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SOMETHING NEW IN SEWERAGE : THE BIO-DRUM

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Not a month goes by without a new sewage process being developed by specialists considering the subject, practically everywhere in the world.

Certain processes are either too complicated or too costly from the purchase or operation viewpoint for us to consider adopting them along rational lines in the islands.

Recently, a Danish firm has developed, and is now preparing to commercialize, a system that drew our attention through its simplicity and low cost in terms of capital expenditure, operation and maintenance. Another factor that seems to favour the adoption of this system is its technical efficiency.

The principle involved is simple : in a metal tank, through which the effluent to be treated slowly passes, float two rotary type drums filled with plastic balls. The drums are turned very slowly by a low-power motor to which they are connected by a simple chain. Within the drums are fixed little plastic containers which, as they rotate, gather polluted water to release it over the plastic balls. Meanwhile, they are filled with air which, at the next half-turn, will be released into the water below the balls, in the form of bubbles.

During the treatment of $37m^3$ of effluent per day in a unit of $2m^3$ of drums and a polluting load of 4.7 kg of BOD5(1) per m^3, a BOD5 reduction of the order of 90% was obtained. The density of sludge is very good, with an index of 60 (the normal for active sludge stations being between 120 and 150).

The latest test results, verified by the Vki-Vand Kvalitets Instituttet in Copenhagen, may be summed up as follows in the table below:-

Date	Crude effluents P(2)	BOD(3)	COD(4)	Purified effluent P	BOD	COD	Flow m^3/m^3/day	Polluting load kg	BOD/m^3/day	Reduction %
6.6.73	135	195	490	47	28	100	12.3	2,398	2,054	85.65
12.6.73	155	170	380	38	30	45	14.4	2,448	2,016	82.35
26.6.73	195	270	530	40	30	80	16.5	4,700	4,176	88.9
5.7.73	170	260	490	35	40	87	18.6	4,836	4,092	84.6

The above figures would indicate that the BOD of the purified effluent meet in 3 out of 4 cases the requirements of French and British legislation (30 mg/l on leaving stations).

Finally, the manufacturer indicates that the following points are vital to the efficient working of the system:-

1. The drums float on the effluent.

2. Very little energy is required to make them rotate.

3. The little containers fitted inside act as regular pumps, alternatively making use of air and water.

4. The surface-volume ratio is $102m^2/m^3$.

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(1) BOD5 = Biochemical oxygen demand for 5 days, expressed in mg/litre.

(2) P = Proportional value.

(3) BOD = Biochemical oxygen demand (total requirement when it is not followed by a figure indicating the number of days of incubation).

(4) COD = Chemical oxygen demand; the COD/BOD5 ratio indicates the "biodegradability" of an effluent.

5. The effect of the slow rotation being to submerge the balls with each revolution, there is effective wetting of the bio-film as well as an exchange of air. All the air borne in the plastic containers is in fact released below the mass of balls during submersion, and renewed air containing fresh oxygen is again introduced when the containers next emerge.

6. The Bio-drum system is a combination of bacterial beds, activated sludge, rotary filter and the bio-disc.

7. Initial investment is reasonable.

8. The operating expenses are much lower than those required for the working of conventional systems, calculated on the basis of power consumption per kilogram of BOD5 removed.

9. The bio-drum may be used as an auxiliary to treatment in existing stations that are overloaded.

10. The bio-drum produces a thick sludge which is very easily deposited in a compact manner.

We had the opportunity, at the beginning of the year, of visiting a bio-drum station in Denmark, and we were pleasantly surprised by the simplicity of the unit and the limited space it occupies.

With each rotation, about 200 litres of water are oxidized in this process. The high specific area (unit area per volume of plastic balls) makes for the development of quite a considerable biological film which ensures that the treatment is very intensive.

During this continuous movement, a proportion of the micro-organisms covering the spheres are returned to the effluent where they can continue to be active, thanks to the availability of excess oxygen, before settling takes place in the lower part of the bio-drum.

Plastic balls and polythene containers resist strongly the chemical attacks of effluent components, and have no sharp angles or grooves that might retain particles of solid waste. Consequently, the system cannot be clogged up. The drum rotation speed may be adjusted in relation to the degree of pollution of the effluent, and other characteristics such as temperature, pH, etc.

A set of two drums suffices to break down the organic loads from domestic latrines utilized by a population of at least 2,000.

The initial cost is 50% that of a conventional biological sewage treatment plant, while the power consumption is 10 to 15% of that involved in most other processes.

Licences have already been issued in 25 countries, including the U.S.A. and England. The latter country, moreover, participated actively in the tests.

The equipment used in the tests, which have been going on for over a year, is as follows:-

A set of 2 drums, of diameter 1.25 m and length one metre. The total volume of the plastic balls is $2m^3$ and that of the water in the tank $4.5m^3$. Each of the 24 containers in a drum has a capacity of one litre. The final power consumption per rotation is 0.75 H.P.

The last favourable aspect for the adoption of this system in the South Pacific is that everything can be manufactured and assembled locally, even the plastic balls wherever there are plastics factories, as in Fiji, New Caledonia and New Guinea.

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