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वार्षिक प्रतिवेदन

annual report

1982-83

NATIONAL ENVIRONMENTAL
ENGINEERING RESEARCH INSTITUTE
NEHRU MARG, NAGPUR - 440020
राष्ट्रीय पर्यावरण अभियांत्रिकी अनुसंधान संस्थान
नेहरू मार्ग, नागपुर - 440020

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CONTENTS

निदेशक की ओर से

संस्थान के अनुसंधान और विकास कार्यों द्वारा भारत में जल पूर्ति और स्वच्छता दशक कार्यक्रम (1981-1990) को महत्वपूर्ण समर्थन दिया जा रहा है। सुव्यवस्थित जल पूर्ति का स्वास्थ्य पर प्रभाव जानने के लिए आंध्र प्रदेश, उत्तर प्रदेश, उड़ीसा, केरल, गुजरात, तामिलनाड़, पश्चिमी बंगाल, मध्यप्रदेश, महाराष्ट्र, राजस्थान और हरियाणा राज्यों के 17 गांवों के संदर्भ में 66 ग्रामीण जल पूर्ति प्रणालियों का व्यापक अध्ययन किया गया, जिससे इन योजनाओं को लागू करने, चलाने और देख-भाल में प्रौद्योगिक, प्रशासनिक और सामाजिक एवं आर्थिक कठिनाइयों का पता लगाने में सहायता मिली।

देश के विभिन्न भागों में स्थित 20 जल उपचार संयंत्रों का दो साल तक अध्ययन किया गया जिससे पता चला है कि अधिकांश संयंत्र पर्याप्त रूप से प्रशिक्षित प्रचालकों द्वारा नहीं चलाए जा रहे हैं। इन संयंत्रों के डिज़ाइन और गुणवत्ता नियंत्रण की समीक्षा कर उनमें आवश्यक संशोधन किया जाना चाहिए। जल वितरण प्रणालियों से जल रिसाव की जानकारी जल संरक्षण का महत्वपूर्ण अंग है, जो कि जलपूर्ति और स्वच्छता दशक का मूल विषय है।

संस्थान की ग्रामीण स्वच्छता परियोजना प्रत्यक्ष रूप से स्वच्छता दशक कार्यक्रम पर आधारित है। इस परियोजना के अंतर्गत नागपुर के आस-पास के 10 गांवों में सस्ते शौचालय बनवाए गए और स्वास्थ्य शिक्षा तथा स्वास्थ्य पर पड़ने वाले प्रभाव का अध्ययन किया गया। इस कार्यक्रम में जनता के सहयोग और समाज विज्ञानियों को सम्मिलित करने की आवश्यकता पर जोर देने के लिए 'सस्ती सफाई व्यवस्था' विषय पर एक दिन का प्रशिक्षण कार्यक्रम और संगोष्ठी-सह कार्यशाला का आयोजन किया गया ताकि जल पूर्ति और स्वच्छता दशक कार्यक्रम का कारगर प्रभाव पड़ सके।

निम्नलिखित भारत-अमरीकी द्विराष्ट्रीय परियोजनाओं का कार्य पूरा किया गया:-

1) फॉस्फेटी उर्वरक और मूलभूत कार्बनिक रसायन उद्योगों से निकलने वाले विषैले पदार्थों का विश्लेषण, मूल्यांकन और उपचार,

2) विषाणु और जीवाणुओं की दृष्टि से पीने के पानी के स्रोत और जल-पूर्ति प्रणालियों का अध्ययन,

3) चुनिन्दा उद्योगों की चिमनियों से निकलने वाले तथा अन्य उत्सर्जनों का आस-पास की वायुगुणता पर प्रभाव।

इन परियोजनाओं से बड़े औद्योगिक उपक्रमों में पर्यावरण प्रबन्ध सम्बन्धी महत्वपूर्ण परिणाम प्राप्त हुए हैं।

10 शहरों में राष्ट्रीय वायुगुणता मॉनीटरन कार्यक्रम जारी है।

पानी में विषाणु और सालमोनेला एकत्र और अलग करने की नई विधियों और तकनीकों का मूल्यांकन किया गया और यह देखा गया कि सेलाइट कार्बोनेट प्लग विधि भी इस कार्य के लिए उतनी ही सक्षम है जितनी कि मेम्ब्रेन फिल्टर तकनीक। नदी, झील और कुएं के पानी की शुद्धता बनाये रखने के सम्बन्ध में किए गए अध्ययनों के आधार पर यह निष्कर्ष निकाला गया कि 5 पी एच मान पर एल्युमिनियम क्लोराइड मिलाकर मेम्ब्रेन फिल्टर की सहायता से अधिशोषण द्वारा पानी से विषाणु प्राप्त करने की मानक तकनीक की तुलना में बिटुमिनस कोयला विधि, एल्युमिनियम क्लोराइड मिलाकर या बिना मिलाए, दोनों ही स्थितियों में, ज्यादा कारगर है।

वायु और जल गुणता मॉडल तैयार करने के लिए संस्थान के सूक्ष्म संगणक (एच. सी. एल.- 1800) का अधिकाधिक प्रयोग किया जा रहा है। नियमित प्रशिक्षण पाठ्यक्रमों के अतिरिक्त संस्थान और 'ऑरेंज सिटी जेसीज़' द्वारा जन साधारण में पर्यावरण समस्याओं के प्रति सजगता पैदा करने के उद्देश्य से 'पर्यावरण सप्ताह' मनाया गया।

संस्थान के सक्रिय सहयोग से मद्रास में राष्ट्र मण्डल विज्ञान परिषद द्वारा प्रायोजित 'ग्रामीण जल पूर्ति' और नागपुर में केन्द्रीय जल प्रदूषण नियंत्रण मण्डल द्वारा प्रायोजित 'प्रदूषण नियंत्रण अधिनियमों का प्रवर्तन' विषयक दो महत्वपूर्ण कार्यशालाओं का आयोजन किया गया। भारतीय तेल निगम की ओर से 'प्रदूषण नियंत्रण' का एक विशेष पाठ्यक्रम आयोजित किया गया।

वायु और जल गुणता मॉनीटरन, प्रदूषण नियंत्रण और पर्यावरण प्रबन्ध आदि विशिष्ट क्षेत्रों में विशेषज्ञ और सलाहकारों के रूप में कार्य करने के लिए विश्व स्वास्थ्य संगठन और संयुक्त राष्ट्र विकास कार्यक्रम जैसे अन्तर्राष्ट्रीय संगठनों द्वारा संस्थान के वैज्ञानिकों की मांग दिन पर दिन बढ़ती जा रही है।

बी. सुन्दरेसन.

(बी. बी. सुन्दरेसन)
निदेशक

नागपुर
16 अगस्त, 1983

DIRECTOR'S REPORT

The Institute is providing significant R&D support to the Water Supply and Sanitation Decade Programme in India (1981-90). A comprehensive study on rural water supply systems covering 66 villages along with 17 reference villages has been completed in Andhra Pradesh, Gujarat, Haryana, Kerala, Madhya Pradesh, Orissa, Rajasthan, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal. These States were surveyed with a view to assess the health impact on the community due to organised water supply. The study has helped in identification of technological, administrative and socio-economic constraints in implementation, operation and maintenance of small community water supply schemes.

A two-year study on twenty water treatment plants in different parts of the country indicated that majority of them were being operated with poorly trained operators. The design and quality control need review and revision. Leakage detection in water distribution systems forms an important facet of conservation of water which is background theme of water supply and sanitation decade.

In sanitation aspects of the decade programme, rural sanitation project of the Institute has a direct bearing. This project carried out in 10 villages around Nagpur includes construction of 'Low Cost Latrines', health education and studies on health impact. A one-day training programme followed by a Seminar-cum-Workshop on 'Low Cost Sanitation' was arranged at Nagpur to emphasize the need of community participation and involvement of social scientists for effective impact of water supply and sanitation programme.

Three Indo-US Binational projects comprise (1) Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries; (2) Study of drinking water sources and supplies for virus and bacteria; and (3) Impact of fugitive and stack emissions from selected industries on neighbourhood air quality. These projects have been completed with significant findings of relevance to environmental management in large industrial undertakings.

National air quality monitoring in ten cities is being continued. New methodologies for concentration and isolation techniques for viruses and *salmonella* from water were evaluated. The Celite Carbonate plug method was found to be as efficient as MF technique for concentration and isolation of *salmonella*. Bituminous coal with and without addition of aluminium chloride was found to be more efficient than standard MF technique for

adsorption and recovery of virus at pH 5 with aluminium chloride. These conclusions are based on studies for monitoring river, lake and well water quality.

Microcomputer (HCL-1800) is being increasingly utilised to develop programmes concerning air and water quality modelling. Besides organising the training programmes which are conducted routinely, NEERI and Orange City Jaycees organised Environment Week in order to promote general awareness about environmental issues. Two significant workshops in which NEERI actively participated were on "Rural Water Supply" at Madras sponsored by the Commonwealth Science Council and on "Enforcement of Pollution Control Acts" at Nagpur sponsored by Central Water Pollution Control Board. A special course on "Pollution Control" was conducted at NEERI for the benefit of pollution control specialists in Indian Oil Corporation.

NEERI Scientists are being increasingly invited as Experts/Consultants by International organisations such as WHO, UNDP, etc., in specialised areas including Air and Water quality monitoring, Pollution control and Environmental management.

(B.B. SUNDARESAN)
Director

Nagpur
August 16, 1983

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 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

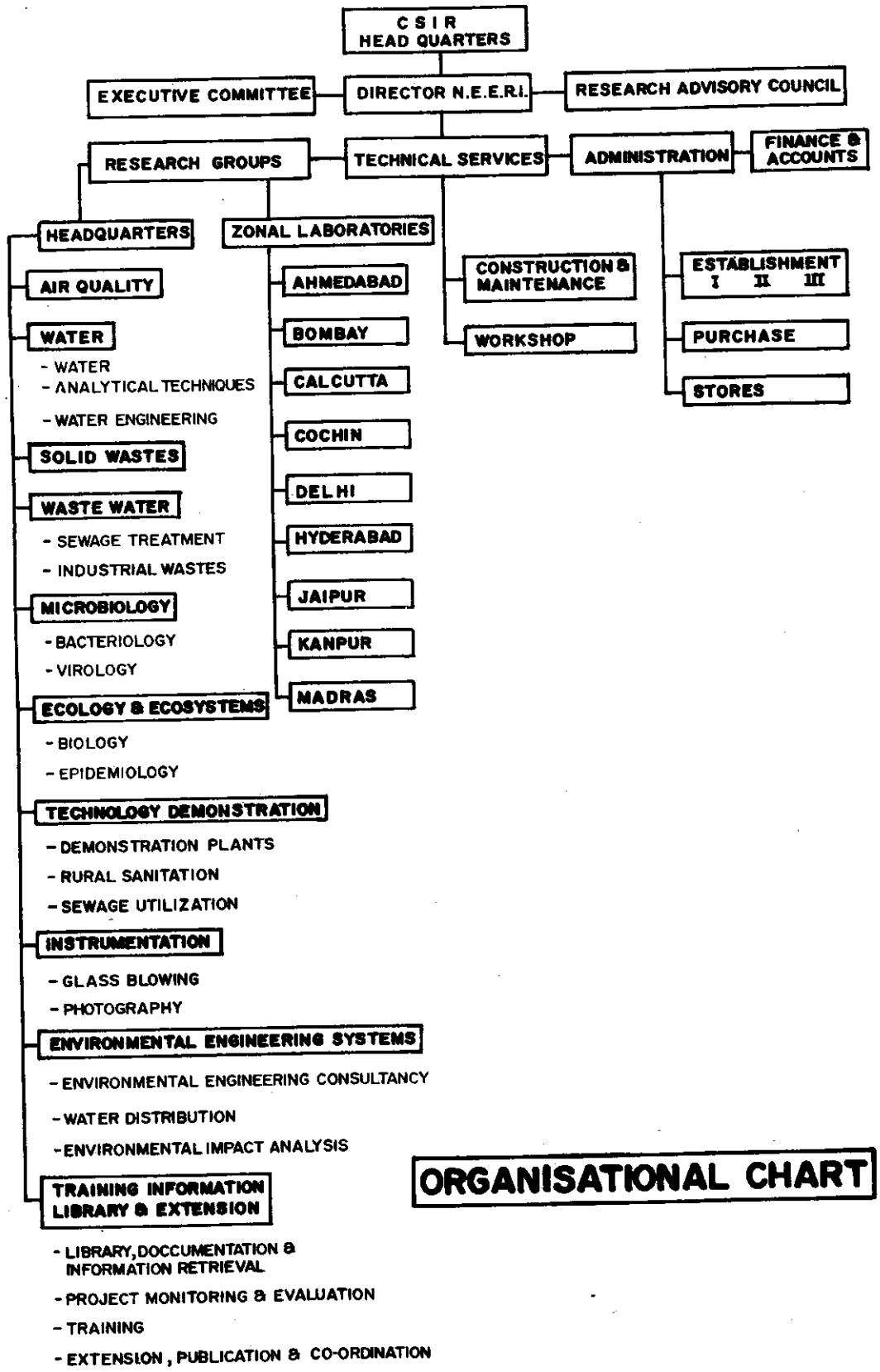
- Project monitoring & planning
- Training
- Information, documentation & retrieval
- International collaboration
- Technology transfer

Technical Services

- Workshop
- Glass blowing
- Photography
- Construction & maintenance

Zonal Laboratories

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



ORGANISATIONAL CHART

ACTIVITY GROUPS AT HEADOUARTERS

AIR QUALITY

B.B. Sundaresan

A.L. Aggarwal
P.K. Yennawar
V.L. Pampattiwar
R. Swaminathan
V. Muralidhar
V.S.S. Bhaskara Murty
G.H. Pandya
M.K. Reddy
K.S.M. Rao
K.M. Phadke
D.M. Dharmadhikari
S.K. Pentu Saheb
J.V. Kothari
S.D. Joshi
M.J. Parvez
A.K. Jain
C.P. Gajrani

Three new projects have been added in addition to Ambient air quality monitoring and emission inventory. Air quality data from Bombay are being used to predict long term trends. The study of atmospheric diffusion of pollutant emissions with the help of tracers like SF_6 and Freons is in progress.

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring net-work.
2.	0122	Impact of fugitive and stack emissions from selected industries on neighbourhood air quality (Indo-US project).
3.	0128	Air quality study at Taj Mahal, Agra.
4.	0130	Seasonal patterns and long term trends of air pollution in Bombay.
5.	0131	Sulphur hexafluoride tracer technique development.

WATER

Water

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

Water Engineering

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

Analytical Techniques Development

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

Two projects on removal and recovery of metal ions from waters and development of coagulant and coagulant aids from indigenous material have been taken up.

Identification of heavy metals, trace elements and pesticides in different water supplies has been started.

Three projects on high rate settlers, development of package water treatment plant and recovery of alum by liquid ion exchange are being continued.

Sl. No.	Project No.	Title
1.	0501	Research-cum-demonstration project on Slow Sand Filtration - Phase III. Collaborative project between NEERI and WHO IRC.
2.	0506	Performance evaluation of water treatment plants in India.
3.	0507	Study of high rate settlers.
4.	0509	Development of simple methods of water treatment (Design and development package water treatment unit).
5.	0511	Assessment and characterisation of water works waste and feasibility studies on alum recovery from sludge by Liquid Ion Exchange (LIE) technique.
6.	1435	Study of synthetic membranes of environmental engineering utility other than reverse osmosis.
7.	1438	Development of analytical methodology for continuous monitoring of water quality using ion-selective electrodes.

Sl. No.	Project No.	Title
8.	1439	Development and evaluation of Graphite Furnace Atomic Absorption Spectrophotometric Method for the determination of trace metals using matrix modification technique.
9.	1440	Speciation studies of trace elements in natural waters by "Chemical Modelling".
10.	1441	Baseline data on organochlorine pesticides, their identification and quantification in urban water supplies. Standardization of analytical procedure for the estimation of organo-phosphorus pesticides in water samples. Some studies on the removal of pesticides using granular adsorption media.
11.	1442-A	Baseline data on heavy metals, their identification and quantification in urban water supplies. Application of Flameless AAS method for analysis.
12.	1442-W	Studies on the methods for the removal and recovery of metal ions from waters.
13.	1443	Development of coagulants and coagulant aids from indigenous materials.

SOLID WASTES

A.D. Bhide
S.K. Titus
A.V. Shekdar
S.A. Gaikwad
M.S. Olaniya
A.D. Patil
R.V. Bhoyar
J.K. Bhattacharya
V.U. Muley

On the basis of studies on by-product phosphogypsum (BPG) from phosphatic fertiliser industry, a simple method of treatment of BPG was suggested. BPG can also be used for fabrication of plasterboards.

Sl. No.	Project No.	Title
1.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries (Indo-US project).
2.	1118	Evaluation of performance of mechanical composting plants under Indian conditions. (Sponsored by CPHEEO, Ministry of Works and Housing, Govt. of India, New Delhi).

Sl. No.	Project No.	Title
3.	1119	Systems analysis of refuse transportation system in a given city – A case study.
4.	1121	Anaerobic digestion of muncipal solid waste: Studies on fate of pesticides, intestinal parasites and heavy metals during composting of city refuse.
5.	1122	Studies on alternate heating system for pyrolysis.
6.	1123	Evaluation of existing facilities of solid waste disposal in Delhi & Planning for future needs (1981-2000). (Sponsored by Delhi Development Autority).

WASTE WATER

Sewage Treatment

V. Raman
K.L. Saxena
S.N. Kaul
C.K. Kale
A.N. Khan
P.P. Pathe
T. Nandy
(Mrs.) S.A. Patkie
A.C. Manuel
N.C. Jaitwar

Industrial Wastes

P.V.R. Subrahmanyam
J.S. Gadgil
T. Chakrabarti
T. Swaminathan
S.B. Deshmukh
(Mrs.) S. Satyanarayana
A. Ghosh
S.N. Khadakkar
S.D. Deshpande
(Mrs.) K. Swaminathan
C.V. Deshpande
S.R. Wate

Studies on treatment of catechol and m-nitrobenzene sulphonate (both in a mixture) showed that acclimated activated sludge degraded catechol preferentially whereas in a mixture of resorcinol and m-nitrobenzene sulphonate, the latter is preferentially degraded.

Radioactive tracer technique was used to find out the dispersion and flow characteristics of rotating biological reactor and anerobic upflow filter. Br^{82} was used as tracer.

Other significant projects are treatment of sewage & distillery wastewater anaerobically by upflow sludge blanket reactor & an upflow filter respectively; and evaluation of surface aerator for treatment of waste water by aerated lagoon at Ahmedabad.

Sl. No.	Project No.	Title
1.	0717	Treatment of wastewater from major dye manufacturing processes.
2.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries.

Sl. No.	Project No.	Title
3.	0724	Treatment of black liquor of small paper mills for lignin recovery and colour removal.
4.	0725	Bio-physical techniques for the removal of total organic carbon from industrial waste waters.
5.	0726	Biodegradation of mixed aromatics and phenolic substrates in aqueous environment under aerobic, anaerobic and facultative conditions.
6.	0727	Utilization of waste organic materials for removal of toxic heavy metals from industrial waste waters.
7.	0728	Biological hydrolysis of urea bearing nitrogenous fertilizer waste water under anoxic condition.
8.	1019	Effluent utilisation for cultivation of *Citrus reticulata* (Orange)
9.	1031	Model studies on Surface Aerators.
10.	1037	Overland flow (grass filtration) system to upgrade waste water anaerobic filter effluent.
11.	1038	Biological wastewater treatment by upflow anaerobic sludge blanket reactor.
12.	1039	Evaluation of low cost discs for rotating biological contactor.
13.	1040	Utilisation of rooted aquatic vascular plants for tertiary treatment of waste waters.

ECOLOGY & ECOSYSTEMS

K.P. Krishnamoorthi

Biology

(Mrs.) I.S. Jayangoudar
(Mrs.) R. Sarkar
J.P. Kotangale
P.R. Choudhari
(Mrs.) L. Sangolkar
T.K. Ghosh
A.V. Jagannadha Rao

Epidemiology

P.V.R.C. Panicker
(Mrs.) A.S. Gadkari
P.R. Sarode
M.W. Joshi
A.V. Talkhande

The Regional Workshop on Slow Sand Filtration and Commonwealth Science Council Meeting at Madras, May 10-14, 1982.

Adv. C.D. Oomachen, M.L.A., Chairman, Maharashtra Prevention of Water Pollution Board, Inaugurating the NEERI-CBPCWP (Central Board for the Prevention & Control of Pollution) Workshop at Nagpur. September 21, 1983.

MICROBIOLOGY

N.M. Parhad

Bacteriology

M.D. Patil
P. Kumaran
S.R. Joshi
N. Shivaraman
D.G. Kshirsagar
R.A. Pande
(Mrs.) S. Sandhya
D.S. Tajne

Virology

P.M. Phirke
S.B. Lakhe
S.V. Waghmare
T.V. Subba Rao
W.N. Paunikar
(Mrs.) P. Dubey

All-India Coordinated projects on algae and Waste water reclamation through aquaculture & agriculture are being continued. Fish breeding experiments and bioassays of treated effluents were carried out.

Live industrial waste from the LTC plant was treated successfully in a pilot plant with conventional hydraulic & organic loading for detoxification of phenol and cyanide.

Sl. No.	Project No.	Title
1.	0313	Study of drinking water sources and supplies for virus and bacteria (Indo-US project).
2.	0314	Microbial degradation of model compounds of lignin and lignin in pulp and paper mill wastes.
3.	0315	Bacteriological performance and evaluation of filter candle (CGCRI developed).
4.	0316	Development of appropriate technology for the complete treatment of toxic industrial wastes discharged by different coal carbonization processes.
5.	0317	Microbial degradation of substituted phenolic compounds.
6.	0401	Wastewater reclamation through acquaculture and agriculture.
7.	0407	All-India Coordinated project on algae (Sponsored by Department of Science & Technology, New Delhi).
8.	0409	Field testing of integrated water supply and wastewater disposal systems at village level (Aided by WHO)
9.	0410	Observations on the performance of Slow Sand Filters with special reference to flora and fauna.
10.	0411	Studies on suitability of oxidation pond method for the anaerobically treated slaughter house effluent.
11.	0412	Assessment of eutrophic status of certain fish culture ponds in Nagpur with special reference to standing crop of primary food-chain organism.

Sl. No.	Project No.	Title
12.	0413	Studies on fish breeding in sewage fed ponds.
13.	0602	An investigation of the epidemiological aspects of human schistosomiasis and schistosoma dermatitis in Nagpur district.
14.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries (Indo-US Project).
15.	1007	Fate of human enteric parasites in the soil environment (Sponsored by ICMR).
16.	1009	Rural sanitation pilot project in 10 villages around Nagpur : Assessment of health status.

TECHNOLOGY DEMONSTRATION

S.R. Kshirsagar

Sewage Utilisation

G.B. Shende
A.S. Juwarkar
(Mrs.) A. Juwarkar
(Mrs.) V.J. Nashikkar
(Mrs.) C. Chakrabarti
P.B. Deshbhratar

Rural Sanitation

M.V. Srinivasan
H.J. Patil
A.V. Bhoi
D.Y. Ratnaparkhi

NEERI's experience in motivating the villagers through health & general education for constructing and using pour flush water seal pit latrines is encouraging. The project has indicated that there is scope for improvement which can be carried out by the collaborating agencies like Gram Panchayat. Sixty-eight household latrines and three toilet blocks for village schools were constructed.

Ornamental plants in gardens around demonstration sewage treatment plants bagged 28 prizes. These were awarded by Nagpur Garden Club.

ICAR scheme on safe and optimum utilisation of domestic & industrial wastewaters for agriculture was continued.

Sl. No.	Project No.	Title
1.	1007	Safe and optimum utilization of domestic and industrial wastewaters in agriculture.
2.	1009	Rural Sanitation pilot project in 10 villages around Nagpur.
3.	1202	Survey of sewage farming in India.

V.R. Bhave
V.R. Apte
V.K. Kondawar
B.Z. Alone
G.T. Kale
Animesh Kumar
P.L. Muthal
S.D. Wachasunder
J.K. Bassin
S.M. Dhopte
Amol Singh

New projects based on micro-processor based technique and Gas Chromatograph techniques have been proposed and will be operative from April 1983. Repairs and maintenance & Instrumental analysis support to various projects are being provided.

Magnetic tape-drive and controller has been procured and installed. The microcomputer is being used by almost all the Divisions for their respective R&D activities. Following software programmes have been developed (using Fortran and Basic languages) by Instrumentation staff.

1. Time series Analysis – Harmonic Analysis
2. F test- Analysis of variance
3. AAS Absorbance
4. Pay Bills/Pay Slips
5. Reference Search (In progress).

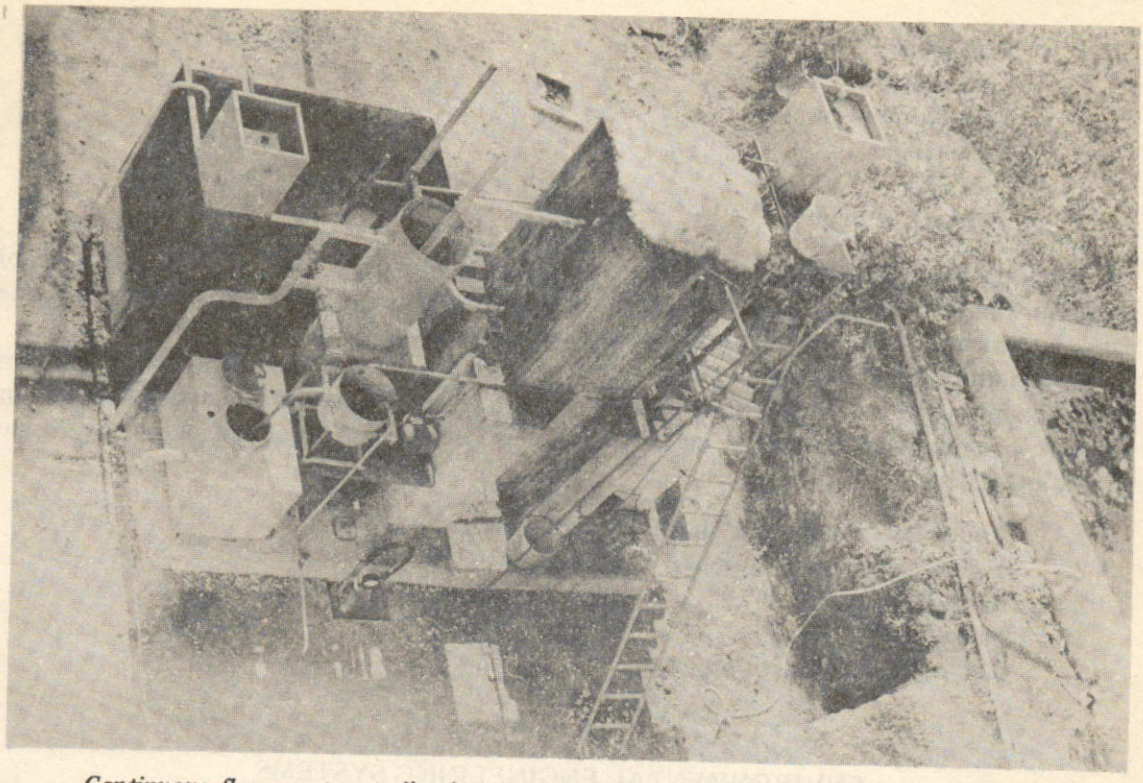
ENVIRONMENTAL ENGINEERING SYSTEMS

V. Raman

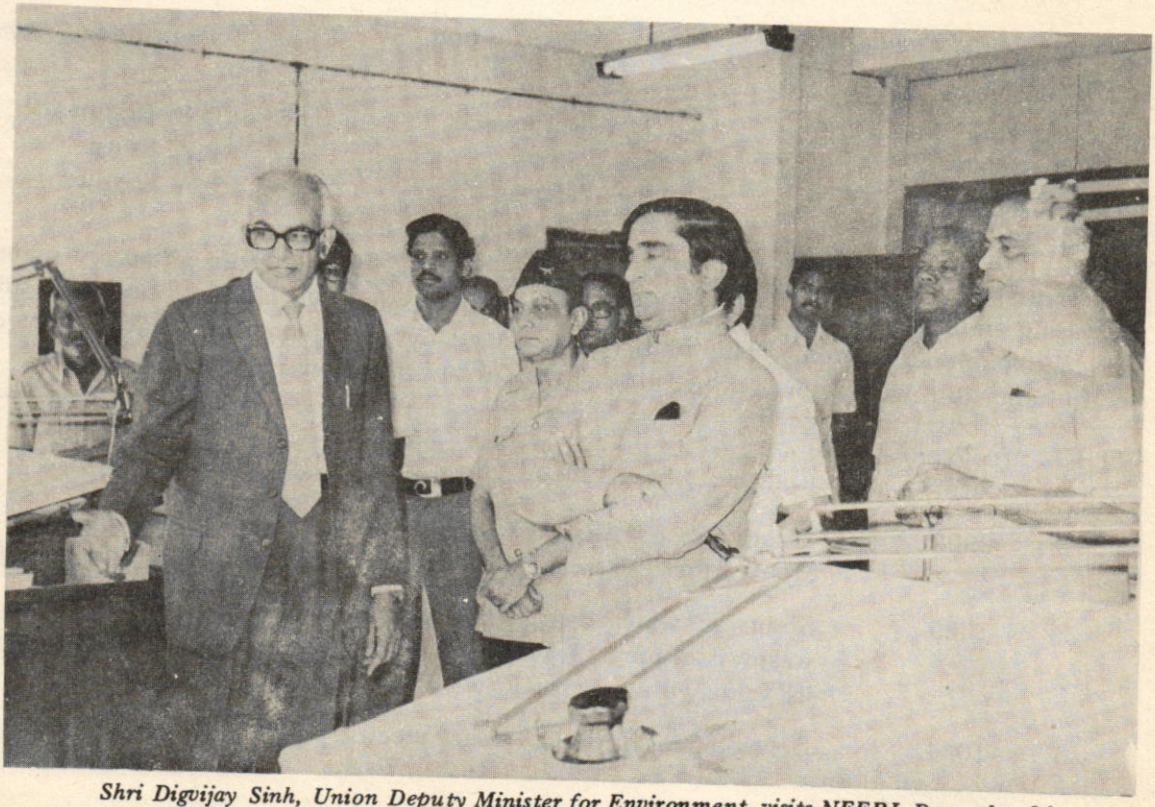
Environmental Engineering Consultancy	*Water Distribution*	*Drawing & Design*
S.K. Gadkari	A.W. Deshpande	D.G. Deshpande
S.D. Badrinath	S.K. Pathak	B.A. Kedar
V.P. Deshpande	R.P. Pillewan	P.A. Kasture
B. Chakradhar		

Treatability and field studies of wastewaters from a typical fertilizer factory manufacturing ammonia & urea were used to provide designs for hydrolysis of urea and subsequent ammonia stripping. This is to be confirmed by pilot plant studies. Other major consultancy jobs were sponsored by rubber factories and tamarind seed powder factory.

Sl. No.	Project No.	Title
1.	0902	Treatment and disposal of wastewater from fertilizer factory of M/s Southern Petrochemical Industrial Corporation Ltd., Tuticorin.
2.	1025	Status of water distribution system at Nagpur with reference to waste assessment, leak detection and its control, deterioration of 'C' value with water quality.
3.	1034	Development of direct reading electric pipeline network analyser.



Continuous flow reactor studies for phenol removal of Low Temperature Carbonisation Plant at Naspur (Andhra Pradesh).



Shri Digvijay Sinh, Union Deputy Minister for Environment, visits NEERI, December 24, 1982.

TRAINING, INFORMATION, LIBRARY & EXTENSION (TILE)

S.B. Dabadghao

Extension, Publication & Coordination

(Miss) K.W. Chaudhari
C.M. Freitas
Y.N. Murthy
K.M. Nandgaonkar
R.S. Sharma
P.P. Godbole
G.G. Pardhi
P.B. Palandurkar

Project Monitoring & Evaluation

R.K. Saraf
(Mrs.) P. Nawghare
(Mrs.) V.A. Deshpande

Library, Documentation & Information Retrieval

S.G. Bhat
S.K. Kesarwani
(Mrs.) S.N. Sinnarkar
V.D. Madkey
(Mrs.) A. Bankar
A.M. Khan
S.P. Gharote
M.W. Joshi

Training

V.P. Thergaonkar
H.C. Sharma
(Mrs.) R.A. Thakre
D.S. Ramteke
C.A. Moghe

TRAINING

Training Programmes :

Following courses were conducted :

Sl. No.	Course and duration	No. of participants
1.	Water & Wastewater analysis (July 26 - Aug. 13, 1983)	14
2.	Waste Treatment for I.O.C. officials (Dec. 14-24, 1982)	16
3.	Bioassay (Oct. 11-15, 1982)	9
4.	Air Pollution Control (Oct. 5-15, 1982)	20
5.	Solid Waste Management (Feb. 14-18, 1982)	11
6.	Preventive Maintenance in Water Distribution Systems (March 8-18, 1982)	10

LIBRARY, DOCUMENTATION AND INFORMATION RETRIEVAL

The LDIR Cell continued to render environmental information services to scientists and engineers in the field. These services include :

i) Information support for preparation of the state-of-the-art report and specialized bibliographical review. Indian contribution in environmental aspects of Steel Industry has been compiled.

ii) Updating of the data on "Work done on Biogas in India" has been completed.

iii) Literature search on Appropriate Technology in Environmental Health Programmes in Rural and Urban Underserved Areas was carried out and a bibliography containing 222 references was compiled.

The following documentation and information services were continued :

i) Selective Dissemination of Information.

ii) Current Awareness Service in the form of Monthly Guide to Current Literature in Environmental Health Engineering and Science. Over 2,000 current references were included.

iii) The work of collection and analysis of the data regarding Indian contribution in Environmental Engineering and Science is in progress.

iv) Literature search and querry handling.

v) Document Supply Service : Over 300 requests for photocopies were executed and 10,000 pages copied.

Sl. No.	Project No.	Title
		TRAINING
1.	2.4.01	Effect of air pollutants on vegetation near thermal power plants.
2.	2.4.02	Chemical nature of clays and their effect on coagulant doses.
3.	0128-A	Impact of refinery emission on vegetation.
		LDIR
1.	2.2.01	Development of a Central Information File for Environmental Information.
2.	2.2.03	Industrial Waste Treatment Bibliographical Review of work done in India.

PROJECT MONITORING & EVALUATION

PME Cell assists NEERI scientists in the design of experiments and statistical analysis of data on R&D projects. It consolidates annual and five-year plan proposals for projection at various forums. Projectwise budget and research utilization data and processing of project proposals are the other activities of the cell.

The cell organises periodical meetings with the R&D groups for review/monitoring of the projects.

EXTENSION, PUBLICATION & COORDINATION

Deputation/Exchange of personnel

Five NEERI scientists were deputed abroad as Consultants and Advisers to WHO/ UNEP during 1982-83. Participation and presenting of papers in symposia/seminars/work-shops/conferences held abroad and in India was another major activity. Under WHO and other bilateral exchange programmes with overseas countries, five NEERI scientists have completed advanced training in various fields of environmental science and engineering.

Patents

The Institute has patented the know-how of "Improved Process for manufacture of membrane filters" by S/Shri M.V. Nanoti and P.M. Patni. The Patent (No.149580) was accepted vide Gazette of India, Part III Section 2, June 30, 1982.

Hindi

Several members of the staff are being regularly coached under the Hindi Teaching Scheme of the Govt. of India. The Institute continued to publish the Hindi version of Director's Report in NEERI Annual Report 1981-82. Press releases to newspapers, news-agencies, All India Radio and Doordarshan were issued from time to time in Hindi and English.

COORDINATION WITH ISI, NRDC, CENTRAL AND STATE POLLUTION CONTROL BOARDS

TILE Division maintained close coordination with several institutions, offices and boards including Indian Standards Institution, New Delhi, Central and State Pollution Control Boards, CSIR, National Research Development Corporation of India (NRDC), Department of Environment and Department of Science & Technology, Govt. of India, New Delhi. Coordination with NEERI's nine zonal laboratories and Headquarters was also maintained by TILE Division.

Coordination with Mass Media

Dissemination of information by issuing about 30 press releases during 1982-83 to All-India Radio, Doordarshan, News Agencies and Editor, CSIR News. Correspondents of local and national dailies and Editor, IRC Newsletter (The Netherlands) has helped to increase public awareness about NEERI's R&D activities.

Publications

(i) **Indian Journal of Environmental Health (IJEH)** : The twentyfourth volume of this quarterly journal was published during 1982. The subscribers were 1500.

(ii) The 13th Volume of **"A Guide to Current Literature in Environmental Health Engineering and Science"** (monthly) was published in 1982. Total subscribers were about 100.

(iii) **NEERI-News** : The Monthly Newsletter of the Institute.

(iv) **Special Publication** : Annual Report 1981-82.

Conferences/Symposia/Seminars

Information circulars containing information of conferences, meetings, seminars and symposia in India and abroad were issued every month.

Display, Exhibitions, Visitors

Preparation of charts, flowsheets and diagrams for the Institute's scientists was a continuing activity of TILE Division. Some of these were shown to the Prime Minister, Smt. Indira Gandhi during her visit to the Institute on April 10, 1982. About 400 visitors including scientists, engineers and medical and engineering college students were shown around the Institute's laboratories during 1982-83. These visits were coordinated by TILE Division.

World Environment Day

World Environment Day was celebrated at NEERI on June 4, 1982. Prof. G.B. Kadam, Vice-Chancellor, Nagpur University was the chief guest. Speakers on the occasion were Dr. B.B. Sundaresan, Director, NEERI and Advocate P.N. Chandurkar who spoke on "Environmental Law". Six outstanding school and college students who participated in the World Environment Day Painting and Essay competitions were awarded certificates and prizes. The prizes-winners were :

Drawing/Painting : 1st Arvind Verma, Kendriya Vidyalaya, Vayusenanagar, Nagpur-7; 2nd Rajesh Padole, Railway Men's High School, Ajni, Nagpur-3; and 3rd Prateek Joseph, Bishop Cotton School, Nagpur-1.

Essay : 1st Sughosh Moharikar and 2nd Ku. Anita Pampattiwar (both from Somalwar Junior College, Napur-10); and 3rd Ku. Lata Murthy, Institute of Science, Nagpur-1. The WED celebrations was co-sponsored by Nagpur University. The University contributed Rs.200/- for purchase of the six prizes for the competitions.

The Orange City Jaycees and NEERI observed Environment Week from April 25 to May 1, 1982. Lectures, tape-slide shows and film shows were arranged in schools and slum areas of Nagpur to promote general awareness about environmental issues.

Director's Press Conference

Dr. B.B. Sundaresan, Director, NEERI, addressed a press conference on March 14, 1983, in connection with leak detection survey in the water distribution system at Shankar-

nagar locality of Nagpur City. Shri V. Raman, Scientist & Head, Sewage Treatment and Environmental Engineering Consultancy Divisions, outlined the aim of the programme. Dr. Sundaresan underlined the need for establishing a Department of Preventive Maintenance in the Nagpur Municipal Corporation. The Conference was well attended and reported.

Technical Services

Workshop	*Photography*
N.G. Swarnakar	E.P.I. Sundersingh
S.K. Nimkhedkar	
S.C. Shrivastava	*Glass Blowing*
V.L. Waranashiwar	
G.S. Motghare	P.S. Kshirsagar
A.G. Parkhi	
V.D. Bhonsle	

Major jobs fabricated were field scale unit for biological hydrolysis of urea, package water treatment plant (cap. 5 litres per minute), venturi scrubber and laboratory scale unit for fluidised bed studies.

About 5000 jobs including preparation of slides, microfilming, photomicrographs and other photographic work were undertaken by Photography Section while the Glass Blowing Section completed 153 jobs.

ADMINISTRATION

Kuldip Rai	Administrative Officer
P.A. Chandekar	Section Officer
M.V. Joglekar	Section Officer
Hameed Khan	Section Officer
K. Muthuswamy	Private Secretary
V.K. Sankaran	Sr. Personal Asstt.

STORES	*PURCHASE*
Sikander Sultan, Stores & Purchase Officer	G. Srinivasan, Stores & Purchase Officer

FINANCE & ACCOUNTS

A.V. Subba Rao	Finance & Accounts Officer
Santosh Kumar	Section Officer (F&A)

BUILDING AND CONSTRUCTION	*STAFF QUARTERS*
N.M. Narasimhan, Asstt. Executive Engineer.	J.J. Saha, Civil Engineer.

The Prime Minister, Smt. Indira Gandhi, visits the Institute, April 10, 1982.

Prof. G.B. Kadam, Vice-Chancellor, Nagpur University, addressing the World Environment Day celebrations, June 4, 1982. Third from right is Adv. P.N. Chandurkar who spoke on 'Environment Law'.

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.

NEERI ZONAL LABORATORIES

1. NEERI Zonal Laboratory
   Sub-urban, Sub-Pumping Station
   Beyond Calico Mills
   Sewage Farm Road
   AHMEDABAD-380022 (Gujarat)
   Gram : NEERI, Ahmedabad-22
   Phone : 391300 (Off.)

2. NEERI Zonal Laboratory
   89-B, Dr. Annie Besant Road
   Worli
   BOMBAY-400018 (Maharashtra)
   Gram : BOMPHERI, Bombay-18
   Phone : 376635 (Off.)
   396034 (Res.)
   Telex : 011 - 3462

3. NEERI Zonal Laboratory
   23, R.N. Mukherjee Road
   CALCUTTA-700001 (W.B.)
   Gram : NEERI, Calcutta-1
   Phone : 238792 (Off.)
   467753 (Res.)

4. NEERI Zonal Laboratory
   "Maitri", No.33/24 A,
   Chakkungal Road
   Palarivattom P.O.
   COCHIN-682025 (Kerala)
   Gram : NEERI, Ernakulam
   Phone : 39788 (Off.)

5. NEERI Zonal Laboratory
   Chandrawal Water Works No. II
   Lala Shamnath Marg
   DELHI-110054
   Gram : DELPHERI, Delhi-54
   Phone : 221757 (Off.)
   565279 (Res.)

6. NEERI Zonal Laboratory
   R.R.L. Campus
   HYDERABAD-500007
   (Andhra Pradesh)
   Gram : NEERI, Hyderabad-7
   Phone : 703349 (Off.)
   71563 (Res.)
   Telex : 155 - 261
   (RRL Hyderabad)

7. NEERI Zonal Laboratory
   A-11, Mahavir Udyan Path
   Bajaj Nagar
   JAIPUR-302017 (Rajasthan)
   Gram : NEERI, Jaipur-17
   Phone : 74872 (Off.)
   62411 (Res.)

8. NEERI Zonal Laboratory
   6/33, Civil Lines
   KANPUR-208002 (U.P.)
   Gram : NEERI, Kanpur-2
   Phone : 40127 (Off.)
   47701 (Res.)

9. NEERI Zonal Laboratory
   CSIR Complex, T.T.T.I.,
   Taramani P.O.
   MADRAS-600113
   Gram : CONSEARCH Madras
   Phone : 413964 (Off.)
   412321 (Res.)
   Telex : 041 - 363
   (CSIR Complex)

ZONAL LABORATORIES

AHMEDABAD

S.K. Shrivastava
P. Nema
A.M. Deshkar
N.C. Kankal
C.G. Mehta
B.H. Gokhe

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring network.
2.	0506	Performance evaluation of water treatment plants in India.
3.	0909 6.1.06	Pilot plant studies on aerated lagoon system for the treatment of sewage from Ahmedabad City.
4.	SP	To study the causes of corrosion and frequent breakdowns of sewers in Ahmedabad City.

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
S.G. Thakur
S.S. Tipnis

Sl. No.	Project No.	Title
1.	0115 6.2.01	National air quality monitoring network.
2.	506 6.2.02	Performance evaluation of water treatment plants in India.
3.	2.4.01 6.2.03	Effect of air pollutants on vegetation.
4.	0907 6.2.06	Total environmental impact study for Bombay Port Trust (Sponsored by Chief Engineer, Bombay Port Trust, Bombay).

CALCUTTA

A.K. Basu
R.S. Dhaneshwar
K.K. Das
(Mrs.) D. Ray
A.K. Biswas
(Mrs.) Giti Mukherjee
R.D. Sahu
A.K. Ganguly
S.H. Molla
M.K.A. Kutty
N. Chatterjee
P.B. Sanyal
S.K. Patra

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring network.
2.	0119 SE-ICP-CEP-003	Air pollution survey for Calcutta and Howrah.
3.	0506	Performance evaluation of water treatment plants in India.
4.	6.3.05	Development of an integrated method of farm animal waste disposal in West Bengal.
5.	6.3.06	Performance evaluation of commercially made activated carbon for treatment of wastewater from selected industries.

COCHIN

C.S.G. Rao
V.S. Narayanaswami
(Mrs.) Gracy Anto

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring network.
2.	0506	Performance evaluation of water treatment plants.
3.	SP	Treatment and disposal of wastewater from Bleach/Dye vats. (Sponsored by Central Coir Board, Kalavoor, Alleppy).
4.	SP	Preventive maintenance of water distribution system with reference to waste assessment, leak detection and its control at Cochin (Sponsored by Cochin Corporation & P.H.E. Deptt., Govt. of Kerala).

DELHI

A. Raman
V. Hara Prasad
L.N. Sharma
R.C. Dixit
J.L. Nagpal

Sl. No.	Project No.	Title
1.	0115 6.4.02	National air quality monitoring network.
2.	0409	Field testing of integrated water supply and wastewater disposal systems at village level (Sponsored by WHO).
3.	0501 6.4.04	Research-cum-demonstration project on Slow Sand Filtration. Phase II and III.
4.	0506	Performance evaluation of water treatment plants in India.
5.	1022 6.4.01	Monitoring of Jamuna river water quality near proposed outfall of Mathura refinery (Sponsored by Indian Oil Corporation, New Delhi).
6.	0912 6.4.07	Effluent treatment & disposal for Barauni Oil Refinery (Sponsored by Indian Oil Corporation, New Delhi).
7.	0913 6.4.08	Monitoring of river water quality at Munak regulator and Jamuna river at Panipat near proposed Karnal refinery (Sponsored by Indian Oil Corporation, New Delhi).

HYDERABAD

Y.S. Murty
D. Seethapathi Rao
M. Vittal Rao
R.C. Reddy
S.S. Mudri
G. Sambiah
L. Shanti Kumar
S.I. Elyas
P. Murahari Rao
D.G. Gajghate
D. Venkata Rao
M.R.K. Murthy
K.G. Rama Rao
I. Rama Mohan Rao

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring network.
2.	0129	Assessment of air quality in Visakhapatnam City.
3.	6.5.02	Fluidized bed biological reactor for waste treatment to control environmental pollution (Sponsored by Department of Science & Technology, New Delhi.

JAIPUR

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

Sl. No.	Project No.	Title
1.	0115 6.6.01	National air quality monitoring network.
2.	6.6.02	Performance evaluation of sewage treatment plant at Jaipur.
3.	0506 6.6.03	Performance evaluation of water treatment plants in India.

KANPUR

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

Sl. No.	Project No.	Title
1.	0115 6.7.01	National air quality monitoring network.
2.	6.7.02	Treatment of industrial effluents by anaerobic contact filter process (Treatment of Mixed Tanning Liquor and Brewery Waste).
3.	6.7.04	Performance evaluation studies of water treatment plants in Uttar Pradesh.
4.	0128-B	Laboratory studies on exploitation of common local trees as sink for gaseous pollutants with special reference to SO_2.

MADRAS

M. Mariappan
V. Subbiah
T.K. Srinivasan
V. Kothandaraman
R. Jayabalou
K.S. Subba Rao
K.M. Aboo
S.P. Subramanian
U. Manivel
Y.V. Subrahmanyam
Miss R. Kamatchiammal

Sl. No.	Project No.	Title
1.	0115	National air quality monitoring network.
2.	6.9.14	Toxicity of pulp and paper mill effluents to fresh water fish.
3.	6.9.15	Technological evaluation of waste water treatment plants in Tamil Nadu and Karnataka.

Sl. No.	Project No.	Title
4.	6.9.16	Studies on the effect of Tannery wastes both solids and liquids wastes on aquatic micro and macrophytes.
5.	6.9.13	Polymer supported anion and cation exchange resins for treatment of water & wastewater.
6.	0506	Performance evaluation of water treatment plants in India.
7.	0719	Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries.
8.	0409	Field testing of integrated water supply and wastewater disposal systems at village level.

The Coordination Council Meeting of the Engineering Science Group at NEERI, Nagpur, January 20, 1983. Also seen are Shri R.N. Bhargava, Joint Adviser, CSIR (on the extreme left) and Prof. P.K. Jena, Chairman of the Council (third from leaf).

R&D PROJECTS IN PROGRESS

AIR QUALITY

0115 : National Air Quality Monitoring

The process of urbanisation or industrialisation and growth in ambient air pollution levels are synonymous in nature. Besides anthropogenic sources of air pollution, the biopogenic sources (natural origin), meteorological and geographical conditions also govern the pollution belt pattern in an urban area. Air pollution status trends in ten Indian cities are being regularly monitored since 1978. The comparative picture of pollution status with respect to SPM, SO_2, NO_2, SR and DF as observed during 1982 is presented in Table I.

The inter-city comparison of SPM and SO_2 level showed Calcutta as the most and Cochin as the least polluted city. When SO_2 is taken as an index of anthropogenic sources, the ambient level in Calcutta was 81 $\mu g/m^3$ and being higher than ref. level of 80 $\mu g/m^3$, the city can be classified as a polluted city. Delhi, Bombay and Ahmedabad followed Calcutta in order of pollution levels. In Delhi, high NO_2 levels comparatively reflected the status of motor vehicular activity.

As regards SPM, the coastal cities (viz. Bombay, Madras and Cochin) becuase of high humidity condition experienced low SPM levels. The ambient SPM levels in Indian cities in general are highly influenced by background contributory factors (viz. deserts, uplifted dust from unpaved surfaces as meteorological or geographical conditions).

0122 : Impact of fugitive and stack emissions from selected industries on neighbourhood air quality

This is the final phase of the Indo-US project during which winter season observations in refinery (Baroda) and aluminium plant (Korba) were recorded. The salient features of observations were :

(a) The refineries emit SO_2 in addition to organic pollutants. The SO_2 emission varied from 2 gms. in catalytic distillation unit to 200 gms. in Catalytic reformation unit per metric tonne of throughput processed. The SO_2 emission depend on the sulphur content of the crude processed. The air quality inside the plant due to fugitive source was monitored. The levels of inorganic pollutants were less compared to the organic pollutants such as RSH and HCHO. The maximum concentration was recorded in LPG plant.

(b) The main source of fluoride emission in the aluminium plant is aluminium smelters. About 33 kg. of F was discharged per day. Steam plant discharged about 12 kg. of SO_2 per day. Steam plant discharged about 12 kg. of SO_2 per day. The anode paste plant discharged about 12 kg. of dust per day. High levels of fluoride dust were recorded inside the cell house. Fluoride was present in the ambient air at the downwind monitoring stations.

TABLE - I

Air Quality in selected cities in India-1982 (Annual 24 hrs. averages)

City	SPM $\mu g/m^3$	SO_2 $\mu g/m^3$	NO_2 $\mu g/m^3$	SR $mgSO_3/100\ cm^2/day$	DF $MT/km^2/month$
Ahmedabad	234	22	20	0.08	91
Bombay	148	29	31	0.33	22
Calcutta	418	81	24	0.31	33
Cochin*	89	7	Tr	0.07	---
Delhi	328	33	32	0.22	28
Hyderabad	173	14	6		---
Jaipur	279	Tr	18	0.15	17
Kanpur	307	11	7	0.16	44
Madras	145	9	11	0.37	12
Nagpur	161	10	9	0.18	34

SPM = Suspended particulate matter, SO_2 = Sulphur dioxide, NO_2 = Nitrogen dioxide, Tr = traces.

SR = Sulphation rate, DF = Dust fall rate, $\mu g/m^3$ = microgramme per cubic meter, $Mt/km^2/month$ = Metric tonne per square kilometre per month , * Seven month avg.

0128 : Air quality study at Tajmahal, Agra

Government of India has taken a special note on the potential of damage to the national monument (Tajmahal) due to ambient pollution built up in and around Agra. On the basis of recommendations of a high power committee, NEERI has been entrusted with responsibility of continuous monitoring of pollution status around Tajmahal.

Since 1980, NEERI has been continuously observing the variations in SO_2, NO_x and SPM levels by taking 4 nos. average recordings for SO_2 and NO_x whereas SPM levels are observed as 24 hr. averages.

The observations recorded during this period exhibited no significant rise in pollution status because SO_2 levels were invariably less than 20 $\mu g/m^3$. However, seasonal effects on ambient SO_2 build up was noticed, because in winter low dilution capacity of the atmosphere has resulted in higher ambient levels.

0130 : Seasonal Patterns and long-term trends of air pollution in Bombay

As an essential pre-requisite for urban diffusion models, a proper data storage and analysis system needs to be developed. In this regard, considerable progress has been achieved on the following two aspects :

(a) A system has been evolved for storage of aerometric data in SAROAD (EPA) format and subsequent statistical analysis, so that long and short term trends, seasonal or diurnal variations, and correlations between air quality and meteorology can be projected on regular basis.

(b) The radio-sonde observation of IMD are also being stored and computer programmes have been written for calculating mixing height and ventilation coefficients. Programmes to compute stability classes based on routine IMD airport observations have also been written. For these calculations, the same programme can be adopted for any city in India and in fact, at a later stage one may characterize air pollution climatology over all important urban centres of India based on procedures developed here.

0131 : Sulphur hexafluoride tracer technique development

This project is primarily aimed at the development of tracer techniques methodology as a tool for validating or developing diffusion models in India. There are two major tasks involved in this project, one is the standardization of analytical techniques for tracer gases (SF_6 or Freon-12) and the second is to conduct small scale field tests using these tracer gases for evaluation of diffusion coefficients and simulation models.

During this period, in light of the delays involved in SF_6 procurement, analytical procedures have been standardized for Freon-12 gas analysis on GC-ECD and new columns (SA molecular seive) are being tested for SF_6 gas. Freon 11 and 12 can also be used for such tracer gas experiments in areas where their background sources are negligible.

WATER

0506 : Performance evaluation of water treatment plants in India

Twenty water treatment plants of capacities ranging from 0.1 to 59 MGD selected from different regions of the country are being evaluated for their performance and the state of art of operation and maintenance. Twelve more plants were taken up for study during the year. The important findings common to most of the plants are : (i) pre-treatment is a weak link and due attention is not given to this vital step; (ii) Mechanical equipments & gadgets used in the various treatment units are either inoperative or not maintained in working condition; (iii) Even the minimum laboratory facilities and equipments are generally lacking. Most of the staff running the treatment plants have not undergone any formal training in plant operation and maintenance.

0507 : Study of high rate settlers

Experiments conducted with flocculated water indicated that tube settlers are more efficient than plate settlers under identical conditions of raw water flow rates and turbidities. Two flow velocities, 10 & 20 cm/min were tried. Flocculated water turbidity varied from 82-320 NTU and effluent turbidity from tube settlers varied between 8 and 26 and for plate settlers between 18 and 39.

0509 : Development of simple methods of water treatment

After studying one configuration of package plant, another unit was designed and fabricated. This comprised of gravel media flocculator, plate settler and sand filter. Raw water turbidity up to 100 NTU was treated at flow rates 5 to 8 lpm. Preliminary trials indicate satisfactory settled water turbidity (< 40 NTU) and filtrate quality (< 1 NTU).

0511 : Assessment and characterization of water works waste, feasibility studies on alum recovery from sludge by liquid ion exchange (LIE) technique

Wastes sample from Wunna and Gorewara water treatment plants are being collected and analysed for Turbidity, pH, Total Solids, Suspended Solids, Total Volatile Solids, COD & BOD. Experiments on optimization of LIE technique are in progress in which different variables like pH, time of extraction, phase ratio and concentration of LIE are being studied.

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

Membranes prepared from methyl acetate, n-butanol, distilled water and glycerine between temp. 15-22°C were used for removal of zinc during ultrafiltration. From the various combinations of the above chemicals, 98.99% Zn - EDT complex rejection was observed when the composition of the membrane casting solution was 62%, 31%, 6.5% and 0.5%. Cellulose acetate was 8.3 (W/V) % of solvents. Ideal temperature for this membrane was 20 ± 1°C. Same membrane is being tried for Pb-EDTA removal.

1441 : Baseline data on organochlorine pesticides, their identification and quantification in urban water supplies. Standardization of analytical procedure for the estimation of organo-phosphorus pesticides in water samples, some studies on the removal of pesticides using granular adsorption media

Water samples were collected from 14 sampling points in Kanpur. Hexane extracts collected as per previously standardised procedure were analysed by GC after concentration in Kuderna - Danish evaporator. Similar work will be carried out on water samples from other cities. Pesticides estimated by GC were lindane, aldrin, dieldrin, heptachlor & DDT. It is worth noting that the concentrations were observed in the lower ppb range (Table I).

1442 A: Baseline data on heavy metals, their identification and quantification in urban water supplies. Application of flameless AAS method for metal analysis

Water samples were collected from 14 sampling points in Kanpur and were analysed for concentration of heavy metals. The metals estimated were cadmium, chromium, copper, iron, manganese, nickel, lead and zinc by AAS. Samples from other cities are also being analysed. A record of these metals of public health significance will indicate the trend in water quality of a few selected cities (Table II).

1442 W: Studies on the Methods for the Removal and recovery of metal ions from waters

Work on removal and recovery of heavy metals by naturally occuring minerals and chelating polymers was continued. Minerals were serpentine - yellow and green, calcite and magnesite, activated alumina and the chelating polymers were chitosan and polycarboxylic acids. Manganese was used as indicator metal ion and aquatic pH range was between 2 & 7.

Experiments with serpentine showed that manganese removal was better when finer particle size was used. The column studies showed accumulation of manganese on serpentine which at -30, + 30 mesh got frequently choked. Regeneration of the columns by various chemicals is being tried.

TABLE - I

Z Pesticide levels in Kanpur Waters

Sample No.	CONCENTRATION (ppb)							
	Lindane	Aldrin	Dieldrin	Heptachlor	Heptachlor Epoxide	Total DDT		
						P-P DDD	P-P DDE	P-P' DDT
1	ND	ND	ND	ND	ND	ND	0.057	ND
2	ND	ND	ND	0.022	ND	ND	0.070	ND
3	0.081	ND	ND	ND	ND	0.171	0.047	ND
4	0.100	0.028	0.240	ND	ND	0.200	0.706	ND
5	ND	ND	ND	ND	ND	ND	0.100	ND
6	0.043	ND	0.060	ND	ND	0.285	0.247	ND
7	0.024	ND	ND	ND	ND	0.040	0.008	ND
8	0.015	ND	0.054	ND	ND	0.140	0.221	ND
9	0.200	ND	0.054	ND	ND	ND	0.204	ND
10	0.054	ND	0.038	ND	ND	ND	0.255	ND
11	0.006	ND	0.032	ND	ND	0.000	0.117	ND
12	0.013	ND	ND	ND	ND	0.077	0.440	ND
13	0.023	ND	ND	ND	ND	0.065	0.049	ND
(WHO Guidelines - 1981)								
	3	0.03	0.03	0.1		1		

ND = Not Detected.

Calcite column showed 80-99% Zinc removal when the flow rates were varied from 0.2 to 2 ml/cm^2, influent and effluent concentrations were 80 & 0.5-2 mg/l, respectively.

Columns using chitosan were used to study removal of copper (10 mg/l in distilled water). Effluent copper concentration was 0.01 to 0.02 mg/l.

1443 : Development of Coagulants and Coagulant Aids from indigenous materials

Manganese dioxide acts as catalytic oxidant when added to acidified ferrous sulfate solution and aerated. In the process ferrous is converted to ferric iron. Resulting ferric sulfate is a good metal coagulant. Studies were conducted to optimise conversion, concentration of MnO_2 and time of aeration. Resulting ferric sulfate solution was used as coagulant from removal of water turbidity (700 NTU). Settled water turbidity in Jar Test was 15 NTU. Residual manganese in water indicates that this process can be used for treatment of wastewaters.

TABLE - II

Heavy metal levels in Kanpur waters

Sample No.	Cd µg/l	Cr µg/l	Cu µg/l	Fe mg/l	Mn µg/l	Ni µg/l	Pb µg/l	Zn mg/l
1	4.0	8.7	25.9	0.48	0.075	22.7	13.5	0.13
2	2.2	3.8	11.6	0.54	0.082	4.3	10.3	0.10
3	2.6	3.8	17.3	0.08	0.056	8.6	11.4	0.08
4	1.1	7.9	8.8	2.17	0.101	7.4	6.3	0.08
5	3.2	3.0	23.4	0.19	0.041	5.9	7.6	0.10
6	1.6	73.7	28.6	1.47	0.096	12.6	8.5	0.13
7	1.5	12.3	10.3	0.07	0.218	4.0	5.0	0.06
8	3.0	0.3	7.8	0.07	0.088	7.2	5.3	0.13
9	2.3	6.6	17.3	0.35	0.033	8.6	5.7	0.13
10	0.9	6.1	16.6	0.50	0.068	4.4	6.1	0.08
11	3.8	0.2	29.2	0.16	0.080	5.5	4.0	0.09
12	1.4	0.0	33.4	0.21	0.061	8.6	8.1	0.11
13	1.7	1.1	18.1	0.59	0.054	8.4	6.5	0.09
14	1.4	1.6	126.4	1.16	0.093	11.7	8.2	0.23
(WHO Guidelines - 1981)								
	10	50	1000	0.3	0.5	100	50	5

Cassiafora seeds were used as coagulant and coagulant aid. These seeds are proteinous and abundantly available in India. Powdered seeds when added as paste to turbid waters acted both as coagulant and coagulant aid in laboratory jar test at concentration of 10-175 mg/l and 5.25 mg/l respectively. Alum dose varied from 2-13 mg/l. Raw turbidity was 400-600 NTU.

SOLID WASTES

0719 : Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries [(Indo-US Project No. PR-1-501-1)]

Detailed investigations were carried out on the pollutants contained in leachates from BPG. More than 80% of leachable fluorides, phosphates & heavy metals came out in the first five days in the leachate. The BPG hence can be washed and washwater treated for removal of toxic pollutants. Washed BPG can be disposed off or used for plasterboard manufacture.

Iron sludge can be used as a pigment in the manufacture of paint.

1119 : Systems analysis of refuse transportation system in a given city – A case study

Original computer programme regarding the quantity of waste collected at different points and the distance between these points was modified for use of HCL-1800 microcomputer. Computation work was carried out for obtaining solution to a 41 point problem.

1121 : Anaerobic digestion of municipal solid waste : studies on fate of pesticides/intestinal parasites and heavy metals during composfing of city refuse

Separation of organics and inorganics from refuse was satisfactorily achieved when a system using partly gravity separation and an air blower at the lower end. Mining mechanism is being standardised.

1122 : Studies on alternate heating system for pyrolysis

On the basis of small scale experiments, the time required for pyrolysis and also the velocity needed for fluidisation of paper mill sludge was found out. The experimental reactor has been designed and is being fabricated.

1123 : Evaluation of existing facilities of solid waste disposal in Delhi & Planning for future needs (1981-2000) (Sponsored by Delhi Development Authority)

The detailed information about the existing systems of collection, transportation and disposal was obtained. Analysis of 110 samples of refuse collection from the planning area was carried out.

WASTEWATER

0719 : Analysis, Assessment and Treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries

A two stage treatment system using lime and byproduct phosphogypsum has been developed to remove fluoride and phosphate in the combined wastewater from phosphoric acid and diammonium phosphate plant.

Organics present in nitrochlorobenzene, nitrotoluene, aniline and nitrobenzene wastewaters have been identified and quantified. Studies to evaluate relevant biokinetic constants of wastewaters from aniline, nitrobenzene and meta-amino phenol manufacture have been completed.

Thirteen different brands of activated carbon were studied for removal of some organics interfering in the biological treatment of wastewaters from DNB, NCB and Alkaline streams of NT and NB. Treatability studies on DNB, NCB, NT & NB wastewater after treatment with Ac - F4, DA - 125 and 0 - 107 brands of activated carbon have been completed.

Fish toxicity studies using *Lebistes reticulatus* as test fish with raw and treated wastewaters from DNB and NCB manufacture showed that aniline does not seem to accmulate in fish tissues as compared to nitrobenzene.

0724 : Treatment of black liquor of small paper mills for lignin recovery and colour removal

Recovery of lignin from black liquor by precipitation with CO_2 and removal of colour due to lignin from wastewaters.

Studies on removal of colour due to lignin using calcium sulphate alone and with magnesium and iron salt have shown promising results. Using lime (1000-1200 mg/l CaO) gave sparkling clear light straw yellow coloured effluent.

Colour removal studies on wastewater from pulp and paper industry were further extended to addition of lime and alum as coagulating agents. It is observed that wastewater when subjected to massive lime (75 gm/l) treatment showed 90-95% colour removal. Alum at 400 to 800 mg/l of wastewater containing lignin in the range of 1500 mg/l is effective in removing colour to the extent of 90%.

0725 : Bio-physical techniques for the removal of total organic carbon from Industrial wastewaters

Treatment of combined (acidic and alkaline) wastewaters from Nitrobenzene (NB) and Nitrotoluene (NT) manufacture by biological activated carbon system is being studied. Though BOD/COD ratio of these wastewaters indicates their amenability for biodegradation, the presence of some interfering components seem to pose problems in biodegradation.

The acclimated seed developed with diffused aeration was diluted with 5% wastewater and was supplemented with sewage initially as nutrients and later as inorganic salts. Activated carbon ACPG was added at the rate of 100 mg/l. The organics removal was monitored through TOC reduction and through specific component reduction using spectrophotometer.

The results, though somewhat erratic, indicated that carbon addition marginally improves the TOC removal. However, the colour removal is substantially enhanced by the addition of carbon. The average per cent TOC removals are - for NB combined 35.7 with control and 57.0 with carbon addition; for NT combined 46.0 with control and 57.4 with carbon addition.

Though the sludge settling is good, its maintenance poses some problems. To overcome this problem, feeding the waste twice a day was attempted. Though the TOC removals maintained the same pattern, sludge regeneration did not improve much.

0726 : Biodegradation of Mixed Aromatics and Phenolic Substrates in Aqueous Environment under Aerobic, Anaerobic and Facultative conditions

An electrolytic respirometer was fabricated to determine the oxygen uptake rate (OUR) of m-NBS acclimated activated sludge with m-NBS and resorcinol mixture as substrates. Up to a concentration of 70 mg/l (expressed as TOC), resorcinol addition has no effect on the OUR of m-NBS acclimated activated sludge with m-NBS as the substrate. However, at a concentration of 104 mg/l and above (expressed as TOC), resorcinol retards OUR of the sludge.

An attempt was made to degrade a mixture of resorcinol and m-NBS in a two stage system consisting of resorcinol acclimated sludge system (1st stage) and m-NBS acclimated activated sludge system (2nd stage). Detention time in the first stage was 3 hours and that in the second stage was 20 hours. TOC removal rates were calculated in both the stages and rates were found to be unaffected in presence of MAP and MAA.

In the bench scale activated sludge experiment, HPLC studies have revealed that resorcinol and MAP were completely removed from the wastewaters whereas m-NBS was only partially removed from the system.

Attempts are now being made to treat simulated as well as neutralised combined wastewater in a two stage activated sludge and m-NBS acclimated activated sludge. Degradation of resorcinol under anaerobic and facultative condition is also in progress.

0727 : Utilization of Waste Organic Materials for Removal of Toxic Heavy Metals from Industrial Waste waters

Chitosan, a cationic polymer from fish processing industry, was observed to remove copper to the extent of 90-92% from an initial concentration of 1000 mg/l Cu at pH 4.0, contact time 30 min. with chitosan being at a level of 1 gm. per 100 ml.

Further work on removal of Cu at different initial levels is in progress. It is proposed to extend the studies with chitosan for removal of Pb, Cd, Hg, and As.

Experiments on removal of mercury by treated water hyacinth confirmed the earlier results. Treated water hyacinth and other waste organics such as spent tea leaves and coffee grounds will be studied for their efficiency in removing mercury and other toxic metals like Cr, Cd and As.

0728 Biological Hydrolysis of Urea Bearing Nitrogenous Fertilizer Wastewater under Anoxic Condition

Fabrication and installation of pilot plant is complete. Plant trial was taken to detect leaks at the joints as well as in the main reactor, constant head tank and classifier.

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

Five pits each of one m^3 volume were dug in the area to make controlled lysimeters for growing new orange plants under controlled conditions. Out of these, two have been completed with one orange seedling transplanted in each. Soil and plant analysis on well water and sewage irrigated *Citrus* plants is being carried out.

1031 : Model Studies on Surface Aerators

The mathematical formulations for oxygenation capacity and power consumption for pitched type surface aerators have been determined. The effect of various operational and system configuration have been included in the equation, viz., rotational speed, submergence, tank diameter, water depth, blade angle, blade height, diameter of the aerator, etc., in terms of dimension-less parameters.

The relationship between aerator diameter and optimum speed of rotation is given by

$$DN^{1.49} = 601$$

This means as the diameter of the aerator is increased, there is a corresponding reduction in optimum speed of rotation.

The oxygenation capacity was found to be related to volumetric flow rate by the following equation:

$$OC = 62\ Q^{1.44}$$

The optimum values of the aerator were determined by oxygenation efficiency criteria. It was found that oxygenation efficiency at first increases with increase in number of blade until standard - blade number four is reached. Similarly with blade angle, the optimum was found to be 45°. The optimum size of the tank was found to be between T/D = 5 and T/D = 6.

The water depth should be in the vicinity of H = 1.8D. As the size of the aerator was increased there was a corresponding reduction in its efficiency.

1037 : Overland flow (grass filtration) system to upgrade wastewater anaerobic filter effluent

To improve aesthetic acceptability and further reduction in BOD and suspended solids, overland flow through grass plot was used for 'polishing' of the anaerobic filter effluent. Hydraulic loading to the anaerobic filter was 0.4-0.5 m^3/hour and an equal quantity of the effluent was coming out and overflowing through the two grass plots of size 3 m x 1.5 m and 6 m x 1 m with Dug grass (*Cynoden* sp.) every alternate day. The hydraulic loading on the grass plot was 0.8-1.5 $m^3/day/m^2$ of the surface area. On an average the BOD reduction achieved in the anerobic filter was 70% which was brought down to 83% as the effluent passes through the grass plot. Suspended solids removal in the filter was about 60% which was polished to 74% by the 'overland flow' of the effluent through the grass-plot. The oxygen built up was 1 mg/l in the final effluent.

1038 : Biological wastewater treatment by upflow anaerobic sludge blanket reactor

Studies were carried out to investigate the treatment efficiency of the upflow anaerobic sludge blanket (VASB) process, followed by polishing of the effluent through upflow anaerobic contact filter and sand filtration.

In the upflow sludge blanket with hydraulic flow of 50 litres/day an approximate detention time of 12 hours is maintained followed by 3 hours each in upflow contact filter and downflow sand filter.

A gradual reduction in BOD, COD and suspended solids was obtained as the wastewater passes through the UASB reactor to anaerobic contact filter and finally the sand filter. A COD reduction of 60-70%, 70-85% and 85-95% was achieved respectively through the different components of the system as mentioned above. The final effluent has a turbidity of 3-8 NTU.

1039 : Evaluation of low cost discs for rotating biological contractor

The RBC system due to its compact construction, simplicity of operation and favourable climatic conditions has great potential for use in treatment of wastewaters in India. The cost of the PVC discs alone form nearly 35-40% of the total cost of the system. One of the alternate cheap materials expected to reduce the cost to more than 50% is discs knitted with polythene cane on a light metallic frame.

1040 : Utilisation of rooted aquatic vascular plants for tertiary treatment of wastewaters

Newly developed fodder grass N.P.21 has been grown in a controlled lysimeter and percolate samples of the effluent were collected. The grass material has been cut about 0.3 m above the soil surface. Treatment efficiency is being studied with percolate as well as grass filter run-off. A lysimeter with soil only but no plant is being set up as a control for comparison.

ECOLOGY AND ECOSYSTEMS

0313 : Study of drinking water sources and supplies for virus and bacteria (Indo-US project)

Investigations for the presence of Salmonella, indicator bacteria and enteric virus were carried out by both the methods - developed by NEERI and prescribed. Membrane

filter and Celite-Calcium carbonate plug were used for recovery of Salmonella from different water sources. Out of 30 dug well water samples, 11 were found to contain Salmonella but all well water samples had high counts of indicator bacteria. All 16 tube well water samples were negative for Salmonella. Out of 5 each, river and treated water samples, 1 each were found to contain Salmonella.

Polio virus type 1 from water gets adsorbed on coal when water pH is adjusted to 5 and $AlCl_3$ is added to a final concentration of 0.0005 M. Out of 29 well water samples analysed, in 2 samples enteric viruses could be detected (16 & 256 PFU in 50 litres of water samples respectively).

0314 : Microbial degradation of model compounds of lignin and lignin present in pulp and paper mill waste

Seven bacterial cultures and two actinomycetes isolated from different types of soils were found to degrade 250 and 1000 mg/l of phenol respectively. Bacterial cultures & actinomycetes could degrade vanillin & cinnamic acid but could not degrade anisic acid. Colour removal by soil perfussion was studied. Amongst different nitrogen sources tested, ammonium chloride when added to black liquor, acted as the most efficient source of nitrogen since the colour could be removed in 72 hours. Fungi belonging to genus *Aspergillus, Fusarium, Penicillum* and *Trichoderma* were isolated and tried for lignin degradation. *Aspergillus* sp. was found to adsorb maximum colour during its growth.

0315 : Bacteriological Performance and evaluation of filter candle (CGCRI developed)

Filtered water from both the types of candles (domestic and community) was found to be free from coliform organisms when 150 litres of raw water having coliform in the range of 24,000 to 24,00,000 per 100 ml. was filtered.

0316 : Development of appropriate technology for the complete treatment of toxic industrial wastes discharged by different coal carbonization processes

Wastewater from the Low Temperature Carbonization plant (LTC) was characterized and found to contain high concentrations of ammonia (7,000 to 8,000 mg/l), phenols (13,000 to 17,500 mg/l). Thiocyanate, Sulphides & Cyanides have also found to be present. Colour of the waste is coffee brown (23,000 to 26,000 units). Removal of nitrogenous and carbonious materials are being tried.

0317 : Microbial degradation of substituted phenolic compounds

Cultures of yeast and a bacterium which were studied earlier and two other cultures isolated from soil were tested to see if they could take phenol, resorcinol and catechol as carbon source. Whereas phenol could be degraded by all the four cultures, three of them could degrade catechol, resorcinol was degraded by yeast and one of the bacterial cultures.

0401 : Wastewater reclamation through aquaculture & agriculture

Fish ponds were connected in series. While physico-chemical, biological, microbiological and virological aspects were studied, the effluent was utilised for agriculture to grow wheat, paddy and jasmine.

0407 : All-India coordinated project on Algae (DST)

Phytomorphology of *Spirulina* filaments grown is stabilisation ponds, fish ponds and laboratory models were studied. Succession of other algal species was also noted. It was observed that count of coiled filaments was reduced from 5000 fil. to 300 fil./ml during post-monsoon to winter season. Coiled filaments were completely absent in March. There was a correlation between BOD, ammonia - N and bloom of coiled filaments in stabilization ponds.

Laboratory experiments showed phytomorphological changes in Spirulina from straight to coiled filaments when BOD was reduced to 60 mg/l and ammonia - N increased in the medium. High count of coiled filaments was associated with subdominant algal species: *Microcystis, Ochromonas, Cyclotella & Navicula.* Decrease in count was associated with increasing dominance of *Ankistrodesmus, Euglena* and *Carteria* accompanied by relative increase in straight filaments.

0410 : Observations on the performance of Slow Sand Filters with special reference to flora and fauna

Quantitative counts of microfauna of raw waters, zoological mats, sand samples at different depths and the count in the filtered effluent were collected for each filter run.

Algal count of the surface mat over the sand bed of filters 1,2,3 varied between 4×10^4 to 6×10^6; 2×10^5 to 2×10^6 and 1×10^5 to 2×10^7 algae/cm^2 respectively.

Predominant algae were filamentous green and blue-green and were mucilage producing. Mucilage producing & filamentous algae helped to bind the zoological layer. Therefore, mucilage flocs were seen in this layer. These species were *Zygnema, Oscillatoria, Mougeotia, Phormidium, Navicula, Fragillaria, Synedra* and *Cymbella.* About 96% algae was filtered out through Slow Sand filters and 10-14 cm. depth 18,000 organisms/100 cm^2, 6750/50 cm^3 and 4000/50 cm^3 was the average microfauna count in the zoological mat, and 0-2 cms and 2-6 cm depth of sand bed respectively. Nematode larvae were predominant.

0411 : Studies on suitability of oxidation pond method for the anaerobically treated slaughter house effluents

Laboratory experiments on treatment of anaerobically-treated slaughter house Effluent were conducted by innoculating sp. of *Chlorella* and *Scenedesmus* to a mixture of the waste and sewage using laboratory oxidation pond model at the rate of 2.75 lpd. With Detention time of 20 days, reduction in BOD_5, HN_3-N and PO_4-P was found to be 91%, 83% and 45% respectively.

0413 : Studies on fish breeding in sewage fed ponds

In order to standardize the technique of hypophysation, eight sets of singhi (*Heteropneustes fossilis*) and magur (*Clarias batrachus*) fishes were injected by the extracts of the pituitary glands of major carps in August and September, 1982. Each set comprised of two males and one female. Two sets of singhi spawned as usual in 50 litre glass aquaria at a temperature of 29°C. The eggs of the remaining female were stripped out and artificially fertilized with the sperms of injected males. On an average 1250 and 375 eggs were released by each of singhi (45 gm) and magur (72 gm) females respectively. About 80-90% of the eggs were fertilized. Moreover, recovery of hatchlings was very poor.

The aerated lagoon at the Pilot Plant site is stocked with major carp seeds @ 1000/ha. The pond is fed intermittently with diluted settled sewage. The fish seeds are yet to be introduced in control pond fertilised with commercial manures.

Studies are being carried out to measure the oxygen consumption by different components of an aquatic ecosystem. The green alga, *Scenedesmus* consumes 2.235 and 3.110 mg 02/hr/10^{10} cells at 20 and 25°C respectively. Rohu *(Labeo rohita)* and mrigal *(Cirhina mrigala)* consume 0.41 and 0.43 mg 02/hr/gm at 28.5°C respectively. It is further noted that oxygen consumption of larger fishes was less as compared to that of smaller ones of the same species.

Techniques are being standardised to determine the calorific values of fish tissues.

0719 : Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer and basic organic chemical industries - Indo-US project

Toxicity of DNB, NCB, NB and NT was reduced to 92%, 99%, 87% and 67% respectively when treated by activated carbon. When wastewater from meta-aminophenol was treated by activated sludge it was seen that toxicity was reduced by 59%.

0908 : Treatment and disposal of cyanide wastewaters by biological treatment methods

A laboratory model working on continuous feeding and completely mixed aeration system was tried for biological degradation of a simulated cyanide waste mixed with sewage. Twentyfour hours hydraulic detention time showed a 98% reduction when the influent cyanide concentration was between 100 and 147 mg/l as C N and MLSS were 2260-1780 mg/l respectively. Influent pH was between 9.4 and 9.6 whereas effluent pH was 8.8-9.0.

TECHNOLOGY DEMONSTRATION

1007 : Safe and optimum utilization of domestic and industrial wastewaters in agriculture

Part I : Studies on the effect of irrigation with differentially diluted raw sewage with nutrient fortification and application of sewage sludge on the growth and yield of crops and soil properties

Under the cropping pattern - I, i.e., wheat-moong-paddy, the experimental crop of paddy was harvested in October and the Rabi crop of wheat was sown in the month of November, 1982, which was harvested in the month of March, 1983. Similarly, under cropping pattern II, i.e.,. cotton-potato, the harvesting of cotton was continued upto the middle of November and potato crop was planted immediately after that. The Rabi crops of wheat and potato received 7 irrigations each as per treatment schedule.

The data collected have revealed that the yield of paddy and cotton resulting from irrigation with undiluted sewage and diluted sewage in 1:0.5 ratio were almost on par with the standard practice (control), while that resulting from irrigation with diluted sewage in 1:1 ratio and application of sewage sludge at 10 and 20 tonnes/ha tended to be significantly lesser than the control. On the other hand, there were no significant differences in the yield levels of wheat resulting from different treatments involving sewage irrigation and sludge application in comparison with the control. In the case of potato, however, irrigation with undiluted and diluted sewage in 1:0.5 and 1:1 and application of sewage sludge at 10 and 20 tonnes/ha resulted in a significantly higher yield in comparison with the control.

Part II : Effect of irrigation with untreated, treated and settled sewage at moderate and high intensities on the growth and yield of crops and soil properties

As in the part I of the studies, harvest of Kharif crops of paddy and cotton, the Rabi crops of wheat and potato were experimented upon during the period from November, 1982 to March, 1983.

The data collected have indicated that irrigation with untreated, primary treated and secondary treated (SPE) sewage at moderate and high intensities resulted in significant increases in the growth and yields of the crops of paddy, cotton, wheat and potato in comparison with the control. However, in the case of cotton and wheat crops, untreated and secondary treated sewage (SPE) tended to result in almost similar level of yield which were higher than those resulting from primary treated sewage (settled). On the other hand, the yield of paddy was significantly higher under irrigation with secondary treated sewage (SPE) as compared to the untreated and primary treated sewage, while in the case of potato, there were no significant differences in the yield levels resulting from irrigation with the different forms of sewage. The data also showed that the variation in the yields of crops resulting due to moderate and high intensity irrigation was not consistent.

Part III : Studies on the effect of varying levels of BOD of wastewater on the physiological responses of crop plants including the uptake of major nutrients

During the early part of report period, experimental crop pea was grown which was harvested in the month of January, 1983. This was followed by a crop of Bhindi (Lady finger), which was sown in the end of January and the observations are still continuing.

The data from the pea crop have shown that this crop appeared to be sensitive to the higher levels of the BOD (i.e., 400-1000 mg/l) which resulted in a decrease in the yield level in comparison with the control. The data also indicated that although there was no decrease in the rate of nitrification in comparison with the control, ammoniacal nitrogen tended to be higher in the soil receiving irrigation with the sewage having higher BOD,i.e., 400-1000 mg/l.

Part IV : Studies on the microbiological changes in the soil irrigated with various types of diluted/treated sewage

The work carried out and the results obtained have been summarised as follows:

A. Rhizospheric soil samples collected from cotton field irrigated with untreated, treated and settled sewage at moderate and high intensities and differentially diluted raw sewage have indicated the following results:

1. Population of *Azotobacter, Rhizobium, Pseudomonas* total bacterial and fungal count decreased under raw sewage irrigation at both intensities, while the population of actinomycetes increased.

2. *Salmonella* count was higher in raw sewage irrigated plot.

3. Total bacterial count was higher in soil irrigated with plain water than wastewater.

4. *Azotobacter* and fungal population was higher in soil irrigated with diluted sewage (1:1 ratio) as compared to control and other treatments.

B. Studies on interaction between *Salmonella* and other microbial groups,viz.,bacteria, fungus and actinomycetes (pure cultures) have indicated the following results :

1. *Salmonella* x *Rhizobium* : Increase in population (47.1%), size of colony and gum production by *Rhizobium*. *Salmonella* population decreased (68.4%).
2. *Salmonella* x *Fungus* : Fungal population decreased (94%) Colony's size of *Salmonella* decreased, while number was not affected.
3. *Salmonella* x *Actinomycetes* : Actinomycetes population decreased.
   Size of colony of *Salmonella* decreased, number was not affected.
4. *Salmonella* x *Azotobacter* : Slight change in *Azotobacter* population.
   Size of colony of *Salmonella* decreased, number was not affected.

1009 : Rural sanitation Pilot Project in 10 villages around Nagpur

Out of 10 project villages around Nagpur in which rural sanitation programme was initiated,three hundred and twenty latrines of NEERI design have been constructed amounting to 100% coverage. In order to complete the project in time, 5 more villages will be covered for construction of latrines. Orientation training camps, periodic camps with doctors from health centres and community health workers have gone a long way in the success of the project.

Coverage of villages with latrines of NEERI Design

Sl. No.	Village	Block	No. of houses	No. of latrines constructed	Balance to be constructed
1	Burujwada	Kalmeshwar	115	115	Nil
2	Waghoda	"	74	55	19
3	Gujerkhedi	"	47	10	37
4	Mahadulla	Kamptee	205	205	Nil
5	Ajani	Kamptee	224	196	28
6	Mahalgaon	Kamptee	183	90	93
7	Wadoda	Kampte	377	139	238
8	Fetri	Nagpur	149	66	33
9	Wadi	Nagpur	301	160	141
10	Khursapar	Katol	151	126	25

1202 : Survey of Sewage farming in India

In order to gather information on existing sewage farms pertaining to crops grown, health problems, effects on soil and ground water, a questionnaire was sent to various States. This information will also help to arrive at the wastewater availability and lay down guidelines for use of wastewater in sewage farming and crop production. It was observed that proper information or records are not being maintained by municipalities.

WATER DISTRIBUTION CELL

1025 : Status of Water Distribution System at Nagpur with reference to waste assessment, leak detection and its control, deterioration of 'C' value with water quality

Shankar Nagar area was selected for this Pilot study of water distribution system with respect to waste assessment, leak detection and its control. Preparatory work consisting of population and connection survey, inventory of water main sluice valves, repair of faulty stop-cocks, fixing of bypass arrangement and new stop-cocks, repair, replacement of domestic water meter, have been completed. The details of the zone is given in Table.

The residential population of zone spread in an area of 13.52 hectares was 2480. The total length of main was 4377 m (diameter of main varies from 50 mm to 225 mm).

Three bulk water meters were installed at the inlet to the zone to measure the per capita per day water supply of the zone. The per capita per day water supply measured before and after the commencement of Pench Water-supply Scheme was 160 lit. and 205 lit. respectively.

Waste assessment test was conducted by MMF technique which gave a MMF of 175 lit./min. (2358 gph). Same day step-test was conducted by closing stop-cocks. A waste flow of 142 lit./min. (1900 gph) was recorded during stop-cock closed operation, which clearly shows a waste of 458 gph inside the house plumbing fixture. Nine leaks have been detected and the repair of leak is in progress.

A 28" D (700 mm) water main near Seminary Hill has been selected for the field-determination of hydraulic carrying capacity ('C' value).

1034 : Development of direct reading electric pipeline network analyser

Ageing (5-6 hrs.) and testing of various types and makes of filament bulbs was in progress with an objective to set up an electric pipeline network analyser simulating hydraulic network. Electronic circuity for the constant current load cell comprising of four outflows has been built up. Using selected 3.8v, 300mA and 6.3V, 300mA filament bulbs, load cell and source cell (DC power supply), an electric network was set up which was analogous to the small hypothetical hydraulic network consisting of three loops, one inflow and four outflows as a prelude to fabricate an analyser.

Variation in the computed values of headloss around the loop in the hydrualic network with that of the observed voltage drop around the loop of the analogous electric analyser was of the order of 15 cms. which is negligible. Rejection ratio (useful bulbs/bulbs tested) has been observed to be around 80%. To reduce the ratio, experiments using linear resistor in series with special type of filament bulbs are in progress.

TABLE

Details of Pilot Zone at Shankar Nagar, Nagpur

Sl. No.	Particulars	Details	Remarks
1.	Population	2480 + 218 (Domestic + Floating)	i. Residential (mostly occupied on hire by tenants) upper middle class. ii. Educational Institutions (School, agricultural colleges, etc.).
2.	Total length of the mains.	4377m	Dia. of main varies from 50mm to 225mm.
3.	Area of the zone	13.52 hectares.	All mains, upto 80mm dia. are cast iron with spigot and socket lead joints and others are of G.I. fixtures.
4.	Total No. of houses	302	Multi-storeyed building (up to 3 storeyed) all fenced with locking gates (it includes School and Corporation Park also).
5.	Total No. of house-service connection	391	It includes 1/2" dia. 385 Nos. It includes 3/4" dia. 6 Nos. All are metered.
6.	Total No. of valves	25	Inclusive of bypass valves.
7.	Total No. of frame hydrants.	3	--
8.	Water supply per capita per day (1982-83)	160 lit/cap/day	Before commencement of Pench Water Supply.
		205 lit/cap/day	After commencement of Pench Water Supply (based on actual flow measured into the zone through bulk meters).
9.	Minimum night flow on 25-2-1983	175 lit/min (2358 gph)	
	Night flow after stop-cocks closed on 26-2-83	142 lit/min (1900 gph)	

TRAINING

2.4.01 : Effect of air pollution on vegetation near thermal power plants

Gaseous and particulate matter are being emitted from thermal power plants.Studies on air, water and soil quality around a thermal power plant having a present capacity of 680 MW were conducted. It is observed that air quality at control station located in up-wind direction (5000 MSW) has 0.01 ppm sulphur dioxide while the most polluted station (500 ME) has 0.45 ppm sulphur dioxide concentration. Water characteristics of wells show high turbidity and conductivity. Concentrations of some major elements like Na, Mg and silica in the river water have increased two to three folds in comparison to the data obtained two decades ago. Properties of soil mixed with flyash show that water holding capacity decreases as the flyash content in the soil increases. Such flyash amended soils reduced the

germination capacity of wheat and cotton seeds. The soil qualities will be further altered since flyash is continuously getting deposited on the soils. Also, water mixed with flyash spreads in the nearby farm which poses soil and water pollution problems by percolation.

2.4.02 : Chemical nature of clays and their effect on coagulant doses

Synthetic clays-montmorillonite, bentonite and kaolinite which were the predominent clay types in the soils studied earlier were coagulated at different pH varying from 3.0 to 10.0 and in presence of different concentrations of bacterial cells. Coagulation curves drawn indicate differential soil-bacteria sorption and the resulting suspension governs the dose.

0128 A: Impact of refinery emission on vegetation

Survey of available flora was conducted in the downwind and upwind direction of the refinery at Mathura. Sampling sites at 10 km. distance have been selected. Plant species selected are *Mangifera indica* (Mango), *Azadirechta indica* (Neem), *Dalbergia sisso* (Sisam), *Poinciana regia* (Gul Mohr), *Casurina, Eucalyptus,* and *Calistemon* spp. (Bottle brush).

A few seasonals (*Petunia* and *Portulacca*) are being grown at these sampling points where air quality is also being monitored. Sulphate ion rate candles have been installed. Monthly samples are bring analysed for chlorophyll, carotenoid, sugar, proteins ascorbic acid and sulpnate.

R & D PROJECTS COMPLETED

0122 : Impact of Stack and Fugitive Emission from Cement Plant

The ambient air quality as well as stack and fugitive emissions around M/s Andhra Cement Company Limited were assessed. The fugitive emission sources such as coal yard, coal mills, packing house, cement mill roof, crusher, entrainment dust due to truck movement were identified and sampling was carried out. The total emissions were computed which worked out to be 174.4 MT/day.

A few sites were selected to monitor the fugitive dust sources like coal mill, raw-mill, cement mill and packing mill. One treatment at each site was also monitored. The ambient air quality was monitored to assess the impact due to emission from the cement plant. The total emissions from the plant were found in the range of 62-170 MT/day in addition to emissions from the packing plant. It was found that emissions were high mainly due to poor performance of settling chambers and cyclones. The dust levels inside the plant were as high as 21,500 $\mu g/m^3$ due to fugitive sources of short stacks. The levels of suspended particulate matter (SPM) around the plant exceeded 100 $\mu g/m^3$.

A well designed ventilation system and side protection of the conveyor system and other recommendations to reduce the fugitive emissions and dust levels inside the plant were made.

0215 : Air Quality Study at Indian Oil Corporation Haldia Refinery

The Management of Haldia Refinery of Indian Oil Corporation Limited requested NEERI to provide expert advice on establishment of an Air Quality Monitoring Network around the refinery. For this purpose air quality data was collected for one year.

During the studies, sulphur dioxide (SO_2), nitrogen oxide (NO_x), suspended particulate matter (SPM) and sulphation rate were monitored.

Meteorological data such as wind direction and speed, temperature, humidity and rainfall were also collected from a central station located at the refinery.

Sampling procedures and analytical techniques adopted were based on manual operations and chemical analytical methods as follows:

Parameters	*Methods*
Sulphur Dioxide	Pararosaniline Method, ISI
Nitrogen Dioxide	J.H. Modified Method
Suspended Particulate Matter (SPM)	Filtration Technique using Hi-volume Sampling Method, ISI
Sulphation Rate	Lead Peroxide Method.

Samples were collected on four-hourly basis for SO_2 and NO_x with six samples sequentially collected during 24-hour interval. SPM sample was collected on a 24-hour

continuous basis. Sulphation rate was measured by exposing the lead peroxide candle on the first day of the calendar month and removed on the last day of the same month.

The studies revealed that during March through September the prevailing Southerly winds carry emissions towards residential area in Durgachak. As this period is a rainy season, the wash out of pollutants might take place. It was found that meteorological conditions were favourable for adequate dispersion and dilution. However, it was suggested that the monitoring programme should be continued for one more year to establish the baseline data.

0127 : Air Quality Studies in Cochin Port and Neighbourhood

Air Quality in and around the Cochin Port area was studied to assess the impact due to handling of ore.

Air Quality was assessed based on the levels of suspended particulate matter (SPM) and sulphur dioxide (SO_2) by collecting samples periodically at six monitoring stations.

Suspended particulate matter (SPM) appeared to be the predominant pollutant. The annual average concentration of SPM varying from 100 $\mu g/m^3$ at SHO to 154 $\mu g/m^3$ at Vishwa Niryata site adjacent to FACT warehouse recorded consistently high level of SPM. The monitoring sites in Naval Base area recorded moderate levels of SPM. The average concentration of SPM in winter season was found higher.

The meteorological data indicated that stable atmospheric conditions prevail for nearly 35% of the time during the year, as this does not permit effective dispersion and dilution of pollutants released into the atmosphere, the condition will lead to smog formation and ground level fumigation particularly during winter season. Sulphur dioxide values were below the limit of 80 $\mu g/m^3$ normally allowable in this region. The ground level concentrations of SPM would increase under the prevailing meteorological conditions for which precautionary measures have been suggested.

0501 : Slow Sand Filtration : (Research and Demonstration Project - India)

An integrated research and demonstration on slow sand filtration was taken up by NEERI in collaboration with the International Reference Centre for Community Water Supply and Sanitation (IRC), the Netherlands. The overall object of the project was to review the present knowledge on the subject of slow sand filtration, establish and demonstrate under tropical conditions, its efficacy for treatment of surface waters and to promote its large scale application for rural water supplies in developing countries. The project was implemented in two phases.

In the first phase, literature and field survey was carried out to review the current status of slow sand filtration practice in India and identify areas of further research and development. Applied research on pilot and full scale units was undertaken with special emphasis on parameters that influence the performance of slow sand filters and their cost. In the light of the above, guidelines were formulated for rational design, construction, operation and maintenance of slow sand filters.

In order to test the guidelines developed from the first phase study and to demonstrate under prevailing local conditions the efficacy of slow filtration to policy makers and water supply professionals and engineers, four village demonstration plants (VDPs), one each at Pothunuru (Andhra Pradesh), Abub Sahar (Haryana), Borujwada (Maharashtra) and Kamayagoundanpatti (Tamil Nadu) were constructed. These installations designed to cover a wide variety of local conditions, both technical and socio-economic, were studied for their

performance over a period of two years. Health education and community participation programmes were integrated with the theme of slow sand filtration and implemented in the project villages. Guidelines for cost effective design construction, operation and maintenance of slow sand filters have been recommended.

As part of Phase II activities, progress of the project was reviewed, guidelines were developed for future implementation of slow sand filters and rural water supply schemes in general and an implementation strategy with regard to technical, social and economic aspects were indicated in consultation with representatives from Thailand, Sudan, Kenya, Ghana and India where work on slow sand filtration was in progress. Extensive discussions and exchange of views between engineers and scientists on various aspects, resulted in a set of conclusions and recommendations. Further areas of research and development were also identified.

The strategy followed for the development, testing and evaluation of the various technical, organisational and social aspects of the programme at local and national levels has served as a model for future large scale implementation of rural water supply programmes. The project is also an example of how technical cooperation among developing countries can play a vital role in evolving appropriate treatment technologies in water supply of common concern for mutual benefit.

0509 : Development of Simple Methods of Water Treatment (Package Water Treatment Plant)

The studies were carried out to develop a system to treat surface waters of high turbidity with provision for chemical (alum) dosing, flocculation, clarification and filtration in one modular unit. The use of unconventional coagulation/flocculation system, elimination of mechanical equipments (excepting valves) and simplicity in operation are the special features of the design.

The unit has been designed which consists of two concentric cylinders of G.I. sheets, hopper, valve at the bottom of hopper and filter.

Raw water dosed with coagulant chemical enters the unit at the bottom of the hopper and flows upward through the pebble bed where coagulation and flocculation takes place. The pebble bed and space above functions as a sludge blanket clarifier. The clarified water then flows down the filter in the annular space between the cylindrical portions. The filtered water was collected from the outlet provided just above the sand level of the filter.

The package plant developed and tested in the laboratory was found to treat satisfactorily surface waters of high turbidity to produce settled and filtered waters of turbidity always less than 20 NTU and 1 NTU respectively.

The technique thus adopted in this unit for flocculation and clarification and filtration has been found to overcome the problems of process reliability which is generally low with most of the conventional package plants. From the studies, the design criteria have been suggested for package unit for field application and/or mass scale production.

1117 : Solid Wastes Collection and Transportation: Pilot Study at Calcutta

A programme was carried out for improvement of solid waste management and to develop techniques appropriate to the climate, waste characteristics, transport and socio-economic conditions prevailing in the city and its environment. Evaluation and standardisation of equipment and techniques formed were also carried out.

A locality with about 30,000 population representing all the relevant activities was selected for this study. A socio-economic survey was carried out.

Twelve samples of refuse were collected and were analysed for pH, moisture content, organic matter content and NPK. The average density was found to be 608 kg/m^3.

During the study, trial was carried out for house to house collection system, applicability of the method and modification needed.

Preliminary studies were carried out to decide whether polythene bags or paper bags or metal containers should be used by individual house-hold for the storage of waste.

Also a trial for community bin system in slums was undertaken.

The study indicated that the residents were hesitant to locate the community bins near their house mainly because of their fear that the containers may not be cleaned regularly. If regular service is ensured the residents are cooperative, the G.I. bins were found to be easier to handle but get corroded and stolen.

The R.C.C. containers were found to be durable but heavy and hence acceptable size and type needs to be arrived at in the pilot study.

1431 : Aluminium Chloride as Coagulant in Water Treatment

The study was carried out to evaluate the usefulness of aluminium chloride as a coagulant and to compare its performance with aluminium sulphate in removing turbidity.

The pH basicity and turbidity of the test water was in the range 7-8.5, 100-150 mg/l as $CaCO_3$ and 80-540 NTU for which black cotton soil was chosen. During the experiment, turbidity was evaluated. Laboratory tests were carried out using Phipps and Bird Multiple Stirring Device (Jar Tester).

To evaluate the performance of aluminium chloride, a series of jar tests were conduced using waters having different turbidity and compared with alum.

Experiments revealed that for achieving a particular residual turbidity range, the quantity of $AlCl_3$ required was always less than that of alum. The data showed that the ratio of the quantity of alum to $AlCl_3$ varied between 1.412 to 4.000.

The natural alkalinity requirement was 1.13 mg (as $CaCO_3$) per each mg of anhydrous $AlCl_3$ applied as compared to 0.51 mg/l alkalinity, per each mg of alum. Taking the geometric mean value of Alum/$AlCl_3$ as 2.367, the equivalent alkalinity consumption when alum was used was (2.367 x 0.51) 1.21 mg and was greater than 1.13 mg with $AlCl_3$.

The studies proved that $AlCl_3$ acted as a good coagulant over a wide range of turbidity and performed as efficiently as alum. The requirement was approximately 2.4 times less than that of alum. It produced floc as good as with alum and the settled water turbidity quality was better. It consumed less natural alkalinity than with alum for the same performance and had a great potential as a supplement or supplant to conventional alum.

2.4.03 : Preparation of Pyrochar (Active Charcoal) from Solid Waste

Studies were conducted to see whether pyrochar obtained from typical industrial waste (paper mills primary sludge) could be used as adsorbant. Experiments were also carried out to see the possibility to improve the pyrolysed product.

Primary sludge from paper mill was pyrolysed at 700°C. The yield was 50%. The pyrolysed product was analysed for chemical composition, phenol and iodine number, colour removal capacity for malachite green, methylene blue and lignin and phenolic colour.

It was studied for characteristics of raw waste and its ash in % dry weight. Analysis of gaseous products during pyrolysis at different temperatures and in per cent dry basis

was studied. Phenol value and Iodine number were 112 and 584 respectively. Percentage of colour removal for malachite green observed was 97.4%. The pyrochar showed the COD removal capacity Adsorption of chromium with different carbon doses showed an increase in percentage adsorption.

Pyrochar prepared from paper mill waste was found to be effective in removal of colour, turbidity, heavy metals, phosphate and was also found effective in adsorbing SO_2.

6.7.03 : Performance Evaluation of Vegetable Tanning Effluent Treatment Plant (Anaerobic Contact Filter Process) at U.P. Tannery, Jajmau, Kanpur

Based on the extensive laboratory studies on the treatment of vegetable tanning effluent, a full scale treatment unit was designed. The following parameters were evaluated for both the feed and the effluent from the system.

(1) Temperature,
(2) pH,
(3) COD (2 hrs. dichromate reflux method),
(4) BOD (5 days, 20°C), and
(5) Tannin as Tannic acid.

The data revealed that the pH values of the feed varied between 6.2-7.0 and those of the effluent 6.7-7.0. COD values of feed varied between 5315 mg/l to 6904 mg/l with an average of 5913 mg/l. The COD of effluent varied between 1806 mg/l to 2408 mg/l.

The BOD value of feed ranged between 2225 mg/l to 5000 mg/l and those of effluent between 566 mg/l to 1125 mg/l. Values of tannin in feed varied between 950 mg/l to 1250 mg/l and those of effluent between 330 to 460 mg/l. The per cent removals of tannin were recorded to vary between 53.68 to 73.6.

It was concluded that the results obtained in laboratory studies are very largely reproducible in the field also on a full scale plant and justifiably expected to replace the conventional process of treatment. The advantages of this method over the conventional process are:

1. cuts appreciably the requirement of land,
2. the unit is compact one,
3. undesirable odour and unaesthetic sights of open lagoons are eliminated, and
4. byproducts like methane can be collected as this is a closed system.

APPENDIX - I

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The Third and Fourth Research Advisory Council meetings were held on June 22-23, 1982 and January 12-13, 1983 respectively.

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The Twentythird, Twentyfourth & Twentyfifth Executive Committee meetings were held on June 23, 1982, October 5, 1982 and January 13, 1983 respectively.

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The Fourth meeting was held on October 4, 1982.

APPENDIX - IV

SPECIAL REPORTS

Sponsored/Institute

Sl. No.	Title	Sponsor
1.	2.	3.
1	Treatment and disposal of wastewaters.	Hutti Gold Mines Ltd., Raichur (Karnataka).
2	Treatment and disposal of wastewaters from staple fibre factory, Nagda.	Gwalior Rayon Silk Mfg. (Wvg.) Co. Ltd., Nagda (Madhya Pradesh).
3	Aluminium Chloride as coagulant in water treatment.	Institute Project.
4	Treatment of vegetable tannin effluent by anaerobic contact filter process - Multiple Unit.	Institute Project.
5	Impact of stack and fugitive emission from cement plant.	Andhra Cement Company Ltd., Vijayawada (Andhra Pradesh).
6	Air quality study at I.O.C. Haldia Refinery, 1981-82.	Indian Oil Corporation, Haldia Refinery (West Bengal).
7	Preparation of Pyrochar (activated charcoal) from city refuse.	Institute Project.
8	Solid wastes collection and transportation : Pilot study at Calcutta.	Calcutta Metropolitan Development Authority (CMDA), Calcutta (West Bengal).
9	Evaluation of rural water supply schemes in India.	Central Public Health & Environmental Engineering Organization (CPHEEO), Ministry of Works & Housing, Govt. of India, New Delhi.
10	Water quality survey of the Hooghly estuary (In five volumes).	Calcutta Metropolitan Development Authority (CMDA), Calcutta (West Bengal).
11	Slow Sand Filtration - Research and Demonstration Project - India, Final Report.	International Reference Centre for Community Water Supply & Sanitation, The Hague, The Netherlands.
12	Development of simple methods of water treatment (Package water treatment plant).	Institute Project.
13	Air quality studies in Cochin Port and neighbourhood.	Cochin Port Trust, Cochin (Kerala).

Consultancy

Sl. No.	Title	Consultee
1.	2.	3.
1	Suggested pollution control measures for Orissa Aluminium Complex.	M/s Bharat Aluminium Co. Ltd., New Delhi.
2	Characterisation and treatment of wastewaters from rubber factories.	M/s Kurian Abraham Pvt. Ltd. Co., Nagercoil (Tamil Nadu)
3	The existing water supply system for the ordnance factory, Itarsi (M.P.) - Some observations and suggestions.	Ordnance Factory, Itarsi (Madhya Pradesh)
4	Characteristics and treatment of wastewaters.	United Bleachers Ltd., Mettupalayam (Tamil Nadu)
5	Treatment & disposal of waste-water.	M/s Motilal Insecticides Ltd., New Delhi.
6	Night soil Bio-gas Plant.	Sulabh International, Patna (Bihar)
7	Treatment of wastewaters from the proposed leather complex at Devas.	Madhya Pradesh Consultancy Organisation (MPCON) Ltd., Bhopal (M.P.)
8	Selection of air pollution control equipment for existing incinerators.	Reserve Bank of India, Bombay (Maharashtra)

APPENDIX - V

PAPERS PUBLISHED/PRESENTED

Sl. No.	Author(s)	Title of Paper	Published in/ presented at
1.	2.	3.	4.
1	Animesh Kumar, Hasan, M.Z. & B.T. Deshmukh	An improved flameless atomic absorption spectrophotometric method for the determination of Aluminium in sludge and water.	Indian Science Congress at Tirupati, Jan. 3-8, 1983.
2	Basu, A.K. & Biswas, A.	Environmental Pollution.	Science Fair of Young Scientists Association at Calcutta, Feb. 4, 1983.
3	Basu, A.K. & Biswas, A.	Prevention & Control of water pollution in Bengal.	Dhanadhanya, (Govt. of India) Special Number in Jan. 1983.
4.	Basu, A.K.	Water pollution in mining industry.	Seminar on Health Problems of Mining Industry at Jensa, Orissa, Oct. 19, 1982.
5	Bhave, V.R., Koparkar, P.V. & Navaneeth, G.N.	Point discharge current studies near a large pollution source.	Journal of Radio & Space Phys., 11, 91-95, 1982.
6	Bhoyar, R.V. & Bhide, A.D.	Some observations on the effect of temperature on cellulase activity during aerobic composting.	J. of Institution of Engineers (India), 63, EN 1, 45-49, Oct. 1982.
7.	Chandorkar, (Mrs.) A.A. & Raman, V.	Bacteriological assessment of coastal water of Greater Bombay.	Indian J. Environ. Hlth., 24 : 107 (1982).
8.	Chattopadhaya, S.N., Routh, Tapan, Sharma, V.P., Arora, H.C. & Gupta, R.K.	A Short term study on the pollution status of River Ganga in Kanpur Region.	Civic Affairs, 30, Aug. 1982.

1.	2.	3.	4.
9	Deshkar, A.M., Saxena, K.L., Chakrabarti, T. & Subrahmanyam, P.V.R.	Characterisation and treatment of Opium alkaloid processing waste water.	Indian Association of Water Pollution Control (IAWPC), Technical Annual, IX ; 64 (1982)
10	Deshpande, C.V.	Studies on Lanthanide mixed diacetyl monoxime N-phenylurea & N-N-di-phenylurea complexes.	All India Symposium on Mixed ligand chelates at Aurangabad during Nov.1-3, 1982.
11.	Deshmukh, S.B.	Anaerobic treatment of Rayon Grade Pulp Mill Wastewater - Some aspects of nutritional requirements.	Indian J. Environ. Hlth., 24, 201-205 (1982).
12	Deshmukh, S.B.	Laboratory techniques in wastewater analysis.	Workshop for Pollution Control Enforcement Personnel organised by Central Board for Prevention & Control of Water Pollution held at NEERI, Nagpur,Sept.21-28, 1982.
13	Dhage, (Mrs.) S.S., Paramasivam, R., Andey, S.P. & Ravindra Rao, R.	Water works wastes - A Pollutor of receiving water body.	Seminar on Environmental Problems in Maharashtra at Karad, Dec. 18-19, 1982.
14.	Dharmadhikari, D.M. & Yennawar, P.K.	Air-borne Manganese level in surroundings of ferro-manganese factory.	Indian J.Environ. Hlth., 24(1), 31, 1982.
15	Dhaneshwar, R.S., Basu, A.K. Deshpande, A.W., Molla, S.H. & Chattopadhyaya, N.	Study of pulp & paper mill wastewater from Titagarh Paper Mills.	IAWPC Technical Annual, IX; 1982.
16	Gadkari, S.K. & Raman, V.	Solar evaporation ponds for treatment and disposal of complex waste waters.	All-India Seminar on Conservation of Energy & Resources in Env. Engg. Systems, April 10-11, 1982 at Nagpur under auspices of Institution of Engineers (India).

1.	2.	3.	4.
17	Ghosh, A.	Effluent Standards.	Workshop for "Pollution Control Enforcement Personnel" organised by Central Board for Prevention & Control of Water Pollution at NEERI, Nagpur, Sept. 21-28, 1982.
18	Ghosh, T.K. & Kshirsagar, S.R.	Fertilizer values of sewage sludge accumulated in stablisation ponds.	Indian J. Environ. Hlth., 24(2): 95-106, (1982).
19	Ghosh, T.K., Kshirsagar, S.R., Kshirsagar, D.G. & Animesh Kumar.	Studies on heavy metals in deposited sludge and bottom soil of sewage stabilization pond.	Indian Science Congress at Tirupati, Jan. 3-8, 1983.
20.	Hasan, M.Z. & Pande, S.P.	Determination of Cadmium in water by flameless atomic absorption spectrophotometry.	Research & Industry, 27(1): 8-10 (1982).
21.	Hasan, M.Z. & Pande, S.P.	Nitrosamines, the nasty carcinogens.	Science Reporter, 19(6), 348-351 (1982).
22.	Hasan, M.Z. & Kumar, A.	Sodium interference in flameless atomic absorption spectrophotometry (AAS) determination of lead in water. Its suppression by matrix modification.	Indian Science Congress at Tirupati, Jan. 3-8, 1983.
23.	Hasan, M.Z. & Kumar, A.	Atomization of lead in the presence of complex matrices in graphite furnace atomic absorption spectrophotometry.	Symposium on Microanalytical Chemistry on Dec. 27-30, 1982 at Presidency College, Calcutta.
24.	Hasan, M.Z. & Pande, S.P.	Heavy metals in urban water supplies at Nagpur, Maharashtra.	Seminar on Environmental Pollution Problems in Maharashtra on Dec. 18-19, 1982 at Karad.
25.	Hasan, M.Z. & Pande, S.P.	Monitoring study of heavy metals in Vena water works, Nagpur.	Seminar on Status & impact of heavy metal pollution in India on Dec. 1-3, 1982 at Madras.

1.	2.	3.	4.
26.	Hasan, M.Z.	Importance of pure chemicals in analysis.	Chemical Era, 18(8), 192-193 (1982).
27.	Jothikumar, N. & Krishnamoorthi, K.P.	Evaluation of toxicity of ammoniacal fertilizer effluents	Environmental pollution - An International Series 'A' 30, 77-86(1983).
28.	Joshi, (Miss) N.S. Dhage, (Mrs) S.S. Kelkar, P.S. & Paramasivam, R.	Water quality changes during Slow Sand Filtration	Indian. J.Environ.Hlth., 24(4), (1982).
29.	Kalyankar, S.D. & Kankal, N.C.	Effect of different saline concentration on egg hatching of *Camallanides* sp.	Marathwada University Journal of Science, XXI, Sci. 14.
30.	Kankal, N.C. & Kalyankar, S.D.	Osmoregulation & survival rate of *Tangua anomala* (Linstow 1904) in vitro.	Marathwada University Journal of Science, XXI, Sci. 14.
31.	Kankal, N.C.	Free amino acids of *Tangua anomala* (Linstow 1904).	Journal of Biology, III, 3 (1982).
32.	Kaul, S.N. & Raman, V.	Measurement of energy input for aeration in aeration tank.	Technical Annual of Institution of Engineers (India), Nagpur Centre, April 13,1982.
33.	Kaul, S.N. & Seshadri, C.V.	Mass culture of Algae using a helical coil reactor.	National Conference on Biotechnology, Punjab University, Chandigarh, March 13-15, 1982.
34.	Kaul, S.N., Manuel, A.C. & Raman, V.	Effect of temperature on the Arrhenius constant for mass transfer of oxygen and biological reaction rate using a surface aerator.	IAWPC Technical Annual, IX: (1982).
35.	Kaul, S.N., Kumaran, P., Pandey, R.A., Swarnakar, N.G., Parhad, N.M. & Raman, V.	Bio-Oxidation of Phenol by an activated sludge plant.	Annual meeting of Indian Institute of Chemical Engineers, Department of Chemical Engineering, Andhra University, Waltair on Jan.4-7, 1983.

1.	2.	3.	4.
36.	Kumaran, P., Kaul, S.N., Pandey, R.A., Deshpande, V., Shivaraman, N., Parhad, N.M. & Raman, V.	Continuous flow tank reactor for phenol removal by an activated sludge plant.	IAWPC Technical Annual, IX: (1982).
37.	Kumaran, P. & Sundaresan, B.B.	Yeast technology in environmental pollution control.	VIIIth International specialised symposium on Yeasts, Bombay, Jan. 24-28, 1983.
38.	Kulkarni, D.N. & Bulusu, K.R.	Sodium aluminate as coagulant and coagulant aid in turbidity removal - Laboratory studies.	J. Institution of Engineers (India) 63, EN-4, 22-28, Oct. 1982.
39	Kshirsagar, S.R.	Conservation of energy and resources in water supply systems.	J. Institution of Engineers (India), April, 1982.
40	Kshirsagar, S.R.	Removal of colour in tertiary treatment of sanitary sewage chemical methods.	J. Institution of Engineers (India), 62(2), 1982.
41	Kshirsagar, S.R.	Some measures for economising fuel oil consumption with special reference to Textile Mills.	J. Institution of Engineers (India), 62, 1982.
42	Kshirsagar, S.R.	Evaporation control as a measure of conservation of water.	J. Indian Water Works Association XVI, Jan.–March, 1983.
43	Kshirsagar, S.R.	Problems in operation & maintenance of sewage treatment plants.	National Seminar of Instt. of Engrs. at Bangalore, Feb. 25-27, 1983.
44	Mariappan, M.	Indian capability in monitoring water & air pollution.	Proc. of Indo-US Workshop on ecological management. I.I.Sc., Bangalore, March 4, 1984.

1.	2.	3.	4.
45	Mhaisalkar, V.A., Paramasivam, R. & Dhage (Mrs.) S.S.	Package plants for rural water supply.	Commonwealth Science Council Workshop on Rural Drinking Water Supply, Madras, May 10-13, 1982.
46	Moghe, C.A., Gavane, A.G., Bakde, S.N. & Kathuria, A.K.	Steel Mills waste treatment and disposal.	National Workshop on 'Environment Preservation' organised by Rajasthan State Board for Prevention & Control of Water Pollution, Jaipur. Oct. 21-22, 1982.
47	Moghe, C.A., Thakre, (Mrs) R.A. & Ramteke, D.S.	Adsorption of Sulphur dioxide on pyrolytic char made from paper mill sludge waste.	Seminar sponsored by Indian Carbon Society, New Delhi, Dec. 15-18, 1982.
48	Muley, V.U., Dixit, R.C. & Bhide, A.D.	Changes in leachate characteristics during passage through different soil strata.	J. Institution of Engineers (India), 63, EN2, Feb. 1983.
49	Murty, Y.S.	Development of low cost biogas plants under Karimnagar Project.	International Seminar on Water Hyacinth at Regional Research Laboratory, Hyderabad, Feb. 7-9, 1983.
50	Olaniya, M.S., Pendharkar, A.V. & Bhide, A.D.	Evaluation and estimation of heavy metals in city refuse.	Proc. Seminar on Status & impact of heavy metal pollution in India, Madras, Dec. 1982.
51	Olaniya, M.S., Shekdar, A.V. & Bhide, A.D.	Chemical test to assess degradation during aerobic composting.	J. Institution of Engineers (India), 63, EN 2, Feb. 1983.
52	Pampattiwar, V.L.	On laboratory techniques in air quality monitoring.	Workshop for Pollution Control Enforcement Personnel organised by Central Board for Prevention & Control of Water Pollution at NEERI, Nagpur on Sept. 21-28, 1982.
53	Pande, S.P. & Hasan, M.Z.	Studies of trace metals in ground waters.	J. Institution of Engineers (India), 63 EN 2, 53-58 (1983).

1.	2.	3.	4.
54	Pande, S.P.	Modified Gas absorber for the Analytical Determination of Cyanides in Drinking Waters.	Indian Science Congress at Tirupati, Jan. 3-8, 1983.
55	Pande, S.P. & Hasan, M.Z.	Study of Heavy Metals in Ramtek Water Works, Nagpur.	Seminar on Status & Impact of Heavy Metal Pollution in India, at Madras, Dec. 1-3 (1982).
56	Pande, S.P.	Analytical Quality Control for the Water Analysis Laboratories.	Workshop for Pollution Control Enforcement Personnel organised by the Central Board for the Prevention & Control of Water Pollution at NEERI, Nagpur, Sept. 21-28, 1982.
57	Pande, S.P. & Bulusu, K.R.	Treatment of Mine Water from Rajpura Dariba Mines of M/s. Hindustan Zinc Ltd., Udaipur, Rajasthan.	National Conference on Lead, Zinc & Cadmium at Workplace - Environment & Health Care, at New Delhi, Dec. 14-15, 1983.
58	Panicker, P.V.R.C., Gadkari (Mrs.) A.S., Joshi, M.W. & Talkhande, A.V.	Experiences in community education & participation (CEP) in Water Supply & Sanitation Programme.	Commonwealth Science Council Workshop on Rural Drinking Water Supply, Madras. May 10-13, 1982.
59	Paramasivam, R. & Mhaisalkar, V.A.	Slow Sand filters for safe water in rural areas.	Commonwealth Science Council Workshop on Rural Drinking Water Supply, Madras. May 10-13, 1982.
60	Pathe, P.P., Ambekar, (Miss) M.W., Nimdeokar, N.M. & Paranjape, M.G.	On 1,3,5-Triazines Pt. II - Synthesis of 2, 4-Dithio-3,5-diaryl-6-phenyl imino-hexahydro-1,3,5-Triazines & 2,6-dithio-3,5-diaryl-4-phenyl imino-hexahydro-1,3,5-triazines.	J. Indian Chem. Soc., 59, 670, 1982.

1.	2.	3.	4.
61	Pathe, P.P., Satyanarayana, (Mrs.) S., Deshpande, C.V., Srinivasan, M.V. & Subrahmanyam, P.V.R.	Water Hyacinth as feed supplement in cattle dung biogas plants.	International Conference on Water Hyacinth, R.R.L., Hyderabad, Feb. 7-11, 1983.
62	Pathe, P.P., Alone, B.Z., Titus, S.K. & Bhide, A.D.	Anaerobic digestion of cotton dust from textile mills.	Indian J. Environ. Hlth., 24, 4 (1983)
63	Patil, A.D., Alone, B.Z. & Bhide, A.D.	Characteristics of municipal solid wastes and its variation in Pune City.	Proc. Symp. on Environmental Pollution Problems in Maharashtra, Karad, Dec. 18-19, 1982.
64	Patil, M.D., Sane, (Miss) G.M. & Parhad, N.M.	Comparison of different media for isolation of Salmonella from wastewaters.	ICMR/CRI National Symposium on Salmonella infections in India, Kasauli, Oct. 1982
65	Raguraman, D.	Production of Energy (biogas) and Environmental Management in Rural Areas.	Seminar on River Pollution & Human Health, Banaras Hindu University, Feb. 20-21, 1983.
66	Raman, A.	Planning consideration in rural water supply distribution system.	Commonwealth Science Council Workshop on Rural Drinking Water Supply, Madras, May 10-13, 1982.
67	Raman, V. & Badrinath, S.D.	Static mixer - An energy saving device in water and wastewater treatment.	Seminar on Conservation of Energy & Resources in Environmental Engineering System, Institution of Engineers (India), Nagpur Centre, April 10-11, 1982.
68	Raman, V. & Kale, C.K.	Evaluation of Sewage of Greater Bombay for irrigation.	Seminar on Environmental Pollution Problems in Maharashtra, Karad, Dec. 18-19, 1982.

1.	2.	3.	4.
69	Raman, V., Pathak, S.K. & Deshpande, A.W.	Water distribution management with reference to control of water losses.	Journal of Institution of Engineers (India), 63 EN; 10: 1982.
70	Raman, V., Patkie, (Mrs.) S.A. & Khan, A.N.	Low cost sanitation by anaerobic filter system.	Second National Conference on Sanitation held at Calcutta, Nov. 4-6, 1982.
71	Raman, V.	Impact of corrosion in conveyance & distribution of water.	J. Indian Water Works Association, 15, 115, 1983.
72	Raman, V., Patkie, (Mrs.) S.A., Khan, A.N. & Swarnakar, N.G.	Rotating biological contactor, anaerobic upflow filter and 'Grass' plots for sewage treatment.	IAWPC Technical Annual, IX, 73, 1982.
73	Raman, V.	Appropriate environmental appraisal approach for siting of Industry - A case study.	National Seminar on 'Environmental Impact assessment' for siting of industry, Anna University, College of Engineering, Guindy, Madras on Feb.9, 1983.
74	Raman, V. & Kale, C.K.	Environmentally compatible approach to land application of sewage of Bombay city.	National Seminar on Environmental Management, Engineering College, Trichur for the Silver Jubilee Celebrations, March 3-4, 1983.
75	Raman, V. & Sundaresan, B.B.	Environmental Impact analysis with reference to Indian Context.	National Seminar on Environmental Management, IIT, Bombay, Feb. 11, 1983.
76	Raman, V.	Planning manpower, training & infrastructure requirements for leakage control programme.	Resource paper presented at the Regional Seminar on 'Control of water distribution system' organised by Asian Development Bank, Singapore, Feb. 8-11, 1983.

1.	2.	3.	4.
77	Sarin, R.	Evaluation of Iodide Ion-Selective elctrode for the determination of ppm levels of mercury (ii), in water.	J. Institution Chemists (India), 54, 69 (1982).
78	Sarin, R.	Evaluation of Iodide Ion-selective electrode for the determinations of residual chlorine in drinking water.	J. Institution Chemists (India), 54, 77 (1982).
79	Sarin, R.	Measurement of trace concentrations of ammonium nitrogen in water : Gas sensing Membrane Electrode technique.	J. Indian Water Works Association, XIV(4), 295(1982).
80	Sarin, R.	A modified TISAB for fluoride measurements with fluoride selective electrode.	J. Institution Chemists (India), 54, 116 (1982).
81	Sarin, R. & Bhave, V.R.	Reactivation of Ion-Selective Electrode-improving the response time.	National Symposium on Instrumentation at the Institute of Science, Bangalore, organised by Instrument Society of India, June 30 - July 3, 1982.
82	Sharma, H.C. & Rao, D.N.	Morphological responses of *Phaseolus aureus* to SO_2 & HF Pollution	Indian Science Congress at Tirupati, Jan. 3-8, 1983.
84	Shende, G.B. & Nashikkar, (Mrs.) V.J.	Significance of BOD levels of wastewaters in irrigation and crop response.	National Seminar on Utilization of Organic Wastes at Agricultural College and Research Instt., Tamil Nadu Agricultural University, Madurai, March 24-25, 1983.

1.	2.	3.	4.
85	Shende, G.B. & Sundaresan, B.B.	Wastewater recycling for prevention of environmental pollution & promotion of agricultural production – an appropriate technology for developing countries.	Ist International Symposium of Environmental Technology for Developing Countries, Instt. Environmental Sciences & Technology, Bogazici University, Istanbul (Turkey), July 7-14, 1982.
86	Shende, G.B., Chakrabarti, (Mrs.) C., Kshirsagar, D.G. & Deshbhratar, P.B.	Optimum exploitation of irrigational and manurial potential of wastewaters.	47th Annual Convention of Soil Science, National Bureau of Soil Survey & Land Use Planning, Nagpur, Oct.2-4, 1982.
87	Shende, G.B., Juwarkar, A.S. & Sundaresan, B.B.	Prevention of Environmental Pollution through reuse of wastewaters in agriculture – An integrated approach.	National Seminar on Utilisation of Organic Wastes held at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, March 24-25, 1983.
83	Shekdar, A.V., Muley, V.U. & Bhide, A.D.	Studies on use of hammermills for size reduction of refuse.	J. Institution of Engineers (India), 62 EN, 3, 105-107 (1982).
88	Srinivasan, M.V. & Kshirsagar, S.R.	Million biogas plants for India – An analysis for extension programme.	Biowaste Treatment Journal, 1981.
89	Srinivasan, M.V.	Utilisation of Algae for waste treatment and related by-products recovery.	Seminar on Biogas Microbiology, at Coimbatore, June, 1982.
90	Subrahmanyam, P.V.R., Krishnamoorthi, K.P. & Sundaresan, B.B.	Energy fertilizer and agriculture in Mesophilic digestive system.	Proceedings of the 3rd International Recycling Congress in Developing countries, West Berlin, 157-162, April, 1982.
91	Subrahmanyam, P.V.R., Khadakkar, S.N., Chakrabarti, T. & Sundaresan, B.B.	Wastewater treatment of a Phthalate Plasticizers, Ethanolamine & Morpholine Manufacturing Plant – A case study.	Proceedings 37th Purdue University, Industrial Wastes Conference, Vol. 37, 13-20 (1982).

1.	2.	3.	4.
92	Sundaresan, B.B. & Paramasivam, R.	Water Supply & Sanitation Decade - India: An over view.	Commonwealth Science Council Workshop on Rural Drinking Water Supply at Madras, May 10-13, 1982.
93	Sundaresan, B.B., Paramasivam, R. & Mhaisalkar, V.A.	Technology choice for rural water supply.	Commonwealth Science Council Workshop on Rural Drinking Water Supply at Madras, May 10-13, 1982.
94	Sundaresan, B.B., Subrahmanyam, P.V.R. & Bhide, A.D.	Toxic & Hazardous Waste Scene in India.	Second International Symposium on 'Solid & Hazardous Wastes' ASTM, Philadelphia, March 1983.
95	Swaminathan, (Miss) B.V., Kale, C.K. & Raman, V.	Application of settled sewage to soil columns - Preliminary studies.	Indian Science Congress Association, Tirupati, Jan. 3-8, 1983.
96	Swaminathan, R.	Guidelines on Air Pollution Monitoring Studies.	Workshop for 'Pollution Control Enforcement Personnel organised by Central Board for Prevention & Control of Water Pollution at NEERI, Nagpur, Sept. 21-28, 1982.
97	Tamhane, S.M. & Seth, A.K.	Impact of air pollution on environment and its status in Jaipur.	World Environment Day, organised by State Board for Prevention & Control of Water Pollution, Rajasthan, Jaipur June 5-6, 1982.
98	Thakkar, (Miss) N. & Kondawar, V.K.	Pesticide residues in water resources.	Symposium on State of Environment in India Today, held at Indian Agricultural Research Institute, New Delhi on the occasion of Ist National Environment Congress, Dec. 28-30, 1982.
99	Thakre, (Mrs.) Rekha, Ramteke, D.S. & Thergaonkar, V.P.	Thermal Power Plant emissions: Effect on ecosystem.	Proceedings of International Conference on Coal fired power plants and aquatic environment held at Cophenhagen, Denmark, August 16-18, 1982.

1.	2.	3.	4.
100	Thakre, (Mrs.) Rekha & Vittal Rao, M.	Biomonitoring of automobile exhaust with special reference to lead.	Symposium on Environmental problems in Maharashtra, Karad, Dec. 18-19, 1982.
101	Thakre, (Mrs.) Rekha & Vittal Rao, M.	i) Interaction of flyash on the growth of *Pisum sativum*. ii) Interaction of flyash on the growth of Wheat Plants.	Indian Science Congress, Tirupati, Jan. 3-8, 1983.
102	शर्मा, राधेश्याम और (डॉ.) पणिक्कर, पी. वी. आर. सी.	विश्व पर्यावरण दिवस	राष्ट्रदूत,पर्यावरण विशेषांक, 5 जून, 1982 नागपुर
103	शर्मा, राधेश्याम	प्रदूषण और स्वास्थ्य	राष्ट्रदूत,पर्यावरण विशेषांक, 5 जून, 1982 नागपुर
104	शर्मा, राधेश्याम	स्वदेशी प्रौद्योगिकी और ग्रामीण पर्यावरण, नेशनल रिसर्च डेवलपमेंट कार्पोरेशन ,नई दिल्ली	आविष्कार, सितम्बर-अक्टूबर 1982,

SYMPOSIA AND SEMINARS

NEERI SEMINAR GROUP

Office-bearers :

Dr.B.B. Sundaresan, (Ex-officio) Chairman
Director

Shri A.D. Bhide, Convenor
Scientist & Head,
Solid Wastes Division

Shri A.S. Juwarkar, Scientist was awarded the First Prize of Rs.100/- for Seminar on 'Utilisation of Pulp & Paper Mill Wastewater for Crop Irrigation' delivered on Feb.22, 1982.

The following Seminars were delivered by NEERI scientists and invitees during 1982-83 :

Sl.No.	Speaker	Title	Date
1.	2.	3.	4.
1	Dr. P.M. Phirke	Recovery of viruses from Water & Wastewater.	April 23, 1982
2	Prof. G.B. Kadam, Vice-Chancellor, Nagpur University. Adv. P.N. Chandurkar Dr. B.B. Sundaresan	World Environment Day.	June 4, 1982
3	Shri S.K. Kesarwani	On-line information system.	July 12, 1982
4	Shri V.P. Deshpande	Treatment of Wastewaters from Viscose staple fibre industry -- A case study.	August 20, 1982
5.	Dr. V.K. Kondawar	High performance liquid chromatography.	Sept. 20, 1982
6	Dr. M.B. Ranade, Environmental Technology, Research Triangle Institute, USA.	Research on Particulate Control at RTI, USA.	Dec. 13, 1982

7	Prof. A.F. Gaudy, Jr. Professor & Chairman Deptt. of Civil Engg. University of Delaware, USA.	(i) Kinetic Model for completely mixed activated sludge process.	Jan. 5, 1983
		(ii) Extended aeration process.	Jan. 6, 1983
8	Dr. J.C. Bosch US EPA, Research Triangle Park, North Carolina, USA.	Systems approach to environmental management.	Feb. 8, 1983

APPENDIX - VII

MEMBERSHIP OF INDIAN STANDARDS INSTITUTION (ISI) COMMITTEES

Sl.No.	Name of the Committee, Committee Number.	Name of the NEERI Representative Principal Member (P) Alternate Member (A)
1.	2.	3.
1	Concrete pipes and poles Sub-Committee BDC 2:6	N.M. Narasimhan (P) V.A. Mhaisalkar (A)
2	Sanitary appliances & Water fittings Sectional Committee 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 Meter Sub-Committee BDC 3:4	Y.S. Murty (P) N.M. Narasimhan (A)
5	Water Works Fittings Sub-Committee BDC 3:5	A.K. Seth (P) V. Haraprasad (A)
6	Plastic Pipes Sub-Committee BDC 3:8	S.K. Gadkari (P) C.V. Chalapatirao (A)
7	Panel for Water Supply & Plumbing BDC 13:P4	V.A. Mhaisalkar (P) P. Nema (A)
8	Fluid flow in closed circuits BDC 17:3	S.K. Gadkari (P) V. Subbiah (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	V. Raman (P) S.R. Kshirsagar (A)
11	Water Supply & Plumbing Sub-Committee BCD 24:1	A.K. Seth (P) A. Biswas (A)
12	Drainage Sub-Committee BCD 24:2	Y.S. Murty (P) A.K. Seth (A)
13	Public Health Engineering Equipment Sectional Committee BDC 40	B.B. Sundaresan, Chairman R. Paramasivam (A)

14	Water Treatment Equipment Sub-Committee BDC 40:1	R. Paramasivam (P) N.G. Swarnakar (A)
15	Wastewater Treatment Equipment Sub-Committee BDC 40:2	V. Raman (P) S.K. Gadkari (A)
16	Composition of Panel of Industrial Building BDC 64:P21	M. Mariappan (P) P. Nema (A)
17	Guiding Committee for National Building Code BDC 64	S.D. Badrinath (P) V. Subbiah (A)
18	Panel for Plumbing Service BDC 64:P16	M. Mariappan (P) V.P. Deshpande (A)
19	Panel of Environmental Pollution Control BDC 64:P24	S.D. Badrinath (P) V. Subbiah (A)
20	Civil Engineering Division Council CEDC	A. Raman (P) M. Mariappan (A)
21	Chemical Division Council CDC	P.V.R. Subrahmanyam (P) S.N. Kaul (A)
22	Water Sectional Committee CDC 26	R. Paramasivam (P) M.V. Nanoti (A)
23	Waste Treatment Methods Sub-Committee CDC 26:1	A. Raman (P) Convenor A.S. Bal (A)
24	Panel for Food and Fermentation Industry Wastes CDC 26:1:2	M.V. Srinivasan (P) R.K. Pandit (A)
25	Panel for Paper and Allied Industry Wastes CDC 26:1:3	P.V.R. Subrahmanyam (P) Convenor J.S. Gadgil (A)
26	Panel for Tanning Industry Waste CDC 26:1:4	H.C. Arora (P) S.D. Badrinath (A)
27	Panel for Textiles & Allied Industries Wastes CDC 26:1:5	T. Swaminathan (P) S.S. Mudri (A)
28	Panel for Dye-Stuff Industry Wastes CDC 26:1:6/WG	A.K. Basu (P) T. Swaminathan (A)
29	Panel for Chemical & Allied Industries Wastes CDC 26:1:6	P.V.R. Subrahmanyam (P) D. Seethapathirao (A)

1.	2.	3.
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) A. Ghosh (A)
33	Panel for Pesticides Industry Wastes CDC 26:1:17	Y.S. Murty (P) R.C. Reddy (A)
34	Panel for Pharmaceutical Industry Wastes CDC 26:1:18	S.N. Kaul (P) T. Swaminathan (A)
35	Panel for Rubber Industry Wastes CDC 26:1:21	C.S.G. Rao (P)
36	Water for Industrial Purposes Sub-Committee CDC 26:2	K.R. Bulusu (P) M.Z. Hasan (A)
37	Water & Effluents Sub-Committee CDC 26:3	V. Raman (P) D. Raguraman (A)
38	Panel for Methods of Test for Water & Effluents : (i) Bacteriological & Virological methods; (ii) Physical & Chemical methods; CDC 26	N.M. Parhad (P) S.R. Joshi (A) S.P. Pande (P) M.V. Nanoti (A)
39	Panel for Treatment of Water for Cooling Systems CDC 26:P7	A.S. Bal (P) R. Sarin (A)
40	Panel for Glossary of Terms for Water CDC 26:P8	S.G. Bhat (P) S.K. Kesarwani (A)
41	Panel for Drinking Water CDC 26:P11	S.P. Pande (P) R. Sarin (A)
42	Air Pollution Sectional Committee CDC 53	B.B. Sundaresan (P) P.K. Yennawar (A)
43	Terminology Sub-Committee CDC 53:1	V.I. Pandit (P) M.S. Manthapurwar (A)
44	Methods of Sampling and Analysis Sub-Committee CDC 53:2	P.K. Yennawar (P) G.H. Pandya (A)

1.	2.	3.
45	Ambient Air Quality Sub-Committee CDC 53:3	V.L. Pampattiwar (P) C.S.G. Rao (A)
46	Code of practice for Control of Air Pollution CDC 53:4	A.L. Aggarwal (P) G.H. Pandya (A)
47	Micrometerological Technique & Land Use Sub-Committee CDC 53:5	V.R. Bhave (P) S.M. Tamhane (A)
48	Emission Standard for Chemical, Fertilizer & Petroleum Industry CDC 53:P2	R. Swaminathan (P) V.I. Pandit (A)
49	Panel for Emission Standards for Cement, Glass & Ceramic Industries CDC 53:P3	R. Swaminathan (P) N.S. Phadke (A)
50	Panel to Deal with ISO Documents CDC 53:P4	B.B. Sundaresan (P) P.K. Yennawar (A)
51	Solid Waste Sectional Committee CDC 54	A.D. Bhide (P), Chairman A.V. Shekdar (A)
52	Panel for Method of Sampling & Test for Solid Wastes CDC 54: 2:6	S.K. Titus (P), Convenor V.P. Thergaonkar (A)
53	Panel for Steel Mill Solid Wastes CDC 54:P5	S.K. Titus (P) M.S. Olaniya (A)
54	Panel for Flyash CDC 54:P6	A.D. Bhide (P) S.K. Titus (A)
55	Panel for Solid Wastes of Ceramic & Refractory Industries CDC 54:P7	S.K. Titus (P) A.D. Patil (A)
56	Panel for Solid Wastes from Coal Mining & Washery Industries CDC 54:P8	A.V. Shekdar (P) S.A. Gaikwad (A)
57	Urban Solid Wastes Sub-Committee CDC 54:2	A.D. Bhide (P) S.K. Titus (A)
58	Panel for Collection, Transportation, Disposal & Utilisation of Urban Solid Wastes CDC 54:2:5	A.V. Shekdar (P) S.A. Gaikwad (A)
59	Agricultural Residues and Rural Wastes Sub-Committee CDC 54:3	C.K. Kale (P) A.S. Juwarkar (A)

1.	2.	3.
60	Environmental Protection Advisory Committee EPAC	B.B. Sundaresan (P) V. Raman (A)
61	Panel for Test Equipment for Water Quality LTDC 21:P3	V.R. Bhave (P) V.R. Apte (A)
62	Sectional Committee on Water Requirements for Crops AFDC 46	G.B. Shende (P) A.S. Juwarkar (A)
63	Meteorological Instruments Sectional Committee EDC 69	V. Muralidhar (P) M.K. Reddy (A)
64	Hygienic Codes Sub-Committee AFDC 36:5	P.V.R.C. Panicker (P) (Mrs.) A.S. Gadkari (A)

EXPERT COMMITTEES

Sl.No.	Name of the Committee (Authority/Department)	Name of the Members/ Representative
1.	2.	3.
1	Standing Committee of the Construction Division of the Bureau of Public Enterprises, Ministry of Finance, Govt. of India.	Director or his representative.
2	Central Board for the Prevention & Control of Water Pollution, Govt. of India, New Delhi.	Dr. B.B. Sundaresan
3	Indian National Committee for International Hydrological Programme (CSIR, New Delhi).	Dr. B.B. Sundaresen
4	Indian National Committee for Scope, Indian National Science Academy, New Delhi.	Dr. B.B. Sundaresan
5	Scientific Advisory Committee of the National Institute of Occupational Health, Ahmedabad.	Dr. B.B. Sundaresan
6	Environment Research Committee, Department of Environment.	Dr. B.B. Sundaresan
7	Advisory Committee on Environmental Planning & Coordination, Department of Petroleum, Ministry of Petroleum, Govt. of India.	Dr. B.B. Sundaresan (P) Shri A. Raman (A)

1.	2.	3.
8	Member of Working Group on Himalayan Water Resources for Development, Planning Commission, Govt. of India.	Dr. B.B. Sundaresan
9	Member of Advisory Committee for Research & Development (ACRD) for Environmental Effects of Water Resources Projects, Central Board of Irrigation and Power.	Dr. B.B. Sundaresan
10	Expert Committee to Monitor Pollution Abatement Measures in the Agra-Mathura Region.	Dr. B.B. Sundaresan
11	Working Group to examine the Environmental Aspects of Human Settlements, Ministry of Works and Housing, Govt. of India.	Dr. B.B. Sundaresan
12	Member of Expert Working Group on Air Pollution Aspects of Rural Fuels Use, Department of Environment, Govt. of India.	Dr. A.L. Aggarwal
13	Member of Technical Evaluation Committee to asssess the nature and extent of pollution caused by M/s Gwalior Rayon Factory, Mavoor (Kerala), Department of Environment, Govt. of India.	Shri C.S.G. Rao
14	Environmental Appraisal Committee for Industries Proposed : Lead-Zinc Smelter at Chittorgarh, Department of Environment, Govt. of India.	Shri A.K. Seth
15	Site Selection Committee for the Proposed Fertilizer Plant at Sawai Madhavpur (Rajasthan), Ministry of Petroleum, Chemicals & Fertilizers, Govt. of India.	Shri A.K. Seth
16	Advisory Committee on 'Hazardous Chemical Waste Management Project' constituted by National Productivity Council and Department of Environment.	Dr. P.V.R. Subrahmanyam

STATE GOVERNMENT COMMITTEES/BOARDS

Sl. No.	Name of the Committee/Board (Authority/Department)	Name of the Member/ Representative
1.	2.	3.
1	State High Level Coordination Committee of Science & Technology Research and Utilisation, Govt. of Maharashtra, Bombay.	Dr. B.B. Sundaresan
2	Water Resources Management Board, Bombay.	Dr. B.B. Sundaresan
3	Advisory Committee for Scientific Engineering Research Promotion, Division of the Council of Science & Technology, Uttar Pradesh, Lucknow.	Dr. B.B. Sundaresan (P) Dr. H.C. Arora (A)
4	Advisory Committee to assist the University School of Energy, Environment & Natural Resources, Madurai Kamaraj University, Madurai.	Dr. B.B. Sundaresan
5	Technical Sub-Committee of Kerala State Board for Prevention & Control of Water Pollution, Trivendrum.	Shri C.S.G. Rao
6	Expert Committee in Air Pollution, Bihar State Board for Prevention and Control of Water Pollution, Patna.	Dr. H.C. Arora
7	Member of Sub-Committee for Framing Syllabus for ME (Environmental Engineering) Course, Bharathiar University of Coimbatore.	Dr. M. Mariappan

COMMITTEES OF INTERNATIONAL ORGANIZATIONS

Sl. No.	Name of the Committee/Board (Authority/Department)	Name of the Member/ Representative.
1.	2.	3.
1	WHO/SEARO - Working Group on Human Ecology and Health, Metepec, Mexico.	Dr. B.B. Sundaresan
2	WHO/SEARO - Drinking Water Quality Surveillance for Rural Community Supplies, Bangkok, Thailand.	
3	UNEP/PARIS - Expert Group on Environmental Management in the Chemical Industry, Geneva, Switzerland.	
4	Expert Advisor of ATEC (Appropriate Technology Extension Centre), Kathmandu, Nepal.	
5	WHO- Expert Advisory Panel on Environmental Pollution and Hazards, Geneva, Switzerland.	

OTHER COMMITTEES

Sl. No.	Name of the Committee (Organisation Constituting the Committee)	Name of the NEERI Representative
1.	2.	3.
1	Committee of experts to study Public Health Engineering problems at Tirupati Township, Tirupati and Tirumalai Devasthanam, Tirupati (A.P.)	Dr. B.B. Sundaresan (P) Shri V. Raman (A) Shri Y.S. Murty (A)
2	World Wild Life Fund (India), Nagpur Branch.	Dr. H.C. Sharma
3	Advisory Board of (i) Journal of Environmental Biology; (ii) Pollution Research.	Dr. K.P. Krishnamoorthi
4	Board of Environmental Studies, University of Cochin.	Shri V.P. Thergaonkar

1.	2.	3.
5	Member, Board of Studies in Botany, Marathwada University, Aurangabad, for three years, 1982-85.	Dr. S.R. Joshi
6	Member, Board of Studies in Chemistry, Nagpur University.	Dr. R. Sarin
7	Member, Institution of Engineers (India), Calcutta.	Shri N.G. Swarnakar
8	Member, Faculty of Social Sciences & Member, Board of Studies in Library & Information Science, Nagpur University.	Shri S.G. Bhat
9	Member, Faculty of Science & Member, Board of Studies in Biochemistry & Microbiology of Nagpur University.	Dr. T. Chakrabarti
10	Elected Fellow of Institution of Engineers (India), Calcutta.	Shri V. Raman
11	Elected Fellow of Institution of Chemists, Calcutta	Dr. (Miss) N. Thakkar

APPENDIX - VIII

HONOURS AND AWARDS

Sl. No.	Name	Award/Honour/Degree	Awarded by/Programme & purpose
1.	2.	3.	4.
1	Dr. H.C. Arora	Cash prize of Rs.150/- for extempore lecture on 'Treatment of high organic wastewaters by anaerobic contact filter process.'	National Centre for Technical Development at All India Convention held on Jan. 7-8, 1983 at Delhi and sponsored by All India Distillers Association.
2	Mrs. Bhanumati Swamy	Cash award of Rs.250/- for passing Departmental Hindi Exam. (Prabodh).	NEERI.
3	Mrs. S.S. Dhage	Prize for Best Lecture delivered at Nagpur chapter of IWWA on 'Water Works Wastes : Studies on Characterization and recycling of Alum' on Sept. 16, 1982.	Indian Water Works Association.
4	Mrs. A.S. Gadkari	Ph.D. (Zoology), Topic: 'Evaluation of Toxic Effects of some chemicals on fishes and invertebrates'.	Nagpur University.
5	Shri S.D. Khangar	Special prize for best attendance in 118 Battalion of Territorial Army.	Territorial Army. On the occasion of Territorial Army Day on Nov. 20, 1982.
6	NEERI, Nagpur (Technology Demonstration Dn.)	17 prizes (14 for Cactus & 3 for Succulents).	Nagpur Garden Club, Jan. 9 & 29, 1983.
7	Shri N.S. Phadke	Ph.D. Topic : 'Scientific approach to astrology with reference to planets and profession'.	University of Pune.

1.	2.	3.	4.
8	Dr. R. Sarin	Plaque of honour.	Indonesian Govt. For successful completion of training programme on "Analytical Quality Control" as a Short-term WHO Consultant, December, 1982.
9	Dr. S.R. Wate	Ph.D. Topic : 'Studies on Anaerobic digestion process as applied to organic matter in presence of some additives'.	Nagpur University.

APPENDIX - IX

DEPUTATION ABROAD

Sl. No.	Name	Programme & purpose
1.	2.	3.
1	Dr P.V.R. Subrahmanyam	(i) Participated in International Recycling Congress at Berlin, April 21-22, 1982. (ii) Deputed to FRG as Consultant to Task Group Meeting of Advisory Committee of World Bank, April 22, 1982. (iii) Visited institutions in West Germany with a view to identify possible areas of co-operation under Indo-German Exchange Programme, during April, 1982.
2	Dr. S.P. Pande	Attended meeting of key personnel under UNEP/WHO/UNESCO/WHO Project on Global Water Quality Monitoring at Burlington, Canada, April 26-30, 1982.
3	Dr. K.P. Krishnamoorthi	Deputed to USA under Indo-US binational project on 'Analysis, assessment & treatment of toxic discharges from phosphatic fertilizers and basic organic chemical industries' for discussion on fish bioassay, May 8-28, 1982.
4	Shri V.P. Thergaonkar	Short-term WHO Consultant to Afghanistan for one month from May 18, 1982.
5	Dr. R. Sarin	Short-term WHO consultant to Institute of Hydraulic Engineering, Bandung, Indonesia, Sept. 2-22, 1982 and Dec. 1-24, 1982.
6	(i) Shri T.K. Srinivasan (ii) Shri K. Subba Rao (iii) Shri S.B. Deshmukh (iv) Shri S.N. Khadakkar (v) Shri S.V. Deshpande	WHO Fellowship to Netherlands to participate in 12-week course on "Assessment and control of inland & surface water pollution", Sept. 28 to Dec. 7, 1982.
7	Dr. B.B. Sundaresan	(i) Deputed to USA under Indo–US binational project to hold discussions with EPA officials & finalise report, Oct. 26 to Nov. 26, 1982. (ii) Attended Inter-Regional meeting on 'Drinking water quality surveillance for rural community supplies' at Bangkok, Nov. 29 to Dec. 3, 1982.

1.	2.	3.
8	Shri V. Raman	Visited Singapore to present paper in Regional Seminar on 'Control of Water Supply distribution system' and participate as Resource Speaker, Feb. 8-12, 1983.
9	Shri A.D. Bhide	Attended International Symposium on Industrial & Hazardous Solid Waste at Philadelphia, USA to present invited paper, March 6-11, 1983. Deputed to USA under Indo-US binational project on Analysis, assessment and treatment of toxic discharges from phosphatic fertilizer & basic organic chemical industries, March 12-18, 1983.

APPENDIX - X

BUDGET

Actual Expenditure 1982-83

			(Rupees in Lakhs)
Capital :	Plan	..	40.136
	Non-Plan	..	2.686
Recurring :	Plan	..	16.405
	Non-Plan	..	103.410
Total :	Plan	..	56.541
	Non-Plan	..	106.096
Grand Total :		..	162.637

RECEIPTS FROM SPONSORED AND CONSULTANCY PROJECTS

	1982-83	(Rupees in Lakhs)
Sponsored Projects	..	31.976
Consultancy Projects	..	3.057

STAFF*

Scientific	...	206
Technical	...	207
Administrative	...	192
Total	...	605

***As on March 31, 1983**

APPENDIX - XIII

VISITORS

Sl. No.	Name	Date(s)
1.	2.	3.
1	Mr. H.A. Heijnen Project Manager (SSF), WHO, IRC Netherlands.	May 17-19, 1982
2	Prof. Guang Hang Zeng People's Republic of China.	June 25, 1982
3	Mr. Timothy A. Ayanleye, Federal Institute of Industrial Research, Nigeria.	June 28, 1982
4	Shri C.D. Oomachen, MLA Chairman, Maharashtra State Board for Prevention and Control of Water Pollution, Bombay.	July 20, 1982
5	Smt. Shanti Sadiq Ali President, Bal Varsha Pratishthan.	July 21, 1982
6	Shri R. Sundaram Iyer Chairman, Kerala State Board for Prevention and Control of Water Pollution, Trivandrum.	August 13, 1982
7	Shri U. Vidyanathan, Adviser (SP), Planning Commission, New Delhi.	August 23, 1982
8	Shri D.K. Mittal Secretary, Govt. of Uttar Pradesh, Lucknow.	August 24, 1982
9	Dr. A.H.V. Sarma, United Nations ESCAP, Bangkok.	October 21, 1982
10	Shri Nobert Gerzer Geselleschaft fur Strahlen und Umurltfosschug, Munchen.	October 25-26, 1982
11	Shri J.T. Visscher WHO IRC, The Netherlands.	November 2-4, 1982

APPENDIX - XII

DISTINGUISHED VISITORS

Sl. No.	Name	Date(s)
1.	Smt. Indira Gandhi, Prime Minister of India & President, CSIR, New Delhi.	April 10, 1982
2.	Prof. S. Nurul Hasan, Vice-President, CSIR, New Delhi	
3.	Shri V.P. Sathe, Union Minister for Information & Broadcasting, New Delhi.	
4.	Shri Babasaheb Bhosale, Chief Minister of Maharashtra, Bombay.	

1.	2.	3.
12	Dr. Kenneth Knapp US EPA, USA.	December 13-15, 1982
13	Prof. Dale A Lundgren University of Florida, USA.	December 13-15, 1982
14	Dr. P.J. Lavakare Director, Department of Science & Technology, New Delhi.	December 16, 1982
15	Shri V.M. Kelkar Director, Department of Environment, New Delhi.	December 20, 1982
16	Shri Digvijay Sinh Union Deputy Minister for Environment, New Delhi.	December 24, 1982
17	Dr. Jan R. Dojlido UN Consultant to Hindustan Insecticides Ltd., New Delhi.	January 3, 1983
18	Dr. R.J. Turner US EPA, USA.	January 17-18, 1983
19	Shri Subba Rao UNDP, New Delhi.	January 24, 1983
20	Dr. Dick De Jong WHO IRC, The Hague, The Netherlands.	February 4-5, 1983
21	Dr. J.C. Bosch US EPA, RTP, North Carolina, USA.	February 6-10, 1983
22	Shri Toon Van Dam WHO, IRC, The Netherlands.	February 22-26, 1983
23	Shri Peterse Administrator, WHO, IRC, The Netherlands.	February 21-23, 1983
24	Dr. M.P. Mitchell British High Commission, Bombay.	March 23, 1983
25	Dr. V. Majstrik Prof. Environmental Biology, Czechoslovakia.	March 23 - April 2, 1983

WHO CONSULTANT

Prof. A.F. Gaudy Prof. and Chairman, Department of Civil Engineering, University of Delaware, Newark, Delaware, USA.	December 30, 1982 - January 22, 1983

WHO FELLOWS

Sl. No.	Name	Date(s)
1	Mr. Rachmadhi Purwana Faculty of Public Health, University of Indonesia, Indonesia.	April 8-17, 1982
2	Mr. P.W. Perera Division of Occupational Hygiene, Colombo, Sri Lanka.	April 19 - May 14, 1982
3	Mr. Badri Nath Shrestha Department of Health Services, Teku Kathmandu, Nepal.	August 2-6, 1982
4	Miss Tri Tugaswati National Institute of Health Research & Development, Indonesia.	September 28 - October 8, 1982
5	Mr. K.M.N.S. Fernando National Water Supply & Drainage Board, Sri Lanka.	September 29 - October 1, 1982
6	Mr. S.K.H. Perera National Water Supply & Drinage Board, Sri Lanka.	September 29 - October 1, 1982
7	Mr. P. Thangaraj National Water Supply & Drainage Board, Sri Lanka.	September 29 - October 1, 1982
8	Miss Shakeela Taheri Ministry of Public Health, Kabul, Afghanistan.	October 5 - November 5, 1982

Sl. No.	Name	Date(s)
9	(i) Mr. Abdul Quader Choudhury (ii) Mr. M.D. Abdul Bari (iii) Mr. M.D. Matiar Rahman of Public Health Engg. Deptt., Bangladesh.	October 7-8, 1982
10	Mr. Shri Ram Shrestha Local Development Department, Nepal.	October 7-8, 1982

OTHER TRAINEES

Sl. No.	Name	Date(s)
1	Mr. K.B. Taori, VRCE, Nagpur. Work carried out for M.E. (PHE) on Evaluation of existing treatment plant & feasibility studies of anaerobic filter for treatment of dairy waste.	May - September, 1982
2	Mr. Simon Veenstra & Mr. J.W. Van Groenestijn of Agricultural University, Wageningen, The Netherlands. Studies carried out on Biological disc system for sewage treatment and Slow Sand Filtration respectively by them in partial fulfilment of M.Sc. degree.	August - November, 1982