The Beginning

NEERI

The journey started in 1958 when a serious water pollution episode confronted the country's capital city, Delhi. The country's policy makers, led notably by the then Prime Minister Pandit Jawaharlal Nehru, took the momentous decision of creating an umbrella organization that would have ability to address all the related linkages concerning public health. An organization was necessary that could assess and counter any issue in the public health domain. Thus was created the Central Public Health Engineering Research Institute (CPHERI). CPHERI was established on 8th April 1958 by Council of Scientific & Industrial Research (CSIR) to initially deal with problems of water and air pollution in urban settlements to assist industry, to anticipate problems, provide solutions and to concentrate on regional development. The laboratory started functioning in 1959. Foundation stone of the main building was laid at the hands of Prof. M.S. Thacker, the then Director General, CSIR. Then, the Institute started functioning with Headquarters at Nagpur and Zonal Laboratories located in different parts of the country. The Institute provided excellent services to the society in the domain of public health by carrying out various important activities in the areas of water and air environment.

Foundation stone of the main building of CPHERI was laid at the hands of Prof. M.S. Thacker, the then Director General, CSIR

That time environmental concerns were limited to human health with a focus on water supply, sewage disposal and communicable diseases. Later

on, world wide public awareness on the environmental degradation started getting attention. After participating in the "United Nations Inter-Governmental Conference on Human Environment" at Stockholm in 1972, which gave legitimacy to environmental issues, the then Prime Minister of India and President, CSIR, Smt. Indira Gandhi renamed the Central Public Health Engineering Research Institute as the National Environmental Engineering Research Institute (NEERI) in 1974. This was done to encompass the entire vistas of R&D in the area of environmental science and engineering. Accordingly, the Institute, in line with the vision, mission and policy of CSIR, delineated thrust areas for R&D comprising Environmental Monitoring, Environmental Biotechnology, Solid & Hazardous Waste Management, Environmental Systems Design Modelling and Optimization, Environmental Impact & Risk Assessment, and Environmental Policy Analysis. Presently, CSIR-NEERI is functioning with Headquarters at Nagpur and five Zonal Centres located at Mumbai, Kolkata, Delhi, Chennai and Hyderabad.

While the Institute started its journey primarily to address issues related to water pollution control, later entries into air and land made it encompass all the major domains of environment.

Former Prime Minister of India Smt. Indira Gandhi addressing the Institute's staff on the occasion of the renaming ceremony of the Institute

1958-1968

In this decade, to ensure potable water to communities, NEERI (formerly CPHERI) paid special attention to process development and also made efforts to ensure these processes are economic. The processes include defluoridation, removal of heavy metals and salts, destruction of microorganisms, etc.

Some of the significant achievements of the Institute in this decade have been:

- **Development of a portable water demineralizing unit**

A small portable demineralizing unit, to treat about 50 gallons of water per regeneration cycle, containing 500 ppm solids, was designed and fabricated, to cater to the needs of demineralized water for hospitals, educational institutions, and research laboratories, etc.

- **Processes for chlorination of well waters**

Two types of processes, i.e. for well without pump and for well with pump, were devised by the Institute, which proved to be simple and economical. For well without pump, the device developed consisted of a container having an outlet at the bottom in which a tube bent at right angles was fitted. To the outlet of the container, a polythene tube was connected leading into the well. At the end of the polythene tube, a jet was fitted facilitating the control of flow of bleaching powder solution. The polythene tube was provided with a pinch-cock. For well with pump, the device developed differed only in the dosing arrangement. The polythene tubing was connected to the suction pipe of the water pump. The doser consisted of a measuring cylinder, connected at the bottom with three way stop cock.

- **Development of a cartridge decontaminator**

The studies were carried out to evolve a practical and handy process to enable our soldiers stationed at high altitude to purify and decontaminate the water to make it safe for drinking purposes. Accordingly, a syringe was fabricated and charged with a series of absorbents, which in turn was able to

remove various toxic substances like arsenic, lead, cyanide, etc. from the water.

- **Disinfection of rural well water by carboy method**

A simple device for automatic chlorination of small wells was developed. A pocket kit for estimation of residual chlorine was distributed to municipal bodies.

1969-1978

During this decade, the Institute helped in designing water treatment plants involving the application of slow sand filtration and use of membranes. Analytical procedures for rapid and accurate estimation of quality of water were developed. The Institute was also involved in air quality monitoring at various places in the country

Some of the significant achievements of the Institute in this decade have been:

- **Pilot plant for defluoridation**

NEERI helped to set-up a pilot plant for defluoridation of water at Nalgonda (A P) to treat 20, 000 gal / day of drinking water using Defluoron 2, a defluoridation agent developed by the Institute.

- **Membrane filters**

Membrane filters were developed by the Institute from indigenous materials and found as good as the imported ones in bacteriological analysis of water and wastewater. The cost of the product was estimated as ₹ 0.22 per piece.

- **Chlorine tablets**

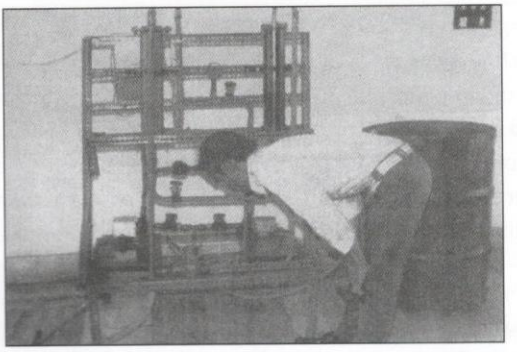
Chlorine tablets effective in disinfecting water on an emergency basis and convenient for use were developed at NEERI. About 2 lakh tablets were made

Disinfection tablets under preparation

and supplied for emergency disinfection in refugee camps and other places. The manufacturing process involved bleaching powder as a raw material.

- **Carbon chloroform extraction (CCE) unit**

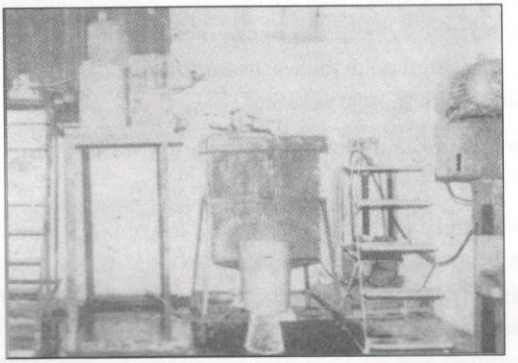
A carbon chloroform extraction (CCE) unit was fabricated for estimation of low concentrations of organics such as pesticides, insecticides and herbicides in water. The Institute also fabricated a package water treatment plant of 200 gallons per hour capacity.



Carbon chloroform extraction (CCE) unit for determining micro-quantities of organic pollutants in water supplies

- **Nalgonda technique for defluoridation of water**

The Nalgonda technique was proved to be a convenient and easily adaptable way of defluoridating water than by any other methods hitherto known. This new technique was adopted on an individual scale or on a community level. In this technique, lime, bleaching powder and filter alum were added to



Nalgonda technique for defluoridation of water : A demonstration plant

fluoride bearing water in sequence, stirred for ten minutes and settled for an hour. A clear supernatant was obtained containing fluoride within the permissible limits. A pilot plant to treat 180-240 L / h was operated both in the field and the laboratory to study the new technique on a continuous basis. The studies indicated that 3.5-4.5 mg F / L can be brought within the permissible limits.

1979 1988

Water being an important resource for all life processes and for industry, specific technologies were developed by the Institute in this decade for treatment of industrial and domestic wastewater so that it can be further reused and recycled. A wide range of surveys on the quality of water and origin of pollution were carried out. Besides providing solutions to wastewater treatment to various industries, the Institute was also involved in air quality monitoring, development of various processes for water treatment and solid waste management and management of toxic chemicals. The Institute also evaluated various rural water supply schemes in India. The efforts were also made in this decade to develop various instruments for environmental monitoring.

Some of the significant achievements of the Institute in this decade have been:

- **Treatment and reuse of pulp and paper mill wastewater**

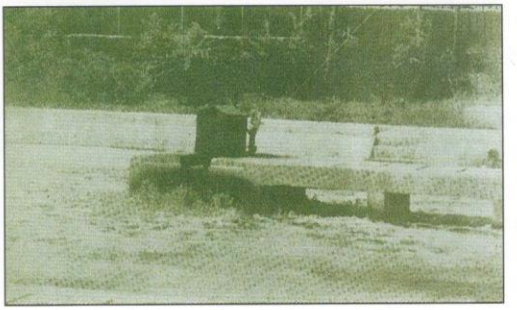
A four-year study on different aspects of utilization of pulp mill wastewater for crop irrigation revealed that it can be satisfactorily used in sandy to sandy loam soils. Maize, barley, wheat, rice and sugar found to tolerate the wastewater irrigation without any sign of reduction in the yield. Kenaf, a pulp wood plant, withstood pulp mill wastewater irrigation and showed promise for its cultivation with the wastewater.

- **Treatment of urea and ammonia bearing wastewater from fertilizer industry**

The study indicated that urea did not inhibit the removal of nitrates at all the concentrations studied and at the same time got hydrolysed to ammonia. Optimum carbon requirements for bacterial culture in the form of methanol were also worked out. The Institute provided environmental management plan for treatment and disposal of wastewaters for the fertilizer industry-SPIC, Tuticorin (Tamil Nadu)

- **Aerated lagoon and sludge drying beds**

Aerated lagoon was made operational at Ranipet tannery. Studies were also carried out on sludge drying beds at Ranipet tannery.



Aerated lagoon in operation at Ranipet tannery

1989 - 1998

In this decade, the Institute witnessed a phenomenal growth in its activities, manifested by much enhanced external cash flow, swelling number of projects, and a concomitant overall growth of in-house infrastructure facilities including analytical instruments. The Institute was called upon by various industries and organisations to carry out environmental impact and risk assessment (EIRA) studies to identify and evaluate the impacts of various proposed activities and delineate environmental management plans. Environmental audit studies were also carried out by the Institute for various industries. Various R&D activities were also carried out in the area of environmental science and engineering. Various activities related to environmental biotechnology were also initiated in this decade from the sustainable development point of view.

Some of the significant achievements of the Institute in this decade have been:

- **Development of portable kits for water quality analysis**

The Institute developed portable kits: Rapid Aqua Tester (Visual Comparator) for estimation of iron, fluoride, residual chloride and pH; Digital Mini Colorimeter with narrow band special light sources for estimation of fluoride, iron, nitrite; Titrimetric Analyser for estimation of harness, acidity, alkalinity

and chlorides; Rapid Bacteriological Analyser for estimation of faecal coliforms. The know-how was transferred to various entrepreneurs for commercialization

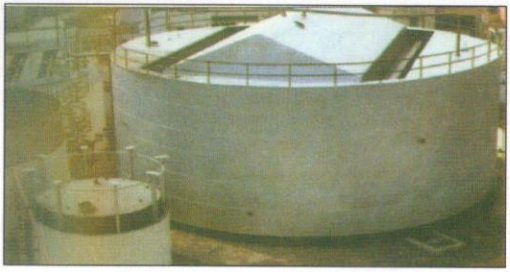
A portable kit for water quality analysis : rapid aqua tester

- **Impact assessment of Ganga Action Plan on public health**

The Institute carried out studies related to impact assessment of Ganga Action Plan on public health. The studies involved evaluation of the benefits of the project vis-à-vis the costs, and identification of corrective / supplementary measures. The studies carried out by the Institute helped in designing cost-effective strategies for similar water quality management programmes

- **Biomethanation studies**

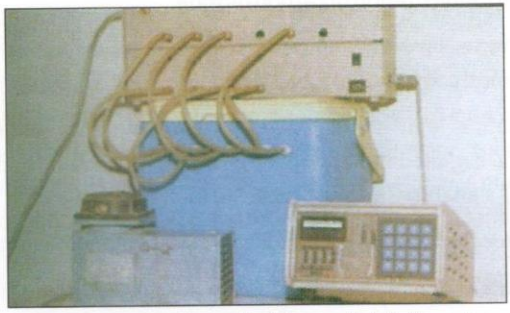
The Institute carried out biomethanation studies based on fixed film reactor technology for treatment of wastewaters from distillery, sugar, fruit processing, tannery and hospital wastewaters on bench, pilot and full scale.



Fixed film biomethanation plant for treating 450 cu / day distillery spentwash at Central Distillery and Breweries Ltd., Meerut

- **Development of auto exhaust smokemeter and automatic sequential air sampler**

The Institute designed and developed a prototype of auto exhaust smokemeter with sponsorship from M/s Envirotech Instruments Pvt. Ltd., New Delhi for carrying out the detailed evaluation of Envirotech Smokemeter System and to evolve a modified verision. Based on the studies undertaken for testing, over 200 diesel driven vehicles were tested. The technical know-how was transferred to Ms Envirotech Instruments (P) Ltd., New Delhi. Also the automatic sequential air sampler was developed by the Institute for sampling gaseous air pollutants in source emissions and ambient air. The sampler was also capable of estimation of both short-term peak concentration and long-term average levels.



Microprocessor Controlled Sequential Air Sampler

1999-2008

As an outcome of the contributions rendered by the Institute in the past decade, NEERI's expertise was developed to give solutions to the society to existing problems. In this decade, environmental biotechnology and genomics emerged as useful tools for sustainable development. The Institute entered into micro-niches by which the Institute studied how DNA structure can be used as a tool to analyse and provide solutions to environmental pollution problems. The Institute also started working in the area of development of various nano-materials that are useful in cleaner energy production systems, vehicular emission control, remediation of air and water pollution, etc. The Institute pioneered mega projects for various industries to manage their solid and hazardous wastes. NEERI demonstrated rejuvenation of mine spoil dump sites.

The significant achievements in this decade have been:

- Development of biotechnological methods for treatment of nitrogenous wastewater using anaerobic ammonia oxidation process
- Biotechnological applications of novel hybrid zeolitic material for *in-situ* remediation of contaminated soil
- Phytoremediation and bio-utilization of industrial wastes
- Anaerobic production of hydrogen by diverting electron flow from methane to hydrogen generation
- Biological deodorization of industrial emissions containing sulphurous odorants generated from pulp and paper industries
- Microbial sequestration of carbon dioxide
- The hitherto unknown microbial population of activated biomass assessed and bacteria identified by sequencing 16S rDNA
- Mathematical and statistical tools were used to address specific problems, e.g. biodegradation of mixed waste stream for pesticides, or designing signature specific probes for bacteria
- Development of novel functionalized materials for CO_2 capture
- Development of nano-structured zeolitic materials for artificial photosynthesis vis-à-vis control of green house gases (alternate route for non-renewable energy sources)
- Bioremediation and phytoremediation