INTRODUCTION

In the two older conventional methods of sewage purification:- Trickling Filter and Activated sludge-process-oxygen which is essential for oxidation of the putrid and decomposing organic matter is ordinarily obtained by mechanical means which involve huge capital, foreign equipment, considerable recurring costs for their maintenance and technical knowhow. Most of the municipalities and even municipal corporations in India are finding difficulties to provide money for these facilities, the cost of the final disposal works being the main deciding factor as to whether or not a city can undertake a sewerage system.

In recent years, however, a cheap, simple and natural process of sewage purification in lagoons or ponds has been evolved in western countries utilising solar energy for synthesising fresh algal cells which split water molecules as a part of their photosynthetic activity to produce the oxygen required. Algae which develop are those which are indigenous to the region and adapted to conditions imposed by the process in the locality. Thus, natural light energy is used to produce oxygen whose availability is independent

of the physical laws normally governing oxygenation from atmospheric sources. Thus two basic types of reactions are taking place together in this process: oxygenation by algal photosynthesis and bacterial oxidation of the decomposing organic matter.

The possibilities of purification of Indian Sewage by algal photosynthesis have not been adequately investigated although sufficient light energy is normally available anywhere in India. Over 40 installations of stabilization ponds now exist in India as compared to 3,452 lagoon installations serving municipalities in States (Williamson1970); and the Central Public Health Engineering Research Institute in Nagpur, India is doing a distinct service on various facets of the problem (Arceivala et al. 1969). There is no doubt that in the years to come an ever increasing number of ponds will be built, particularly in the tropics where sunshine is plentiful and money is scarce.

"Waste stabilization ponds" are defined as bodies of water — artificial or natural — where the wastes are rendered stable and inoffensive through the two processes mentioned at the beginning, for discharge

into receiving waters or on land. They may be sub-divided into the following types: (i) Anaerobic pre-treatment Units; (ii) Facultative ponds where the waste water is aerobically-anaerobically stabilized; (iii) High-rate aerobic lagoons whose depth of the liquid is limited to 9 to 18 inches and the retention time from 2 to 6 days; (iv) Maturation ponds which treat the effluent from trickling filters or activated sludge plants; (v) Mechanically assisted ponds where re-circulation is a main feature; (vi) Aerated lagoons where the pond is mechanically aerated as against aeration by photosynthetic oxygenation as in (iii).

Extensive literature dealing with the engineering design data and operational details are available for each of these types but practically none about their biochemical and microbiological aspects. Also most of the literature now available deal only with the engineering design and operation of facultative ponds. As compared to facultative ponds, high-rate aerobic ponds are quite a few; and an attempt has been made in this thesis to study the physico-chemical, biochemical and microbiological aspects of algal-bacterial symbiosis taking place in

laboratory model high rate completely aerobic ponds using Oscillatoria Spp. and Anacystis nidulans and Scenedesmus obliqus which are technically classed as autotrophic — photolithotrophs and Baroda settled and strained sewage.

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