Research	—	Prof. N. Majumder (Representative from India)
6.	Committee to study the problem of disposal of Urban Wastes and their utilisation for agricultural purposes.	Ministry of Health, Government of India	Prof. N. Majumder (P) Shri J. M. Dave (A) Dr. G. J. Mohanrao (A)

(1)	(2)	(3)	(4)
7.	Expert Committee set-up by the Ministry of Health, Govt. of India to prepare Manual on :	Ministry of Health, Government of India	
	(a) Water Supply and Water Treatment		Shri V. Raman (P) Shri S. R. Kshirsagar (A)
	(b) Sewerage and Sewage Treatment		Dr. R. H. Siddiqi (P) Shri R. Paramasivam (A)
8.	Water Pollution Prevention Board of the Government of Maharashtra.	Government of Maharashtra	Prof. N. Majumder (P) Shri V. Raman (A)
9.	Technical Association of Pulp & Paper Industry	Atlanta Ga (USA)	Dr. G. K. Seth (Affiliate)
10.	American Society of Microbiology	U.S.A.	Dr. V. Chalapati Rao
11.	Rural Sanitation Advisory Committee	Kasturba Health Society, Sewagram	Dr. A. K. Anwikar (P)

(1)	(2)	(3)	(4)
12.	Problems of Sanitary & Water Supply Arrangements at High Altitudes and Low Temperature Regions	Ministry of Defence, Government of India.	Shri D. Raguraman (P)
13.	Pesticides Environmental Pollution Advisory Committee	Ministry of Agriculture, Directorate of Plant Protection, Quarantine & Storage.	Prof. N. Majumder (P) Dr. G. B. Shende (A)
14.	Expert Group on Legislaton on Dairy Effluent Disposal.	International Dairy Federation, Belgium	Dr. G. J. Mohanrao (Representative on behalf of the Ministry of Agriculture, Govt. of India).

DEPUTATIONS, HONOURS & AWARDS

1. Dr. V. I. Pandit, SSA has been awarded Ph.D. Degree in Biochemistry of the Nagpur University.

2. Dr. N. U. Rao, Scientist, was appointed as a WHO Consultant to conduct a Training Course for 'Water Distribution and Plant Operators' for the U.S. Trust Territory of Pacific Islands, Saipan from March 12, 1974 to June 11, 1974.

3. Dr. G. J. Mohanrao, Scientist, attended the National Convention on Man and Water at Melbourne, Australia during April 1974.

4. Shri V. L. Pampattiwar, Scientist, was awarded a WHO Fellowship for a period of 6 months to study Air Pollution Control Techniques in U.S.A. and European countries.

5. Shri S. N. Dixit, S.S.A. attended one year course on "Air Environment Studies" at the University of Melbourne, Australia, under the Colombo plan.

6. Shri J. H. Govind, Watch & Ward Assistant was awarded "Sainya Seva Medal for Ex-Servicemen" for his services in Jammu & Kashmir operational areas during his active service career in the army.

7. Dr. N. U. Rao, Scientist, assisted WHO as Temporary Adviser for a meeting on "Health Related Monitoring Programme," at Geneva during July 15-19, 1974.

8. Dr. G. J. Mohanrao, Scientist, was appointed as a WHO Consultant for Training Course on "Sewage Treatment Plant Operators" in Egypt, UAR for a period of one month from July 25 to August 25 1974.

9. Shri J. M. Dave, Scientist, attended the UNIDO Expert Group Meeting on Minimising Polluton from Fertilizer Plants at Helsinki, Finland, during August 26-31, 1974. He also attended an International Fair held during Sept. 1-10, 1974 at Gothenberg, Sweden at the invitation of the Swedish Water & Air Pollution Research Laboratory.

10. Dr. P. V. R. Subrahmanyam, Scientist, was awarded a three month WHO Fellowship to West Germany to get acquainted with the latest techniques used in Waste

Water Treatment pertaning to physical, chemical and biological methods. He also participated in the 7th International Conference on Water Pollution Research during September 9-13, 1974 in Paris.

11. Prof. N. Majumder, Director, attended the Governing Body Meeting of the International Association of Water Pollution Research and VII International Conference on Water Pollution Research held in Paris between September 4-13, 1974. Prof. Majumder also visited the WHO International Reference Centres on Community Water Supply in the Hague and Waste Disposal in Dubendorf, Switzerland, besides other leading research institutes in these countries.

12. Shri A. K. Seth, Scientist, was deputed to take up an assignment in Iraq as Sanitary Engineer in the Ministry of Industry for a period of one year.

13. Dr. Tapan Chakrabarti, Senior Research Fellow has been awarded Ph.D. Degree by th University of Nagpur.

14. Shri J. M. Dave, Scientist, visited Hong Kong and other Far Eastern countries as a Member of the Indian Delegation of the Urban Wastes Committee, Government of India, for a period of one month.

15. Dr. G. J. Mohanrao, Scientist, served as a short-term consultant to WHO Eastern Mediterranian Region for 3 weeks to assist the WHO to review the Master Plan Proposals for the Baharian Sewage Project.

16. Prof. N. Majumder, Director, visited Iraq as a Consultant in the WHO assisted Rural Water Supply Programme for a period of two months w.e.f. Nov. 16, 1974.

17. Dr. N. U. Rao, Scientist, visited Papua, New Guinea on a six month WHO assignment as a Consultant (Microbiologist) to advise on the Health Laboratory Services Project from Nov. 14, 1974.

18. Shri P. K. Yennawar, Scientist, attended a group meeting on the Health Effects of Specific Pollutants from Industrial Emissions, organised under the auspices of WHO during November 4-9, 1974 at Geneva.

19. Dr. R. H. Siddiqi, Scientist, attended a meeting on the Preparation of a Guide Book on Water Quality Surveys, organised under the auspices of UNESCO at Geneva during November 10-30, 1974.

20. Dr. V. I. Pandit, S.S.A., was deputed to West Germany under the Fellowship offered by the German Academic Exchange Service for training in the field of air pollution control for 16 months.

STAFF

DIRECTOR

Prof. N. Majumder

HEADQUARTERS

AIR POLLUTION AND INDUSTRIAL HYGIENE

Shri J. M. Dave, Scientist (Incharge)
Shri P. K. Yennawar, Scientist
Shri V. L. Pampattiwar, Scientist
Shri S. K. Maira, Scientist
Shri H. C. Sharma, SSA
Shri S. N. Dixit, SSA
Dr. V. I. Pandit, SSA (On deputation)
Mrs. R. A. Thakre, JSA

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Shri S. K. Gadkari, Scientist
Ku. N. S. Joshi, SSA
Shri S. K. Pathe, JSA
Shri S. G. Dave, Junior Engineer

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Shri P.V.R.C. Panicker, Scientist
Shri A. H. Khante, JSA

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Shri K. G. Nimbalkar, Junior Engineer

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Shri R. C. Dixit, SSA

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Shri L. M. Motghare, JSA
Shri P. P. Pathe, JSA

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Shri S. K. Nimkhedkar, JMA

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Shri V. Kothandaraman, SSA
Shri K. Subbarao, SSA
Shri K. M. Aboo, SSA

ADMINISTRATIVE & HOUSE KEEPING STAFF

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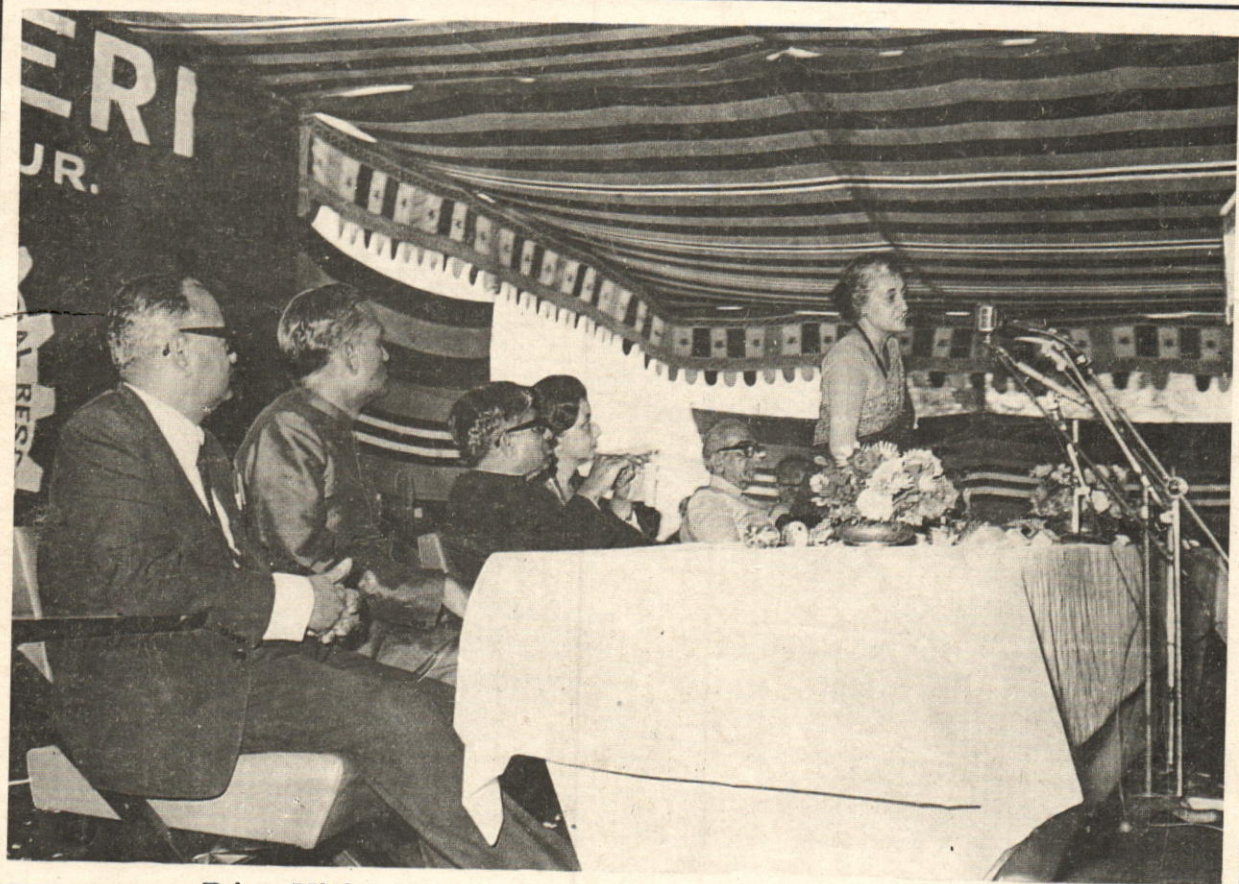
Shri V. K. Bhatnagar, Accounts Officer
Shri Kuldip Rai, Section Officer
Shri S. K. Roy, Section Officer
Shri R. Narayanan, Stores Officer
Shri Thomas Joseph, Purchase Officer
Shri A. V. Subbarao, Senior Accountant
Shri Kishori Lal, Assistant
Shri Amar Singh, Assistant
Shri R. C. Maheshwari, Assistant
Shri P. A. Chandekar, Assistant
Shri Santosh Kumar, Junior Accountant
Shri A. D. Bhardwaj, Junior Accountant
Shri B. Y. Badge, Senior Stenographer
Shri Hamid Khan, Senior Stenographer
Shri B. Damodaran, Senior Stenographer
Shri H. V. Garde, Laboratory Supervisor
Shri U. G. Deshmukh, Stores Supervisor
Shri G. L. Banerjee, STA
Shri R. C. Bajpayee, STA
Shri M. P. Vyas, JTA
Shri J. D. Sharma, Horticulture Overseer
Mrs. I. D'Souza, Receptionist

DISTINGUISHED VISITORS

1.	Smt. Indira Gandhi	Prime Minister of India and President of CSIR, New Delhi.
2.	H. E. Ali Yavar Jung	Governor of Maharashtra, Bombay.
3.	Hon'ble V. P. Naik	Chief Minister of Maharashtra, Bombay.
4.	Dr. M. S. Swaminathan	Director-General, ICAR, Govt. of India, New Delhi.
5.	Prof. T. R. Seshadri	Emeritus Professor, Delhi University, Delhi.
6.	Mr. Abdul Matin Chaudhary	Vice-Chancellor, Dacca University, Bangla Desh, Dacca.
7.	Mr. Daniel A. Okun	University of North Carolina, U.S.A.
8.	Mr. Simon Maxwell	Assistant Resident of UNDP, New Delhi.
9.	Dr. D. Rondia	Associate Professor, Industrial Toxicology, Faculty of Medicine, State University of Liege, Belgium.
10.	Prof. Dr. Ing. H. M. Ruffer	Technical University, Hannover, Germany.
11.	Dr. Robert A. Frosch	Assistant Executive Director, UNEP, Nairobi.
12.	Prof. M. G. K. Menon	Director, TIFR, Chairman, Electronic Commission, New Delhi.

13.	Dr. J. M. van Zuilichem Dr. M. C. Geerling Dr. Inq. Rudi E. Kratel	Officials of UNIDO, Vienna, Austria.
14.	Prof. Dinesh Mohan	Director, CBRI, Roorkee.
15.	Mr. L. A. Orhuela	Chief, Community Water Supply & Sanitation, WHO, Geneva.
16.	Mr. Samuel Kantor	World Bank Consultant.
17.	Mr. M. A. Acheson	Regional Adviser on Environmental Health, WHO-SEARO, New Delhi.
18.	Dr. A. L. Downing	UN Consultants
19.	Dr. C. P. Straub	
20.	Dr. F. Josa	WHO Consultant
21.	Mr. John Finch	WHO Consultant
22.	Dr. P. K. Jena	Director, RRL, Bhubaneshwar.
23.	Prof. (Mrs.) Kira A. Bustueva	Central Institute for Advanced Medical Training, Grafskij, Moscow, USSR.
24.	Prof. E. H. Spaulding	WHO Consultant, Temple University, Philadelphia, USA.
25.	Dr. Robert Taylor	Regional Educational Adviser, British High Commission, Bombay.
26.	Dr. B. D. Tilak	Director, NCL, Poona.
27.	Prof. M. A. Shapiro	Director, Westernport Bag, Environmental Study, East Melbourne, Australia.



Prime Minister addressing the Staff Members of the Institute