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INCREASING EFFICIENCY OF EFFLUENT TREATMENT PLANT

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Abstract:

A number of Mills, who have set up Effluent Treatment Plants are finding that they are unable to meet the pollution standards. This may be due to the reason, that they have designed an under-capacity plant, or else their effluent quantity has increased, since they put up the treatment plant. Now technology is available to enhance and improve the efficiency of the treatment plant, without high capital investment. Collaboration is with Advanced Environmental Control A/S, Denmark.

There are now many mills now, which have set up effluent treatment plants. The mills who have not set up a plant so far, are planning one soon. It thus transpires, that the majority of mills in near future will have an effluent treatment plant.

The usual method of setting up ETP in pulp & paper mills is the following:-

Primary Clarification followed by activated sludge treatment, comprising of aeration tank & secondary clarifier.

Some mills have set up an aerated lagoon with a retention period of 6 dys, followed by a polishing pond with a retention time of 4 days; the lagoon generally preceded by a primary clarifier.

Some mills are now finding it necessary to incorporate an anaerobic lagoon for Black liquer, with retention time of around 20 days, to decrease load on their aerated biological reactor.

Thus it can be seen that a vast amount of funds are being spent on waste water treatment. This will eventually result in significant improvements in the quality of water of most of our rivers, streams and near shore areas. But as a whole results are still far from satisfactory.

The reason principally is that the technical equipments, design of plant or management of the biological life is not adequate.

The reasons include:

1. No biological activity being established in the secondary treatment plants
2. No attempts being made by the mills to set right the plants for proper functioning because of non availability of trained operating personnel,
3. No operation and maintenance schedules being followed
4. Too great variations in waste water from time to time
5. Hydraulic and/or pollution loads being too heavy
6. Waste water containing substances, which are difficult to decompose.

To run these plants adequately to meet the pollution, standards, suggestions are frequently made by the consultants, to make new investment in far larger dimensions of ETP. If one chooses to ignore these problems, one must live with the continuous risk of the environment being seriously, polluted by the waste water.

One Alternative Exists:-

Bioflock -----

This is an active substance which can be used for biological purification of waste water. The effects become noticeable after a short period of time. After Bioflock is applied for 6 to 12 weeks a sturdy and vigorous bacteria strain has been established which has the ability to degrade organic substances.

Bioflock results in a more rapid transfer of oxygen to the bacteria. Other micro-fauna, such as bell animalcules, etc. will prosper. Together with the bacteria these micro-organisms will consume practically all organic matter available.

After Bio-flock has been applied for 9-12 weeks the following improvements can be observed:

- a reduction in the energy cost for aeration,
- an improved sedimentation in secondary settling tanks,
- the establishment of aerobic conditions in the sludge, eliminating bad smells from the sludge treatment,
- a higher percentage of dry matter in the sludge as well as more effective dewatering,
- substantial improvements in bacterial flora.

Bioflock is not affected by changes in BOD loads on the waste-water treatment plant. This means that the usual problems which may arise because of accidental, or in some cases, lasting overloading may practically be disregarded. This may prove to be a great advantage to mills, enabling them to postpone capital expenditure on enlargements of existing plants or construction of new ones.

Non-Clog Fine Bubble Diffusers :

These fine bubble diffusers can be added to aeration tank at a very low capital investment to enhance the aeration. These are about a meter long and rectangular in shape, with c.s. of 120 mm x 120 mm.

These are laid at the bottom of the aeration tank and have a 25 mm connection for feeding in of compressed air. The air is generally compressed by twin lobe rotary compressor or a centrifugal compressor. As there is complete flexibility of locating these diffusers, the aeration of tank can be increased, without changing the existing arrangement.

On account of their construction and the choice of materials, these diffusers make up elastic units, which are in constant motion during the injection of air. In this way no sludge will be blocking up and neither will bacteria cultures be sticking on. This means that high operational stability is achieved even if operations are suspended for short or longer periods. Besides supplying oxygen, the diffuser system ensures a good mixture of fluid and bacteria cultures. This is especially true where foaming is a problem, and foam is reducing the efficiency of surface aerators.

A combination of Fine Bubble Diffusers and Bioflock dramatically increase the effect of waste water treatment plants, and keep the bacterial cultures in a high and long lasting activity.

The following formula can be used:

$$Q = \frac{\text{BOD}_5 \times \text{O}_2 \text{ LOAD} \times C_t \times 1000}{a (C_t - C) \times k \times H}$$

whereas

- Q is Total quantity of air added (Nm³/h)
- BOD₅ is Biological oxygen demand (kg BOD₅/h)
- O₂ LOAD is added oxygen ratio (kg O₂/Kg BOD₅)
- a is oxygen passing coefficient for waste water
- C_t is oxygen saturation of water (mg/l)
- C is required stabilising oxygen surplus (mg/l)
- k is transferred quantity of oxygen per meter of depth (gO₂/Nm³air)
- H is depth of injection (m)

Lamella Clarifies :

To increase the efficiency of existing primary and secondary clarifiers Lamella packs can be used to enhance their clarifying ability.

The beneficial effect of the presence of inclined surfaces in a vessel designed for sedimentation has been known for a considerable period of time. It was, however, only in 1960's that the simple application of lamella separator received full industrial attention.

The term lamella separator can be deemed to include all gravitational separating devices which incorporate extended settling surfaces. Thus surfaces may well be horizontal or inclined flat plane surfaces, or tubes, in various cross sections. These can be made into packs, and incorporated into existing clarifiers, thus increasing clarification capacity, without major investments.

A considerable data has been gathered by the manufacturers of such devices to cater to all kind of industrial needs.

Conclusion:

Simple devices or additives can go a long way in enhancing the capacity of existing ETPs, and go a long way in meeting pollution standards, without major capital investments. While Mills putting up ETP should look into the newer technology for savings in capital investment and land.