Economic Aspects of Wastewater Treatment in South Africa

V.N. BOLITHO
(ASSISTANT CITY ENGINEER, HEALTH SERVICES, JOHANNESBURG CITY COUNCIL)

Abstract
Rapid expansion of urban populations in South Africa will require additional waste water treatment facilities with a capacity of 10000-12000 Ml/d. The cost of constructing plant units of 100 Ml/d capacity and employing the extended aeration process is estimated at R4,25m with operating cost at 2,25 c/m³. Methods of sludge disposal are changing and new cost structures will have to be taken into account. Estimated investments and running costs for waste water facilities in South Africa during the next 25 years are given. Economic considerations are discussed for the following: purifying municipal effluents to various standards of purity, including that of potable water; industrial waste treatment; and regional sewerage chernes.

The Investment Involved
The investment involved in meeting future wastewater purification requirements is affected by the following factors:

(i) Water requirements and effluent treatment: For purposes of calculation, an overall urban water demand figure of 500 l/p/d for all uses is assumed. About 85 percent will be returned to sewers. Thus additional wastewater purification facilities having a capacity of between 10 000 Ml/d and 12000 Ml/d must be provided.

(ii) Effluent standards: The South African General Standard for municipal and industrial effluents discharged to rivers is a multi-parameter composite standard, in which the most important criteria for works design are:
- Permanganate Value (4 hrs) not more than 10 mg/l
- Chemical oxygen demand not more than 75 mg/l
- Nitrogen in NH₃ form not more than 10 mg/l

In the past this standard, together with economic factors, led to wide use of trickling filter plants producing effluents high in nitrates and phosphates. However, the reliable supply of surface water in South Africa depends on long-term storage in conditions favourable to eutrophication. Thus the effects of nutrients on the trophic status of impoundments has led designers to anticipate future legislation limiting nutrients in effluents. Consequently many new plants use the extended aeration process and are designed for biological denitrification. The large plant being built at Goudkoppies will be one of the first to provide also for biological phosphorus removal. At present price levels, the cost of constructing such a plant is estimated at R4,25m per unit of 100 Ml/d capacity, and the operating cost at 2,25 c/m³, excluding sludge disposal.

(iii) Sludge disposal: To date, digested sludge at most plants is disposed of very cheaply on land. Costs vary between R1 and R2/t of dry solids, so that sludge disposal is not a significant item of cost. However, such procedures are reaching their limit and we find new developments as follows:

(a) Widespread use of extended aeration plants incorporating ‘long sludge age’ stabilisation.