NEWS

TACKLING GANGA POLLUTION

To millions of Hindus, the Ganga is not merely a life-giving or life-supporting river, it is goddess incarnate. To bathe in the river, to drink its holy water and to have one's ashes scattered over its surface—this is the great wish of every devout Hindu. A common practice among the religious Hindus is to carry the Ganga water in airtight metallic vessels and keep it for use on ceremonial occasions. This water has been found to remain pure, clear and unchanged even after many years.

The myth of the ever-pure Ganga, however, is fast fading with increase in urban population and industrial activity on its banks. The quality of water in many locations is found to be unfit even for agricultural operations, not to speak of its fitness for human consumption. Ganga pollution mainly results from industries—tanneries, paper mills, petrochemical and fertilizer complexes—using the river as a convenient dumping ground for their liquid wastes, city wastes being allowed into the river and partly burnt and decomposed bodies of men and animals being dumped into it. To top it all, most of the cities situated on its banks do not have any worthwhile sewerage treatment system. The result is that there is frequent occurrence of waterborne diseases like hepatitis, cholera and dysentery.

Alive to the dangers of water pollution, the Government of India enacted the Water (Prevention and Control of Pollution) Act in 1974 under which Pollution Control Boards have been set up in the States and at the Centre for prevention, abatement and control of pollution of rivers by regulating the quality of domestic and industrial effluents. The Act requires the industrial and sewage wastes to be treated to a desired level before they are discharged into the rivers. Based on a comprehensive survey of the Ganga basin carried out by the Central Board, an action plan was prepared by the Department of Environment, Government of India, in December 1984 for the prevention of pollution of Ganga. Besides, Central Ganga Authority was constituted in February 1985 with the Prime Minister as its Chairman to control pollution in the Ganga on a priority basis. The Action Plan has identified urban liquid wastes and industrial wastes as the main sources of pollution of the river and envisages the following:

(a) Renovation of existing trunk sewers and outfalls to prevent the overflow of sewage into Ganga; (b) Construction of interceptors to divert flow of sewage and other liquid wastes into Ganga; (c) Renovation of existing sewage pumping stations and sewage treatment plants and installation of such new plants; (d) Arrangement for bringing human and animal wastes from locations proximate to sewage/sullage digesters for sanitary disposal; (e) Provision of sullage or sewage pumping stations at the outfall points of open drains; (f) Alternate arrangements to prevent discharge of animal and human wastes from cattle sheds located on the river banks; (g) Biological conservation measures based on proven techniques for the purification of streams; (h) Low-cost sanitation schemes in areas adjoining the river to reduce or prevent the flow of human wastes into the river; (j) Prevention of throwing dead bodies in the river; and (k) Regulation of the usage of pesticides for agricultural use so that the surface run-off from fields does not carry their excessive quantities to rivers.

The Indian Standards Institution became conscious of the gravity of the problem of water pollution as far back as 1957 when it set up its Water Sectional Committee (CDC 26). Dealing with the subject in an integrated manner, the Committee has stipulated tolerance limits for industrial effluents to be discharged into various modes like rivers, marine coastal areas and public sewers and on land. The Institution has also brought out guides for treatment and disposal of industrial effluents from specific industries besides publishing a series of standards on methods of sampling and test for industrial effluents. A set of standards on tolerance limits for industrial effluents discharged into inland surface areas covering general limits and specific industries like distilleries, sugar, strawboards, fertilizers, coke ovens, tanneries and rubber have also been published. The Institution also realized that the quality of river water had a bearing on the quality of the effluents received. Hence tolerance limits were also prescribed for inland surface waters subject to pollution.

The effluent limits suggested by Central Ganga Authority for industrial effluents to be discharged into Ganga are more or less compatible with those prescribed in the Indian Standards which have the benefit of experience of several experts in the field. It is, therefore, felt that, with close monitoring and enforcement of these limits and various other steps taken by Central Ganga Authority, it will be possible to restore the pristine purity of Ganga in the foreseeable future. (*ISI Bulletin*, Vol. 38, No. 5, p. 160–161, May 1986; The Editor, Indian Standards Institution, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002).

INDO BRITISH COLLABORATION IN THE WATER SECTOR

The Indian Government has far some years wished in principle to clean up the Ganga, and in February last year the Central Ganga Authority (CGA) was created with the Prime Minister as Chairman. The Project Directorate of the CGA was created in June 1985 with responsibility for implementing a recently prepared Action Plan for controlling pollution in the Ganga. The Thames Water Authority, U.K. with its experience over the last twenty years in the cleaning of the Thames, widely regarded as one of the most successful river restoration programmes ever, was recently appointed by the project directorate to provide advisory services in River Quality Management, Wastewater Treatment and Resource Recovery Technology, Institutional Organisation for Operation and Maintenance and Training Requirements.

The British Government has agreed to an aid grant of £200,000 to cover the cost of the advisory services to be provided by the Thames Water Authority (TWA). TWA propose to develop a computerised fresh-water river quality model for the Ganga suitable for analysis of critical sections of the river. They will also provide a suitable desktop computer and items of portable river monitoring equipment. Services will be rendered by Thames Water personnel on assignment in India during a number of short term visits. These will be supported by research and development work carried out in the U.K. The total level of effort is estimated to be around 21 man-months of which approximately 8 man-months will be undertaken in India over an 11 or 12 month period.

Thames Water Authority are the national choice as initial advisers to the Ganga Project Directorate as they set about implementing the mammoth Action Plan. So is the Project Director, Mr David Triggs who is a student of Indian philosophy and Sanskrit as well as being a civil engineer, and has worked on a previous Third World contract for Thames, helping cleanse waste water along the Nile.

It is hoped that this is the beginning of greater and continuing Indo-British collaboration in the Indian water sector where there have of course already been some British inputs. The Calcutta Metropolitan Development Authority appointed the Thames Water Authority in 1984 as consultants in laying a 10-kilometre long and 16 inches diameter underground water main at Falter to augment water supply to Calcutta.

Earlier, British aid to the tune of about £450,000 including the provision of experts, training and laboratory equipment and books led to the establishment of India's first water sector training college in Madras, under the auspices of the Madras Metropolitan Water Supply and Sewerage Board. Britain's National Water Council was involved in the provision of experts, training and equipment.

With the higher priority now accorded to the water sector by the Indian Government a number of British firms and organisations are showing interest in providing their services. Future prospects for collaboration seem bright. (*British Industrial News*, April–May 1986, p. 17; R. P. Nash, British Information Services, British High Commission, New Delhi 110 021).

COMETS—HALLEY'S DIRTY SNOWBALL

The astronomers finally have their answer: comets really are just 'dirty snowballs'. Over 30 years ago Fred Whipple suggested as much, when he proposed that comets' heads were composed primarily of frozen water incorporating rock fragments and dust.

The trouble was that water in the Earth's atmosphere caused spectral line interference in the infrared and prevented direct observation by ground-based spectrometers. Water does not fluoresce in the ultraviolet, and its radio spectrum is too weak to be detected, thus eliminating all the astronomer's usual tools.

However, indirect corroboration for the presence of water came from the discovery of atomic oxygen and hydrogen, molecular OH, and ionic H_2O^+. In 1980 a new theory was conceived by Dr Michael Mumma, head of the Planetary Systems Branch at Nasa's Goddard Space Center in Maryland, and developed in conjunction with Dr Harold Weaver of Johns Hopkins University. The theory suggested that parent molecules could best be detected by measuring the ir fluorescence spectrum stimulated by the sunlight. It predicts in precise detail the wavelength and relative intensity of ir lines. An airborne telescope would reduce the degree of interference from atmospheric water. The near approach of Halley's Comet this winter was a golden opportunity to test the predictions.

Hardware was provided by a group at the University of Arizona, who specialise in airborne spectrometry and detected water in Jupiter's atmosphere 10 years ago. The Kuiper Airborne Observatory consists of a 36-inch diameter telescope in a converted C-141 aircraft operated by Nasa's Ames Research Center, California.

With this spectrometer, observations were made at an altitude of 41000 feet over the days just before Christmas. Mumma and Weaver's theory predicted 10 spectral lines of water in Halley's coma, the bright gas cloud surrounding the nucleus. On 21 December the observers picked up four of the lines; on 23 December all 10 lines were detected.

Mumma explained that 'this is our first direct confirmation that neutral water is the dominant molecular species in a comet'. Nasa says that 'the direct detection of a major parent molecule ushers in a new era of direct investigations of the compositions of cometary nuclei and of the physics of cometary coma. Until now, scientists had to work backward using the known fragments to infer the identities of plausible parent molecules'.

The Nasa–university team will be flying their airborne spectrometer from Australia later this month, looking both for water and methane in an effort to map both substances in Halley's coma. Meanwhile, the European Space Agency's *Giotto* and a Soviet spacecraft are heading toward their close encounters, carrying the hopes of astronomers that even more information can be gleaned from Halley's once-in-a-lifetime appearance. (*Chemistry in Britain*, Vol. 22, No. 3, March 1986, p. 194; The Royal Society of Chemistry, Burlington House, London W1V 0BN, 01–4378656).

NEW STANDARD FOR MEASURING RADON CONCENTRATION IN WATER

The National Bureau of Standards (NBS) has developed a new standard for measuring radon concentration in water. The standard was developed for EPA, where scientists believe that radon in domestic water supplies is a chief source of indoor radon pollution and a possible cause of lung cancer. The NBS standard is a radon generator consisting of a sealed source of radium-226 in a partially automated system that dispenses measured samples of water with radon-222 in solution. The generator can be calibrated and certified in terms of the radon-222 concentration in the dispensed samples. The uncertainty of calibration is estimated at 4 per cent. (*Environ. Sci. Technol.* Vol. 20, No. 6, 1986, p. 536; The American Chemical Society, 1155, 16th Street, N. W. Washington D.C. 20036, USA).

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