वार्षिक प्रतिवेदन : ANNUAL REPORT

1980-81

NEERI

राष्ट्रीय पर्यावरण अभियांत्रिकी अनुसंधान संस्थान, नागपुर (भारत)

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE, NAGPUR (INDIA)

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नेहरु मार्ग, नागपुर - 440 020

NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
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Published by : S. B. Dabadghao, Scientist & Head, TILE Division, NEERI, Nagpur-440 020

Technical Editing and Production : V. P. Thergaonkar, C. M. Freitas, K. M. Nandgaonkar, P. P. Godbole & H. K. Shrivastava.

Hindi Translation : R. S. Sharma.

Secretarial Assistance : C. W. Francis, C. N. Nawariya.

Printed at : Mahima Printing Press, Post Office Road, Gokulpeth, Nagpur-440 010.

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DIRECTOR'S REPORT

DIRECTOR'S REPORT

The Government of India has initiated action for implementing the programme to provide safe drinking water for all its citizens by the year 1990 and effective sanitation by 2000 A. D. involving an outlay of several thousand crores of rupees. R & D support is an essential component of the national programme and NEERI should contribute effectively.

Evaluation of selected Rural Water Supply Schemes has been undertaken as desired by the Central Public Health Environmental Engineering Organisation, Ministry of Works & Housing, Government of India, New Delhi. This will provide valuable insight on the technology adopted, effectiveness on utilisation, community participation, cost benefit analysis for future planning and management. An interim report for the first year has been submitted to the Government of India.

The second phase of the Slow Sand Filtration Project sponsored by the WHO International Reference Centre for Community Water Supply, The Netherlands has been completed. An Inter-country meeting was held during September 1980 in which 35 participants from seven countries reviewed the progress made in their respective countries. The meeting emphasized the need to transfer the know-how to the executing departments of the respective countries. NEERI has taken due steps in this regard.

Under the Indo-US bilateral programme, three research projects viz : (i) Investigation, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries ; (ii) Study on drinking water sources and supplies for virus and bacteria; and (iii) Impact of fugitive and stack emissions from selected industries on neighbourhood air quality; have been taken up. Interim reports at the end of the first year have also been submitted. Arising out of the data collected in these projects, environmentally compatible industrial complexes could be planned for selected industries.

The concern for environment is becoming more pronounced in recent years in India. Developmental activities do have an impact on the environment depending upon the nature of the project, location and other factors. Environmental impact analysis and assessment of selected developmental projects are being under taken by various public sector undertakings in which NEERI has been actively participating. Such reports are now being widely used by different organisations. At the Indo-US workshop on Environmental Impact Analysis and Assessment

(EIA&A), the methodologies abopted by the US and India were discussed for mutual benefit by experts from both sides. A report identifying 20 R & D projects of relevance to both India and United States and guidelines for EIA & A for Indian conditions has been published.

Microbial degradation of industrial wastes should prove beneficial for a tropical country like India and save on energy. Energy consumption is considerably less during microbial degradation than that through chemical or physical methods. The potential role of microbial processes for environmental pollution control was highlighted during a workshop held during February 1981 at NEERI on Microbial Degradation of Industrial Wastes. State of art papers on selected industrial wastes and their treatment were presented. During the workshop, attended by 50 eminent scientisits, several project proposals were reviewed and focal points alongwith collaborating institutions were indentified.

Five R & D projects, nineteen consultancy and sponsored projects were completed.

A report on "Air Quality in Selected Cities in India" was published. This is the first attempt in India to compile urban air quality data at the national level.

The other important completed projects include treatment of paper mill wastes, treatment and disposal of fertilizer factory wastes at Cochin and treatment of wastewaters from Hindustan Organic Chemicals Ltd., Rasayani.

The Research Advisory Committee (RAC) indicated that the Annual Report could be in two parts with the infrastructure and general information in the first part and technical information in the second part which will be useful for those involved in environmental research. Accordingly the report for the year 1980–81 is being presented in two parts.

(B. B. SUNDARESAN)
DIRECTOR

Nagpur
June 24, 1981

वार्षिक प्रतिवेदन : 1980 - 81

निदेशक की ओर से

सन् 1990 ई. तक सभी नागरिकों के लिए पीने के साफ पानी और 2000 ई. तक सफाई की कारगर व्यवस्था सम्बन्धी कार्यक्रम लागू करने के लिए भारत सरकार द्वारा कार्रवाई शुरू कर दी गयी है। अरबों रुपयों की लागत के इस राष्ट्रीय कार्यक्रम के लिए अनुसंन्धान और विकास कार्य आवश्यक हैं, जिनमें राष्ट्रीय पर्यावरण अभियांत्रिकी अनुसन्धान संस्थान को कारगर ढंग से सहयोग देना चाहिए। केन्द्रीय जन–स्वास्थ्य एवं पर्यावरण इंजीनियरी संगठन, निर्माण और आवास मंत्रालय, भारत सरकार, नई दिल्ली के अनुरोध पर कुछ चुनिन्दा ग्रामीण जल पूर्ति योजनाओं के मूल्यांकन का काम शुरू किया गया, जिससे इन योजनाओं के लिए उपयोग की गयी प्रौद्योगिकी, उनकी उपयोगिता, जन-सहयोग और भावी नियोजन तथा प्रबन्ध के लिए लागत लाभ विश्लेषण सम्बन्धी महत्वपूर्ण जानकारी प्राप्त होगी। पहले साल की अंतरिम रिपोर्ट भारत सरकार को भेज दी गयी है।

विश्व स्वास्थ्य संगठन के नीदरलैंड स्थित अन्तर्राष्ट्रीय सामुदायिक जल पूर्ति संदर्भ केन्द्र द्वारा प्रायोजित मंद बालू निस्यंदन (फिल्ट्रेशन) परियोजना का दूसरा चरण पूरा हो गया है।

सितम्बर, 1980 में एक अंतर्राष्ट्रीय बैठक में 7 देशों के 35 प्रतिनिधियों ने अपने अपने देशों में हुई प्रगति की समीक्षा की। बैठक में मंद बालू निस्यंदन विषयक तकनीकी ज्ञान को सम्बद्ध देशों के कार्यकारी विभागों को सौंपने की आवश्यकता पर बल दिया गया। संस्थान द्वारा इस सम्बन्ध में यथोचित उपाय किये गये हैं।

भारत-अमरीकी द्विपक्षीय कार्यक्रम के अन्तर्गत निम्नलिखित तीन अनुसन्धान परियोजनाएं आरंभ की गयीं :-

(1) फॉस्फेटी उर्वरक और मूलभूत कार्बनिक रसायन उद्योगों के विषैले अपशिष्टों की जांच, आकलन और उपचार।

(2) पीने के पानी के स्रोत और स्थलों में विषाणु और जीवाणु सम्बन्धी अध्ययन ।

(3) कुछ चुनिन्दा उद्योगों की चिमनियों के तथा अन्य उत्सर्जनों का आस-पास की वायु गुणता पर प्रभाव ।

वर्षांत में उपरोक्त परियोजनाओं की अंतरिम रिपोर्टें भी भेज दी गयी हैं । इन परियोजनाओं से प्राप्त आंकड़ों के आधार पर कुछ ऐसे विशेष औद्योगिक संकुलों की स्थापना की योजना बनायी जा सकेगी, जो पर्यावरण के अनुरूप होंगे ।

भारत में पिछले कुछ वर्षों से पर्यावरण के प्रति अभिरुचि बढ़ी है । परियोजना के स्वरूप, स्थान और अन्य कारकों के अनुसार विकास कार्य पर्यावरण को अवश्य प्रभावित करते हैं । संस्थान के सक्रिय सहयोग से विभिन्न सार्वजनिक क्षेत्रों के उपक्रमों द्वारा कुछ विशिष्ट विकास परियोजनाओं के पर्यावरण पर प्रभाव का विश्लेषण और आकलन किया जा रहा है। इन रिपोर्टों का विभिन्न संगठनों द्वारा आजकल व्यापक रूप से उपयोग किया जा रहा है । विकास योजनाओं का पर्यावरण पर प्रभाव और मूल्यांकन विषयक भारत-अमरीकी कार्य-शिविर में पारस्परिक लाभ के लिए दोनों देशों के विशेषज्ञों द्वारा भारत और अमरीका द्वारा अपनाई गई प्रणालियों पर विचार विमर्श किया गया और एक रिपोर्ट प्रकाशित की गई, जिसमें भारत और अमरीका दोनों देशों के लिए सुसंगत 20 विकास और अनुसंधान परियोजनाएं और भारतीय परिस्थितियों में उपरोक्त विषय के अध्ययन के लिए मार्गनिर्देश दिये गये हैं ।

सूक्ष्मजीवों द्वारा औद्योगिक अपशिष्टों की अपघटन प्रक्रिया भारत जैसे उष्ण-कटिबन्धीय देशों के लिए लाभकारी सिद्ध होगी । इससे ऊर्जा की बचत हो सकेगी । भौतिक या रासायनिक विधियों की अपेक्षा सूक्ष्मजीवी अपघटन प्रक्रिया में ऊर्जा की खपत कम होती है । संस्थान में फरवरी 1981 में आयोजित औद्योगिक अपशिष्टों के सूक्ष्मजीवी अपघटन विषयक कार्यशिविर में पर्यावरण प्रदूषण नियंत्रण में सूक्ष्मजीवी प्रक्रिया की सशक्त भूमिका के महत्व पर प्रकाश डाला गया । जैविक अपघटन की दृष्टि से दु:साध्य कुछ विशेष औद्योगिक अपशिष्टों और उनके उपचार की वर्तमान स्थिति पर अनेक निबन्ध प्रस्तुत किये गये । इस कार्यशिविर में 50 प्रख्यात वैज्ञानिकों ने भाग लिया, अनेक परियोजना प्रस्तावों की समीक्षा की गयी, और ऐसे संस्थानों को चुना गया जो इन परियोजनाओं के लिए केन्द्रीय और सहयोगी संस्थाओं के रूप में कार्य करेंगे ।

5 अनुसन्धान और विकास तथा 19 परामर्श एवं प्रायोजित परियोजनाएं पूरी की गयीं । 'एयर क्वालिटी इन सलेक्टेड सिटीज् इन इंडिया' नामक रिपोर्ट प्रकाशित की गयी । भारत में राष्ट्रीय स्तर पर शहरी वायुगुणता सम्बन्धी आंकड़े इकट्ठा करने का यह पहला प्रयास है ।

कागज मिल अपशिष्टों का उपचार, कोचीन की एक उर्वरक फैक्ट्री के अपशिष्टों का उपचार और निपटान तथा हिन्दुस्तान आर्गेनिक केमिकल्स लि. रसायनी के अपजल का उपचार आदि कुछ अन्य महत्वपूर्ण योजनाएं पूरी की गयीं।

अनुसन्धान परामर्श समिति (आर. ए. सी.)की सिफारिश पर वार्षिक प्रतिवेदन दो भागों में प्रस्तुत किया जा रहा है । पहले भाग में आधारभूत सुविधाएं और सामान्य जानकारी और दूसरे भाग में तकनीकी जानकारी दी गई है। पर्यावरण विषयक अनुसन्धान से सम्बद्ध व्यक्तियों के लिए यह अधिक उपयोगी होगी ।

बी. सुन्दरेसन

बी. बी. सुन्दरेसन
निदेशक

नागपुर
24 जून, 1981

ACTIVITY GROUPS

Air Quality

- Air quality monitoring
- Analytical techniques
- Control equipment
- Emission inventory
- Process design

Water

- Water Chemistry
- Analytical techniques
- Process design
- Water engineering and demonstration plants
- Industrial water treatment
- Rural water supply

Solid Wastes

- Transportation of refuse
- Characterisation and analysis
- Process design and engineering equipment

Wastewater

- Characterisation and analysis treatability
- Process design
- Engineering and demonstration plants
- Effluent utilisation and recycle
- Advanced waste treatment

Ecology & Ecosystems

- Aquatic biology
- Bacteriology
- Virology
- Analytical techniques

Health Sciences

- Epidemiology
- Toxicology
- Health education
- Vital statistics

Technology Demonstration

- Demonstration Plants
- Rural sanitation
- Sewage utilisation

Instrumentation

- Advanced instrumental analysis
- Instrument development, service & maintenance

Environmental Engineering Systems

- Environmental Engineering Consultancy
- Water quality modelling
- Air quality modelling
- Network analysis
- Environmental impact analysis
- Data processing
- Drawing and Design

Training, Information, Library & Extension

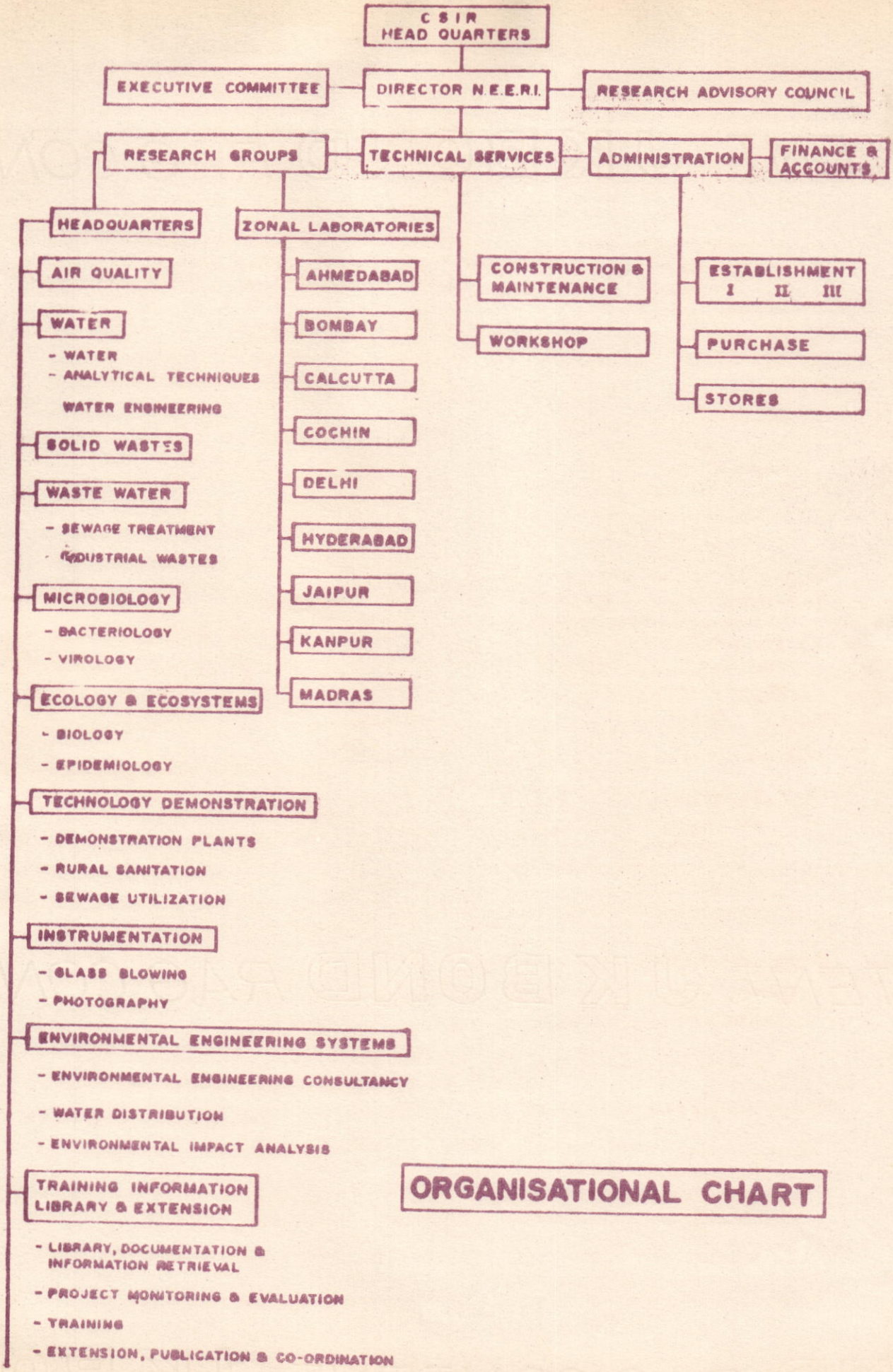
- Project monitoring and planning
- Training,
- Information, documentation & retrieval
- International collaboration
- Technology transfer

Technical Services

- Workshop
- Glass blowing
- Photography
- Construction and maintenance

Zonal Laboratories

- Water
- Wastewater
- Solid wastes
- Air quality
- Technology transfer



ORGANISATIONAL CHART

REPORT OF ACTIVITY GROUPS AT HEADQUARTERS

AIR QUALITY

B. B. Sundaresan

P. K. Yennawar
V. L. Pampattiwar
R. Swaminathan
V. S. S. Bhaskara Murty
N. S. Manthapurwar
G. H. Pandya
M. K. Reddy
K. S. M. Rao
K. M. Phadke
J. V. Kothari
S. D. Joshi
D. M. Dharmadhikari

The R & D activities of this group are directed towards evolving methods of measurement of air pollutants, introduction of reliable and effective procedures for calibration in air quality monitoring. These activities in turn will help evolve effective design criteria for air pollution control and arrive at permissible levels of air pollutants under Indian conditions. Meteorological parameters, especially in the domain of micrometeorology have an important bearing on the dispersion pattern of pollutants. Development of relevant methodology for recording these parameters and incorporating in air quality data analysis and interpretations, forms a part of the activity of this group.

First Report on " Air quality in selected cities in India" was published. It consists of systematic presentation of the national air quality network programme.

An interim report on Impact of Fugitive and Stack Emission from a Thermal Power Plant Industry was submitted to US EPA, the sponsor of the project.

Sl. No.	Project No.	Title
1.	0115	National Air Quality Monitoring Network.
2.	0117	Air quality and emission inventory survey for urban areas and industries.
		(i) Assessment of toxic gases in the drainage galleries of Nagarjuna Sagar Dam. Sponsored by SE, Dam Division, A. P.
		(ii) Advice on the location of Korba Township (M. P.) with particular reference to the impact of air pollution from newly coming up industries. Sponsored by Additional Director, Department of Town and Country Planning, Bhopal, M. P.

Sl. No	Project No.	Title
		(iii) Report on determination of NO_x content in the Mine Air Samples from Pipla of Silivara. Sponsored by the General Manager, Western Coalfields Ltd., Nagpur, M. S.

WATER

WATER

K. R. Bulusu
B. N. Pathak
A. S. Bal
M. V. Nanoti
D. N. Kulkarni
(Mrs) M. V. Vaidya
W. G. Nawlakhe
P. M. Patni
(Mrs) V. A. Joshi

ANALYTICAL QUALITY

S. P. Pande
M. Z. Hasan
R. Sarin
(Miss) N. Thakkar

WATER ENGINEERING

R. Paramasivam
V. A. Mhaisalkar
C. V. Chalapati Rao
(Miss) N. S. Joshi
(Mrs) S. S. Dhage

This group undertakes programmes to evolve simple and low cost methods to ensure safe potable water. Significant attainments of this group are the completion of first phase of the project to develop suitable membranes, standardisation of analytical methods for deleterious substances, like arsenic, boron and selenium.

Design criteria and operational methodology have been evolved for adoption of slow sand filters in rural water supply systems. This has led to the second phase of the WHO IRC project involving village demonstration programmes of slow sand filters in four different states in India. Studies on filtration include declining rate and two-layer filters and low cost package water treatment plants for field application.

NEERI's contribution to water supply and santitation decade has commenced in the form of CPHEEO sponsored project on evaluation of rural water supply schemes. Interim report

has been submitted. Performance evaluation of the slow sand filters and health education in project-villages was continued.

The first plant based on Nalgonda technique viz., addition of alum to waters containing fluoride was commissioned in 1980. The trial runs have shown a satisfactory performance in bringing down fluoride levels from above 4.0 mg/l to less than 1.0 mg/l.

Sl. No	Project No.	Title
1.	1431	Aluminium chloride as coagulant in water clarification.
2.	1435	Study of synthetic membranes of environmental engineering utility other than reverse osmosis.
3.	1436	Solid liquid separation using floatation technique.
4.	0501	Slow sand filtration.
5.	0506	Performance evaluation of water treatment plants in India.
6.	0507	Study of high rate settlers.
7.	0509	Development of simple methods of water treatment.
8.	0510	Evaluation of rural water supply schemes in India. Sponsored by CPHEEO, Government of India.

SOLID WASTES

A. D. Bhide — B. Z. Alone
S. K. Titus — M. S. Olaniya
A. V. Shekdar — A. D. Patil
S. A. Gaikwad — R. V. Bhoyar

Solid waste management has not received due priority though the local bodies have been spending about 30-50 per cent of their budgets in this area. Expected results concomitant with the expenditure were rarely seen for want of scientific approach towards this vital aspect of environmental protection. Growing concern about organic manure shortage resulted in evoloving appropriate design for mechanical composting plants for 15 cities in the country. Feasibility/project reports have been provided for installation and semi-mechanical compost plants.

Investigation of six mechanical compost plants has shown that some units are redundant. Suggestions were given to modify the reception hopper and plant layout, which would reduce the cost of mechanical composting and improve plant performance.

Sl. No.	Project No.	Title
1.	1105	Pyrolysis of solid wastes
2.	1117	Improvements in collection and transportation of solid waste in Calcutta, sponsored by Calcutta Metropolitan Development Authority, Calcutta.
3.	1118	Evaluation of mechanical composting plants in Indian conditions.
4.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries (sponsored, Indo-US Project).
5.	2.4.07	Preparation of activated charcoal from city refuse (in collaboration with Training Cell.)

WASTEWATER

SEWAGE TREATMENT

V. Raman
S. N. Kaul
S. Venkatesan
C. K. Kale
A. N. Khan
(Mrs.) S. A. Patkie
A. V. Bhoi
N. C. Jaitwar

INDUSTRIAL WASTES

P. V. R. Subrahmanyam
M. V. Srinivasan
K. L. Saxena
J. S. Gadgil
S. B. Deshmukh
T. Chakrabarti
(Mrs.) S. Satyanarayana
A. Ghosh
T. Swaminathan
G. Muthukumar
N. Ramadoss
S. N. Khadakkar
A. M. Deshkar
P. P. Pathe
S. D. Deshpande
(Mrs.) K. Swaminathan
C. V. Deshpande

Wastewater group works on sewage and industrial waste treatment, utilisation and disposal, characterisation and quantification of effluents from industrial process streams are carried

Comparative study on irrigation of sugarcane by paper mill effluent (on left) and plain water (right) at demonstration plot near Orient Paper Mills, Amlai (Madhya Pradesh).

A lovely crop of Kenaf which was irrigated by Paper mill effluent from Orient Paper Mills, Amlai (Madhya Pradesh).

for optimal design of waste treatment plants. Wastewater recycling and reuse through aquaculture and agriculture emphasised. Bacteriological, biological and viral quality of effluents are also considered to provide for safeguards against health hazards.

Field experiments on using raw sewage duly diluted with water and fortified with inorganic nutrients showed that crop yield increased by about 12–60% in comparison with conventional irrigation practices. In the initial stages with sewage as irrigation water, crop yield for wheat, moong and paddy appeared to be less for the first crop but subsequently exceeded that from normal practices. In sewage irrigated soils, there is accumulation of all the ions present in sewage with decrease in pH of soil. Suitable cultural practice allowing for rest and leaching is desirable. These observations were considered in a project sponsored by Bombay Municipal Corporation on sewage disposal by irrigation.

A process for the removal of sulphite from high sulphite bearing organic wastewaters from a basic organic chemical industry has been developed. Removal of sulphite is a pre-requisite before the wastewater is subjected for biological treatment.

Based on the knowhow supplied earlier by NEERI, M/s National Newsprint & Paper Mills, Nepanagar, have established a full-scale plant for treating the entire wastewater from their factory during 1980-81.

Treatment of sewage involves development of appropriate systems which should consider the economics, technological relevance and utilisation of the treated effluents, preferably in the same ecosystem.

Sl. No.	Project No.	Title
1.	0717	Treatment of wastewater from major dyes manufacturing processes.
2.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries (Indo US Project No. PR-1-501).
3.	0721	Studies on conditioning and dewatering of sludges from industrial wastewater.
4.	–	Treatment of wastewater from Gwalior Rayons and Silk manufacturing factory.
5.	1019	Effluent utilisation for cultivation of *Citrus reticulata* (orange).
6.	1027	Remodelling of sewage treatment system at Hyderabad.
7.	1031	Model studies on surface aerator.

ECOLOGY & ECOSYSTEMS

ECOLOGY & ECOSYSTEMS

K. P. Krishnamoorthi

BIOLOGY	EPIDEMIOLOGY
M. Vittal Rao	P. V. R. C. Panicker
(Mrs) Indira Jayangoudar	(Mrs) A. S. Gadkari
(Mrs) R. Sarkar	P. R. Sarode
J. P. Kotangale	
P. R. Chaudhari	
(Miss) L. R. Kotangale	

MICROBIOLOGY

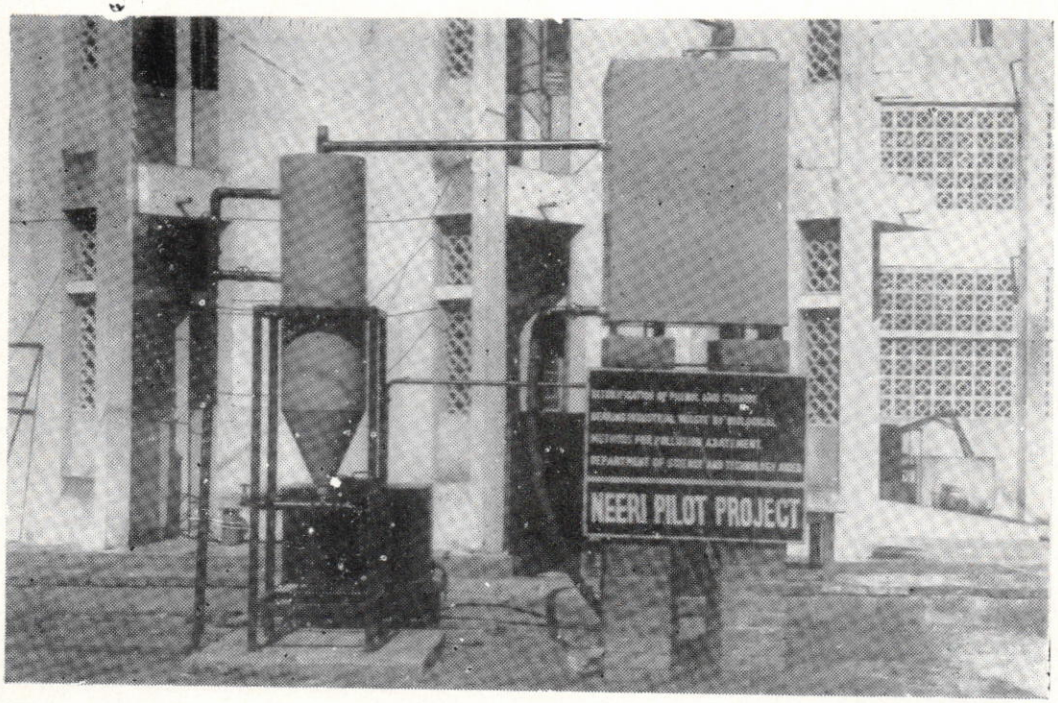
N. M. Parhad

BACTERIOLOGY	VIROLOGY
M. D. Patil	P. M. Phirke
P. Kumaran	S. B. Lakhe
S. R. Joshi	S. V. Waghmare
N. Shivaraman	T. V. Subba Rao
R. A. Pande	
(Miss) S. Y. Dekate	

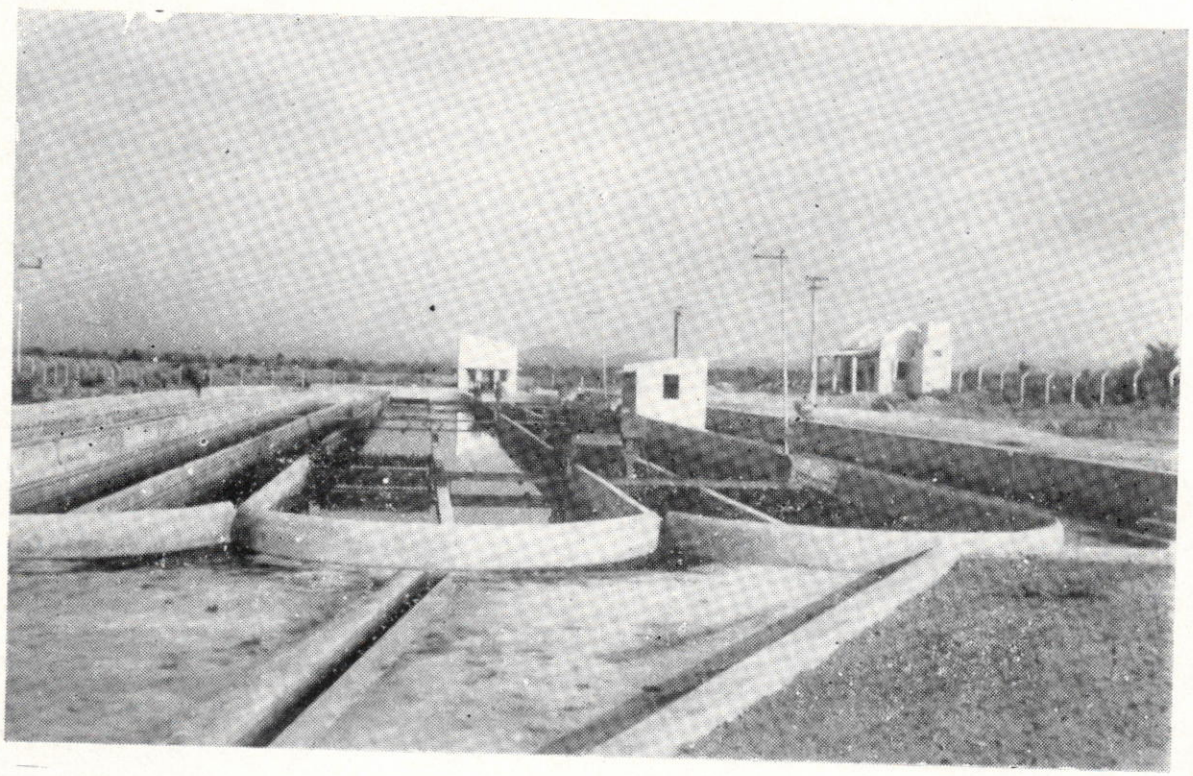
Activity of this group involves research on ecosystems with reference to living organisms and the degradation of dead organic matter of complex nature. Development of simple and appropriate methodology for bacterial and viral analysis and bioassay techniques are undertaken. Special projects include algal systems, wastewater aquaculture with mono and poly culture techniques. Development of specific microbial cultures to degrade toxic and recalcitrant substances from industrial wastes is an important activity.

In order to assess the effect of various sanitation measures on the improvement of the health status of the people, epidemiological studies have been taken up in ten villages in Nagpur District. Stool samples from the population of these villages showed a parasitic prevalence ranging from 47.5 to 77.9 per cent. It is also observed that majority of the village community were anaemic and suffered from high levels of eosinophilia. Introduction of hand flushed water seal type latrines, disinfection of well water, protected water supply through public stand posts and soakage pits for sullage disposal are some of the measures introduced through health education and co-operation of local bodies.

Cercariae causing schistosome dermatitis have been isolated for the first time from two areas in Nagpur District.



Pilot plant studies on detoxification of phenol and cyanide bearing industrial wastes.



Biological treatment plant for Low Temperature Carbonization (L. T. C.) Waste at Naspur (A. P.)

A bench-scale unit using soil culture for microbial degradation of phenol was fabricated and studies initiated. It is expected to provide design criteria and techniques for scaling up to prototype units in industries.

Sl. No.	Project No	Title
1.	0307	Bacteriological performance of slow sand filtration sponsored by WHO IRC.
2.	0311	Detoxification of phenol and cyanide bearing industrial wastes by biological methods for pollution abatement. (Aided by DOE, New Delhi).
3.	0313	Studies on drinking water supplies and sources for viruses and bacteria. Indo-US project PR-1-502-1
4.	0401	Wastewater reclamation through aquaculture and agriculture in collaboration with Bacteriology and Virology Cells.
5.	0405	Toxicity studies on certain heavy metals to aquatic food chain organisms.
6.	0407	All India Coordinated Project on Algae. Sponsored by Department of Science & Technology, New Delhi.
7.	0409	Field testing of integrated water supply and wastewater utilisation system for villages sponsored by WHO.
8.	0510	Evaluation of rural water supply schemes in India. Sponsored by CPHEEO, Ministry of Works & Housing, Government of India, New Delhi.
9.	0602	An investigation of epidemiological aspects and schistosome dermatitis in Nagpur District (India).
10.	0503	Epidemiological and engineering investigation of the incidence and prevalance of human enteric parasites in the city of Jaipur, Rajasthan. Sponsored by P. H. E. D., Government of Rajasthan.
11.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries. Indo US project PR-1-501-1 in collaboration with Industrial Wastes Division.
12.	1009	Rural Sanitation Pilot Project. (In collaboration with Technology Demonstration Division).

TECHNOLOGY DEMONSTRATION

S. R. Kshirsagar

SEWAGE UTILISATION	RURAL SANITATION
G. B. Shende	H. J. Patil
A. S. Juwarkar	D. Y. Ratnaparkhi
D. G. Kshirsagar	M. H. Ansari
(Mrs.) C. Chakrabarti	T. K. Ghosh
(Mrs.) V. J. Nashikkar	
P. B. Deshbhratar	

This group continued its efforts towards creating public awareness about sanitary practices for better environment. In four villages efforts were concentrated for construction of latrines. It is known that for effective implementation of any health programme community participation is very essential. This can be best achieved if the local bodies of elected members like Zilla Parishad are involved in programmes pertaining to sanitary practices. NEERI has been able to seek Nagpur Zilla Parishad's cooperation in its sanitary programme in 10 villages around Nagpur with a result that as many as 1200 handflushed water-seal pit type of latrines have been constructed. Preservation of water quality, specially in wells by disinfection is a pre-requisite as a health measure. Therefore, weekly disinfection of wells in villages is being carried out using pot chlorination method.

The sewage utilisation cell of this group continued the R & D work on the safe and optimum utilisation of sewage in agriculture. Indian Council of Agricultural Research, New Delhi is encouraging the research in this field by providing grant-in-aid for the project. Various field, pot-culture and laboratory investigations have been conducted with a wide-range of variables including irrigation with raw, variously diluted and treated sewage and application of sewage sludge at varying rates and varying levels of BOD of wastewaters with the object of evaluating the crop response and effects on soil properties. Growth and yield responses of the crop of wheat, moong, paddy, potato, cotton, cabbage and brinjal have been studied during the year. Also the work on a new aspect of the study on the fate of human parasites in sewage irrigated soil has been started. These investigations are aimed at maximising the reuse efficiency of the water and nutrients from the waste in terms of crop production, minimising the hazards to the pubic health due to sewage farming and simultaneously controlling water pollution.

These long-term studies have yielded valuable information which provides guidelines for improvement of sewage farming practice in the country.

Sl. No.	Project No.	Title
1.	1007	Microbial decomposition and recycling of farm and city wastes–All India Coordinated project sponsored by Indian Council of Agricultural Research, New Delhi.
2.	1009	Rural sanitation pilot project. (In collaboration with Epidemiology cell)

INSTRUMENTATION

V. R. Bhave — P. L. Muthal
V. R. Apte — S. D. Wachasundar
V. K. Kondawar — J. K. Bassin
G. T. Kale — S. M. Dhopte
Animesh Kumar — Amol Singh

An automatic sequential air sampler was fabricated and put to field trials at Agra. An increase in number of samples analysed with sophisticated instruments shows a healthy trend among scientists of relying on instrumental analysis. These included Gas Liquid Chromatograph, total organic carbon analyser, atomic absorption spectrophotometer. Air, water, solid waste samples were analysed. 238 repair and maintenance jobs were undertaken and completed.

Sl. No.	Project No.	Title
1.	—	Automatic sequential air sampler.
2.	—	Applications of Radio isotopes in the treatment of sewage and industrial waste waters (In collaboration with Sewage Treatment Division)

Analytical assistance

	Instrument	No. of samples
1.	Atomic Absorption Spectrophotometer	1749
2.	Mercury Analyser	507
3.	Gas Liquid Chromatography	454
4.	Total Organic Carbon Analyser	1038
5.	UV, IR Spectrophotometer	146
6.	DU Spectrophotometer	44
7.	Spectronic 710	148
	Total ...	4122

ENVIRONMENTAL ENGINEERING SYSTEMS

V. Raman

ENVIRONMENTAL ENGINEERING CONSULTANCY

S. K. Gadkari
K. K. Das
S. D. Badrinath
V. P. Deshpande

WATER DISTRIBUTION

S. K. Pathak
R. P. Pillewan

Developmental projects are essential for a nation's economy. These involve industrial activities for power generation, fertilizer, cement, coal, oil, etc. Such projects can cause inadvertant changes in the environment-ecosystem, historical monuments, besides pollution of air water and land. Remedial measures to revive environmental quality will prove costly if undertaken after completion of such projects. Environmental impact analysis of developmental projects at the initial stages of planning are being undertaken. This group develops methodology on environmental impact analysis to suit developing country situations.

Leakages and cross-connections result in wastage and are also potential health hazards in urban water supply systems. Studies have been conduct in several cities and follow up action initiated to minimise wastage of treated water.

A need was felt to appraise various organisations like Geological Survey of India, Petrochemical Complex, Oil Refineries etc; of the environmental impact analysis and assessment. NEERI has suitable methodology for environmental impact analysis and made statements available to some of the organisations.

Field demonstration programmes of the methods to prevent leakages from the water distribution system and detect cross connections was continued in Surat city. Environmental improvement especially in water supply system of TELCO Colony at Jamshedpur was suggested which involved suggestions for improvement in water storage system, proper management of the water treatment facility with pre and post chlorination. The authorities were advised to change old GI pipes. Raw water intake needs to be well protected.

Impact of human activities in the catchment areas of Berijam lake was studied at the request of Government of Tamil Nadu. It was seen that (i) agricultural operations on the hill slopes will cause gradual pollution of the lake due to use of fertilizer pesticides, (ii) human settlements will cause bacterial pollution, and (iii) cultivation on the hill slopes will cause soil erosion. Remedial measures were suggested.

Sl. No.	Project No.	Title
1.	1034	Development of Direct reading electric pipeline network analyser.

Consultancy assignments completed during the year were eight. These were :

Sl. No.	Sponsor
1.	Fertilizer Corporation of India, Talcher (Orissa).
2.	Madura Coats, Koratti.
3.	Bharat Gold Mines, Kolar.
4.	Laxmi Starch, Hyderabad.
5.	Bharat Skin Corporation, Central Leather Research Institute, Madras.
6.	Government Spun Silk Factory, Chennapatna.
7.	M/s Madura Coats, Ambasamudram.
8.	M/s Hyderabad Asbestos, Hyderabad.

Air Marshal O. P. Mehra, Governor of Maharashtra, on his visit to the Institute on Dec. 23, 1980.

TRAINING, INFORMATION, LIBRARY & EXTENSION (TILE)

S. B. Dabadghao

EXTENSION, PUBLICATION & COORDINATION	PROJECT, MONITORING & EVALUATION
(Miss) K. W. Chaudhari	R. K. Saraf
C. M. Freitas	(Mrs) P. Nawghare
Y. N. Murthy	(Mrs) V. A. Deshpande
K. M. Nandgaonkar	
R. S. Sharma	
P. P. Godbole	
G. G. Pardhi	

LIBRARY, DOCUMENTATION & INFORMATION RETRIEVAL	TRAINING
	V. P. Thergaonkar
S. G. Bhat	H. C. Sharma
S. K. Kesarwani	(Mrs) R. A. Thakre
(Mrs) S. N. Sinnarkar	D. S. Ramteke

EXTENSION, PUBLICATION & COORDINATION

World Environment Day

Posters and publicity material issued by the United Nations Environmental Programme (UNEP), Nairobi and Press Institute of India (PII), New Delhi were displayed at the Institute on June 5, 1980, World Environment Day.

Publications

(i) Indian Journal of Environmental Health (IJEH)

The twenty second volume of Indian Journal of Environmental Health was published during 1980. The subscribers were 1200.

(ii) A Guide to Current Literature in Environmental Health Engineering and Science

The publication provides the latest information on environmental health engineering and science. The 12th volume of the publication was published during 1980. Its subscribers are about 100

(iii) NEERI News : The newsletter of the Institute was published every month.

(iv) Special publication

The following special publications were brought out during the year :

1. Annual Report 1979–80.
2. Proceedings of Workshop on R & D Needs : Water Supply & Sanitation Decade (1981-90), India.
3. Air quality in selected cities in India 1978–79 : National Air Quality Network.

Coordination

TILE Division organised the major programmes of the Institute which were held during the year. These programmes included.

i. Inter-country meting on Slow Sand Filtration which was sponsored by WHO IRC and held at NEERI, Nagpur during September 15-19, 1980.

ii. Indo-US Workshop on Environmental Impact Analysis and Assesssment was organised at NEERI, Nagpur during October 27-31, 1980. The co-organisers were Department of Science & Technology, Government of India, New Delhi and the Environmental Protection Agency of USA.

iii. The Homi Bhabha Memorial Seminar on "Computers : Meeting the Challenges of tomorrow" was organised by the Raman Museum of Science & Technology, Nagpur University; NEERI, Nagpur ; Computronics India, Bombay and Electronics Development Association, Nagpur; at NEERI, Nagpur on January 24, 1981.

iv. National Workshop on "Microbial degradation of Industrial Wastes" was held at NEERI, Nagpur during February 23-27, 1981. The Workshop was sponsored by the Department of Environment, Government of India, New Delhi.

Deputation/Exchange of personnel

Training of personnel under bilateral exchange programmes was coordinated by TILE Division. At present NEERI (through CSIR) has bilateral exchange with about 12 countries of the world. Under these and WHO programmes, five NEERI scientists were deputed abroad during 1980-81.

Five NEERI scientists were deputed abroad as WHO Consultants/ Advisers during 1980-81 and they participated in international symposia/seminar/conference held in overseas countries.

Patents and Release of Know-how

TILE Division provided coordination of activities with NEERI R & D divisions, CSIR, NRDC and entrepreneurs for (i) Release of know-how developed by NEERI; (ii) Registration/ filing of patents; and (iii) Providing assistance to entrepreneurs.

The process know-how released during 1980-81 was : NEERI Chloroscope to M/s Water Chem Laboratories, Red Hills, Hyderabad (Andhra Pradesh).

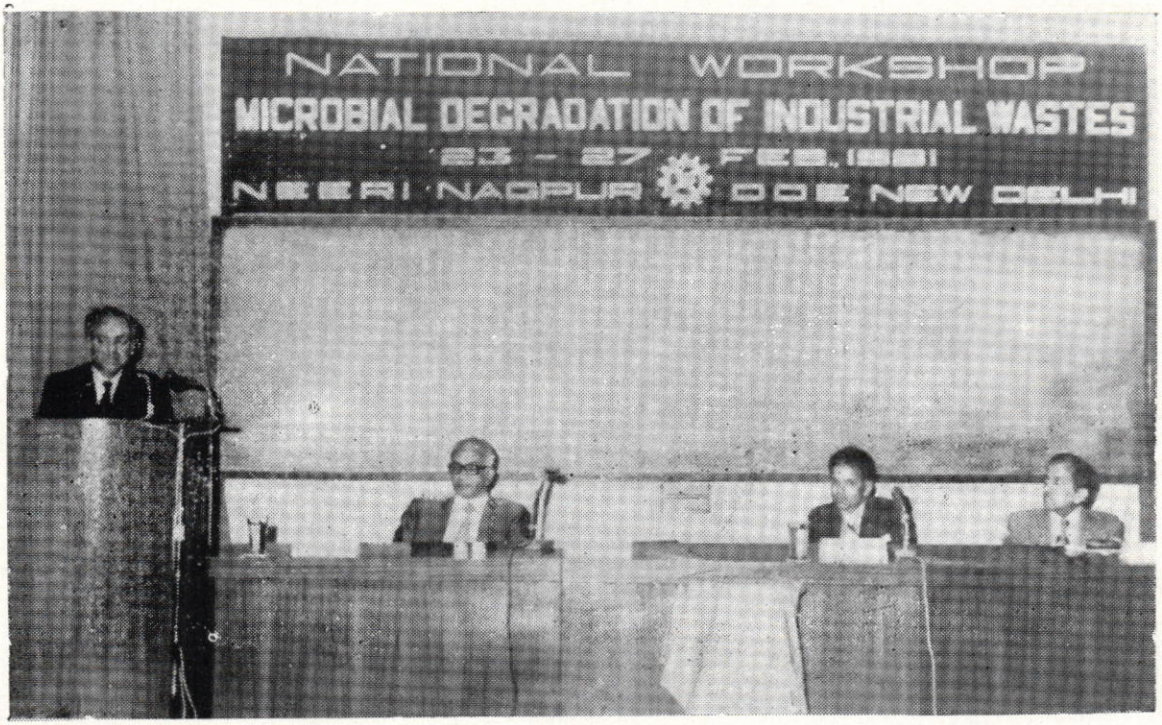
Two patents filed were : (i) Multigas Sampling Kit and (ii) Improved Air Spora Sampling Device.

Hindi

The Institute staff were encouraged to study Hindi and appear in examinations conducted by the Department of Official Languages, Ministry of Home Affairs, Government of India, under the Hindi Teaching Scheme.

The use of Hindi is being promoted by replying to querries/ correspondence which are received in Hindi. The Hindi version of Director's Report was publised in NEENI Annual Report 1979-80, and the Institute continued to issue bilingual press releases to newspapers, newsagencies, All India Radio and popular science journals and magazines.

Hon'ble Shri V. P. Sathe, Union Minister for Information & Broadcasting, delivering the inaugural address at the Inter-Country Meeting on Slow Sand Filtration on Sept. 15, 1980.



Dr. S. Varadarajan, Chairman-cum-Managing Director, Indian Petrochemicals Corporation Ltd., delivering the inaugural address at the National Workshop on Microbial Degradation of Industrial Wastes, on Feb. 23, 1981.

Seminars/Symposia/Conferences

Information with regard to 250 forthcoming conferences, meetings, seminars, symposia and training programmes in India and abroad were communicated to scientists of the Institute by issuing information circulars.

Coordination with Mass Media

About 30 bilingual press releases were issued to All India Radio, newsagencies, newspapers and correspondents of national dailies from time to time with regard to programmes and attainments of the Institute. Dr. B. B. Sundaresan, Director, NEERI addressed a press conference on February 20, 1980, the eve of the National Workshop on "Microbial degradation of industrial wastes." The conference was well attended and reported.

Coordination with ISI, State & Cenrtal Government Boards

TILE Division maintained liaison with Indian Standards Institution, New Delhi and Central and State Government Boards with regard to nomination/ membership of NEERI scientists as experts on various committees of ISI and Central/State Governments.

TRAINING

Following training programmes were conducted :

	Course & duration	Number of participants	Venue
1.	Preventive Maintenance in Water Distribution Systems 16–26 June, 1980.	26	Surat
2.	Wastewater Treatment (for Kudremukh and Seshsayee Paper Mill) July 14–24, 1980.	4	Nagpur
3.	Air Quality Monitoring, August 20–26, 1980.	17	Nagpur
4.	Wastewater Treatment : Unit Operations and Processes, Nov. 18 to Oct 12, 1980.	16	Nagpur
5.	Solid Waste Management, February 3-10. 1980.	8	Nagpur

Following course manuals were brought out :

(a) Solid Waste Management

(b) Instrumentation in Environmental Engineering

(e) Unit Processes in Wastewater Treatment

PROJECT MONITORING & EVALUATION

Project Monitoring and Evaluation was a continuing activity. Scientists of the Institute were assisted in statistical analysis of data on R & D Projects. Project budget for the year 1980–81 and Research Utilisation Data were compiled and forwarded to CSIR.

LIBRARY, DOCUMENTATION, INFORMATION RETRIEVAL

Library continued to cater to the environmental information needs of scientists of the Institute through

i. Selective Dissemination of Information
ii. Document Copying
iii. Current Awareness Service
lv. Press Clippings Service.

Documents in Library

S. No.	Items	Nos.
1.	Books and Bound Volumes of Periodicals	23400
2.	Current Periodicals	289
3.	Microfilms	704
4.	Photocopies	890
5.	Microfiche	10
6.	Documents added	950
Services		
	Document copying	9000
	Current Awareness Service	4515

Compilation of Bibliographies & Reference Tools

i. Indian Literature in Environmental Engineering : An annual bibliography 1975.
ii. Mining and Environment : Selected Indian References.
iii. Pollen and spores as Allergens : Selected Indian References.

TECHNICAL SERVICES

WORKSHOP

N. G. Swarnakar
S. K. Nimkhedkar
S. C. Shrivastava

PHOTOGRAPHY

E. P. I. Sundersingh

GLASS BLOWING

P. S. Kshirsagar

Major jobs fabricated duriug the year were (i) Stands for high volume samplers, (ii) Thimble holders, (iii) Thermohydrograph screen, (iv) M. S. tanks. Installation of pilot plant etc., for DST project No. 0311 and (v) Surface aerators of different sizes for project No. 1031 "Model studies on surface aerator."

The workshop continued to provide valuable assistance to scientists by fabricating of gadgets, models, pilot and demonstration plants for use in R & D activities. For the first time,

major overhaul of jeep engine was carried out departmentally. 180 KVA stand by Diesel generator set was commissioned.

Altogether technical services (132 jobs) including new fabrication as well as repair of glass parts were completed during the year. Five job were attended for the outside organisations on request and payment.

The photography section continued to provide valuable assistance to the R & D Divisions of the Institute. The section undertook some outdoor photography assignments on NEERI consultancy projects. Altogether 286 jobs including preparation of projection slides, photographs, microfilms and photomicrographs were completed.

ADMINISTRATION

Kuldip Rai

V. M. Kamble	K. Muthuswamy
N. G. Parmar	B. Y. Bagde
M. V. Joglekar	Y. G. Shankaran
M. P. Gharote	Mrs I. D. Souza
S. K. Shrivastava	J. H. Govind
STORES	PURCHASE
R. Narayana	Thomas Joseph
U. G. Deshmukh	G. Srinivasan
K. Valson	P. V. Chauganjkar
M. P. Vyas	G. L. Banerjee

Administration in research institutes is essentially different from that of other govenrment departments. NEERI has been trying to involve the administrative personnel in such programmes like workshop on R&D management. Their response has been encouraging and it has made it a practice to sponsor one or two administrative staff every year for refresher courses.

FINANCE & ACCOUNTS

A. V. Subba Rao
Santosh Kumar
S. Thamilarasu
A. W. Kulkarni

New concepts like project budgeting, pattern of deployment of manpower and its utilisation are being logistically included in R & D management. Besides keeping account for the government contribution to NEERI various sponsored projects have to be properly accounted. This section keeps close liaison with PME (Project Monitoring & Evaluation Cell) in preparation of project budget and to strike a balance between the conventional and project budgets.

BUILDING & CONSTRUCTION

N. M. Narasimhan
B. V. Kale
R. N. Thanekar
S. Y. Patil
S. R. Nagraj
K. G. Nimbalkar
K. C. Verghase

Maintenance of the buildings, civil works pertaining to research projects in the campus, construction of buildings at zonal laboratories and process laboratories are being managed by this section. Civil Engineer is entrusted with construction of new quarters and maintenance of facilities in the colonies.

Prof. S. Nurul Hasan, Vice-President CSIR, inaugurating the NEERI School Building at NEERI Campus on July 7, 1980.

NEERI ZONAL LABORATORIES

NEERI Zonal Laboratory
Suburban Sub-Pumping
Station
Beyond Calico Mills
Sewage Farm Road
Ahmedabad-380 022
(Gujrat)
Gram : NEERI, Ahmedabad-22
Phone : 20[illegible] (Off)
41[illegible] (Res)

NEERI Zonal Laboratory
60-B, Dr. Annie Besant Road
Worli,
Bombay-400 018
(Maharashtra)
Gram : [illegible]NEERI Bombay-18
Phone : 5[illegible] (Off)
[illegible] (Res)
Telex : 011 - [illegible]

NEERI Zonal Laboratory
4th Floor
23, R. [illegible]
Calcutta-[illegible]
(West Bengal)
Gram : NEERI, [illegible]
Phone : 236752 (Off)
467753 (Res)

NEERI Zonal Laboratory
CSIR Complex
Kalamassery Development Plot
Kalamassery (South)-683 104
(Kerala)
Gram : NEERI, Kalamassery-683 104
Phone : 5096 (Off)
5002 (Res)

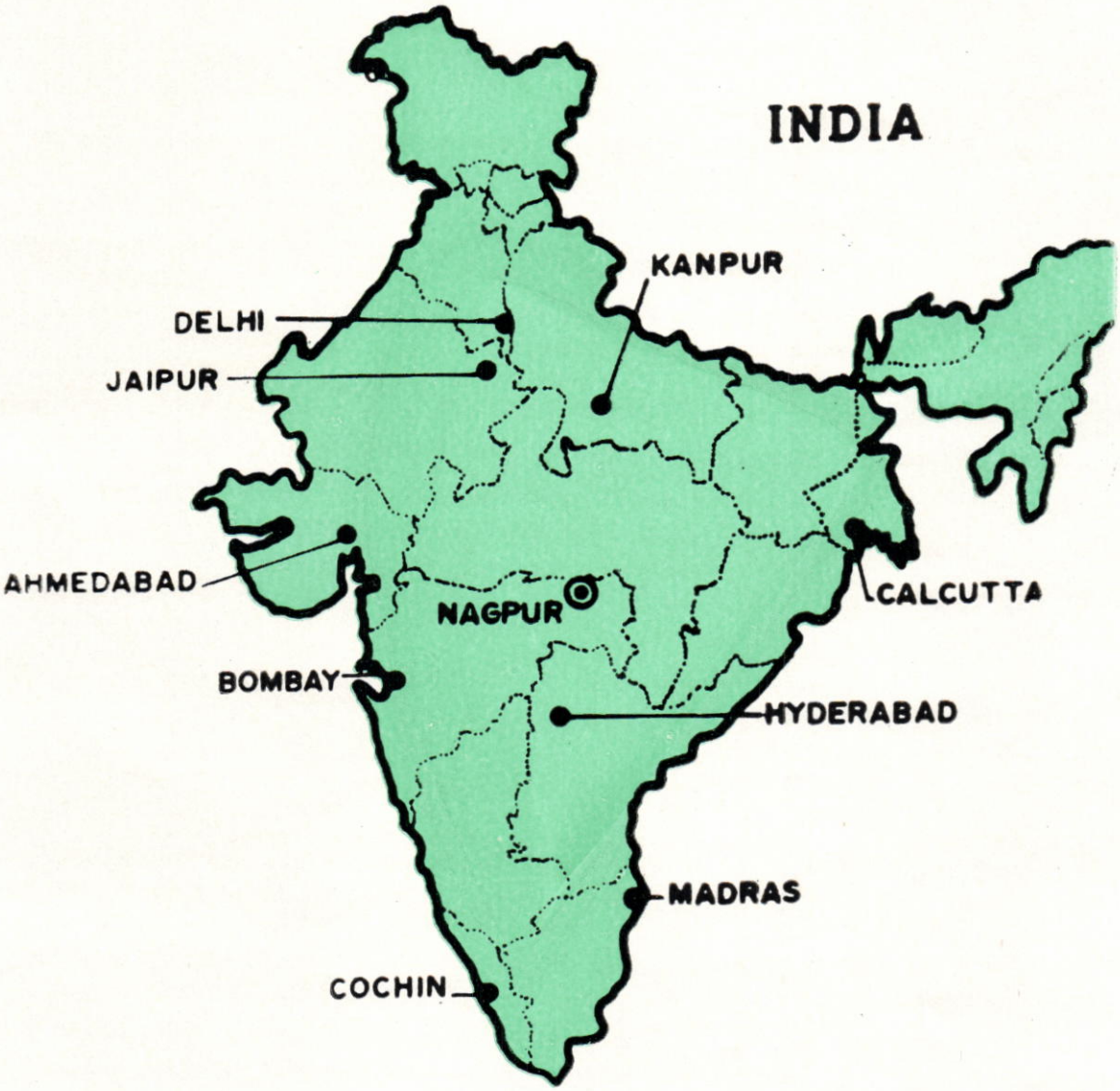
NEERI Zonal Laboratory
Chandrawal Water Works No. II
Lala Shankar Mal Marg
Delhi-110 054
Gram : [illegible]NEERI, Delhi-54
Phone : [illegible] (Off)
[illegible] (Res)

NEERI Zonal Laboratory
[illegible]
[illegible]
[illegible]
[illegible], Hyderabad-9
[illegible] (Off)
[illegible] (Res)
[illegible]

[illegible] Laboratory
[illegible]
[illegible]
[illegible]-4
[illegible] (Off)
[illegible] (Res)

[illegible] Laboratory
[illegible]
[illegible]
(U[illegible])
[illegible]NEERI, Kanpur-2
[illegible]40127 (Off)
[illegible]47701 (Res)

NEERI Zonal Laboratory
CSIR Complex, Adyar
Madras-600 020 (Tamil Nadu)
Gram : CONSEARCH, Madras-20
Phone : 419964 (Off)
412521 (Res)
Telex : 041-363
(CSIR Complex, Madras)



Headquarters at Nagpur and Zonal Laboratories

ZONAL LABORATORIES

The Institute has nine zonal laboratories in order to cater to the needs of different regions in India. Rajasthan represented by Jaipur which is a typical arid zone, characterised by desert and has problems of water, both of quality and quantity. Bombay, Calcutta and Madras pose problems which arise out of modern technological and industrial sophistication and by an affluent society. Kanpur and Hyderabad zonal laboratories look after problems of both rural and urban origin. Ahmedabad in Gujrat represents an area which is fast approaching heavy industrialisation, alongwith planned rural-based project like dairy and chemical industries. Cochin in South India takes up the marine and estuarine environmental problems.

Zonal laboratories have sufficient expertise to attent to the problems of the respective regions. They are comlimentary to headquarters efforts in some national projects like air quality monitoring, performance and assessment of water treatment plants, and industrial effluent treatment and utilisation. They also serve as extension centres for transfer of technology and provide liaison with local Water Pollution Control Boards, public health engineering departments, universities and engineering colleges.

AHMEDABAD

S. Rajagopalan
S. K. Shrivastava
P. Nema
N. C. Kankal

This zonal laboratory was during the year, involved in collaborative projects with headquarters on water treatment, air quality data, evaluation of rural water supply and performance evaluation of water treatment plants.

Sl. No.	Project No.	Title
1.	—	Studies on treatment of water for augmentation of water supply to Ahmedabad. Sponsored by Municipal Corporation, in collaboration with Environmental Engineering Consultancy Division at headquarters.
2.	—	National Air Quality Monitoring Network.
3.	—	Pilot project on Preventive Maintenance of Water Distribution System in Surat/Short-term training programme on Leak Detection, sponsored by Surat Municipal Corporation, Surat. In collaboration with Water Distribution Cell at headquarters.
4.	—	Evaluation of Rural Water Supply Schemes in India. Sponsored by CPHEEO, Ministry of Works & Housing, Government of India. In collaboration with Water Engineering Division at headquarters.
5.	—	Evaluation of Performance of Water Treatment Plants.

BOMBAY

D. Raguraman
R. K. Pandit
N. S. Phadke
V. I. Pandit
A. L. Kulkarni
(Mrs) A. A. Chandorkar
S. V. Deshpande
(Mrs) M. M. Patil
K. E. Rosario

This zonal laboratory represented NEERI in various meetings of BMRDA and undertook consultancy assignments besides collaborating with headquarters on performance study on water treatment plants, and rural water supply schemes.

Sl. No.	Project No.	Title
1.	—	National Air Quality Monitoring Network.
2.	—	Performance study of water treatment plant in Pune.
3.	—	Rural Water Supply Evaluation Study. Sponsored by CPHEEO, Ministry of Works & Housing, New Delhi.

CALCUTTA

A. K. Basu	(Mrs) G. Mukherjee
R. S. Dhaneshwar	R. D. Sahu
C. S. G. Rao	M. K. A. Mutty
A. W. Deshpande	S. M. Molla
S. S. Mudri	S. K. Ghose
(Mrs) D. Ray	A. K. Ganguly
A. K. Biswas	

Major activity of this loboratory was on air and water quality monitoring, wastewater and solid waste management studies in Calcutta Metropolitan Development Area (CMDA), associated with head quarters on Evaluation of Rural Water Supply Schemes in India and Performance Evaluation of Water Treatment Plants in India.

Sl. No.	Project No.	Title
1.	—	Problems of water supply schemes at CMRS Colony, Dhanbad. Sponsored by Director, CMRS, Dhanbad.
2.	—	National Air Quality Monitoring Network.
3.	—	Pilot studies on improvement of solid waste management at Calcutta.
4.	—	Performance evaluation of rural water supply schemes.

COCHIN

M. Mariappan	Mrs. Gracy Jacob
U. Manivel	C. G. Gopalkrishnan

Pollution problems arise due to such complexes like fertilizers, petro-chemicals etc. In order to solve these, a comprehensive study of the effect of emissions both gaseous and liquid on the ecosystems has to be undertaken. NEERI has with the active participation of COZL undertaken detailed investigation of the effects of the fertilizer complex at Cochin and KCPC.

Sl. No.	Project No.	Title
1.	—	Evaluation of Rural Water Supply Schemes in Kerala.
2.	—	Treatment and disposal of effluent from propellant fuel complex, Trivandrum. Sponsored by V.S.S.C., Trivandrum.

DELHI

A. Raman
R. P. Mishra
S. K. Shrivastava
V. Haraprasad
L. N. Sharma
R. C. Dixit
J. L. Nagpal
B. R. Belurkar

Performance evaluation of a slow sand filter at Abub Shehar and rural water supply schemes evaluation in eight villages was continued. Water quality in Jamuna river, Air quality monitoring network and study of water treatment plants, also formed a major activity of this zonal lab. Liaison work with Council of Scientific & Industrial Research (CSIR), Department of Environment (DOE), National Productivity Council (NPC) and analysis of 166 samples was a significant activity.

Environmental impact statement of a refinery complex will envisage detailed investigations on present conditions prevailing in the ecosystem, prediction of the characteristics of liquid and gaseous emissions and their effects on water and air quality. Such detailed investigations are being undertaken at Mathura Refinery with the active cooperation of Delhi Zonal lab and headquarters.

Sl. No.	Project No.	Title
1.	—	Evaluation of Rural Water Supply Schemes. Sponsored by Central Public Health & Environmental Engineering Organisation in collaboration with headquarters.
2.	—	WHO IRC Slow Sand Filtration Project Phase II. Sponsored by WHO IRC, Hague, The Netherlands.

Sl. No	Project No.	Title
3.	—	Monitoring Water Quality of Jamuna River at Mathura. Sponsored by Indian Oil Corporation, New Delhi.
4.	—	National Air Quality Monitoring Network.
5.	—	Performance Evaluation of Water Treatment Plants in India.
6.	—	Mathura Refinery effluents utilisation project. Sponsored by Indian Oil Corporation, New Delhi.

HYDERABAD

Y. S. Murty
D. Seetapathi Rao
R. C. Reddy
V. Subbiah
L. Shantikumar
G. Sambaiah
S. I. Eliyas
D. Venkata Rao
N. J. Mathew

Hyderabad Zonal Laboratory has been well developed as of the infrastrucuture required for R & D work in all environmental Sciences-Availahility of sophisticated instruments, library, hydraulic laboratory and computer are available in vicinity. Special emphasis will be given to Hard Core wastes treatment.

Other activity includes in the integrated rural development project undertaken by CSIR in Karimnagar District.

Sl. No.	Project No.	Title
1.	—	Slow and filtration demonstration plant at Pothunuru, Andhra Pradesh. Sponsored by WHO IRC.
2.	—	Fluidized Bed Biological Reactor for Waste Treatment to Control Environmental Pollution. Sponsored by Depertment of Environment, New Delhi.
3.	—	National Air Quality Monitoring Network Programme (NAQM NP).
4.	—	Asessement of Soure Emissions and Air Quality in and around the Fertllizer Complex of M/s Andhra Sugar Ltd., Kovvour, West Godavari District, Andra Pradesh. Sponsored by M/s Andhra Sugars Ltd., Tanuka, West Godavari District (A. P).
5.	—	Evaluation of Rural Water Supply Schemes. Sponsored by CPHEEO, Ministry of Works & Housing, Government of India. New Delhi.
6.	—	Remodelling of the Sewage Treatment System of Hyderabad. Sponsored by Commissioner & Special Officer, Municipal Corporation of Hyderabad. A collaborative project with heaquarters.

JAIPUR

A. K. Seth — S. L. Govindwar
S. M. Tamhane — A. G. Gavane

This zonal laboratory is actively coordinating a project on helminthic infestation studies at Jaipur. This is being conducted by epidemiology cell and is sponsored by PHED, Rajastan. Performance studies of water treatment plants, evaluation of rural water supply schemes and the sewage treatment plant at Jaipur have been started. Training in chemical and bacteriological analysis of water was conducted for a few industries.

Sl. No.	Project No.	Title
1.	—	National Air Quality Monitoring Network.
2.	—	Evaluation Rural Water Supply Shemes.
3.	—	Performance evaluation of sewage treatment plant.
4.	—	Performance evaluation of water treatment plant.

KANPUR

H. C. Arora — Tapan Routh
S. N. Chattopadhya — R. K. Gupta
V. P. Sharma

Main activity of this zonal laboratory was treatment of tannery waste for small units. Anaerobic contact filters were found suitable and different aspects are being studied. The lab know how been transferred into the field and is under assessment.

Sl. No.	Project No.	Title
1.	—	Treatment of vegetable tanning waste by Anaerobic Contact Filter Process–Multiple Unit System.
2.	—	Performance Evaluation of Anaerobic Contact Filter Process Treatment Plant at UP Tannery, Kanpur.
3.	—	National Air Quality Monitoring Network.
4.	—	Performance Evaluation of Studies of Water Treatment Plants in Uttar Pradesh.
5.	—	Bioassay Studies of Industrial Effluents with fish.

MADRAS

C. A. Sastry
T. K. Srinivasan
V. Kothandaraman
R. Jayabalou
K. Subba Rao
K. M. Aboo
P. Murahari Rao
S. P. Subramanian
Y. V. Subramaniam

This zonal laboratory is located in the CSIR Complex. Industrial waste treatment and collaborative projects with headquarters were the main activities.

Sl. No.	Project No.	Title
1.	—	Characteristic treatment of wastewater, M/s Hindusthan Photo-films. Ooty.
2.	—	Characterisation and treatment of textile mill waste, Unltep Bleachers, Mettupalayam.
3.	—	Evalsation of treatment plant of M/s Coimbatore Pioneer Textile Mill, Erode.
4.	—	Treatment of wastewaters from Mangalore Chemicals & Fertilizers Ltd., Mangalore.
5.	—	Treatment and disposal of effluent from fertilizer factory of SPIC, Tuticorin.
6.	—	Wastewater reclamation through aquaculture and agriculture.
7.	—	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries. SPIC, Tuticorin.
8.	—	National Air Quality Monitoring Network.
9.	—	Slow sand filter studies at Kamayagoundanpatti. for augmentation of water supply. (NEERI/WHO-IRC Collaborative project.)

REPORT OF R & D PROJECTS IN PROGRESS

AIR QUALITY

0.115 : National Air Quality Monitoring Network.

Assessment of air quality in selected Indian cities has become necessary because air quality gets impaired by industrial and vehicular activity. If monitoring of air quality is important, compilation and analysis of data acquire greater importance for information storage. This being a national project, cooperation and participation by all zonal laboratories is being sought. The compilation of data and systematic presentation is done by the Air Pollution Division at headquarters.

Ambient air quality monitoring was initiated in cities where zonal laboratories are located. Suspended particulate matter (SPM), sulphur dioxide (SO_2), sulphation rate (SR), oxides of nitrogen (NO_x) and dust fall (DF) were selected. Meteorological data also were collected.

Annual Summary of Air Quality for 1979

	SPM $\mu g/m^3$	SO_2 $\mu g/m^3$	SR $mgSO'_3/100/day/km^2$	DF Dust Fall M. T./km^2/mm^2
Bombay	197–285	20–83	0.45–0.66	8–19
Calcutta	413–5172	28–85	0.44–0.67	21–37
Delhi	296–481	Trace–39	0.14–0.44	12–30
Hyderabad	255–295	26–27	0.06–0.09	12–20
Jaipur	222–379	Trace–17	0.09–0.12	12–16
Kanpur	206–344	10–25	0.09–0.25	24–36
Madras	106–169	10–25	0.06–0.1	8–12
Nagpur	159–386	10–12	0.06–0.09	8–88

Wind roses, geographical features meteorology indicate the following observations :

Bombay	The presence of active pollutants and discharges in the area can result in high atmospheric corrosivity.
Calcutta	The city can be classified as dusty.
Delhi	Commercial area is found to be more polluted as compared with other areas. High SPM values are recorded during the years.
Hyderabad	Air borne dust problems are indicated.
Jaipur	Natural dust due to frequent desert storms is the major source of having high concentrations of SPM.
Kanpur	Air pollution problems can arise due to different wind pattern.
Madras	Air pollution problems can arise at active centres.
Nagpur	Ambient air quality is satisfactory.

Annual seasonal averages for 1980.

Conc in $\mu g/m^3$	Bandra	American Centre	Parel
SO_2	22.25	22	48.25
NO_2	26.25	22.25	23.75
SPM	109.00	178.5	263

0117 : Air quality and emission inventory survey for urban areas and industries.

(i) Traces of Hydrogen Sulphide gas were detected in various drainage galleries. The average concentrations in seepage water being 25.7, 67.4, 127.9, 154.2 $\mu g/l$, presence of H_2S has been traced to anaerobic conditions at the bottom of the reservior.

(ii) High suspended particulate matter (191-322 $\mu g/m^3$) in the township have been traced to industrial emissions, poor roads etc. To reduce the impact on air quality, it is necessary to (1) declare pollution zone and construct a green belt, (2) Construct industrial estate to south-east (SE), and (3) Proposed super thermal power plant would aggrevate the situation hence no residential zone within two kilometers is advised.

(iii) Different explosives were used for blasting. The sponsor was interested in the NO_x values after the blasts. The concetration ranged from Traces-25 ppm.

WATER

1431 : Aluminium chloride as coagulant in water clarification.

Preliminary trials indicated potential application of aluminium chloride as a coagulant in water treatment for the removal of suspended solids. Its performance was compared with alum and $FeCl_3$ on jar test. The results indicate that $AlCl_3$ dose required is between 40-50% of alum dose, but is higher than $FeCl_3$ dose.

1435 : Study of synthetic membranes of environmental engineering utility other than reverse osmosis.

Ultrafiltration separates the dissolved species from the liquid on the basis of molecular size and structure. For convenience, membranes are graded on the basis of molecular weight. The terminology used is nominal molecular weight cut off level (NMWL). Membranes of NMWL 1000 and above are available commercially in foreign countries.

Most of the trace organic pollutants fall below this level of molecular weight. Development of membranes with NMWL less than 1000 is of importance in pollution control studies. The added advantages of these membranes are recognised in the study of trace metal pollutants. Such studies are based on the complexes of these metals. These complexes at the differential pressure of 4 to 10 kg/cm^2 is envisaged in these studies. Metals when separated by reverse osmosis need the pressure of 40 to 80 kg/cm^2 as a characteristic of membrane.

Membrane preparation and study of four solutes with NMWL 500 to 650 has been completed.

1436 : Solid liquid separation using floatation technique.

The process of dissolved air floatation is a high rate process which separates solids from

liquids. The principle involved in the process is attachment of micro bubbles of air to solid particles which causes them to float.

Basic studies regarding the use of this process in water treatment show encouraging results. An experimental set-up giving 9 l/m treated water removing the suspended solids to the extent of 91% was designed and installed.

0501 : Slow sand filtration.

During the second phase of this project sponsored by WHO (IRC), four village demonstration plants (VDPs) one each in the states of Haryana (Abub Shehar), Tamil Nadu (Kamayagoundapatti), Maharashtra (Borujwada) and Anhra Pradesh (Pothunuru) were commissioned. These were evaluated for their performance, the data* on which are given below :-

	Raw Water				Treatment Water		
Name of the plant	Turb. NTU	COD mg/l	Coli form MPN/ 100 ml	*E. coli* MPN 100 ml	Turb. NTU	COD % removal	*E. coli* MPN/ 100 ml
Abubshehar	0.6–7.0	2–9	1700	33–1600	Less than 1	27–47	0–2
K. G. Patti	2–28	2–12	13–11000	4–930	Less than 1	47	0–23
Borujwada	2–16	2–30	110–92000	70–92000	0.2–1.4	85–87	0–5
Pothunuru	5–13	4–20	240–4600	15–930	Less than 1	—	0–23

*The values indicate the ranges.

0506 : Performance evaluation of water treatment plants in India

Fifteen water treatment plants were selected from different parts of the country for a detailed survey and performance evaluation. The salient findings of this survey show the following major deficiencies ;

1. Absence of suitable device for raw water flow measurement and control.
2. Improper alum dosing.
3. Poor maintenance of filters.
4. Non-functioning of loss of headgauges, rate of flow controllers and chlorinators.

0507 : Study of high rate settlers.

The laboratory model has been set up with facilities for preparation of clay suspension, a raw water tank of 3800 litres capacity, a constant head feed tank, flocculator tank with baffles and a tube settler module made of nine aluminium tubes of 1.2 m length with a square 50mm section. Provision has been made to keep the tube settler module at any desired

angle of inclination. Three flocculator tanks of different capacities were fabricated with a detention time of 25 minutes at the three flow rates proposed to be studied. Flocculation is achieved through diffused air agitation preceded by alum addition and coagulation. Optimum alum dose was determined by a jar test. The alum dose which produced minimum settled water turbidity was considered optimum for experimental purposes. Trial runs were conducted with raw water turbidities upto 250 NTU. Further work including standardisation of parameters for effective flocculation is in progress.

0509 : Development of simple methods of water treatment.

The system provides for alum coagulation, flocculation, clarification and filtration operations in one modular pre-fabricated and assembled unit. The special features of the unit are simplicity and ease of operation and maintenance, minimum mechanical equipment, ease of pre-fabrication and flow capital cost.

A laboratory unit of 90 l/hr capacity has been designed and fabricated.

The unit was studied for its performance with raw water having a turbidity in the range 100–500 NTU. The optimum alum dose as determined by jar test was 20 to 70 mg/l. The unit operated at 90 l/hr has always given filtered water with turbidity less than 1.0 NTU.

0510 : Evaluation of rural water supply schemes in India

26 rural water supply schemes in 10 states having a population between 1000 to 10,000 and less than 1000 have been studied in detail. The salient findings on technological, administration, financial and socio-cultural aspects are given below :—

Observations

- Objectives set forth with reference to reliability of source and degree of service have not been fully met.
- When administered by more than one agency, there is lack of coordination between them.
- Delay in according administrative approval has been noticed.
- Systems operated and maintained by local bodies are not found satisfactory.
- Irregular electric power supply, adversely affects the degree of service.
- When water supply is only through public stand posts, revenue collection is poor.
- Environmental sanitation in general is poor.
- Motivation, health education and community participation have not been effective.

Constraints

- Scarcity and non-availability of materials on time.
- Inadequate allocation of funds for capital works and operation and maintenance.
- Lack of trained personnel for operation and maintenance.

Recommendations

- A separate agency / department with its functions decentralized at district level is desirable.
- Smooth flow of construction material like cement, steel, pipes and specials should be ensured.

— Operation and maintenance of schemes serving a population less than 1000 should be entrusted to the district level agency Public Health Engineering Department (PHED).

— Monitoring and evaluation should form an integral part of any water supply agency with a separate cell.

— Training centres for operators should be established at each district level.

— Community participation right from planning to the implementation and continued operation and maintenance water supply schemes should be ensured.

SOLID WASTES

0719 : Analysis assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries.

Toxic components in phospho-gypsum include fluoride, and heavy metals Mn, Cu, Zn, Cr, Fe, Pb, and also it has residual radio-activity. Concentration of these metals varied from 4–164 ppm on moisture free basis. Leachate from phospho-gypsum was analysed for these heavy metals and were found to be present in different concentrations.

1118 : Evaluation of mechanical composting plants in Indian conditions.

Evaluation of mechanical composting plants.

Observations	Recommendations
i. Plant is over mechanised	i. Magnetic separator not needed
ii. Some units are redundant.	ii. Rotary conditioner not useful.
iii. Cost of compost	iii. Artifical air supply to windrows is not necessary.
	iv. Covering of windrow yard is not necessary.
	v. Proper market survey and market development essential.

WASTE WATER

0717 : Treatment of wastewater from major dye manufacturing processes.

The first phase triphenyl methane based dyes viz., malachite green, brilliant green and methyl violet have been selected for study. After an inplant survey, composite samples of wastewaters from methyl violet manufacture have been collected and characterised. Treatability studies using lime and coagulants such as alum and iron salts have been initiated. Mixing of alkaline filter press washing and decanted liquor after dye formation in the flow ratio of 2 : 1 from methyl violet dye section has effected appreciable removal of colour and COD in the combined wastewater. Further studies are in progress. The combined wastewater from the dye factory as a whole will be taken up for characterisation and treatability.

0719 : Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries.

Samples of wastewater generated during the manufacture of phosphoric acid and diammonium phosphate have been characterised. The wastewaters contained fluorides, phosphates and ammonia in appreciable quantities. Two-stage lime treatment for the removal of fluoride

and phosphate revealed that nearly 99% of fluoride and 97% of phosphate could be removed from the wastewater with an initial concentration of 760 mg/l and 920 mg/l P. Further studies are in progress using different samples with varying initial phosphate and fluoride concentration. Characterisation studies are being continued to identify and quantify heavy metal pollutants besides F, P and NH_3.

0721 : Studies on conditioning and de-watering of sludges from industrial wastewater.

Studies on various aspects of sludge conditioning and de-waterability of a sludge have been initiated. The sludge was prepared from the simulated wastewater of a factory proposed to produce Titanium dioxide pigment. The sludge is inorganic in nature and was tested for settling and vacuum filtration. Settling tests, produced a characteristic power law equation between settling velocity and solids concentration.

Extensive tests for vacuum filtration using Buchner funnel method provided information on the effects of pressure and concentration on specific resistance.

The above tests were carried out with varying geometry of the settling vessels and Buchner funnels. Future studies include testing the effect of various coagulant aids on both the aspects. The same methods can be applied to any sludge and it is proposed to use them according to availability.

The result at a glance

(1) From settling study : $V = 12 \times C^{-0.26}$
where V = settling velocity, C = solids concentration.

(2) From vacuum filtration study
(a) $r = 5.6 \times 10^{12}$ m/kg of 650 mm Hg
where r = specific resistance of the settled sludge.
(b) Compressibility coefficient of the settled sludge = 0.65.

(3) The slurry contained 1.5 - 1.8% solids which was improved upon thickning and vacuum filtration to 3% and 18% respectively

1019 : Effluent utilisation for cultivation of *Citrus reticulata* (orange).

Additional area (3 hectares is being developed for plantation for forest and avenue trees and this will be irrigated with treated effluent.

1031 : Model studies on surface aerator.

Effect of temperature on Arrhenious constant for oxygen mass transfer coefficient was determined on fabricated laboratory aeration basin (3' × 3' 3') has 3 values between 5 and 45°C.

	Temp°C
0 = 1.0233	25
0 = 1.028	25-35
0 = 1.031	35-45

ECOLOGY & ECOSYSTEMS

0311 : Detoxification of phenol and cyanide bearing industrial wastes by biological methods for pollution abatement.

Performance of the demonstration plant to degrade a synthetic phenolic waste using *Candida tropicalis* was as under :

Phenol, mg/l	468	less than 1.0	99.99
Solids, gms/l	1.037	0.045	---
COD	1117	72	more than 90%
Loading rate kg phe/kg MLLS/day	Phenol 0.88	COD 2.014	—

Flow rates was 80 l/hr.

Bench scale studies using mixed culture to degrade phenol, cyanides and thio-cyanates have been completed and trials will be taken on the demonstration plant at the factory site.

0401 : Wastewater reclamation through aquaculture and agriculture.

Sewage treated in stabilisation pond and through a series of fish ponds gave salmonella free effluent (1 1 sample) with maximum reduction in the indicator bacteria (salmonella count-Raw sewage 5-24,00/100 ml).

0510 : Evaluation of rural water supply schèmes in India.

Total number of 21 samples from Maharashtra, 8 samples from Madhya Pradesh and 11 samples from Orissa showed that well waters from all these states were highly polluted. Water samples from public stand posts and bore wells were marginally polluted.

0719 : Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries.

Static bioassy tests renewal type at room temperature have been conducted on some wastewaters such as Meta-amino-phenol, dinitrobenzene, paranitro-phenol and nitro-chloro-benzene from basic organic chemicals factory wastes. The test fish used were guppies. The LC_{50}, LC_{100}, and LC_0 values were recorded as under :

The results of bioassay tests using three different wastewaters from phosphatic fertilizer factory 'A' are shown :

Wastewater	96 hr LC_{50} %v/v (Tilapia)
Diammonium phosphate plant	0.36
Diammonium phosphatic + phosphoric acid plant	6.00
NPK plant	3.70

Acute toxicity of wastewaters from a basic organic chemical industry (Test fish-*Lebistes reticulatus*-Guppy)

Sample	96 hr LC_{50} % v/v	Upper limit for 95% prob-ability % v/v	Lower limit for 95% probabi-lity % v/v	96 hr LC_0 % v/v	96 hr LC_{100} % v/v
DNB waste water	0.13	0.20	0.08	0.01	0.45
Neutralised with H_2SO_4	0.02	0.03	0.10	0.01	0.25
NCB wastewater	6.46	0.59	0.38	0.36	0.56
MAP acid wastewater	0.07	0.08	0.05	0.01	0.10
Neutralised with NaOH	1.93	2.22	1.68	1.20	2.60
Neutralised with lime	4.00	4.44	3.60	3.40	6.00
PNP wastewater	0.36	0.37	0.35	0.28	0.44
Neutralised with NaOH	1.46	1.61	1.33	1.00	2 50
Neutralised with lime	1.40	1.54	1.27	1.00	2.80

96 hr LC_0 and LC_{100} are observed values.

1009 : Rural Sanitation Pilot project.

Health status survey has been completed in the 9th project village of population 420. Enteric parasites were identified from 47.5% of the population. 59.1% of the commnnity were anaemic and 69.9% suffering from Eosinophilia.

TECHNOLOGY DEMONSTRATION

1007 : Microbial decomposition and recycling of farm and city wastes.

The investigations were divided into three parts :

i. Effect of differentially diluted raw sewage irrigation and application rates of sewage sludge with nutrient fortifications on the growth and yield of crops and soil properties.

Wheat, potato, moong, paddy and cotton were grown in the experimental fields.

Sl. No.	Treatment Particulars	Mean yield of grain (Q/ha)				
		Wheat	Potato	Moong	Paddy	Cotton
1.	Undiluted sewage	22.54	208.93	4.73	20.00	11.46
2.	Diluted (1 : 0 : 5) Sewage	26.33	246.00	4.27	27.00	17.33
3.	Diluted (1:1) Sewage	19.82	194.43	4.58	25.00	14.16
4.	Control	31.46	311.37	4.17	25.65	20.00
5.	Sewage sludge 20 tonnes/ha	26.45	180.50	3.76	19.00	20.31
6.	Sewage sludge	24.38	162.03	4.35	29.35	17.39
Standard error for mean (SE)		2.15	34.23	0.046	3.90	4.75
Critical differences (CD) 5%		4.59	72.91	N. S.	N. S.	N. S
Critical differences (CD) 1%		6.35	100.64			

ii. Effect of irrigation with untreated, treated and settled sewage at varying rates of application on the growth and yield of crops and soil properties.

Sl. No.	Treatment particulars. Irrigation water and moderate irrigation	Mean yield of grain Q/ha				
		Wheat	Potato	Moong	Paddy	Cotton
1.	Raw sewage	29.11	298.92	4.96	15.57	24.55
2.	Stabilisation pond effluent	36.72	242.92	6.14	22.49	22.57
3.	Settled sewage	34.66	247.59	5.39	18.89	22.81
4.	Tap water	25.63	252.35	5.55	21.93	22.81
	S. E.	5.45	32.51	1.98	6.70	1.52
	C. D. 5%	N.S.	N.S.	N.S.	N.S.	3.17
	C. D. 1%					4.33

iii. Effect of varying levels of BOD of irrigation water on the physiological responses of crops including the uptake of major nutrients.

Sl. No	Treatment detais/ BOD mg/l	Yield of market-able cabbage quintals/hectare	Yield of market-able bringal quintals/hectare
1.	Plant water	182.90	191 52
2.	Stabilisation pond	202.80	203.62
3.	Settled sewage/ 100-200	337.10	339.30
4.	Settled sewage + Raw sludge-I/350-450	327.40	410.60
5.	Settled sewa ge + Raw sludge-II/950-1050	266.60	413.67
	S.E (m)	18.53	19.52
	C. D 5%	40.47	42.53
	C. D 1%	56.61	59.63

1009 : Rural sanitation pilot project.

Humus samples from soakpit.

	Paunar	Burujwada
Total solids	5–10	11–15
Volatile solids	70–80	80–87
Nitrogen	0.7–5.0	3.5–4.5
Phosphates	1.5–2.7	0.3–0.5
Potassium	0.2–0 5	1.5–2.5

Values in percentages.

ENVIRONMENTAL ENGINEERING SYSTEMS

Sponsor : FCI, Talcher, (Orissa).

Fly ash generated is 250 tonnes/day, wastewater quality 350 m^3/hour. pH 3.5 — 5.0. 30% solids settled in 15-30 minutes. Suggested treatment scheme : (i) Neutralise fly ash with lime (ii) settle, (iii) secondary settling (polishing) (iv) baffle to arrest floatables (v) periodical desludging and (vi) rectangular horizontal flow.

Sponsor : Madura Coats; Koratti.

One kilogram of thread from this factory results in 283 litres of wastewater having pH 12, BOD 511 mg/l, COD 786 mg/l, SS 223 mg/l. Since the existing treatment is inadequate alum coagulation after pH adjustment followed by activated sludge process (extended aerated) was suggested. Existing lagoons can be converted to aeration basins with mechanical surface aerators.

Sponsor : Bharat Gold Mines, Kolar.

Mine water is used as raw water for processing the ores.. 540 m^3/d and 9000 m^3/d are wastewater quantities with 4200 mg COD/l and 14,748 mg COD/l, cyanide concentration is 8 mg CN/l and 36 mg CN/l. Suspended solids in slime tanks were 204, 760 mg/l and COD was due to suspended solids, which reduce on 95% on settling. Alkaline chlorination will reduce the cyanide to 0.1 mg/l.

Sponsor : Laxmi Starch, Hyderabad.

Out of various sections of the starch factory steeping section contributes 96% of BOD load. Average BOD of this section is 10285 kg (volume 180 m^3/d). Combined starch and glucose wastes contribute 1715 kg BOD/day (640 m^3/d). Two alternate treatment methods are (i) Convential activated sludge followed by extended aeration unit and polishing pond and (ii) Extended aeration unit followed by stabilisation and polishing ponds.

Sponsor : Bharat Skin Corporation, CLRI, Madras.

250 kg of skin per day produced at the factory generates 21950 l/day of wastewater. Composited wastewaters have BOD — 850-1900 mg/l, COD — 2300-5250 mg/l. Cr — 120-180 mg/l, SS — 2050-4220 mg/l. Simple settling for 4 hrs removes 65% SS and 25% BOD. Lime treatment of the settled water removes Cr and BOD remaining is 400 mg/l. Lime treated effluent treatment suggested include lime treatment followed by (i) aerated lagoon, followed by polishing pond; or (ii) oxidation ditch.

Sponsor : Government Spun Silk Factory, Chennapatna.

200 m^3/day wastewater has COD — 3680-3800 mg/l COD — 2200-2450, SS — 650-750. Nitrogen — 380-400, Phosphate — 9-10, BOD load — 440-950 kg/day. Settling experiments showed percentage reduction in BOD and SS was 30% and 58% respectively. Degumming wastes containing organic pollutants had to be seggregated and treated anaerobically. The supernatent can be treated alongwith other wastewaters in two celled oxidation ponds or in oxidation ditch followed by a polishing pond.

Sponsor : M/s Madura Coats, Ambasamudram

Major pollutants from the unit at Ambasamudram are (1) colour (2) high pH (3) high sodium concentration (4) high BOD and (5) high detergents. Laboratory experiments have shown that optimum detention time for 90% BOD removal in aerated lagoon in three days. Chemical treatment is suggested for dye-printing wastes followed by biological treatment.

Sponsor : M/s Hyderabad Asbestos, Hyderabad.

Wastewater quantity is 265 m^3/ day including sanitary sewage process water. BOD 65-220 mg/l, TDS—3000 mg/l. Proposed treatment includes oxidation ditch for sewage, settling and neutralisation of process water, recycling of treated water is suggested.

Characterisation and treatment of wastewater, M/s Hindusthan Photofilms, Ooty.

2,10,000 g/d of emulsion wash water, laboratory wash-water and whitewater in the

ratio of 28:15:2 by volume, is treated with alum and clarified in a flocculator and is then treated in aciivated sludge system whose efficiency is being evaluated.

Characterisation and treatment of textile mill waste, United Bleachers, Mettupalayam.

BOD of wastewater @ 2000 m^3 / day varies from 220 to 420 mg/l, desizing contributing the maximum. Laboratory experiments are in progress.

Evaluation of treatment plant of M/s Coimbatore Pioneer Textile Mill, Erode.

Treatment plant to treat 5000 m^3 on the basis of NEERI report was erected. It consisted of :—

i.	Holding tank	12 hr capacity	Kier waste
ii.	Neutralisation tank	4 hrs detention	Kier, desizing dyeing
iii.	Clariflocculator		
iv.	Equalisation/ neutralisation tank		Rest of waste
v.	Oxidation ditch	12 hr detention	—
vi.	Sludge drying	—	—

Treatment of wastewaters from Mangalore Chemicals & Fertilzers Ltd., Mangalore.

4 mgd wastewater are generated from the manufacture of 660 and 1030 tonnes of ammonia and urea per day respectively. This is diluted with raw water @ 400 m^3/hr and pumped into the sea. Final effluent has a pH of 8.3, Amm. – N 43 mg/l, Urea-N 2.5 mg/l. Oil and grease 8 mg/l.

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2.4.01 Effect of air pollutants on vegetation near thermal power plant.

Germination experiments were conducted with various soil and flyash mixtures (0 to 100%). The physical properties of soil changed markedly in water holding capacity and % pore spaces when compared with native soil. Flyash had high sulfates (320 mg/l) in water soluble fractions with negligible cation exchange capacity.

Seed	Native Soil	Soil : Flyash 50:50	Flyash
Tomato	70	35	10
Wheat	70	25	15
Cotton	55	30	10

2.4.02 Chemical nature of clays and its effect on coagulation doses.

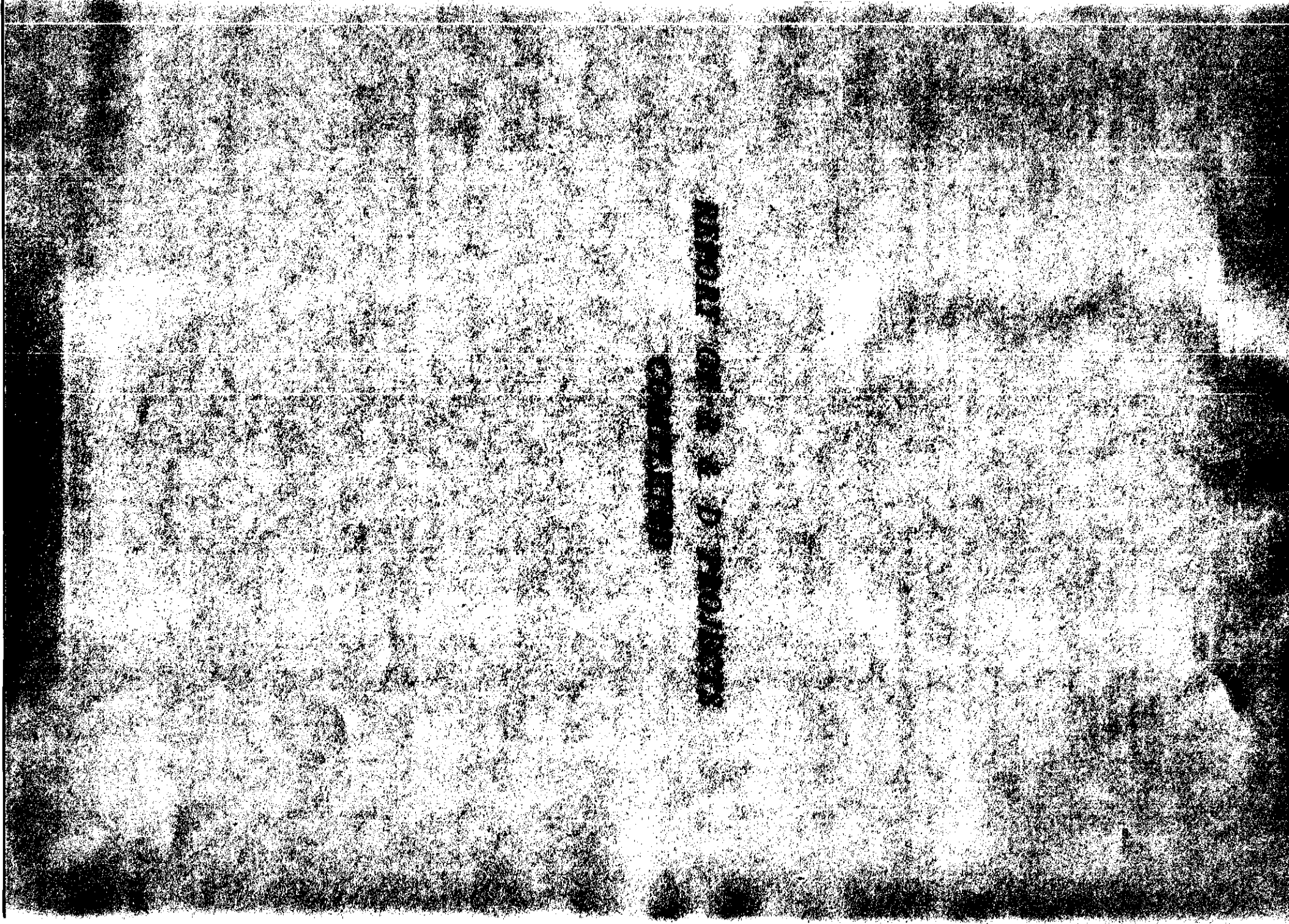
Water suspensions of particulates with cation exchange capacity (CEC) varying from negligible to 88 me/100g were flocculated with alum at different pH values. The results have shown a marginal increase in alum dose with increase in cation exchange capacity (CEC) for the same residual turbidity.

2.4.03 Preparation of activted charcoal from city refuse (in collaboration with Solid Wastes Division)

Phenol value for a chemical grade activated charcoal, petroleum coke and pyrolysed product from paper mill sludge and city refuse were tabulated as under :

	Phenol value
L. R. Activated charcoal	25
BDH charcoal for colour removal	55
Charcoal from paper waste	112
Charcoal from city refuse	250
Petroleum coke	250

Jar tests with pyrolysed product for colour and COD removal from a 10% phenolic waste and sewage have shown removal upto 98% and 50% respectively, at a dose of 10 g/l.



0309 : Microbial Aspects of Anaerobic Digestion

A laboratory scale model of anaerobic cow-dung digester was set up and maintained, (Working volume 5 lit. detention period–25 days at a loading rate of 2.6-3.0 kg/V/m^3/day) to study the micro–biological aspects of the digester. Initially, in order to isolate anaerobic micro organisms, settling of anaerobic laboratory was taken up. Facultative, aerobic and anaerobic count of the effluent slurry were tried using McIntosh and Flides Jar by pour plate technique using sodium thioglycollate medium. Since hydrogen, nitrogen and specific chemicals such as Hemin, Vitamin K were not available, further work on cultivation and isolation of anaeroaic bacteria could not progress. In order to find out the efficient working of anaerobic digester, chemical parameters such as total and volatile solids, volatile acids, pH alkalinity and gas volume were tested which indicated the efficient working of digesters.

Experiments to increase the gas production by increasing the biodegradability of lignocellulosic meterials present in cow-dung indicated that alkali treatment (2 gram of sodium hydroxide per 100 ml of slurry) could enhance the gas production as compared to control.

0310 : Correlation of Salmonella and Indicator Bacteria in Naturally Polluted Waters.

Investigation were carried out to find out whether fevers, gastro enteritis, dysentery and infectious any correlation exists between the indicator organisms like *E. coli* and pathogenic organisms like Salmonella.

River waters were used in the study. To one litre of water sample, 1 gm of diatomaceous earth was added and shaken vigorously. The contents were allowed to srand for half an hour. Afterwards, the water was centrifuged at 3000 rpm for 30 minutes at 5°C. The centrifuget was qualitatively analysed for Salmonella using tetrathionate broth. The water was simultaneously analysed for coliforms, faecal coliforms and *E. coli*.

In all 58 samples were analysed. Forty-three samples were positive for Salmonella and fifteen were negative for it. The *E. coli* count of the waters ranged from 0.5×10^3 organisms per 100 ml to 9.6×10^5 organisms per 100 ml.

The results obtained indicate that there may not be any association between the density of *E. coli* and occurrence of Salmonella in polluted water.

0312 : Toxicity Studies of Pollutants and Chemicals used in Water and Wastewater Treatment with Special Reference to Mutagenesis by Bacterial test System.

Exploratory studies were carried out to find the use of a simple bacterial test system–*Salmonella typhimurium* by means of Ame's test far detecting mutagenic and carcenogenic substances in water and wastewater.

For this study specially constructed strains of *Salmonella typhimurium* were obtained from Dr. B. N. Ames USA. Existing laboratory facilities were used in doing this work. The strains were checked through a series of experiments for their purity and specific markers they possessed. The strains were tested for their response to certain mutagens like sodium azide, 2–nitrofluorene, methyl methane sulphonate, 2N–methyl–N–nitro–N nitrosoquenidine (MNNG). Dose response curves for sodium azide and 2–nitrofluorene were tried.

To find if water contained any mutagenic or carcinogenic activity, "spot–test" was carried out using nearly 0.5 ml of chlorinated waters. No activity could be demonstrated in the

amount of sample tested. Higher volumes of waters need to be tested after appropriate concentration of organics present in it. No further work could be carried out as the strains became non-viable during storage. The bottlenecks experienced during the probe studies, i. e., proper equipment, space and storage facilities for tester strains need to be removed, before further work could be taken.

0408 : Use of Chitosan for Algal Harvest.

Chitosan, a substance prepared by CFTRI, Mysore from sea food waste material has shown high quality of flocculation of algae from sewage stabilization pond effluent. During three years' period the work was limited to probing studies to find out the efficiency of flocculation, floc character, stability of floc, qualitative effect of algal composition on flocculation and the stability of chitosan solution at room temperature. The following are the salient observations :

(a) Algal yield at an optimum level of flocculation is 10–15 times that of the weight of chitosan used.

(b) Flocculation was found to be optimum at pH 6.0 to 7.0 and the flocculation of algae is dependent on ' Chitosan ' concentration used.

(c) It was also found that a minimum level of algal concentration needed for flocculation is 60 mg/l (on dry weight basis.)

(d) It was found that if algal composition is predominantly of green algae, the flock formed has settled at the bottom. In case of blue-green algae, the flock lifted to the surface without settling.

(e) Chitosan solution kept under room temperature appeared to loose its property of flocculation. It was found that three is complete loss of flocculating ability within 36 hours.

(f) It was also found that algal sludge obtained from stabilization pond waters contain bacterial pathogens, whereas algal sludge obtained from tertiary ponds (fish ponds) do not contain any bacterial pathogens.

(g) Algal flock settled at the bottom of the container found to get disrupted on keeping it standing for overnight. Re-flocculation of such disrupted algae did not yield consistant results.

(h) Field trials of the above observation on a small scale (150 litres at a time) have confirmed the data obtained in the laboratory.

Large scale traials are essential to find out the critical levels of chitosan Vs. algal load on one hand and pH on the other hand to profitably utilize the chitosan for algal harvest.

Algal sludge thus obtained does not need any further processing to remove the additive before consumption, as chitosan being of animal origin may not have any known toxicity. Hence use of chitosan may be profitable for algal harvest and be easier in operation.

0708 : Complete Treatment of Night Soil and Utilisation of Byproducts.

The disposal of night soil from a rural or semi-urban community has posed problem of sanitation. A study on the treatment of night soil by anaerobic digestion was initiated on laboratory scale initially. Based on the results a demonstration plant was set up at Nagpur Central Prison to collect design and operation parameters for application in the field. The pilot plant is

so designed to have flexibility as well as provisions for utilization of the byproducts of digestion viz. gas, dry sludge cake and the filtrate from drying beds.

The demonstration plant had a capacity of 18 m^3 with a gas holder to contain 8.03 m^3. Digester was operated for three years at a volatile solids (VS) loading ranging from 1.4–3.5 kg VS/m^3/day and produced 336–460 litres of gas/kg VS added. Studies revealed that an organic loading of 1.6-1.8 kg Vs/m^3/d and a hydraulic detention time of 30 days were optimum and under these conditions volatile solids destruction was 45.9 $\pm$ 4.7 per cent and per capita gas production was 24 $\pm$ 1 litre/day.

Hookworm and ascaris were reduced by 70.3 $\pm$ 12.1 and 52.1 $\pm$ 16.5 per cent, respectively. The digested sludge had a capillary suction time of 336 $\pm$ 150 seconds and took 7–8 days in summer and 25 days in rainy season to dry to 70 per cent soilds on sand beds. The sludge cake on dry basis contained 3.5 per cent N, 1.0 per cent P, and 0.83 per cent K. The filtrate from the beds had a BOD around 700 mg/l and is amenable for oxidation pond treatment.

It was concluded that night soil digestion should be primarily viewed as a treatment and disposal system rather than as a biogas unit since per capita gas yield from night soil is 25 litres as compared to 370 litres per cattle. However, digestion of night soil and utilization of byproducts make the system a total recycling and disposal process for human wastes.

Field studies on the oxidation pond treatment of filtrate and fish pond studies could not be carried out for want of facilities at the site of the demonstration plant.

0715 Exploratory Studies on Mercury Pollution Monitoring

The flameless atomic absorptoin method of mercury estimation was standardised using pure mercury solution. The same was later extended to wastewater sample like the spent COD solutions, and the effluents from chloralkali plant. Recovery of mercury added to wastewater samples was 98-99.5% confirming the reliability of the procedure.

During the period, a total of 59 wastewater and 36 river water (Hooghly Estuary) samples were analysed for mercury content. The wastewater were from a drugs and pharmaceuticals manufacturing unit (6 combined wastewaters and 26 mercury bearing streams) : Ordnance Factory (12 samples) and two eachfrom a newsprint mill and a chloralkali plant. Eleven samples from a viscose rayon factory were also analysed.

Bottom deposits from the oxidation pond in the Institute campus were also analysed for mercury content. The pond receives laboratory wastewater containing mercury salts mainly mercuric sulphate. Wet digestion of sludge was resorted to convert organic mercury if any in these deposits to inorganic state. Two chlor-alkali plant sludges were also analysed.

Of the two main combined wastewater streams of the drugs and pharmaceuticals unit, all the three samples of condensate waste (floor washings) contained mercury in the range 20 to 98 μg/l. All the three alkaline waste samples did not contain mercury. The streams from the mercury recovery and washing unit showed a wide range of mercury content from 100,000 μg/l in the HCl washes of mercury to 85,000 μg/l in the acetone wash to 700 μg/l in the nitric acid was to nil in the wash water after nitric acid wash.

The Hooghly estuary showed a minimum of 0.70 μg/l at Serampore at High Tide and Kamarhatti at Low tide, both during summer survey to a maximum of 129.7/Mg/l at Kamarhatti duringw inter survey.

Data on mercury content in oxidation pond sludge showed that the mercury content at the outlet was more (33.46 μg/gm) than at the inlet 1.04/μg/gm of air dried sample, The samples at 45 cm depth at the inlet, midpoint and outlet showed increasing mercury content, increase being 1.05; 3.67 and 33.40 μg/gm of air dried samples, The mercury content of the two sludge samples from chloralkali plants was 26.4 and 29.3 mg/100 gm of dry sludge.

The range of values for Ordnance factory effluents was 0.2 μgl/l to 18.0/μg/l, nil in two samples. Similarly the Hg content in viscose rayon samples varied between 12.0 and 693.3 μg/l.

1008 Soil Wastewater Interaction

The studies were carried out for the use soils for efficient treatment and simultaneous utilization of wastewater. Experiments were conductcd in the laboratory using perspex columns, The medium was sand, clay and actual field soils which were characterised for a number of relevant parmeters.

The wastewater used was primary settled sewage. The settled sewage was made to percolate through the column under saturation condition and the leachates were characterised. The settled sewage and column leachates were analysed for pH, BOD, COD, Nitrogen, Phosphorous etc.

From the observations it was found that initially the leachates were slightly turbid. The settled sewage turbidity was in the range of 20 to 50 FTU. The initial pH of the settled sewage was slightly on acidic side (6.6-7). As the sewage percolated through the soil the pH of leachate increases to about 7.5 to 8.

Reduction in BOD was about 60% with only sand. Soils having some sand and silt tending toawards sandy loam, and clay showed about 80-85% reduction in BOD & COD. Total Nitrogen present in settled sewage was in range of 1.4 to 6.2 mg/1. Leachates showed initial reduction of 80% of N. Total phosphorous in settled sewage was found in the range of 1-9 mg/l. Leachates showed an average of 90% reduction of phosphorous.

1011 : Sewage Treatment by Biological Disc

The studies were carried out to achieve the objectives of formulating relationship amongst the treatment efficiency, organic loading, hydraulic loading rotational speed, power consumption and to evalue compact units for various treatment capacities. A biodisc pilot plant was set up with 40 PVC discs of 1 meter diameter with a clear spacing of 2.5 cms between them and rotating at 5 RPM to investigate its performance for the treatment of domestic wastewater. The disc serve to support the biological slime which grow at the expense of organic matter in the wastewater.

Raw domestic sewage was pumped from a municipal manhole to the biodisc plant. The discs were operated all the 24 hours while the flow of sewage was restricted to 8–10 hours a day. Initially the bio–disc plant was operated without a cover. Latter the chamber was covered for some period with perforated lid. The hydraulic detention period was 1.5 hours. The treated effluent was led through a secondary sedimentation tank with 1 hr. detention capacity for final discharge.

From the studies it was found that 77 to 90% reduction in BOD of the final effluent can be achieved at a loading of 20-28 gm BOD/m^2 of disc area/day for a raw sewage influent BOD_5 of 250–300 mg/l for the pilot plant under the field conditions. There was slight reduction (5%) in the

overall BOD removal efficiency of the close disc system compared to that of the open disc chamber.

Suspended solids concentration in the reactor tank was of the order of 350 mg/l. The dissolved oxygen content in the reactor ranged from 0.5 to 1.5 mg/l. Microscopic studies of slimes on discs showed mixed culture of Protozons, Rotifers, Nematodes, Algae etc. The average concentration of biomass on the discs varied from 35-78 g/m^2. Hydraulic loading rate was 0.078 to 0.090m^3/m^2/day and organic loading rate was 20.7 to 27.7 m^3/m^2/day. The power consumption was around 1.2 KWH/Kg of BOD_5 removed, which could be brought down by using a lower horse power motor drive.

1015 : Studies on Anaerobic Mesophylic & Thermophylic Digestion of Sludge (Sewage)

Laboratory experiment were set up with 2 litre working capacity of digestors. The experiments were carried on batch feeding basis of settled raw domestic sewage sludge for thermophylic and mesophlyic range. There sets of observations were noted.

The studies showed that thermophylic digestion lowers the nitrogen contents of dry elutriated solid and increases the production of gas to some extent. Volatile matter reduction in the thermophylic range was 5% to 10% greater than that of mesophylic digestion. Filtration studies of sludge showed that thermophylicaly dilute Sludge has better filtrebility. Gas generation rate in thermophylic digestion is also more as compared to mesophylic digestion.

Experiments were also conducted for thermophylic digestion of primary settled sludge for various detention time (i.e. 5 days, 10 days, & 15 days). These observations were repeated three times of each detention time on continuous feeding basis. The digesters were under observation for period of 45 to 60 days. The temperature of the digester was kept 50°C.

Toxicity studies on anaerobic digestion of primary settled sludge were also carried out. NaCl was fed to the digester in different concentration ranging from 500 mg/l to 30,000 mg/l. No significant effect was obeserved up to a concentration of 2000 mg/l total gas production. However, there was a noticeable reduction in the efficiency of digesters for higher concentration 5000 mg/l 30000 mg/l, reflecting in 20% to 60% reduction in total gas production.

1012 : Sewage Treatment by Anaerobic Contact Filter

Studies were carried out to find out the efficiency of up flow anaerobic contact filters for the treatment of domestic waste waters and develop a suitable design criteria. Anaerobic contact filter is a stone filled bed where the waste water is introduced from the bottom and flows upward. The wastewater comes in contact with the anaerobic microorganisms adhering to the stones.

A pilot plant study was carried out with a rectangular masonry box filter of dimension 1.61x1.61x1.40 meters. The filter was filled with stones of 2.5 cm to 3.5 cm diameter. The flow of sewage was maintained for 8 to 10 hours/day, Weekly samples were collected and analysed for different conventional paramater Grass filtration was used for the final polishing of effluent from the filter.

The results brought out BOD removal of 80 to 85% Suspended solid and turbidity removal of 80 to 90% and complete removal of ascaris ova. The desirable design criteria have been suggested as depth of media 1.25 to 1.6 meters of gravel or over burnt bricks of size 20mm

to 25mm, a detention time of 6 to 12 hours based on design flow and BOD loading rate of 0.2 to 0.4 kg/m³/day.

The hydraulic loading rate will be equal to that for low rate trickling filters. The influent BOD_5 concentration to filters varied from 100 mg/l to 250 mg/l. It was also observed that the filter effluent after flowing over the grass plot got partly aerated and there was further reduction of BOD to the extent of 15 to 40%. Some nitrification of the effluent was also noticed.

1106 : Studies on Working of Hammer Mills for Size Reduction of City Refuse

Studies were carried out to evaluate the performance of different hammer materials for size reduction of refuse. The components of the machine which are directly responsible for size reduction are blades, hammer blades and gratebars. These are subjected to maximum wear and tear. Thus it was found important to use blades having loanger life. Life of blades is totally dependent on the material of which they are made. Therefore, trials were planned to test the different hammer materials such as Hadfields Manganese Steel, Nihard Manganese Steel and Hichrome Nickle Steel for their suitability in the operation,

During the trials the particle size distribution was measured both before and after size reduction. The blades were placed in communiation chambers in such a way that there was equal chance for each blade in process of size reduction. After the completion of trials the blades were removed and weighed. The loss of weight for different cases is shown in the table.

Sl. No.	Description of material	Average original weight/ blade	Average reduction in weight due to wear
1.	Hadfields Mn Steel	457 gms.	24.25 gms.
2.	Nihard Steel	260.5 gms.	13 gms.
3.	Hichrome Ni Steel	427.125 gms.	10.375 gms.

From the above table it was found that the material Hichrome Nickel Steel is best suited as it showed least amount of wear. This can be due to the fact that Hichrome Nickel Steel is wear as well as corrosion resistant.

1108 Studies on Performance of Multi Chamber Heat Utilization Type Incinerator A (Retort Type Incinerator)

To understand the process of incineration, a retort type multiple chamber incinerator was designed and constructed in NEERI premises. It is a compact cubical incinerator having velocity movement in vertical as well as lateral direction. The economical capacity was upto 350 kg/hr for refuse processing. The aim was to establish specific relationship amongst the various parameters which affect the process of incineration.

For efficient incineration, the design should be in accordance with the characteristics of wastes. It decides the volume, size of different chambers, type of incinerators. etc. It also

decides the amount of auxiliary fuel required for complete combustion of refuse. An attempt was made to establish mathematical model to describe net heat available in terms of various independent variables which were responsible for the basic dimensions of the incinerator.

Present report gives detailed planning of experimentation such as formulation of dimensional equation, decision regarding the dimensionless groups (altered, unaltered) test envelops for every independent dimensionless group, selection of test points, test sequence, selection of instruments, methods for test data checking etc. The observations recorded during the test run was varied and are given in tables. The analysis of the results is also given.

The analysis of the results gives clue that there exists some more factors which affect the proecss of incineration. These may be the ratio of overfire air to underfire air and to secondary air. Improper selection may result in incomplete combustion. Thus this ratio must be in the proper range for the complete combustion at higher temperature.

Turbulance caused due to underfire air may not be sufficient to mix up the charge with air. For this, the mechanical raking is necessary. There should be better draft control arrangement so that there will be more flexibility in the control of addition of excess of air, This is necessary as the combustion reaction is not uniform because of the heterogeneous nature of refuse.

1111 : Studies on Cellulose Degradation and Mineralization of Nitrogen During Aerobic Composting.

Composting involves microbial degradation of organic matter. Studies were carried out to find out optimum temperature for cellulose degradation and cellulase activity, effect of temperature on mineralization of nitrogen and effect of temperature on ammonification.

To study the cellulose degradation, cellulose activity and nitrogen mineralization, city refuse and blow room cotton dust were used. The composting was carried out on a laboratory scale model. Temperature of composting mass was maintained at the desired level by keeping the drum in a constant temperature circulating water bath. These expriments were carried out on both materials at 30^0, 40^0, 50^0, 60^0 and 70^0C. Samples were taken after thorough mixing of composting mass.

From the observations it was found that —

(i) Cellulose degradation was maximum at composting temperature between 30^0-50^0C.

(ii) It was also seen that the cellulase activity was inhibited at temperature above 70^0C.

(iii) Maximum ammonification occurred in the range of 60^0 - 70^0C.

(iv) Maximum nitrification occured between 30^0 - 40^0C.

(v) The maximum amount of gaseous ammonia was observed at 50^0C.

(vi) The exchangeable ammonia was maximum at 60^0C.

1401 : Performance of Defluoridation Plant of 2273 M^3/D Capacity Incorporated into the Water Supply Scheme at Kadiri, Anantpur Dist., Andhra Pradesh

A process for removal of fluoride developed by the Institute comprises of lime and alum. The doses depend upon F. conc. and alkalinity.

Sampels were collected and tested for pH, basicity, sulphates, conductivity and fluorides. Fluorides concentration varied from 4.1 to 4.8 mg F/l. The treated water fluoride ranged between 0.40 and 1.50 mg F/l with an average range of 0.70 - 1.20 mg F/l. The alum dose requirement worked out as 494 mg/l. It was found that the defluoridation plant based on NEERI know-how (Nalgonda Technique) could effectively remove fluorides from Kadiri water supply scheme. The cost per m^3 water will be Rs. 0.53 without defluoridation and Rs. 1.15 with defluoridation.

1404 : Split Coagulation Package Water Treatment Plant.

Based on the laboratory studies on effect of split treatment with alum using Kanhan river water and laboratory jar test machine, a split coagulation plant was conceived. A plant was installed with alum as the treatment chemical. The plant comprised of flocculation and sedimenta- in two stages.

The coagulant applied in first flocculator varied from 27 to 59 % of control jar tests and from 20 to 45% of water works. The coagulant applied in second flocculator was between 13 and 23% of control jar tests and from 10 to 18% of water works.

At an average flow of 5.45 m^3/h, the increase in power consumption was equal to 0.60 watt/h (m^3 flow). As compared to this, the saving in alum accrued was 7 to 54 kg/per 1000 m^3 water (the increased powor consumption worked out as 600 watts per 1000 m^3 water treated).

Due to the split cogulation treatment, the savings in alum correspond to 32 to 73%. Higher savings are anticipated at higher turbidity values. The plant operated satisfactorily at 50% over load, i. e. 6.7 m^3/h.

1410 : Monitoring of Deleterious Substances in Drinking Water (Lead & Cadmium).

The project was initiated by WHO and the task was entrusted to WRC, Medmanham Laboratory, London, UK. Different countries participated in this project and NEERI was the participating laboratory from India. The first objective of the project was to formulate a general procedure for monitoring the amount of lead & cadmium present in urban water supplies in different countries of the world. It was based on atomic absorption spectrophotometry. The method involves complexing lead and cadmium with ammonium pyrolidine dithiocarbonate (APDC) at pH 2.5 $\pm$ 0.2 and extracting the metal complex with methyl-isobutyl ketone (MIBK) for atomising in the AAS. This method was standardised and the results of AQC experiments were sent to WRC. The other objective was to initiate an experimental monitoring programme based on the formulated general procedure. For this water samples were collected from the household taps from different locations of Nagpur city. Sampling was done in two stages-a) the first flush was collected in the early morning hours, and b) the tap water was allowed to flow for ten minutes and then collection was made. Lead & cadmium were estimated by the analytical procedure formulated as indicated above. It was observed that the first flush samples always contained higher amounts of lead & cadmium, although they were below the permissible limit laid down for these deleterious metals. The study will help in evaluating the suitability of the (APDC-MIBK) procedure for monitoring of lead and cadmium in drinking waters.

1417 : Development of Small Scale cake Filters (Porous cake Pressure Filter) for Water Filtration Study of Parameter.

Studies were carried out for the development of the filter aid for replacement of diato-

mite. Availability, low cost and performance were criteria for developmental efforts. Materials such as compounded clays, minerals, cellulose, french chalk, locomotive engine ash, cow-dung ash, etc. were tried. This resulted into development of Filter Aid FA-1, FA-2. Futher work resulted into development of Filter Aid FA-5. Performance of FA-5 was studied and found to be a satisfactory substitute to diatomite filter powder for pressure water filtration.

FA-5 is a carbonaceous filter powder processed from wood charcoal. Experiments were set up to study the parameters such as weight of precoat of filter powder per unit area of filter septum, flow rate and terminal headloss.

Filter Aid FA-5 processed from wood charcoal powder was found suitable for small scale cake filters. Optimum weight of precoat was observed to be 1080 $\pm$ 10 g/m^2. Increased raw water tubidity did not influence the filtered water turbidity beyond 5 NTU. Flow rate of 2.2 m^3/(h) (m)^2 was found to be optimum. Pressure filtration with increased flow rate was found possible. Terminal headloss of 2.8 kg/m^2 was found to be optimum. Back washing was not satisfactory with increased terminal headloss. Soaking of the filter powder for 5-10 minutes was observed to be essential for uniform cake function.

Filter Aid FA-5 was observed to be effective in water filtration upto the terminal headloss of 3.0 kg/cm^2. The filters using FA-5 as a filter medium give water with turbidity below 5 NTU when raw water turbidity is upto 200 NTU.

1419 : Study of Filter Efficiency of Filter Aid FA-5 and Diatomaceous Earth Filter Aids with Reference to Bacterial Quality of Water.

Cake pressure filtration of water with diatomaceous earth filters was reported to remove bacterial load. These studies were mostly made on laboratory filters (0.0929 m^2, filter area) and polyelectrolyte coated filter aids.

Development of FA-5, a carbonaceous filter aid processed from wood-charcoal generated over-all interest in cake filters for water filtration. FA-5 was observed to reduce the filtered water turbidity to below 5 NTU in the investigations conducted prior to these studies. Bacteria removal efficiency of FA-5 was to be ascertained for field applications. Use of coated filter aids or chemical treatment of raw water prior to filtration might pose problems in field application of these filters.

Experiments were conducted with FA-5 and a few diatomaceous earth filter aids to study the coliforms removal. Filtration of raw water with turbidity 570 NTU and coliform counts ranging between 5.4×10^2 and 2.5×10^4 per ml was possible with reduction in coliform counts. FA-5 and celite-505 gave about 90% reduction but filtrate was not free from organisms. Increased raw water turbidity increased coliforms removal. Coliforms removal was increased with all the filter aids when the flow rate was decreased from 1.95 to 1.0 m^3 / (m^2) (h). Filtrate free from organisms could not be obtained even at raw water coliform level of 2.0×10^2 per ml.

1421 : To Develop Know-how for Product P. Dichloro Sulphonamide Benzoic Acid for Disinfection Tablets.

P-dichloro sulphonamide benzoic acid is commercially known as 'Halazone'. Halazone tablets are widely used for disinfection of water particularly in armed forces. These tablets are imported at present.

The studies were undertaken to evolve a process for p-dichloro sulphonomide benzoic acid production as import substitute. The product was produced in laboratory and tested for titrable chlorine. It gave extremely satisfactory results. Hence the product was tabalated and tested for bactericidial effectiveness. The results of bacteriological examination revealed a poor outcome. Although the tests indicate chlorine availability chemically, the chlorine is not useful for disinfection purposes. A new approach in the process of development of 'Halazone' is contemplated in the 2nd phase.

1422 : Serpentine as a Medium for Removal of Phosphates and Nitrates.

While studying the effect of phosphates on the coagulation of turbidity, it was observed that the mineral serpentine removes both filterable and total phosphates from aquatic systems, because it has a high affinity for othophosphate and condensed soluble phosphate. Column studies with 30 cm bed height and 100 ± 25 $(m)^3/m/day$ loading rate revealed a phosphate removal capacity 1.201 kg/m medium at 0 to 0.5 mg phosphate per lit. residual and 1.5 kg phosphate per cu. met. at 1 mg phosphate residual. However, the studies conducted on jar test and column did not indicate any nitrate removal.

1423 : Chlorine-Ammonia Treatment of Rural Wells.

Free chlorine does not remain in solution for longer time. Ammonia combines with chlorine to form chloramines which retain the chlorine in water for a longer time. The evaluation of this phenomenon was carried out by studying present molar proportions of chlorine to ammonia from 3:1 to 1:4. It was observed that with 3:1 molar proportion, chlorine concentration did not last even for an hour. However, proportions 1:3 and 1:4 gave good results and chlorine concentration lasted longer than chlorine alone. The bacteriological effect was also satisfactory.

1425 : Development of Ion Selective Electrode Technique (Phase I)

Analytical studies were carried out with wide range of ion-selective electrodes using micro-processor based multivoltameter (Orion's Microprocessor Ionalyser, Model 901). The utility of this meter in the concentration, blank, known addition, known subtraction, analate addition, analate subtraction modes was tested for analysis of water samples and the results obtained were found to be of acceptable accuracy and precision. The different electrodes included in the studies were ammonia, cadmium, copper, cyanide, fluoride, iodide, lead, nitrate, redox, silver sulfide and water hardness. The studies were also carried out to make use of the electrodes for some ions for which sensing electrodes are not available. It was found possible to measure residual chlorine and mercury (II) by iodide electrode and sulfate by lead electrode.

A detailed study was carried out to standardise the general conditions of operations procedure which include conditioning and storage of electrodes, electrode equilibration, effect of stirring, temperature effects, choice of solvent media, optimum solvent composition, limit of detection, interference of cations and anions and procedure for their elimination was also worked out.

1426 : Application of IR Spectroscopy and Gas Chromatography in Water Analysis.

Infrared (IR) spectroscopic method was studied for the estimation of pesticides in water samples. Studies were carried out using Infrared spectrophotometer-Perkin Elmer Model 237. IR

spectra of DDT in carbon disulphide medium was studied in detail. The precision and accuracy of the method has been evaluated. Gas chromatographic method for the estimation of pesticides (chlorinated hydrocarbons) in water samples has also been standardised in the laboratory. Pesticide residue analysis consists of following steps : i) sampling, ii) extraction of the residue from the sample matrix, iii) removal of interfering co-extractives ('clean up') and iv) identification and estimation of the quantity of residue in the cleaned up extract, usually at very low levels (e. g., 10^{-9} to 10^{-12} gms for gas chromatography). A survey of drinking water sources have been, made to study the levels of pesticides. Pesticides determined in these samples were lindane, aldrin, dialdrin, p, p'-DDT and p, p'-DDE.

1428 : Trace Elements at Various Stages of Municipal Water Treatment Plants in Nagpur.

The study was undertaken to determine the levels of trace elements at vaious stages of treatment in four water works located in and around Nagpur city of Maharastra State. These were i) Kanhan water works, ii) Gorewara water works, iii) Ramtek water works, and iv) Vena water works. The main ojective of the study was to characterise the raw water sources of these water works for dissolved mineral constituents with special reference to trace elements. The trace metals studied were arsenic, cadmium, chromium copper, iron, lead, manganese and zinc. Seasonal variations of the trace elements were studied in all these water works. In addition to this, variation in pH, conductivity and tubrbidity were also measured. Observations were made over a period of 3 years from 1978 to 1980. The study demonstrated the changes in the mineral character of the waters that results from geo-chemical alterations, chemical treatment, filtration and storage process in water treatment plants.

1433 : Water Softening by Precipitation and Ion Exchange.

Softening of water was carried out using ion exchange resins in a domestic water softener having 225 mm dia × 700 mm height. The softener contained 450 mm depth of cationic resin brought on sodium cycle. In the first batch raw water with 150 ± 10 mg/l hardness (as $CaCO_3$) was passed at the rate of 100 ± 20 l/h flow rate. The treated water had 0.8 to 1.1 mg/l hardness and 8.54 m^3 to 9.5 m^3 of treated water was obtained between successive regenerations. The resins were regenerated using 4.0 kg common salt. In the next batch raw water with 250 mg/l hardrness was passed at the rate of 70-78 l/hr to get water of 1.3 to 1.6 hardness. Total quantity of water that can be treated was between 5.3 to 5.76 m^3/regenenration. The speciality of plant is that the softener is simple and can be used by unexperienced persons.

1434 : Further Studies on Activated Alumina (AA) as Defluoridation Medium

Indigeneous availability of grannular activated alumina revived interest in its use as defluoridation media. Studies using 50 mm and 100 mm diameter columns were carried out. In 100 mm column 10 litres of activated alumina was packed while in 50 mm $2\frac{1}{2}$ liters was packed. Effect of 200, 400 and 800 mg/l of alkalinity as $CaCO_3$ in raw water, on the fluoride removal capacity of activated alumina was studied. Aftet exhaustion of bed the activated alumina was regenerated with sulphuric acid. Initial concentration of fluoride in raw water studied was between 4.3 and 5.5 mg F/l. Cycle was terminated at leakage of 2.0 mg F/l. The flow rate was maintained at 5.0 m^3/m^2 (h). Total 40 cycles each of the stipulated alkalinity levels were studied. The study indicated that the fluoride removal capacity depends on initial alkalinity of raw water. As the number of cycle progressed, a fall in fluoride removal capacity was observed.

6.7.02 Treatment of Vegetable Tanning Effluent by Anaerobic Contact Filter Process : Effect of Ionic Load on Its Efficiency

It has been reported in literature that excessive ionic load in a wastewater impairs the efficiency of anaerobic treatment system when subjected to it. The objective of the study, therefore, was to assess whether the ionic concentration with special reference to chlorides, available in live tannery wastes adversely affects the aeaerobic contact filter process. Ionic loadings in terms of chlorides ranging between 3200-5000 mg/l are available in live waste and were tried. Total estimated ionic concentrations corresponding to aforegiven chloride loadings were recorded to be 6500-11500 mg/l. Batch feed system was adopted keeping the retention time as one day.

Even at the highest loading in terms of chlorides, i.e. 5000 mg/l, average per cent removals in terms of COD, BOD and Tannin respectively were recorded as 94 6, 95.0 and 86.1. The percent removals are comparable to those tried earlier by eliminating soak liquor from the feed. It can, therefore, be concluded that the efficiency of the anaerobic contact filter is not impaired at least upto a chloride concentration of 5000 mg/l, the corresponding total estimated concentration (TEIC) being 11500 mg/l.

SP : Treatment of Wastewaters From Synthetic Drugs Plant of IDPL, Hyderabad

An exhaustive inplant survey was conducted and the sources of critical vessels i.e. those whose contents were known to contain toxic and/or heavy metal compounds were identified. The effluents from 23 such vessels and the three main effluents viz. the acidic, alkaline and condesate wastes were characterised for their pollutional parameters and load.

COD : BOD ratio of alkaline and condensate wastewaters as also a 1:1 mixture of alkaline and condensate wastes showed that the wastes are amenable to biodegradation. Batch scale experiments with the two wastewaters., viz. alkaline and condensate showed that upto a concentration of 25% for alkaline and 40% for condensate waste, the BOD removal was about 99%

In a completely mixed activated sludge system, a 1:1 mixture of alkaline + condensate waste gave a reduction of 98% in BOD at a loading of 0.2 kg. BOD/kg MLVSS/d.

Based on the inplant survey and the loboratory data, following modifications of the existing facilities and erection of some treatment units has been suggested :

i) The existing biological trickling filter will treat only the condensate wastes to the maximum extent possible.

ii) The balance of the condensate wastes with the alkaline wastes in 1:1 ratio are to be treated by A.S. Method.

iii) Modifications of the existing drying beds for the neutralised acid waste sludge to achieve better dewatering of the sludge have been suggested.

iv) Neutralised acid waste effluent may be mixed and treated in the A. S. System when effluent standards become more stringent.

SP : Effluent Treatment of Coffee Pulping Units.

Coffee pulping units big and small are located in the plantation areas of Southern India for processing coffee seeds from the fruits. The coffee pulping units work for about 2 to 3 months during the period of November to February. The pulping units work for $\frac{1}{2}$ to 2 hrs. a day in case of arabica fruits and 2 to 4 hours in case of robusta seeds.

About 10,000 gallons of water is required per tonne of finished coffee. The wastewaters let out from the general coffee pulping unit using fermentation process include wash water along with the skin in the pulper, drained water from the seeds and wash water from fermentation operation in fermentation process. The wastewater let out from the coffee pulping unit using aqua pulper include wash water along with skins from the pulper, wash water from the aqua pulper, seed wash water after the aqua pulper. During normal working of the pulpers at CCRI, the wastewater discharged from the pulping units was about 40 to 60 m^3/day in the case of arabica fruits and 50 to 60 m^3/day in the case of processing robusta fruits. The BOD of the combined wastewaters from processing arabica fruits varied from 2000 to 4000 mg/l and the BOD from processing robusta fruits varied from 2000 to 5000 mg/l.

Three treatment alternatives have been suggested out of which first two alternatives deal with relatively big pulping installations processing about 1/10 of clean coffee seeds per day. The third alternative has been suggested for relatively small units. Alternative I consists of equalisation tank, anaerobic lagoon followed by extended aeration system, clarifier and sludge drying bed. Alternative II consists of equalisation tank, anaerobic lagoon, followed by polishing ponds. Alternative III consists of screens, anaerobic lagoon followed by anaerobic contact upflow filter and polishing pond.

The treated effluent is expected to be discharged into natural water course.

SP : Utilization of Pulp and Paper Mill Wastewater for Agriculture.

Studies were carried out to evaluate on field scale, the feasibility of using the anaerobically treated pulp mill waste water for agriculture. The treated effluent falls under the group C_3S_1 which could be used on coarse texture soil. Only salt tolerant crops can be grown. The studies included the effect of effluent on i) germination of a variety of crops and post-culture experiments ii) Macro and micro plot experiment in the field and iii) demonstration field experiment.

Lysimeter studies were undertaken to evaluate the effects due to continuous use of the effluent for crop irrigation. In field studies each plot of soil was irrigated with the effluent for 6 crops seasons during 3 year period to evaluate the changes in physico-chemical characteristics. The data revealed the following ranges of different parameters–pH 7.6–8.9, EC 2240–2600 micromhos/cm, RSC 4.2-10.0 meg/l, SAR 9.5–15.2 meg/l chlorides 7.9–11.2 meg/l, BOD 131–221 mg/l, and COD 1102–1181 mg/l.

Studies also revealed that although the effluent falls under C_3S_1 class of irrigation water it can suceessfully be used for crop irrigation on coarse textured soils. Salt tolerant crops like wheat, Barley, Maize and banana can be raised with the effluent irrigation. Wheat HDM-1593 proved to be well suited for effluent irrigation. Maize gave higher yield with effluent as compared to control. In the case of sugar-cane sucrose content was 2.0% less in the effluent plot as compared to plain water. Among the crops tested, ground-nut and gram were found not suitable.

Physico–Chemical changes in irrigated soils indicated that there was an increase in electrical conductivity. The exchangeable sodium percent value showed a gradual increase. There was nearly 9% increase in organic matter of the soil receiving effluent. The ESP has risen from 5.2 to 40. The lysimeter studies showed that the percolate was sparklingly clear and colourless with D.O. content of 4.5 mg/l. It did not exert any BOD and showed a maximum COD value of 50 mg/l. The soil retained the colour due to lignin, removed the high COD in the effluent and, thus, helped in reducing the pollution.

SP : Treatment and Disposal of Wastewater from the Titanium Dioxide Pigment Plant of the Kerala Minerals and Metals Ltd., Quilon.

Studies were undertaken for suggesting suitable treatment and disposal methods for the proposed Titanium Dioxide Pigment Plant based on ilemenite deposits. The three major process sections, viz., ilemenite benefication, acid regeneration and pigment production plants together are estimated to produce wastewater amounting to about 3600 m^3/day. The wastewater will be highly acidic in nature with a pH of about 2 and is expected to contain about 2.25% of total solids, 5800 mg/l of chlorides, 3700 mg/l of iron, 40 mg/l of trivalent chromium and 1.8 mg/l of zinc. The pollutants are mainly inorganic constituents. Laboratory studies on simulated combined wastewater by treating with lime showed that most of the metallic compounds could be removed to the tolerance limit. Assessment of the impact of wastewater disposal on the surrounding land or water has been made. Two alternatives have been suggested for treatment of the combined process wastewater. Equalisation, lime treatment, clarification followed by polishing the supernatant in the pond has been suggested as one alternative. In the second alternative, the wastewater after equalisation and lime treatment has to be taken to a settling pond. The clear supernatant overflows to a polishing pond from where the same is disposed off to the water course. Semi detailed engineering drawings, showing treatment flowsheets, treatment units and design details were furnished.

SP : Feasibility Studies on Treatment of Water for Augmentation of Water Supply of Ahmedabad.

The municipal Corporation of Ahmedabad intended to commission a water treatment plant of 590 mld to augment water supply to the city. Characterisation studies of raw water quality with seasonal variation, column settling analysis for plain and flocculant settling and jar test to establish optimum alum dose were carried out. Similarly, filtration studies using different sand media with plain settling tank, flash mixer and clarifier were also undertaken. Pilot filters were run on constant rate, declining rate and also direct filtration without pre-treatment. Backwash water and sludge were studied to find out suitable sludge disposal method and feasibility of recycling of backwash water.

Suitable design criteria, treatment specifications and flow sheet for the proposed water treatment plant were evolved. The flowsheet consists of pre-chlorination unit, flash mixer, clarifier incorporating the unit operations of flocculation and sedimentation, rapid sand filters, and post-chlorination unit. Holding tanks for backwash water storage and earthen lagoons for sludge need to be provided.

Studies on raw water, bypassing the plain settling tank and as well as with plain settling have given a logical conclusion in selection of treatment taking into account the cost analysis, i. e., capital, operation and maintenance costs. Therefore, it may not be necessary to have a plain settling tank.

SP : Treatment and Disposal of Effluents From the Fertilizer Complex of FACT, Cochin

Inplant survey, characterisation and treatability studies on the wastewaters discharged from M/s Fertilizer and Chemicals, Travancore (FACT) Ltd., Cochin, were carried out. The factory manufactures urea and complex NPK fertilizer under Phase I and II plants respectively. Phase I of the factory consisting of ammonia and urea plants discharges its wastewaters of about 500 m^3/hr with ammonical nitrogen of 1528 mg/l, urea 2000 mg/l, arsenic 1.35 mg/l and hexavalent chromium 1.2 mg/l in the effluent. Phase II plant comprising of phosphoric acid and NPK

granulation plants discharges wastewaters between 450-500 m^3/hr with 1278 mg/l fluorides and 460 mg/l orthophosphates from the phosphoric acid plant and ammonical nitrogen of 578 mg/l, soluble orthophosphates of 1760 mg/l and fluorides of 236 mg/l from the NPK plants.

Based on the various treatability studies and information collected, treatment flowsheets have been recommended for phase I and II separately. Two alternatives have been suggested for phase I. Alternative I envisages air stripping of ammonia through a stripper and the stripper effluent containing ammonia of about 100-200 mg/l is proposed to be treated in the existing ammonia strippers for further removal before its final disposal. In alternative II, it has been suggested to install a high pressure urea hydrolyser-cum-stripper to handle the entire wastewater from the ammonia and urea plants. The cooling water blowdown will be treated by reduction and precipitation method for chromium removal. Arsenic wastewaters from the vetrocoke system shall be collected and stored in R.C.C. tanks, concentrated, filtered and returned to the system.

Wastewaters from phosphoric acid plant under Phase II is proposed to be treated in two stage lime treatment for removal of fluorides and phosphates. The NPK wastewaters will be treated in single stage lime reactor for precipitation of phosphates and fluorides. The clear effluent containing ammonia is strippered in a cooling tower type stripper. The wastewaters discharged from different sections after treatment shall be neutralised before led into the water course. It has been recommended that the byproduct phosphogypsum should be utilised for production of materials of commercial valh e such as cement, plasterboard, bricks, etc.

SP : Treatment of Wastewater from Synthetic Organic Chemical Industry (HOCL, Rasayani) Manufacturing Amino and Nitrophenols, Nitro and Chloronitro Aromatics

Studies were undertaken to establish the pollution potential of different wastewaters and their treatability and to develop a suitable methods of treatment and disposal. Flow of wastewaters from different units manufacturing meta-amino-phenol (MAP), Resorcinol (RR), Para-nitro-phenol (PNP), (Dinitrobenzene) (DNB) and nitroducts after extraction (RNP) were studied. It was also noticed that sanitary wastes and canteen wastes are mixed with factory waste. Characterisation of wastewaters was undertaken. Data on the identification of organics present in MAP, PNP, RR and DNB wastewater has been collected.

The BOD/COD ratios of individual wastewater revealed that except DNB wastewater all are having ratio of more than 0.3 and as such are amenable to biodegradation.

A method for neutralisation of MAP and PNP wastewaters and simultaneous sulfite removal from RR wastewater has been developed. The combined wastewater after sulfite removal was found to be biodegradable and flow sheets were developed. Bioassay studies were conducted on samples of wastewaters and treated effluents to study the toxicity.

Based on the studies it has been suggested that wastewater be treated by extended aeration activated sludge process. Activated carbon adsorption of the raffinate from nitro products before mixing it with other wastewaters for biological treatment is expected to bring down the COD and toxicity within the desired limits.

Unit size, specifications and estimated capital cost for sulfite removal have been presented.

SP : Pilot Project on Preventive Maintenance of Water Distribution System at Surat.

The work has been carried out to study the preventive maintence of water distribution system which comprises wastage of water, monitoring and detection of leakage of distribution pipes, insitu measurement of per capita water supplies, pressure and flow of hydraulic resistance, cleaning of interior of pipe line, random assessment of tap water quality.

Three pilot zones were selected for carrying out the pilot project on leak detection and control as well as on other aspects of preventive maintenance of distribution system. The programme of field studies consists of detailed preparatory work including house to house collection of statistics regarding population, house service connection, etc., alignment of pipelines and valves, checking & replacement of valves, stopcocks, hydrants etc., provision of bye-passes for hydraulic isolation of zones, waste flow test, leakage detection and control etc. For cost inventory, assessment of control measures, introduction of flushing and swabbing technique for cleaning the interior of pipelines and random water quality monitoring.

It was observed that the leakage in distribution system occurs in the burried pipelines, mainly in house service pipes due to corrosion of underground pipelines. The field determination of hydraulic capacity of two supply trunk mains showed 'C' values. Some of the house service pipes are laid just below the house drainage pipes. There is every possibility of seeping of wastewater.

Recommendations such as continuing the same programme repeatedly, supervision on connections of house service pipes, improvement to hydraulic capacity and quality of interior of pipes by scientific flushing with water, use of polyurethane foam swabs, mechanical cleaning and cement lining of interior, conditioning of water quality, etc. are made,

SP : Treatment and Disposal of Wastewaters from Ossein and DCP Plant of M/s Kerala Chemicals and Proteins Ltd. Kothikudam.

M/s Kerala Chemicals and Proteins Limited promoted by Kerala State Industrial Development Corporation in collaboration with M/s Nitta Gelatine Co. Japan is located at Kathikudam near Chalakudy in Trichur District of Kerala State. The installed manufacturing capacity of the plant is 2210 tonnes of ossein and 4250 tonnes of diacalcium phosphate per annum. Wastewater let out from the plant is being led into settling tanks followed by lagoons. The existing treatment system seems to be inadequate to meet the standards laid down by Kerala State Board for Prevention and Control of Water Pollution.

The project work involved critical evaluation of the existing treatment and disposal system, characterisation of wastewater streams and combined wastewater, laboratory treatability studies, preparation of alternative treatment flow sheets design aspects including semi-detailed engineering drawings, functional specifications and approximate cost estimates. Two treatment alternatives have been suggested taking into account the modifications of the existing treatment. Alternative I provides for screen use neutralisation, aerated lagoon followed by polishing pond. Alternative II provides for screening, neutralisation, oxidation ditch (extended aeration system) followed by polishing pond. The treated effluent is to be discharged into Chalakudy river.

SP : Treatment and Disposal of Wastewaters from M/s Ambuja Petrochemicals Ltd, Patancheru

M/s Ambuja Petrochemicals Ltd. are putting up a modern pathalic anhydride plant at Patancharu, Hyderabad based on feed stock orthoxylene. They have appointed M/s Engineers

India Ltd. as their consultants, who have acquired the process know-how from M/s Aluswisse Ltd. Switzerland. The main raw material used in the process is 'orthoxylene'. The main plant consists of the following sections :

i) Oxidation section
ii) Desublimation and recovery section
iii) Purification section

NEERI has prepared a treatment flowsheet and the design details for treating the wastewaters emanating from the various process units. These are based on the characteristics of wastewaters furnished by M/s Ambuja Petrochemicals Ltd. In addition, the characteristics of wastewaters of similar existing plants were also considered. A separate tank will be provided for oil and grease removal. Since the final effluent pH is expected to be 5.5 to 9.0 it is felt desirable to skip the construction of the neutralisation pit for the DM plant. The treatment flowsheet consists of neutralisation section at demineralisation plant, screens and grit chamber oil separetor, nutrient addition arrangement, oxidation pond followed by a fish pond at treatment plant site.

SP : Baseline Water Quality Study of the Hooghly Estuary

The studies were carried out to assess the pollution of the Hooghly and of other water sources in the region. Survey was carried out covering summer and monsoon period at the six sampling stations, in 100 km stretch of Hooghly estuary for chemical biological as well as bacterial parameters. Wastewater characterisation from six tanneries was also carried out.

It was observed that the turbidity value in all six sampling stations were much low during summer (40-118 SiO_2 units) compared to mansoon period (410-1110 SiO_2 units) but the dissolved solids, electrical conductivity, total alkalinity and Chlorides were lower during monsoon than in summer. The dissolved oxygen value ranged from 4.9 to 7.9 mg/l.

There had been no significant change in BOD value. The decrease in chloride and the increase in DO may be due to continuous discharge of untreated domestic and industrial wastewaters all along the stretch.

The bacteriological quality of water was unacceptable both for bathing & raw water for public water supply. The coliform count was $8.9x10^3$-$4.3x10^5$ MPN/100 ml. Most of these water samples were positive to salmonallae. The planktonic population was considerably increased.

Analysis of water showed that copper and lead were below ISI limits. Chromium limit of 0.05 mg/l was exceeded at many stations. Mercury content of water samples was higher during winter than during summer. Analysis of toxic and heavy metals in bottom deposits showed that concentrations were correlated to discharges of specific industrial wastes around the stations. Wastewater characterization studies showed that the values of BOD, COD and suspended solids were in the range of 75-1900; 691-8640; and 270-1030 mg/l respectively while pH varied between 4.5 to 9.3.

SP : Development and Evaluation of Surface Aerator.

Field studies on the development and evaluation of surface aerators under different condi-

tions of blade sizes and shapes, depth of immersion of blades and rotational speeds were carried out. Aerator performance was evaluated by the non-steady state reaeration test. Using this test procedure it was found possible to plot oxygen deficit against time and determine the overall oxygen transfer coffiecient value (KLa), knowing the KLa value and input power to the aerator, the oxygenation efficiency of the aerator can be computed.

With 5 HP motor and reduction gear, the 90 cm aerator was field evaluated and the oxygenation capacity of the rotor was found to be 1.53 kg of oxygen/kilowatt hour of gross power input. The 90 cm aerator in an aeration basin of 13·4 cm × 13.4 cm with liquid depth 2.4 cm the mixing characteristics of the aerator was not satisfactory.

The horse power requirement for driving the 90 cm rotor was found to be less than the installed capacity of 5 HP motor. Hence, it was recommended that this aerator can be field evaluated with 3 HP drive. The modified aerator with 6 blades fitted to the drive assembly of 15 HP motor with reduction gear gave marginally better performance with reference to oxygen transfer efficiency 1.62 kg/kwhr compared to the original one with twelve blades (both having same surface area).

APPENDICES

APPENDIX - I

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NEERI, Nagpur.

APPENDIX - III

SPECIAL REPORT

Thirty four Special Reports on Institute's R & D Projects, Sponsored research and Consultancy assignments were brought out :

Sl. No.	Title	Sponsor
1.	Commissioning of Wastewater Treatment Facility at Coal Chemical Complex at Naspur, (Andhra Pradesh)	Regional Research Laboratory Hyderabad and Coal Chemical Complex, Naspur (Andhra Pradesh).
2.	Air Pollution Survey for Calcutta and Howrah : April 1978 to march 1979.	Calcutta Metropolitan Development Authority, Calcutta (West Bengal).
3.	Serpentine as a medium for removal of phosphate and nitrate	Institute Project.
4.	Treatment and disposal of Wastewaters.	M/s Laxmi Starch Ltd., Hyderabad (Andhra Pradesh).
5.	Utilization of Pulp & Paper Mill Wastewater for Agriculture.	M/s Orient Paper Industries Ltd., Amlai (Madhya Pradesh).
6.	Remodelling of Sewage Treatment System of Hyderabad.	Municipal Corporation of Hyderabad (Andhra Pradesh).
7.	Studies on Treatment of Water for Augmentation of Water Supply of Ahmedabad.	Municipal Corporation of Ahmedabad (Gujarat)
8.	Treatment & Disposal of Wastewater from the Titaniumdioxide pigment plant.	M/s Kerala Minerals and Metals Ltd., Quilon (Kerala).
9.	Treatment & Disposal of Effluents from Fertilizer Factory of FACT, Cochin.	M/s Fertilizer & Chemicals Travancore Ltd., (FACT) Cochin Division (Kerala).
10.	Treatment & Disposal of Wastewaters.	M/s Hyderabad Asbestos Cement Products Ltd., Hyderabad (Andhra Pradesh).
11.	Development, Modification and Standardisation of Analytical Methods for Deleterious Substances.	Institute Project.
12.	Air Pollution Survey : Calcutta and Howrah (Jan. 1976 & March 1977)	Calcutta Metropolitan Development Authority (CMDA) Calcutta (West Bengal).
13.	Air Pollution Survey : Calcutta and Howrah (April 1977 to March 78).	—do—

1	2	3
14.	Characteristics & Treatment of Wastewater from Government Spun Silk Factory, Chennapatna.	M/s Karnataka State Board for the Prevention & Control of Water Pollution Bangalore (Karnataka).
15.	Treatment of Wastewater from Bharat Gold Mines.	M/s Bharat Gold Mines Kolar (Karnataka).
16.	Treatment of Wastewater from Textile Mill of Madura Coats Ltd.	M/s Madura Coats, Ambasamudram (Tamil Nadu).
17.	Performance of 1.50 cm Surface Aerator with Six Radial Blades	M/s Richardson & Cruddas (1972) Ltd., Madras (Tamil Nadu).
18.	Treatment and Disposal of Wastewaters.	M/s Bharat Skin Corporation, Madras (Tamil Nadu).
19.	Treatment & Disposal of wastewaters (Mill No. 2).	M/s Titaghur Paper Mills Co. Ltd., Kankinara, Calcutta (West Bengal).
20.	Treatment of Wastewater from Hindustan Organic Chemicals Ltd., Rasayani	Hindustan Organic Chemicals Ltd., Bombay (Maharashtra).
21.	Field Evaluation of 90 cm Diameter Surface Aerator with a Motor Drive of 5 hp.	M/s Richardson & Cruddas (1972) Ltd., Madras (Tamil Nadu).
22.	Report & Recommendations of Infective hepatitis in TELCO Town.	M/s TELCO, Jamshedpur (Bihar).
23.	Report on National Air Quality Monitoring Network (Vol. I).	Institute Project
24.	Report on National Air Quality Monitoring Network (Vol. II).	—do—
25.	Treatment & Disposal of Wastewaters from Ossein & DCP Plant.	M/s Kerala Chemicals and Proteins Ltd., Kathikudam, Cochin, (Kerala).
26.	Characterisation & Treatment of Wastewater from Coffee Pulping Units.	Coffee Research Institute Chikmagalur (Karanataka).
27.	Removal of Suspensions from Ash Slurry of Steam Generation plant.	Fertilizer Corporation of India (FCI) Talcher (Orissa).
28.	Assessment of Toxic Gases in the Drainage Galleries of Nagarjuna Sagar Dam.	Superintending Engineer, Dam Division, Nagarjuna Sagar Dam (Andhra Pradesh).
29.	Location of Korba Township with particular reference to Impact of Air Pollution from the new upcoming Industries.	Secretary, Department of Housing & Environment, Govt. of Madhya Pradesh, Bhopal, (Madhya Pradesh).

1	2	3
30.	Ambient Air Quality Survey for the proposed factory site of M/s Mahindra and Mahindra at Tarapur.	M/s Mahindra & Mahindra, Bombay (Maharashtra).
31.	Berijam Lake, Kodaikanal : Protection of Catchment Area.	Department of Forests & Fisheries, Government of Tamil Nadu, Madras, (Tamil Nadu).
32.	Evaluation of Water Supply Schemes in India (Interim Report).	CPHE & EO, Ministry of Works & Housing, Govt. of India, New Delhi.
33.	Air Quality in Selected Cities in India : 1978-1979 (National Air Quality Monitoring Network Programme).	Institute Project
34.	Characterisation and Performance Evaluation of Fertilizer Wastewater Treatment Facilities.	M/s Mangalore Chemicals & Fertilizers Ltd. Managalore, (Karanataka).

APPENDIX — IV

PAPERS PUBLISHED /PRESENTED

Sl. No.	Author	Title of paper	Published in/presented at
1	2	3	4
1.	Arora, H. C. & Routh, Tapan	Studies on a small river receiving waste-water from a nitrogenous Fertilizer factory.	J. of IPHE, India, 3, 1980.
2.	Arora, H. C. & Chattopadhya, S. N.	Anaerobic Contact Filter Process — A Suitable Method for the Treatment of Vegetable Tanning Effluents.	Water Pollution Control (UK), 79, No. 4, 1980.
3.	Aroro, H. C. & Routh, Tapan	Treatment of Slaughter House Effluents by Anaerobic Contact Filter.	IAWPC Technical Annual VI & VII, 1980.
4.	Arora, H. C. & Chattopadhya, S. N.	Wastewater Reuse : A means to water pollution control.	J. Instt. Engrs. (India), Pt. EN 1, 61 October, 1980.
5.	Arora, H. C.	i) Biodegradation of Effluents from Tanning Industry.	National Workshop on 'Microbial Degradation of Industrial Wastes' organised by Department of Environment, New Delhi and NEERI, at Nagpur during February 23–27, 1981.
		ii) Characteristics, treatment and disposal of Sugar Mill Effluents.	All India Seminar on 'Disposal of Sugar Mill & Distillery Effluents' organised by U. P. Water Pollution Prevention & Control Board at Lucknow during April 24–25, 1980 (Journal II).
6.	Badrinath, S.D.	i) Water Quality of River–A case study.	IAWPC Technical Annual. VI & VII, 1980.
		ii) Simple analytical techniques for coagulation practice.	Seventh National Convention of Environmental Engineering held at Jamshedpur, December, 27-29, 1980.

1	2	3	4
		iii) Velocity Discharge Tables in metric units.	TWAD, August 1980.
7.	Bhat, S. G.	Monographs on : i) Plan for organisation of POETRI Workshop for Asia and Pacific Region. ii) Guidelines for Planning User Survey in water Supply and Sanitation. iii) Plan for a National Information Support System in Water Supply and Sanitation.	WHO-IRC, Netherlands and Regional POETRI Workshop for Latin America and the Carribean Countries during Oct. 13 and Nov. 21, 1980. –do–
8.	Bhave, V. R.	"Research Activity in Physics at NEERI with special reference to Instrumentation problems".	Seminar on "Research Activities in Physics in Vidarbha", organised by Department of Physics, Institute of Science on January 18-19, 1980 at Nagpur.
9.	Bhide, A. D. & Sundaresan, B.B.	Street cleaning, storage and collection of solid wastes in developing countries : Indian experience.	Proc. ISWA Congress, London, June, 1980.
10.	Bulusu, K.R. Pathak, B.N. & Kulkarni, D.N.	Treatment of Borewell Water.	Minetech, 4, No. 384, PP 42-49, 1980. Central Mines Planning & Design Institute Ranchi (Bihar).
11.	Bhave, V. R. Dabadghao, S. B. & Bhat, S. G.	"Some thoughts on development of electronic industry in Vidarbha".	Seminar on Electronics for Regional Development organised by the Vidarbha Industries Association at Nagpur on Sept. 14, 1980.
12.	Bulusu, K.R. & Pathak, B. N.	"Discussion on Water Defluoridation with Activated Alumina" by Yeun C Wu & Anan Nitya.	J. Env. Engg. Div., (ASCE) 106, No. EE2 April, 1980.
13.	Chalapati Rao. C.V. & Paramasivam, R.	High Rate Settlers – A review.	IAWPC Technical Annual VI and VII. 91-106, 1980.
14.	Chaudhari, P.R. Krishnamoorthi, K.P. & Rao M. Vittal.	Growth potential of *Spirulina* a blue green algae in sewage,	Proceedings of the Indian Academy of Science (Plant Sciences) 89, No. 3, PP 203-233 June, 1980.

1	2	3	4
15.	Freitas, C. M.	i) Publication activities of NEERI scientists during the decade 1971-80 : A case study.	Pilot study based on a survey carried out by the author among NEERI Scientists and contributors to IJEH.
		ii) Two decades of Indian Journal of Environmental Health : A review.	-do-
16.	Ghosh, T.K., Konar, S. K.	"Toxicity for Chemicals and wastewaters of Paper and Pulp mills to worms, planktons and Molluscs."	Indian J. Environ. Hlth, 22 (4), 278-285, 1980,
17.	Hasan, M.Z. & Seth, T.D.	Effect of lead and zinc administration on Liver, Kidney and Brain levels of copper, lead, manganese and zinc and on Erythrocyte ALAD Activity in Rats.	Toxicology Letters, (U.K.) 7, 353-358, (1981).
18.	Hasan, M.Z.	An atomic absorption Spectrophotometric method for the determination of Manganese in Water.	Research & Industry, 25 (4) 201-203 (1980).
19.	Hasan M.Z. Ajmal, A. Ahmad, A. & Nomani, A.A.	Detrimental effects of pharmaceutical industrial wastes on microorganisms.	Water Air Soil Pollution (U. K.) 13 (4), 447-452 (1980).
20.	Joshi, S. R. & Parhad, N. M.	i) Acid hydrolysis of baggase for the production of single cell protein.	National Seminar on Agricultural waste utilisation, organised by Tamil Nadu Agricultural University, Coimbatore on December, 1980.
		ii) Effect of additives and inducers on cellulase enzymes.	Twenty first Annual Conference of AMI at Bombay during Oct. 31 and Nov. 2, 1980.
21.	Kale, C. K. Misra, R. P. & Sundaresan, B. B.	Utilization of petroleum Refinery Effluents for Crop Irrigation.	Seminar at Haldia (Assam) organised by the Mathura Refinery Corporation, Delhi, April, 1980.
22.	Kaul, S. N. Raman, V.	Alpha an important variable in wastewater aeration.	IAWPC, Technical Annual, VI & VII, 1980.
23.	Krishnamoorthi, K. P. & Sarkar, Rekha.	Biological systems of water quality evaluation using aquatic organisms.	Jorurnal of Scientific & Industrial Research 39 No. 80, 647-652, 1980.

1	2	3	4
24.	Krishnamoorthi, K. P., Chaudhari, P. R. Vittal Rao, M. & Sundaresan, B. B.	Domestic wastewater reclamation through algal systems.	National Workshop on Algal Systems, Madras, on October 3-4, (1980).
25.	Kulkarni,D.N., Tajne, D. S. & Parhad, N. M.	Performance of domestic water filters.	Ind. J. Envi. Hlth., 22, 30-41 (1980).
26.	Kumaran, P. & Joshi, S. R.	Organisation and management of culture banks.	National Workshop on Microbial Dedgradation of Industrial wastes during Feb., 23-27, 1981, NEERI, Nagpur.
27.	Kshirsagar, S. R.	NEERI latrine as a tool for getting organic fertilizer.	India, FAO Norway Seminar on 'Maximising Fertilizer use efficiency, held at New Delhi on September 15-19, 1980.
28.	Muthal, P. L. & Phadke, K. M.	Chromatographic determination of Carcinogenic compounds (PAH) with packed OV 17 column.	Indian Science Congress, 68 session, held at Banaras Hindu University, Varanasi during January 3-7, 1981.
29.	Muthukumar, G. & Subrahmanyam P. V. R.	Disposal and reuse of by-product gypsum from wet process H_3PO_4 Industry.	*Fertilizer News* 25, 23, 1980.
30.	Muthukumar, G. Badrinath, S. D. Subrahmanyam, P. V. R. & Sundaresan, B. B.	Cooling water in Fertilizer Industry Treatment, pollutional aspects and control strategies.	Fertilizer Association of India, Group Discussion on 'Water Treatment' (Raw and cooling) in Fertilizer Industry-during April 23-24, 1980 at Southern Petrochemical Industries Corporation Ltd., Tuticorin. Symposium on application
31.	Murlidhar, V.M. & Campbell,M.J,	Monitoring of CO oxidation in the atmosphere using C-14 tracer technique.	Symposium on application of Nuclear and Applied Techniques in Public Health & Pollution Control", at BARC, Bombay during February 12-13, 1981.

1	2	3	4
32	Mishra, R. P. Sharma, L. N. & Dixit, R. C.	Recycling of Refinery Effluents for Agriculture.	NPC Seminer on Water Pollution Control, Ludhiana, January 20-21, (1981).
33.	Nawlakhe, W.G. & Saxena, K. L.	Conservation of water in small tanks.	IAWPC Tech. Annual VI & VII (1980).
34.	Nawlakhe W.G., Pathak, B. N. Bulusu, K. R. & Paramasivam, R.	Settling characteristics of flocculant suspension in defluoridation of Water by Nalgonda Technique.	J. Instt. Engrs. (India),Div. Env. Engg, 61, Pt-EN2, pp 85-88, (1980).
35.	Nawlakhe, W. G.	Fluorides in cereals from various blocks of Maharashtra State.	Semi-Annual Paper Meeting of Env. Engg. Div. of the Institution of Engineers (India)at Jaipur, Rajasthan. September 11-12, 1980.
36.	Pande, S. P. & Hasan, M. Z.	New Solvent for SDDC in determination of arsenic.	Ind. J. Env. Hlth. **21 (4)**, 332-339, 1979.
37.	Pande, S. P. Sarin, R. & Pandya, G. H.	i) Determination of nanogram level of arsenic in drinking water.	Ind. J Env. Hlth. **22 (3)**, 187-197, (1980).
		ii) Analytical Quality Control (AQC) within laboratory bias test for ammonia estimation.	Ind. J. Env. Hlth. **22 (4)**, 312-327 (1980).
38.	Pande, S. P. & Pendharkar, A.V.	Some Analytical Aspects of Lead and Cadmium determination.	J. Instt. of Chemists(India), **52**, (Part IV), 141-144, July 1980.
39.	Pande. S. P.	i) Study on the determination of zinc in drinking water	**J. IWWA, XII No. 3**, pp 275-278. July-Sept. 1980.
		ii) Morpholine as a new substitute for pyridine in the determination of arsenic in water.	J. Instt. of Chemists (India), **52** (Part VI) 256-258, (1980).
		iii) Analytical study of trace levels of arsenic in aquatic environment.	International Symposium on Trace Analysis & Technological Development, BARC, Bombay, Feb. 16-19, 1980.
		vi) Estimation of Cadmium, Coper, Iron, Lead and Zinc in drinkink waters by atomic absorption spectrophotometry.	Indian Science Congress, 68th Session BHU, Varanasi, January 3-7, 1981.

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40.	Panicker, P. V. R. C., Gadkari, A. S., Kulkarni, S. W., Handa, B. K. & Joshi, M. W.	Prevalance of hookworm in some villages around, Nagpur.	J. of Communicable Diseases, XII, No. 4 (1980)
41.	Parhad, N. M., Kumaran, P. & Shivaraman, N.	Microbial degradation of wastewater from the manufacture of metallurgical and domestic coke.	National Workshop on "Microbial degradation of Industrial Wastes", during Feb. 23–27 1981, NEERI, Nagpur.
42.	Paramasivam, R. Joshi, N. S. Dhage, S. S. & Tajne D. S.	Effect of Intermittant operation of Slow Sand Filters of Filtred water quality.	Ind. J. Env. Hlth., 27, 136–150, (1980).
43.	Paramasivam, R. & Mhaisalkar, V. A.	i) Design and construction of Slow Sand Filters.	Intercountry meeting on Slow Sand Filteration, September 15–19, 1980 organised by WHO IRC & NEERI, Nagpur.
		ii) Slow Sand Filtration–An appropriate technology for medium and small water supplies	13th Annual Convention of the IWWA, at Pune during Jan. 30-31 and Feb. 1–3, 1981.
44.	Pathak, B. N., Kulkarni, D. N & Bulusu, K. R.	Some observation on the operation of demineralisation plant of at Strawboard Products Pvt. Ltd; Jakaypur, Rayagada, Orissa.	Seminar on Water for Industries sponsored by IWWA and the Indian & Eastern Engineers, Feb. 27-28, 1981, at Bombay.
45.	Pandya, G. H. & Rao, K. S. M.	Some analytical application of piezo electric detectors in environmental science.	J. Pure App. Ultrasonic, 2 (1–2), 4–7 (1980).
46.	Pandya, G. H.	i) Trace metal characterisation in aquatic environment by anodic stripping voltametry.	International Symposium on Trace Analysis & Technological Development at BARC, Bombay on Feb. 16-19, 1981
		ii) Anodic stripping voltametry theory and application in water analysis.	Seminar on "Water for Industry" at Bombay during Feb. 27–28, 1981.

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47.	Raguraman, D.	i) Treatment and disposal of Starch Factory Waste.	All India Seminar on Industrial Waste Treatment organised at Bombay, by ITDC, on May 8, 1980.
		ii) Conventional Tracer Study in Pollution Control & Monitoring.	National Seminar on Nuclear & Allied Techniques in Public Health & Pollution Control, BARC, Bombay on Feb. 12-13, 1981.
		iii) Water Quality, its control and Quality Requirements in Industry.	Seminar on Water for Industry organised by IWWA, Bombay Centre at Bombay on Feb. 27-28, 1981.
48.	Rajgopalan, S.	i) Water Pollution and Cotton Textile Industry.	Seminar on Pollution Control in Textile Processing Industry at Walchand College of Engineering, Sangli, during Nov. 20-31 1980.
		ii) Treatment and disposal of dye wastes.	Seminar on Pollution Control Process in Dyestuff Industries at Ahmedabad on August 21, 1980.
		iii) Disinfection of Rural Wells.	Seminar on Chlorinator by IWWA, Ahmedabad on Dec. 14, 1980.
49.	Raman, A. & Haraprasad, V.	i) Monitoring of Industrial Wastewater-An overview.	NPC Seminar on Water Pollution Control, Ludhiyana, Jan. 1981.
		ii) Operation and maintenance of SSF Plants.	Inter-country meeting of Slow Sand Filtration organised by NEERI & WHO IRC during September 15-19, 1980.
50.	Raman, A. Singh, Gurdeep & Nagpal, J. L.	Observations on Design and Construction Aspects of SSF Demonstration Plants at Abub Shehar, Haryana.	– do –

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51.	Raman, A.	i) Pollution Control in Industries–Management Role.	Annual Technical Conference of Hindustan Lever at Agra, Nov. 1980.
		ii) Manual on Sewerage and Sewage Treatment.	CPHE & EO (Govt. of India), Ministry of Works & Housing, New Delhi, 1980.
		iii) Norms and Standards for Urban water supply and Sewerage Services.	Town and Country Planning Organisation, Ministry of Works & Housing, New Delhi on Nov. 1980.
52.	Raman, V. & Bhave, V. R.	Application of Computer in Environmental engineering.	Seminar on "Computers : Meeting the Challenges of Tomorrow", organised by Raman Museum, Nagpur on Jan. 24, 1981.
53.	Raman, V. & Sundaresan, B. B.	i) Environmental Pollution Control and Conservation of Energy.	Proceedings of National Convention of Institution of Plant Engineers held at Cochin on Nov. 28, 1980.
		ii) Wastewater utilisation and Green Belt Development in Madras Metropolitan Area.	Seminar on Environmental Pollution in the Madras Metropolitan Area, at Max Muellar Bhavan, Madras on Nov. 25, 1980.
		iii) Appropriate Wastewater treatment system in Rural and Urban Fringe Areas in India.	IAWPC Tech. Annual No. VI & VII (1980).
54.	Raman, V.	i) Conservation of Water and Water Resources.	Seminar on Nature, Protection and Modern Society held at Bombay—Max Mueller Bhavan & SOCLEEN during Nov. 20–21, 80.
		ii) Conservation of water in water supply system, with reference to International Water Supply and Sanitation Decade.	AQUA–Aug. 1980.

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55.	Raman, V. Bowonder, B. & Sundaresan, B. B.	Environmental Impact Analysis and Assessment.	Proceedings Indo – US Workshop on Environmental Impact Analysis & Assessment organised by Department of Science & Technology, NEERI, US EPA during Oct. 27–31, 1980 at Nagpur.
56.	Rao, M. Vittal, & Krishnamoorthi, K. P.	Algal harvest from sewage stabilisation pond as a source of energy recirculation.	Golden Jubilee Symposium of the National Academy of Sciences on renable sources of energy during Oct. 22–25, 1980 at Allahabad.
57.	Rao, V. G., Lakhe, S. B. & Waghmare, S. V.	Virus removal in primary settling of raw sewage.	J. Env. Engrs. Div. (ASCE) 16026, EE 1, Feb., 1981.
58.	Reddy, M. K.	i) Efficiency of Central equipment in power plant — Case studies.	J. Instt. Pub. Hlth. Engg. (India) 4, 81–86, (1980).
		ii) Efficiency of Control equipment in power plant - Case studies.	Seventh National Convention of Environmental Engineering during Dec. 27–29, 1980 at Jamshedpur.
59.	Sarin R.	Electrode Technique for determination of trace concentration of sulfide in water.	International Symposium on Trace Analysis and Technological Development, BARC, Bombay, Feb. 16–19, 1981.
60.	Sarin, R. & Munshi, K. N.	Potentiometric investigation of the Complexes of Indium (iii) with B-Diketones.	Indian Science Congress, 68th session, Varanasi, Jan. 3–7, 1981.
61.	Sarin, R. & Pande, S. P.	A rapid method for determination of trace levels of selenium.	31st Annual Conference of Indian Association of Occupational Health, Feb. 27 to March 1, 1981.
62.	Shekdar, A. V. & Bhide, A. D.	Use of Computer in Solid Waste Management.	Proc. Symp. on Relevance of Computers in India held by Computer Society of India, New Delhi, March 1–14, 1981.

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63.	Shende. G.B. and Sundaresan, B. B.	Nutrient utilisation from sewage effluent for crop irrigation.	India /FAO/ Norway Seminar on Maximising Fertilizer use efficiency held at Vigyan Bhavan, New Delhi in Sept. 15–20, 1980.
64.	Shivaraman, N. and Parhad, N. M.	Microbial degradation of cyanide.	Presented at the 21st Annual Conference of AMI at Bombay during Oct. 31 and Nov. 2, 1980.
65.	Shrivastava S.K. and Nagpal, J.L.	Characteristics of wastewaters from some industries.	NPC Seminar on Water Pollution Control, Ludhiana during Jan. 20-21, 1981.
66.	Singh, Gurdeep; Raman, A and Nagpal, J. L.	Observations on operation, and maintenance of Village demonstration SSF plant at Abub Shehar, Haryana.	Inter–country meeting on Slow Sand Filtration organised by NEERI & WHO IRC during Sept. 15–19 1980.
67.	Subrahmanyam P.V.R.	Microbial degradation of wastewaters from Pulp & Paper Industry.	National Workshop on Microbial Degradation of Industrial Wastes organised by Dept. of Environment, New Delhi & NEERI. at Nagpur during Feb. 23-27 1981.
68.	Subrahmanyam, P. V. R. and Sundaresan. B.B.	Water Pollution Problems in India.	Annual Convention of Chemists, IIT, Bombay during Dec. 9-13, 1980.
69.	Subrahmanyam, P.V.R., Khadakkar S.N., Chartkarbai, T.& Sundaresan, B.B.	Wastewater Treatment of a phthalate plasticizer Ethanolamine & Morpholine Manufacturing Plant.	IAWPR Conference held at Toronto, Canada, June, 1980.
70.	Sundaresan, B. B. and Raman, V.	Deterioration of water quality and conservation of water supply system.	Proceedings International Water Supply Association Congress, Paris 1980.
71.	Sundaresan, B.B. and Subrahmanyam, P.V.R.	Industrial effluents : A threat to water resources.	J. Instn. of P. H. Engrs. 34, Col, (1980)

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72.	Sundaresan B.B.	'Environment and Industrial Development'.	Science and Industry Workshop on Management & Role of R & D for Industry, organised by Indian National Science Academy New Delhi, April, (1980)
73.	Sundaresan, B.B.	"Industrial Complexes and Environmental Safeguards".	Seminar at Haldia, organised by the Mathura Refinery Corporation, Delhi, April, (1980)
74.	Swaminathan, T. Kaul, S.N. and Seshadri, C.V.	"Continuous reaction for mass culture of algae–some novel designs".	First Annual General meeting of the Indian society, of Biotechnology & National Workshop on Algal systems held during Oct. 3-4, 1980 at Madras.
75.	Swaminathan, R. and Sundaresan, B. B.	Auto Exhaust Emissions in India.	Workshop on Planning & Development of Control of Emission from Motor Vehicles at Kuala Lumpur during Nov. 10–15, 1980.
76.	Swaminathan, T. & Shivaraman, N.	Microbial degradation of wastewaters generated in the manufacture and application of pesticides.	Presented at the National Workshop on Microbial degradition of Industrial Wastes Feb. 23-27, 1981 at NEERI, Nagpur.
77.	Thakkar N. & Muthal, P. L.	i) Chromatographic determination of pesticide residues in aqueous environment.	Presented at Diamond Jubilee Symposium on Environment, Institute of Science, Bombay, Nov. 17-19, 1980.
		ii) Granular Activated carbon in pesticide removal.	Indian J. of Env. Hlth, 22, (2), 124–129, (1980).
78.	Thergaonkar, V. P. et al.	" Determination of optimal fluoride concentration in drinking water in an area of India with dental fluorosis. "	Journal of Community Dentistry and Oral Epidemiology 1979.
79.	Titus, S. K. Olaniya, M. S. & Bhide, A. D.	Variation in composting time with organic fraction and shredding of refuse.	Indian J. of Env. Hlth. (22), (3), July, 1980.

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80.	Vaidya, (Mrs), M. V. & Bulusu, K. R.	The Use of CA-14 synthetic organic poly-electrolyte for operational improvement of coagulation of Turbidity in water treatment.	Indian J. of Env. Hlth., 23 (1) 1-15, (1981).
81.	Wate, S. R., & Saxena, K. L.	Microbial production of sulphur from sulphate : A review.	National Workshop on Microbial degradation of industrial wastes organised by Dept. of Environment New Delhi and NEERI at Nagpur. Feb. 23-27, 1981.
82.	Yennawar, P. K. & Rao, K. S. M.	'Selection of source sampling method for sulphur dioxide'.	Indian J. of Evn. Hlth., 22 (4), 286-297 (1980).
83.	पी. वी. आर सी. पणिकर, अनु० : राधेश्याम शर्मा	: :	हमारे गांव और उनकी सफाई, आरोग्य संदेश, केन्द्रीय स्वास्थ्य शिक्षा ब्यूरो, स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार, नई दिल्ली।
84.	राधेश्याम शर्मा	:	अधिक उपज के लिए वाहित-मल का उपयोग, 'खेती' भारतीय कृषि अनुसंधान परिषद, नई दिल्ली।

SYMPOSIA & SEMINARS

Inter-Country Meeting on Slow Sand Filtration at NEERI

A five-day "Inter-country meeting on Slow Sand Filtration' was held at NEERI, Nagpur during September 15-19, 1980.

Hon'ble Shri V. P. Sathe, Union Minister for Information & Broadcasting, Goverment of India, inaugurated the SSF meeeting on 15th September 1980. Shri P. K. Chatterjee, Advisor-CPHE & EO, New Delhi, delivered the key-not address. The workshop was attended by 35 parti, cipants from the various developing countries including Columbia, Ghana, India, Jamaica, Kenya, Sudan and Thailand.

Dr. J. M. G. Van Damme, Manager, WHO IRC, Dr. B. C. Ghosal, Director, Central Health Education Board, New Delhi and Mr. H. A. Heijnen, Programme Officer, WHO IRC addressed the inaugural session.

Dr. B. B. Sundaresan, Director, NEERI, was Chairman of the meeting and presided over the deliberations, and Shri R. Paramasivam, Scientist & Head, Water Engineering Division, was the Secretary.

Indo-US Workshop on Environmental Impact Analysis & Assessment

The five-day "Indo-US Workshop on Environmental Impact Analysis and Assessment" was held at the National Environmental Engineering Research Institute (NEERI), Nagpur.

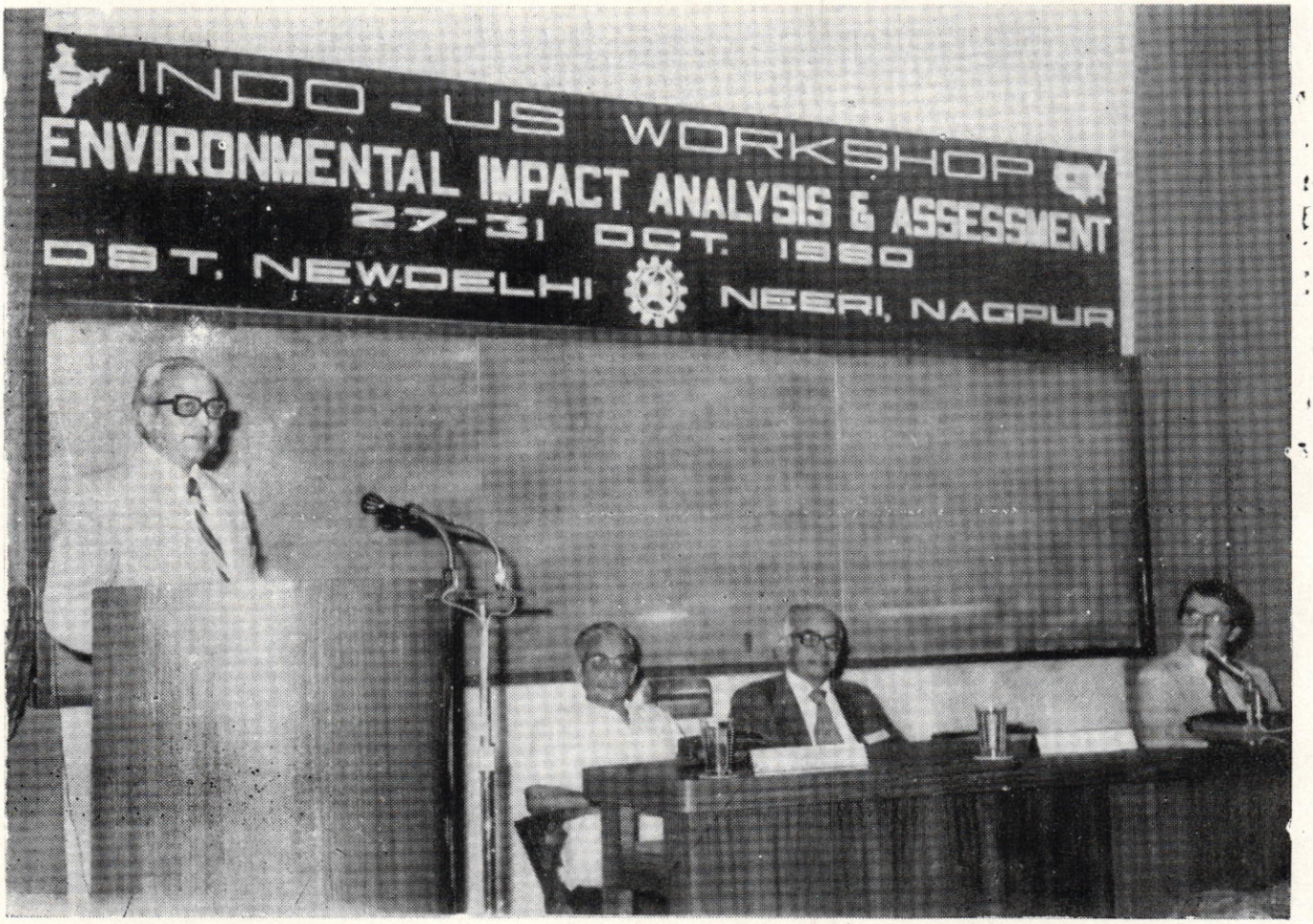
The workshop from October 27 to 31 was organised by NEERI, Nagpur and Department of Science & Technology, New Delhi and with the collaboration of the Environmental Protection Agency of USA. Dr. B. B. Sundaresan, Director, NEERI, presided over the deliberations.

Hon'ble Justice S. W. Puranik of the Bombay High Court, Nagpur Bench, while inaugurating the workshop, emphasised the urgent need for establishing an Environmental Protection Agency in India on the US pattern to protect and preserve the valuable environment for posterity.

Dr. B. B. Sundaresan, Director, NEERI welcomed the participants. Mr. Henry Beal, Director of Standards & Regulations, Environmental Protection Agency, USA and leader of the five member US team of experts, Dr. N. L. Ramananathan, Director (EP) Department of Science & Technology, Government of India, New Delhi and Scientist & Heads of the R & D Divisions of NEERI, participated in the workshop. Shri V. Raman, Scientis & Head, Sewage Treatment and Environmental Engineering Consultancy Divisions, was Technical Coordinator for the Workshop and Shri V. P. Thergaonkar, Scientist, Incharge, Training Cell, TILE Division was the Convenor.

Workshop on Microbial Degradation at NEERI

A five-day National Workshop on "Microbial degradation of industrial wastes" which was sponsored by the Department of Environment (DOE), Government of India, New Delhi and organised by NEERI, Nagpur was inaugurated by Dr. S. Varadarajan, Chairman-cum-Managing Director, India Petrochemicals Corporation Ltd., Baroda at NEERI on February 23, 1981. Dr. B. B. Sundaresan, Director, NEERI, presided over the deliberations.



Hon'ble Justice S. W. Puranik of the Bombay High Court, Nagpur Bench, inaugurating the Indo–US Workshop on Environmental Impact Analysis and Assessment on Oct. 27, 1980.

Dr. Varadarajan delivered the opening address and Shri M. Parabrahmam, Principal Scientific Officer, DOE welcomed the 51 delegates, including NEERI scientists. Dr. P. V. R. Subrahmanyam, Scientist & Head, Industrial Wastes Division, NEERI & Technical Coordinator for the workshop proposed a vote of thanks. Shri V. P. Thergaonkar Scientist, Incharge, Training Cell, TILE Division was the Convenor for the workshop.

NEERI Seminar Group

Dr. Tapan Chakrabarti, Scientist, Industrial Wastes Division, was awarded the Best Seminar prize of Rs. 100/- for seminar on "Biological hydrolysis of urea in a CFSTR under laboratory conditions–A bench scale study", delivered on May 9, 1980 to the group during June 1979 to May 1980. This scheme was introduced as a special incentive to encourage young scientists upto and including the grade of Scientists 'B'.

The office-bearers of the Seminar Group during 1980–81 were :

Chairman (Ex–officio)	Dr. B. B. Sundaresan Director.
Convenor	Shri A. D. Bhide Scientist & Head Solid Wastes Division.

The following Seminars were held at the Institute :

Sl. No.	Speaker	Title	Date
1.	Shri S. N. Khadakkar	Wastewater treatment of a phthalate Plasticizer ethanolamine and morpholine manufacturing plant	10–4–80
2.	Mr. H. A. Heijnen Programme Officer WHO IRC for Community Water Supply	Community participation and education in rural water supply.	14–4–80
3.	Shri R. Swaminathan	Emissions from steel plant-A case study.	24–4–80
4.	Dr. Tapan Chakrabarti.	Biological hydrolysis of urea in a CFSTR under laboratory conditions-A bench scale study.	9–5–80
5.	Dr. D.W. Johnson Director, Biological Station, Murray State University, Kentucky (USA).	Some influences of human activity onwater quality and fisheries.	22-5-80

Sl. No.	Speaker	Title	Date
6.	Dr. J. B. Homoloya US Coordinator for Indo-US Air Pollution project.	The ambient air impact of sulphate emissions from power plants.	31-6-80
7.	Dr. T. Swaminathan,	Design your experiments, save your tears.	29-7-80
8.	Mr. D. R. Watkins Project Officer Industrial Envi. Res. Lab., US EPA Cincinatti, Ohio (USA).	The EPA and dioxin review.	19-8-80
9.	Prof. E. Robinson Meteorologist and Section Head, Air Pollution Res. Washington State University, Pulman, Washington (USA)	Scavenging of ozone at the ground surface.	3-9-80
10.	Shri V.S.S. Bhaskara Murty.	Air Pollution from ferro-mangenese industries-A case study.	12-9-80
11.	Shri S. Venkatesan.	Distillery waste treatment–A case study.	24-10-80
12.	Prof. P. L. Knoppert Prof. of Sanitary Engg. Dept., Delft University of Technology, Netherlands.	i) Development of water treatment in Europe with respect to water quality.	11-11-80
		ii) Health aspects of water storage.	14–11–80
		iii) New European approach to drinking water standards.	28–11–80
13.	Miss K.W. Chaudhary	Techniques to determine ecological-impacts of toxicants by reaction kinetic parameters and to measure growth curves.	20-1-81
14.	Shri P. Kumaran.	Management of environmental pollution control in England.	20-2-81
15.	Dr. C. R. Krishnamurthy, Director, ITRC, Lucknow. (U P.)	Perspectives in environmental toxicology.	24–2–81
16.	Shri K. K. Das	Environmental aspects of the pulp and paper Industry.	27-3-81

LECTURES / RADIO TALKS / SEMINARS / CONFERENCE

Sl. No.	Name (s)	Topic / Date
1.	Arora. H. C.	i) Workshop on "Disposal of Distillery Effluents and lecture on " Characterisation, Treatment and Disposal of Distillery Effluents at Kanpur on April 12–13, 1980.
		ii) Workshop on "Transfer of Technology" organised by Allahabad Polytechnique, Allahabad on January 18, 1981.
2.	Badrinath, S. B.	i) Training Course on "Computer programming for scientists and engineers " organised by VRCE at Nagpur during March – April, 1980.
		ii) Group Discussion on " Water treatment (raw and cooling) in fertilizer industry" at Southern Petrochemical Industries Corporation Ltd., Spicnagar, Tuticorin during April 23–24, 1980.
3.	Basu, A. K.	i) Radio talk on the eve of World Environment Day' organised by All India Radio, Calcutta on June 5, 1980.
		ii) Seminars at the All India Institute of Hygiene and Public Health, Culcutta on June 5 and at University College of Science, Calcutta on June 6 to celebrate 'World Environment Day'. Chaired two technical sessions at the seminars.
		iii) Seminar on ' Quality of working life in Calcutta ' organised by the Institute of Personnel Management, Calcutta on August 16-18, 1980.
		iv) Lectures on "Streams Sanitation " to ME (PH) students at A.I.I.H. and P.H., Calcutta on January 5–8, 1981.
		v) Chaired seminar on 'Man and Environment' at Jadavpur University, Calcutta on February 4, 1981.

Sl. No.	Name (s)	Topic / Date
4.	Basu, A. K., Dhaneshwar, R. S. and Rao, C. S. G.	Seminar on 'What science can do for, Calcutta ' organised by Bio-Chemistry, Department of Calcutta University, Calcutta on June 30, 1980 and July 1, 1980.
5.	Bassin, J. K.	Attended seminar on HPLC Technique conducted by M/s Phillips (India) and (PHE-UNICHEM) at Bombay during November 23-24, 1980.
6.	Bhave, V. R.	i) Seminar on Bhaskara-Performance application to science and technology' organised by Indian Space Research Organisation (ISRO), at Satellite Centre, Bangalore on June 17, 1980. ii) Two-day seminar on ' Synchronised slide projection Systems organised by the Institute of Administrative Management and co-sponsored by CEERI, New Delhi and Central Electronics Ltd., Sahidabad on September 30 and October 1, 1980.
7.	Bhide, A. D.	Workshop on ' Microbiological decomposition of industrial waste ' organised by NEERI and Department of Environment, New Delhi at Nagpur during February 23-27, 1981.
8.	Bulusu, K. R.	Seminar on " Water for industries " sponsored by IWWA and the Indian & Eastern Engineers at Bombay during February 27-28, 1981.
9.	Dabadghao, S. B. & Bhat, S. G.	Professional Improvement Programme (PIP) in Computer Application in Library & Information Services organised by Society for Information Science (Regd.) at INSDOC - PID, New Delhi on September 7, 1980.
10.	Dabadghao, S. B.	i) Radio programme, gave a talk on Striya ani Sabhovatalcha Parisar on January 22, 1981, at All India Radio, Nagpur. ii) Participated in giving information on ' Vaidnyanic Maharashtra ' broadcast by AIR from Bombay and Nagpur in March 1981.

Sl. No.	Name (s)	Topic / Date
11.	Freitas, C. M.	Workshop "Media-World-80" organised by Xavier Institute of Communications at Bombay during November 3–7, 1980.
12.	Haraprasad, V.	Participated in seminar on "Water pollution control" organised by National Productivity Council at Ludhiana during January 20–21, 1981.
13.	Kesarwani, S. K.	i) Ninth National Seminar on "Role of Information in Transfer to Technology" during October 24–26, 1980, organised by Indian Association of Special Libraries and Information Centres (IASLIC) Calcutta, Department of Library Science, Nagpur University, Nagpur. ii) Seminar on "Information System in R & D Planning and Management" organised by CSIR on February 26–27, 1981.
14.	Krishnamoorthi, K. P.	National Workshop on "Microbial Degradation of Industrial Wastes" organised by NEERI-DOE during February 23–27, 1981.
15.	Kshirsagar, S. R.	i) Attended Workshop on 'Radiation treatment of sewage sludges' at BARC, Bombay on April 18, 1980. ii) Delivered a lecture on 'Environmental development in rural areas' at All India Summer School for lecturers in Polytechnics at Allahabad on June 25, 1980. iii) Lecture on 'Sanitary disposal of household and community wastes during natural disasters' at fourth Disaster Relief Instructors Course conducted by National Civil Defence College, Nagpur on July 31, 1980. iv) Lecture on 'Disinfection of well water' and 'Water supply and sanitation' at N. S. S. Camp of Mahatma Gandhi Institute of Medical Science Sewagram Wardha on October 6, 1980 at village Nalwadi.
16.	Mariappan, M.	Participated in Seminar/Workshop on 'Environmental Education' organised by the State Resource Centre, Madras during November 17–20, 1980 at Madras.

Sl. No.	Name (s)	Topic / Date
17.	Mhaisalkar, V. A	Participated in the week-end course on ' Optimal design of water supply and wastewater removal systems ' held at IIT, Bombay during January 24-25, 1981.
18.	Mishra, R. P.	Participated in International Wetlands Conference organised by National Institute of Ecology at New Delhi during September 10-17, 1980.
19.	Mishra, R. P., Shrivastava, S. K. & Haraprasad, V.	Attended seminar on " Water Pollution Control at HPC, Ludhiana on January 20-21, 1981.
20.	Murlidhar, V.	Participated in National Symposium on ' Applications of Nuclear and Applied Techniques in Public Health and Pollution Control at BARC, Bombay on February 12-13, 1981.
21.	Muthuswamy, K.	Participated in two-day programme for Personal Secretaries organised by Institute of Administrative Managements, New Delhi on January 20-21, 1981.
22.	Murty, Y. S.	Participated in symposium on 'Environmental Pollution with special emphasis on water pollution' organised by the Indian Women Scientist Association Hyderabad Branch and A. P. State Board for Prevention and Control of Water Pollution at Hyderabad on February 15, 1981.
23.	Panicker, P. V. R. C.	Participated in the Nagpur Municipal Corporation Coordination Committee meeting of ' The National Filaria Control Programme ' held on 24 October 1980.
24.	Paramasivam, R.	i) Delivered a series of lectures during April 4-5 1980 on ' Water Filtration at the Training course for Water Works & Housing ', Government of India, New Delhi, and conducted by Visvesvaraya Regional College of Engineering, Nagpur. ii) Delivered a lecture on ' Wholesome water supply to the Communities affected by Natural Disasters' at the Fourth Disaster Relief Instructors-Course conducted by National Civil Defence College, Nagpur on July 31, 1980.

Sl. No.	Name (s)	Topic / Date
25.	Parhad, N. M. Patil, M. D. & Phirke, P. M.	Participated as delegates in Indo-US Workshop on Environmental Impact Assessment during 27-31, October 1980 at NEERI, Nagpur.
26.	Parhad, N. M. Patil, M. D. Kumaran, P., Joshi, S. R. & Shivaraman, D.	Participated as delegates in National Workshop on Microbial degradation of industrial wastes during 23-27 February 1981 at NEERI, Nagpur.
27.	Raguraman, D.	i) Participated as expert in All India Symposium on 'Effluent Treatment' organised by Indian Centre for Training and Development (ICTD) at Hotel Oberoi, Bombay during May 8-10, 1980. ii) Participated in seminar on Air pollution control held at IEM, Bombay on 9-11 September 1980 at Hotel Oberoi, Bombay. iii) Attended meeting of Smoke nuisance committee at Mantralaya, Bombay on December 8, 1980. iv) Attended meeting of the Sub-committee on WRBM of BMRDA at Bombay on location of certain industries in Chembur on December 12 and December 24, 1980. v) Participated in the National Seminar on 'Nuclear and Allied Techniques, in Public Health & Pollution Control at BARC Bombay during Feb. 12-13, 1981. vi) Lecture delivered on Instrumentation in Water pollution control monitoring at IDEMI, Bombay on September 3, 1980 for their course for Industrial Instrumentation. vii) Participated in seminer on 'Water for industry' held at Taj Mahal Hotel by IWWA Bombay on February 27-28, 1981.
28.	Rajagopalan, S.	i) Attended seminar on 'Thrust areas on life sciences during Sixth Five-Year Plan sponsored by DST at IPCL, Baroda on 9-10 September, 1980.

Sl. No.	Name (s)	Topic / Date
		ii) Lecture delivered on 'Characterisation and quantification of textile wastewaters' on November 22,1980 at the Short-term training course on pollution control management for specific industries by Gujarat Water Pollution Control Board, Ahmedabad.
		iii) Lectures delivered on (a) Corrosion (b) Water Quality Criteria on June 18th and 23rd 1980 at the field oriented Short term course on "Leak Detection and Preventive Maintenance of Water Supply Distribution Systems' held at Surat.
29.	Raman, A.	i) Attended First meeting of committee on Marine Research & Development, organised by DST, New Delhi on May 3, 1980.
		ii) Attended Environmental Research Committee meeting organised by DST, New Delhi on May 6, 1980.
		iii) Participated in the meeting of Working Group on Integrated Environmental Research Programmes on Heavy Metal Pollution organised by DST, New Delhi on May 24th 1980.
		iv) Attended seminar on 'Environmental impact assessment' organised by India Environmental Society during 5 7 June, 1980 at New Delhi.
		v) Participated in Workshop on Representatives of Slow Sand Filtration-countries, organised by NEERI, Nagpur during September 15-19, 1980.
		vi) Attended meeting on Sewage farming on October 23, 1980 organised by Planning Commission, Government of India, New Delhi.
		vii) Attended Civil Engineering and Environmental Research Commitee meeting organised by CSIR, Delhi on February 24, 1981.

Sl. No.	Name (s)	Topic / Date
		viii) Attended Workshop on Economic benefits of environmental management policies organised by India Environmental Society on March 11–12, 1981 at New Delhi.
		ix) Participated in Environmental Appraisal Committee for Industries organised by Department of Science & Technology (DST), New Delhi on March 24, 1981.
30.	Raman, V.	i) Key-note Address, Lecture and chairing of session 'Water supply in plantations' organised by AFPRO at St. John's Medical College, Bangalore on July 25, 1980.
		ii) Participated as a resource person in the seminar on 'Water Resource Development' organised by St. John's Medical College Bangalore in Collaboration with AFPRO (Action for Food Production) and UPASI, (United Planters Association of Southern India) at Bangalore on July 25–26, 1980.
31.	Raman, V., Kshirsagar, S. R. Subrahmanyam, PVR., Thergaonkar, V. P. & Badrinath, S. D.	Participated in Indo–US Workshop on 'Environmental Impact Analysis and Assessment' jointly organised by NEERI, DST and with the cooperation of US EPA during October 27–31, 1980 at Nagpur.
32.	Raman, V.	i) Lecture on 'Water treatment and sedimentation units' to engineers of Bombay Municipal Corporation - Special course, under World Bank programme on November 11, 1980.
		ii) Participated in seminar on 'Nature Protection & Modern Society' organised by Max-Muller Bhavan, SOCLEEN and World Wild Life Fund India at Bombay on November 20, 1980. Lecture on 'Conservation of water and water resources'.
		iii) Participated in seminar on 'Environmental pollution in the Madras Metropolitan Area, on November 24–25, 1980 at Madras and delivered lecture.
		iv) Delivered lecture on 'Environmental impact analysis' and 'Water supply distribution maintenance management' organised by Administrative Staff College, Hyderabad, on March 4, 1981.

Sl. No.	Name (s)	Topic / Date
		v) Delivered lecture on 'Field techniques, Case studies and Status in India' Economics of control measures at field oriented course on 'Preventive maintenance of water distribution system' sponsored by CPHEEO organised by NEERI at Surat, July 1980.
		vi) Attended course on 'Distribution system analysis using computers' sponsored by CPHEEO, Delhi and organised by College of Engineering, Guindy, Madras during February, 1981 and delivered lectures on the following topics (a) Distribution system analysis by electrical network analysis and (b) Preventive maintenance.
33.	Rao, C. S. G.	i) Participated in the 'World Environmental Day' at College of Science, University of Calcutta on June 6, 1980.
		ii) Participated and Acted a Judge in the Malda District Science Fair Malde, between February 11–13, 1981, organised by BITM and Youth Services, Government of West Bengal.
34.	Saraf, R. K. and Thergaonkar, V. P.	Participated in training course on 'Project Implementation, Monitoring and Evaluation' organised by Ministry of Home Affairs, Department of Personnel and AR, at Nagpur during February 15 and March 6, 1981.
35	Sastry, C. A.	i) Attended meeting in preparation of a book entitled 'Environmental and Health' convened by Director, Institute of Otorhinotaryngology, Madras, on April 30, 1980.
		ii) Participated in seminar on 'Aids for teaching environmental sciences' at School of Biological Sciences, Madurai Kamaraj University, Madurai on April 30, 1980.
		iii) Talk on 'Protecting the human environment' on All India Radio, Madras on June 3, 1980.
		iv) Participated in National Workshop on 'Environmental education' organised by P. A. University of Technology, Guindy at Madras on July 14–15, 1980.

Sl. No.	Name (s)	Topic / Date
		v) Talk on 'Air, water and soil pollution' at Gandhigram Rural Institute, Gandhigram on July 15, 1980.
		vi) Delivered lectures at Refresher course on 'Water treatment plant design' organised by College of Engineering, Guindy, Madras and sponsored by CPHEEO, New Delhi during September 15–20, 1980.
36.	Seth, A. K.	i) Participated in Exhibition organised by Rajasthan State Water Pollution Control Board, Jaipur on the eve of World Environment Day from June 3–6, 1980.
		ii) Participated in Expert Committee meeting to discuss 'Assessment of air pollution due to Hindustan Zinc Ltd., Udaipur' at New Delhi during December 29, 1980 and January 4, 1981.
		iii) Attended the Semi-Annual Paper Meeting of the Environmental Engineering Division of the Institution of Engineers (India) at Jaipur on September 11–12, 1980.
37.	Shekdar, A. V.	Participated in Symposium on 'Relevance of Computers in India' organised by Computer Society of India, New Delhi during March 1–4, 1981.
38.	Shende, G. B.	Participated in India/FAO Norway Seminar on 'Maximising Fertilizer use Efficiency' at New Delhi during September 15-19, 1980.
39.	Subrahmanyan, P. V. R.	i) Participated in Biogas Workshop organised by Commonwealth Science Council and KVIC at Bombay during September 8–10, 1980.
		ii) Participated in the Annual Convention of Chemists held at IIT Bombay during December 9–12, 1980, delivered a symposium lecture on 'Water pollution problem in India.

Sl. No.	Name (s)	Topic / Date
40.	Subrahmanyam, P. V. R., & Sundaresan, B. B.	Participated in Short course on pollution control management for specific wastes sponsored by Gujrat Water Pollution Control, October 1980.
41.	Sundaresan, B. B.	i) Meeting on 'Plant frame for Science & Technology 1980–85' convened by Director General, SIR, Aug. 2–3, 1980, New Delhi. ii) Talk on 'Environmental Pollution : Some thoughts', broadcast by All India Radio, Nagpur, Aug. 28, 1980. iii) All India Conference on Air Pollution organised by Institute of Energy Management, at Bombay, Sept. 8, 1980. iv) Seminar on "Thrust areas in life sciences" organised by Dept. of Science & Technology, Government of India, at IPCL, Baroda on Sept. 9-10, 1980. v) National Conference on "Technological Options for Sanitation" at Regional Engineering College, Surat, December, 27, 1980 vi) Meeting of Environmental Research Committee at Department of Science & Technology, Government of India, New Delhi, January 15–16, 1981. vii) Keynote address on "Environmental Pollution" at symposium on "Environmental Pollution with special emphasis on water pollution" organised by Indian Women Scientists Association, Hyderabad and A. P. Board for the Prevention and Control of Water Pollution at Hyderabad on Feb. 15, 1981. viii) Attended course on "Management of R & D Systems" at Administrative Staff College of India, Hyderabad, during March 16–21, 1981.
42.	Yennawar, P. K., Swaminathan, R., Rao, K. S. M. & Raguraman, D.	Attended the All India Conference on "Air Pollution" Organised by the Institute of Energy Management Bombay during Sept. 8–10, 1980.

APPENDIX-VI

BUDGET

(Rupees in lakhs)

		RE 1980-81	BE 1981-82
1. Capital	Plan	22.760	22.000
	Non-Plan	3.280	2.560
2. Recurring	Plan	10.750	13.000
	Non-Plan	73.070	75.940
3. Total	Plan	33.510	35.000
	Non-Plan	76.350	78.500
	GRAND TOTAL	109.860	113.500

REVENUE FROM SPONSORED /CONSULTANCY PROJECTS

(Rupees in lakhs)
1980-81

		No*	Amount
I.	Sponsored projects	22 (13)	43.03
II.	Consultancy Schemes	15 (9)	3.06

NOTE (*) Figures in brackets indicate completed projects.

APPENDIX - VII

MEMBERSHIP OF INDIAN STANDARDS INSTITUTION COMMITTEES

Sl.No. Name of the Committee Committee No.	Name of the NEERI Representative Principal Member (P) Alternate Member (A)
1. Concrete pipes and Poles Sub-committee BDC : 2:6	N. M. Narasimhan (P) V. A. Mhaisalkar (A)
2 Sanitary Appliances & Water Fittings Sectional Committe. BDC : 3	S. R. Kshirsagar (P) R. C. Reddy (A)
3. Domestic & Municipal Water Fittings Sub-committee. BDC : 3:2	S. R. Kshirsagar (P) A. W. Deshpande (A)
4. Water Meters Sub-committee. BDC : 3:4	Y. S. Murti (P) N. M. Narasimhan (A)
5. Water Works Fittings Sub-committee BDC : 3:5	A. Raman (P) R. C. Reddy (A)
6. Plastic Pipes Sub-comittee. BDC : 3:8	S. K. Gadkari (P) A. W. Deshpande (A)
7. Panel for Water Supply & Plumbing BDC : 13:P_4	N. M. Narasimhan (P) P. Nema (A)
8. Fluid flow in closed circuits. BDC : 17:3	S. K. Gadkari (P) P. Nema (A)
9. Dilution methods Sub-committee. BDC : 17:7	D. Raguraman (P) A. K. Seth (A)
10. Water Supply and Sanitation Sectional Committee. BDC : 24	B. B. Sundaresan (P) V. Raman (A)
11. Water Supply and Plumbing Sub-committee BDC : 24:1	V. Raman (P) A. W. Deshapande (A)
12. Drainage Sub-committee. BDC : 24:2	Y. S. Murty (P) A. K. Seth (A)
13 Public Health Engineering Equipment Sectional committee. BDC : 40	B.B. Sundaresan (Chairman) V. Raman. (P)
14. Water treatment equipment Sub-committee. BCD : 40:1	R. Paramasivam (P) N. G. Swarnakar (A)

Sl. No. Name of the Committee Committee No.	Name of the NEERI Representative Principal Member (P) Alternate Member (A)
15. Wastewater treatment equipment Sub-committee. BDC : 40 : 2	B. B. Sundaresan (Convenor) S. K. Gadkari (A)
16. Sewage treatment panel. BDC : 40 : P_2	V. Raman (P) S. D. Badrinath (A)
17. Guiding committee for National Building Code. BCD : 64	A. Raman (P) D. Raguraman(A)
18. Panel for Plumbing services. BDC : 64:P:16	M. Mariappan (P) V. P. Deshpande (A)
19. Composition of Chemical Division Council CDC	B. B. Sundaresan (P) P.V.R. Subrahmanyam. (A)
20. Chemical hazards Sectional Sub-committee. CDC : 18	A. K. Basu (P)
21. Industrial Chemical hazards Sub-committee. CDC : 18:4	R. K. Pandit (P) S. S. Mudri (A)
22. Water Sectional committee. CDC : 26	R. Paramasivam (P) M. V. Nanoti (A)
23. Water treatment methods Sub-committee. CDC : 26:1	A. Raman (Convenor)
24. Panel for food and Fermentation Indusrty wastes. CDC : 26 : 1:2	M. V. Srinivasan (P) K. L. Saxena (A)
25. Panel for Paper & Allied Industry Wastes. CDC : 26 : 1:3	P. V. R. Subrahmanyam (Convenor) J. S. Gadgil (A)
26. Panel for Tanning Industry waste. CDC :26 : 1:4	C. A. Sastry (P) H. C. Arora (A)
27. Panel for Textiles & Allied Industries Wastes. CDC : 26 : 1 : 5	S. Rajagopalan (Convenor) Mrs. I. S. Jayangouder (A)
28. Working Group for Dyestuff Industry waste. CDC : 26 : 1 : 6/WG	S. Rajagopalan (P) T. Swaminathan (A)
29. Panel for Chemical Allied Industries Wastes. CDC : 26 : 1 : 6	C. A. Sastry (Convenor) D. Seethapati Rao (A)

Sl. No. Name of the Committee Committee No.	Name of the NEERI Representative Principal Member (P) Alternate Member (A)
30. Panel for Fertilizer Industry wastes. CDC : 26 : 1 : 12-	K. L. Saxena (P) T. Chakrabarti (A)
31. Panel for Steel Mill wastes. CDC : 26 : 1 : 13	J S. Gadgil (P) K. K. Das (A)
32. Panel for Oil Refineries wastes. CDC : 26 : 1 : 14	K. K. Das (P) S. Rajagopalan (A)
33. Water for Industrial purposes Sub-committee. CDC : 26 : 2	K. R. Bulusu (P) B. N. Pathak (A)
34. Water and Effluents Sub-committee. CDC : 26 : 3	V. Raman (P) D. Raguraman (A)
35. Panel for Marine disposal of effluents. CDC : 26 : 3 : 1	— D. Raguraman (A)
36. Panel for methods of test for water and effluents (i) Bacteriological and Virological methods (ii) Physical and chemical methods. CDC : 26 : P_1	— (i) N. M. Parhad (P) S. R. Joshi (A) (ii) S. P. Pande (P) M. V. Nanoti (A)
37. Panel for treatment of water for cooling. CDC : 26 : P_7	B. N. Pathak (P) M. V. Nanoti (A)
38. Panel for Glossary of terms for water, sewage and industrial effluents. CDC : 26 : P_8	S. G. Bhat (P) S. K. Kesarwani (A)
39. Air Pollution Sectional committee. CDC : 53	B. B. Sundaresan (P) P. K. Yennawar (A)
40. Terminology Sub-committee. CDC : 53 : 1	V. L. Pampattiwar (P) V. I. Pandit (A)
41. Methods of Sampling & Analysis Sub-committee. CDC : 53 : 2	P. K. Yennawar (P) G. H. Pandya (A)
42. Ambient Air Quality Sub-committee. CDC : 53 : 3	P. K. Yennawar (P) C. S. G. Rao (A)
43. Code of Practice for Control of Air Pollution. CDC : 53 : 4	P. K. Yennawar (P) R. Swaminathan (A)
44. Micro-meteorological Technique and Land use Sub-committee. CDC : 53 : 5	V. R. Bhave (P) V. I. Pandit (A)

Sl. No. Name of the Committee Committee No.	Name of the NEERI Representative Principal Member (P) Alternate Member (A)
45. Air Pollution Standard committee : Emission Standard for Chemical Fertilizer & Petroleum Industry. CDC : 53 : P_2	V. P. Thergaonkar (P) V. I. Pandit (A)
46. Panel for Emission Standards for Cement Glass & Ceramic Industries. CDC : 53 : P_5	R. Swaminathan (P) N. S. Phadke (A)
47. Panel for Emission Standards for domestic sources. CDC : 53 : P_6	H. C. Arora (P) —
48. Panel to deal with ISO documents. CDC : 53 : P_7	B. B. Sundaresan (P) P. K. Yennawar (A)
49. Solid waste Sectional Committee. CDC : 54	B. B. Sundaresan (P) A. D. Bhide (A)
50. Panel for methods of sampling and test for solid wastes. CDC : 54 : 2 : 6	S. K. Titus (Convenor) V. P. Thergaonkar (A)
51. Panel for Steel Mill Solid wastes. CDC : 54 : P_5	S. K. Titus (P) R. S. Dhaneshwar (A)
52. Panel for Flysh. CDC : 54 : P_6	A. D. Bhide (P) S. K. Titus (A)
53. Panel for solid waste of Ceramic and Refractory industries. CDC : 54 : P_7	S. K. Titus (P) R. S. Dhaneshwar (A)
54. Panel for solid waste from Coal Mining & Washery Industries. CDC : 54 : P_8	R. S. Dhaneshwar (P) S. K. Titus (A)
55. Urban Solid Wastes Sub-committee. CDC : 54 : 2	A. D. Bhide (P) S. K. Titus (A)
56. Composition of Panel for collection, transportation, disposal and utilisation of urban solid wastes. CDC : 54 : 2 : 5	A. D. Bhide (P) A. V. Shekdar (A)
57. Agricultural residues and Rural wastes Sub-committee. CDC : 54 : 3	G. B. Shende (P) —
58. Environmental Protection Advisory Committee. EPAC	B. B. Sundaresan (P) V. Raman (A)
59. Civil Engineering Division Council. CEDC	B. B. Sundaresan (P) A. Raman (A)

Sl. No.	Name of the Committee Committee No.	Name of the NEERI Representative Principal Member (P) Alternate Mamber (A)
60.	Panel for Test Equipment for Water Quality. LTDC : 21 : P_3	V. R. Bhave (P) —
61.	Sectional Committee on Water requirements for crops. AFDC : 46	G. B. Shende (P) —
62.	Meteorological Instruments Sectional Committee. EDC : 69	V. S. S. Bhaskaramurty (P) M. K. Reddy (A)

CENTRAL GOVERNMENT COMMITTEE

Sl. No.	Name of the Committee (Authority/Department)	Name of the Member/ Representative
1.	Standing Committee of the Construction Division of the Bureau of Public Enterprises Ministry of Finance, Government of India.	Director or his representative
2.	National Committee on Environmental Planning and Coordination (NCEPC) in the Environmental Board of Tripura and Meghalaya, Department of Science and Technology, Government of India New Delhi.	Dr. B. B. Sundaresan.
3.	Committee of the Central Board for the Prevention and Control of Water Pollution, Government of India. New Delhi.	Dr. B. B. Sundaresan.
4.	Indian National Committee for International Hydrological Programme (CSIR, New Delhi).	Dr. B. B. Sundaresan.
5.	Civil and Environmental Engineering Research Committee, CSIR, New Delhi.	Dr. B. B. Sundaresan.
6.	Indian National Committee for Scope. Indian National Science Academy, New Delhi.	Dr. B. B. Sundaresan.
7.	Environmental Research Committee, Department of Science and Technology. New Delhi.	Dr. B. B. Sundaresan.

Sl. No.	Name of the Committee (Authority/Department)	Name of the Member/ Representative
8.	Scientific Advisory Committee of the National Institute of Occupational Health, Ahmedabad.	Dr. B. B. Sundaresan.
9.	Environmental Monitoring Reseach Committee of the NIOH of ICMR.	Dr. B. B. Sundaresan.
10.	Committee for Welfare Activities. CSIR, New Delhi.	Dr. B. B. Sundaresan.
11.	Working Group on Leather Industry, Department of Industrial Development, Ministry of Industry, Government of India, New Delhi.	Dr. H. C. Arora.
12.	Occupational Health Group, Director General of Health Services, New Delhi.	Dr. H. C. Arora.
13.	Victoria Memorial Protection and Conservation Committee, Victoria Memorial, Government of India, Calcutta.	Dr. A. K. Basu Shri C. S. G. Rao.
14.	Working Group of Mining and Environment, Department of Environment. New Delhi.	Shri A. Raman (P).
15.	Site Selection Committee for Grass Roots Refinery, Ministry of Petroleum and Chemicals, New Delhi.	Shri A. Raman (P)
16.	Working Group on Urban Engineering Services, Town and Country Planning Organisation, New Delhi.	Shri A. Raman (P)
17.	Delhi Smoke Nuisance Commission, Delhi Administration, New Delhi.	Shri A. Raman (P).
18.	Expert Panel for the Environmental Quality Assessment and Coastal Zone Programme, Department of Environment, New Delhi.	Shri V. Raman (P).
19.	Thermal Power and Environmental Impact, Department of Environment, New Delhi.	Shri V. Raman (P).
20.	Site Selection Committee for Establishment of Gas Cracker and Petrochemical Campus, Ministry of Petroleum, Government of India, New Delhi.	Shri S. Rajagopalan.

Sl. No.	Name of the Committee (Authority/Department)	Name of the Member/ Representative
21.	Indian Society for Research and Development Planning and Management, CSIR, New Delhi.	Shri R. K. Saraf
22.	Central Insecticide Board, Ministry of Agriculture and Irrigation, Government of India, New Delhi.	Dr. G. B. Shende (P)
23.	Pesticides Environmental Pollution Advisory Committee, Ministry of Agriculture and Irrigation, Government of India, New Delhi.	Dr. G. B. Shende (P)
24.	Working Group of Cement Industry (Department of Industrial Development, Ministry of Industries, Government of India, New Delhi.	Shri P. K. Yennawar

STATE GOVERNMENT COMMITEES / BOARDS

Sl. No.	Name of the Committee/Board (Authority / Department)	Name of the member/ Representative
1.	State High Level Coordination Committee of Science and Technology. Research and Utilisation, Government of Maharashtra, Bombay.	Dr. B. B. Sundaresan
2.	Environmental Planning and Coordination Committee (Urban Development and Public Health Department, Government of Maharashtra, Bombay).	Dr. B. B. Sundaresan
3.	Water Resources Management Board, Bombay.	Dr. B. B. Sundaresan
4.	Expert Committee to suggest remedial measures on pollution and its effects on Channakeshva Temple at Belur. Directorate of Archaeology and Museums, Government of Karnataka, Mysore.	Dr. B. B. Sundaresan Dr. C. A. Sastry
5.	Kerala State Committee for preparing a report for the establishment of a Centre for Environment studies.	Dr. B. B. Sundaresan

Sl. No.	Name of the Committee/Board (Authority/Department)	Name of the member/ Representative
6.	Uttar Pradesh Effluent Board (Labour, Department, U P. Government, Kanpur).	Dr. H. C. Arora
7.	Coopted Member of Faculty of Engineering and Technology, Nagpur University.	Dr. A. S. Bal
8.	Technical Advisory Committee of Bihar State, Water Pollution Committee of Bihar State Water Pollution and Control Board, Patna.	Dr. A. K. Basu
9.	Maharashtra State Smoke Nuisance Commission for Bombay, Government of Maharashtra, Bombay.	Shri D. Raguraman
10.	Site Selection Committee for BMRDA for industries, Government of Maharashtra Bombay.	Shri D. Raguraman
11.	Technical Committee (Gujarat Water Pollution Control Board).	Shri S. Rajagopalan
12.	Cholera Enquiry Committee, Ahmedabad Municipal Corporation.	Shri S. Rajagopalan
13.	Technical Committee (Punjab Board for Prevention and Control of Water Pollution).	Shri A. Raman
14.	Selection Committee for Selection of Professor of Environmental Science, Institute of Science, Bombay.	Shri V. Raman
15.	Technical Advisory Committee (Madhya Pradesh State Board for Prevention and Control of Water Pollution).	Dr. P. V. R. Subrahmanyam
16.	Board of Studies in Statistics, Nagpur University, Nagpur.	Shri R. K. Saraf
17.	Area Sub-committee for the Nag River Basin (Maharastra Prevention of Water Pollution Board, Bombay).	Dr. P. V. R. Subrahmanyam
18.	Board of Studies in Biochemistry and Microbiology, Nagpur University.	Dr. P. V. R. Subrahmanyam
19.	Management and Technical Committee Rajasthan State Board for the Prevention and Control of Water Pollution).	Shri A. K. Seth
20.	Standard Sub-committee (Rajasthan State Board for the Prevention and Control of Water Pollution).	Shri A. K. Seth

COMMITTEES OF INTERNATIONAL ORGANISATION

Sl. No.	Name of the Committee	Name of the NEERI Representative
1.	Governing Board, International Association on Water Pollution Research, Chichester House, 278 High Holborn, London, WC1, UK.	Dr. B. B. Sundaresan.
2.	World Health Organisation (WHO) Geneva has recognised NEERI as Collaborating Centre in the fields of Air Pollution and Community Water Suupply, Sanitation.	Dr. B. B. Sundaresan.
3.	Editorial Board ENFO (News Letter) Asian Institute of Technology (AIT) P·O. Box 2754, Bangkok–Thailand.	Dr. B. B. Sundaresan
4.	Air Quality Stationary Source Emissions. ISO/TC/146/SCI (International Standards Organisation)	P. K. Yennawar.

OTHER COMMITTEES

Sl. No.	Name of the committee (Organisation Constituting the committee)	Name of the NEERI Representative
1.	Computer Society of India (C.S.I., Bombay).	Dr. B. B. Sundaresan Shri V. Raman Shri Y. S. Murty Shri S. B. Dabadghao Shri R. K. Saraf Shri A. V. Shekdar
2.	Research Council for Centre for Man and Environment, Presidency College, Calcutta.	Dr. A. K. Basu

APPENDIX - VIII

HONOURS & AWARDS

Sl. No.	Name	Award/Honour/ Degree	Awarded by
1.	Dr. A. S. Bal	Co-opted as a member of Faculty of Engineering and Technology.	Nagpur University
2.	Dr. P. R. Chaudhari	Junior Statistician course certificate.	Nagpur University
3.	Shri D. G, Deshpande	Government Diploma in Architecture (G. D. Arch.)	Government of Maharashtra, Maharashtra Technical Education Board, Maharashtra.
4.	Shri R. S. Dhaneshwar	Elected Fellow of the Institution of Chemists (India).	Institution of Chemists (India), Calcutta (West Bengal)
5.	Shri A. K. Ganguly	Diploma of Associateship of Institution of Chemists (India.)	Institution of Chemists (India). Calcutta (West Bengal)
6.	Dr. T. K. Ghosh	Fellowship	Academy of Ichthyology.
7.	Shri M. Z. Hasan	Consolation Prize ofRs. 101/-	Water Chemists Forum M/s Glaxo Chemicals Division, Bombay.
8.	Shri S. R. Joshi	Ph. D. (Microbiology) on Utilisation of Bagasse for production of single cell protein.	Nagpur University, Nagpur.
9.	Shri S. R. Kshirsagar	Nominated on Editorial Board of Journal of Bio-waste treatment.	Jyotsna Arogya Prabodhan, Dehu (Dist - Pune).

Sl. No.	Name	Award/Honour/ Degree	Awarded by
10.	Shri P. Kumaran	Diploma of Computer programme for Science and engineers.	VRCE, Nagpur
11.	Dr. M. Mariappan	Recognised as a Supervisor Teacher under the Faculty of Environmental studies for guiding study for Ph. D. Programme.	University of Cochin, Kerala.
12.	Shri V. V. Muley	Diploma of Associateship of Institution of Chemists (India).	Institution of Chemists (India) Calcutta (West Bengal).
13.	NEERI	Institutional membership.	Indian Society of R & D Planning & Management, New Delhi.
14.	NEERI (Table tennis team) i) Deepak Deshmukh ii) S. V. Waghmare	Runner-up trophy.	14th Shanti Swarup Bhatnagar Memorial Tournment RRL Jammu-Tawi.
15.	NEERI Zonal Lab., Cochin	Recognised as Research Centre for Ph. D programme under the faculty of Enviromental studies.	University of Cochin, (Kerla).
16.	Shri A. D. Patil	Post-graduate Diploma in Environmental Science & Technology.	International Institue for Hydraulic and Env. Engg., Delft Netherlands.
17.	Shri P. Nema	Post-graduate Diploma in Sanitary Engineering.	-do-
18.	Shri P. V. R. C. Panicker.	Ph. D degree in Zoology (Thesis entitled, 'Occurance, distribution and removal of intestinal parasites in different sewage treatment Processes'.	Nagpur University, 1981.
19.	Shri M. Vittal Rao	Recognised as Ph. D guide in the faculty of Botany,	Nagpur University.
20.	Shri K.S.M. Rao	Ph. D (Chemistry) on "Acoustic properties of dilute electrolyte solutions".	Nagpur University, 1980.
21.	Dr. K. S. M. Rao	Nominated on Editorial Board of 'Scavenger' Bulletin of Society for Clean Environment, Bombay.	SOCLEEN, Bombay.

Sl. No.	Name	Award/Honour/ Degree	Awarded by
22.	Shri V. Raman	Recognised as Ph. D Supervisory for Civil and Environmental Engineering.	Nagpur University.
23.	Shri V. S. N. Swami.	M. Sc. degree	I. I. T. Powai, Bombay.
24.	Mrs. J. K. Siddhu	One merit increment.	C. S. I. R., New Delhi.
25.	Shri P. B. Sanyal	Diploma of Associateship of Institution of Chemists (India).	Institution of Chemists (India), Calcutta, (West Bengal).
26.	Dr. R. Sarin	Consolation Prize of Rs. 101/-	Water Chemists Forum M/s. Glaxo Chemicals Division, Bombay.
27.	Dr. R. Sarin	Recognised as Ph. D Supervisor for Chemistry under the faculty of Science.	Nagpur University.
28.	Shri A. V. Shekdar	M. Tech in Production Engineering.	Nagpur University 1980.
29.	Shri D. S. Tajne	Diploma of Associateship of Institution of Chemists (India).	Institution of Chemists (India). Calcutta (West Bengal).
30.	Shri R. S. Sharma	Awarded Silver Medal for being top-notcher in All India Translation Course from Jan. 1 to March 31, 1981.	Central Translation Bureau, Department of Offical Languages, Ministry of Home Affairs, Govt. of India, New Delhi.

APPENDIX - IX

DEPUTATION ABROAD

Sl. No.	Name	Programme & purpose
1.	Dr. B. B. Sundaresan	WHO Task Force Group to prepare guidelines for Drinking water quality and health related Inorganics, Copenhagen, September 22-26, 1980.
2.	Dr. B. B. Sundaresan	WHO Task Force Group to prepare guidelines on drinking water quality and health related organic compounds, Ottawa, Canada, November 18-25, 1980.
3.	Dr. B. B. Sundaresan	Participated in the meeting of Experts at Rijswijk, The Netherlands in connection with Extension and Follow-up of Information Programme of POETRI at WHO-IRC, Netherlands during January 26-30, 1981.
4.	Dr. B. B. Sundaresan	WHO Adviser in WHO Task Force Working Group meeting held at Copenhagen during February 2-5, 1981.
5.	Shri A. D. Bhide	To present a country paper entitled "Status of solid waste disposal and utilisation in India" at Workshop on Solid Waste Disposal and Utilisation held at Amsterdam, Netherlands from October 13-17, 1980.
6.	Shri S. G. Bhat	Short-term Consultant to WHO-IRC, Netherlands, assignment in the field of "Information Support" in Water Supply and Sanitation from October 13 to November 21, 1980.
7.	Shri A. D. Bhide	To attend and present a paper at International Solid Wastes Congress at London on June 16-20, 1980.
8.	Dr. P. V. R. Subrahmanyam	Participated in the meeting of Working Group 'Guide-lines for control of toxic and other hazardous waste' at FRG from March 17 to 20, 1981 as WHO Adviser.
9.	Shri V. Raman	Deputed to Consultant under Sri Lanka as UNEP/UNDP from February 12, 1980 to May 13, 1980.

Sl. No.	Name	Programme & Purpose
10.	Shri S. R. Kshirsagar	One week programme-visit rural water supply scheme in Andaman Islands with a view to suggest Improvement in the design, construction, operation and management from March 20-26, 1981.
11.	Shri R. Swaminathan.	WHO/UNEP Workshop on Planning and Development of Control of Emission from Motor Vehicles at Kuala Lumpur (Malayasiya) and present a country report entitled "Auto Exhaust Emissions in India" by R. Swaminathan & B. B. Sundaresan, from November 10-14, 1980.

Fellowship/Exchange/Training abroad

Sl. No.	Name	Programme & Purpose
1.	Shri K. M. Aboo	Three-month WHO Fellowship for Advanced studies in Environmental Biology in UK from April 3, 1980 to July 3, 1980.
2.	Dr. Tapan Chakrabarti	National Scholarship for Post Doctoral Research in Biochemistry for one-year period at the University of Toronto, Canada from May 23, 1980 to May 23, 1981.
3.	Shri K. K. Das	Three-month FAO Fellowship for training in Sweden under UNDP project on "Exploration and identification of alternative raw materials for paper/newspaper manufacturers in cooperation with NEERI and Indian Pulp Industry" from September 10, 1980 to December 10, 1980.
4.	Shri P. Kumaran	Three-month WHO Fellowship from September 16, 1980 December 19, 1980 to study "Microbiology Industrial Effluents". Analysis and Treatment at Middlesex Polytechnic and Water Research Centre, Stevenage, UK.
5.	Shri K. M. Phadke	Three-month Fellowship for Advanced training in Air Pollution Monitoring and Methodology, UK from September 16, 1980 to Dec. 16, 1980.
6.	Shri V. P. Sharma	Three-month WHO Fellowship from September 19 to December 12, 1980 study" Modern trends the Evaluation of Atmospspheric Quality in highly Industrialised Urban Areas", in U. K.

APPENDIX-X

STAFF*

Scientific	.....	178
Technical	.....	163
Administrative	.....	117
Class IV	.....	127
Total	.....	585

* As on March 31, 1981.

APPENDIX-XI

OBITUARY

The following staff from headquarters went to their eternal abode during 1980-81

Sl. No.	Name	On
1.	Shri Ramdas B. Chouhan, Sweeper	1-2-1981
2.	Shri Abdul Hamid (Sp. Grade) Driver	8-2-1981
3.	Shri Ahmed Miya Junior Animal House Assistant.	6-3-1981

APPENDIX-XII

DISTINGUISHED VISITORS

Sl. No.	Name	Date (s)
1.	Mr. Han A. Heijnen Programme Officer WHO IRC for Community Water Supply The Hague (Netherlands).	12-4-1980 to 14-4-1980 and 10-9-1980 to 19-9-1980.
2.	Dr. F. K. Jalal Officer-in-Charge Environmental Coordinating Unit ESCAP, Bangkok, (Thailand).	6-5-1980
3.	Dr. D. W. Johnson Director Biological Station Murray State University Kentucky, (USA)	22-5-1980
4.	Mr. James B. Homolya US Coordinator for Indo-US Air Pollution Project No. PR-1-503-1	23-6-1980 to 30-6-1980
5.	Dr. B. C. Ghosal Director, Central Health Education Bureau New Delhi.	25-6-1980 to 26-6-1980
6.	Prof. S. Nurul Hasan Vice-President CSIR New Delhi.	7-7-1980
7.	Hon'ble Shri Vijay N. Patil Deputy Minister for Science, Technology & Space Government of India New Delhi.	14-7-1980
8.	Shri P. T. Kuraikose Programme Adviser UNDP Colombo (Sri Lanka).	16-7-1980
9.	Mr. David R. Watkins Project Officer Industrial Environmental Research Laboratory, US EPA Cincinnati, Ohio, (USA).	13-8-1980 to 25-8-1980

Sl. No.	Name	Date (s)
10.	Mr. Van Damme Manager, WHO IRC Netherlands	15-9-1980 to 19-9-1980
11.	Hon'ble Shri V. P. Sathe, Union Minister for Information & Broadcasting, New Delhi.	15-9-1980
12.	Mr. Henry Beal Director of Standards & Regulation, US EPA, Washington (USA).	27-10-1980 to 31-10-1980
13.	Dr. M. I. Sheikh Regional Adviser on Environ- mental Health, WHO Regional Office, Alexandria (Egypt).	3-12-1980 to 4-12-1980
14.	Dr. G. Bachmann WHO Headquarters Geneva (Switzerland).	3-12-1980 to 4-12-1980
15.	Air Marshal O. P. Mehra Governor of Maharashtra Bombay.	23-12-1980
16.	Dr. Charles Hendricks Senior Microbiologist, US EPA Washington (USA).	28-1-1981 to 4-2-1981
17.	Dr. R. J. Seidler Professor of Microbiology Oregon State University (USA).	28-1-1981 to 4-2-1981
18.	Mr. J. S. Jasper First Secretary (Commercial) British Deputy High Commission Bombay.	2-2-1981
19.	Mrs. P. Trivedi, Adviser (State Plans) Planning Commission, New Delhi.	6-3-1981

Sl. No.	Name	Date (s)
	WHO CONSULTANTS	
1.	Prof. Elmer Robinson Meteorologist & Section Head Air Pollution Research Washington State University Pullman Washington (USA).	Aug. 11 to Sept. 20, 1980
2.	Dr. P. L. Knoppert Director Water Storage Corporation Biesbosch, Rotterdam & Prof. of Sanitary Engineering Technology University Delft. Netherlands.	Nov 3 to Dec 5, 1930
	WHO FELLOWS	
1.	Dr. U. Nyunt Lwin, Burma.	May 26–27 1980
2.	Mr. Abdul Karim Adam, Sanitation Officer, Ministry of Health, Water & Sanitation Authority, Maldives.	Sept 15 to Oct. 31, 1980
3.	Mr. U. Thaung Tin, Sub-Assistant Engineer, Environmental Sanitation Division, Burma.	Oct. 6–10, 1930
4.	Mr. Mathew Malas, Health Inspector Papua, New Guinea.	Dec. 3–5, 1980
5.	Mr. Suvit Shumnumsirivath, Assistant Professor, Dept. of Health, Faculty of Public Health, Mahidol University, Thailand.	Feb. 23–28, 1981