Oxidation ditch with bubble aeration

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OXIDATION DITCH is a well known modification of activated sludge process and comes under extended aeration. The use of oxidation ditches for wastewater treatment is not new. In recent years, however there has been considerable renewed interest in the use of oxidation ditches. Much of the work has been done by different research workers. In this process, aeration is one of the governing parameters. Oxygen transfer rate of rotor aerators can be increased with rotor speed (Stephenson et al., 1985) and using draft tube turbine aerators (Boyle W.C, 1989).

In this paper an attempt has been made to improve the oxygenation capacity of aeration system by supporting bubble aeration to the conventional aerators and laboratory study has been made on the performance of oxidation ditch with bubble aeration with reference to domestic wastewater treatment.

Methodology

The oxidation ditch model was used to carry out this laboratory study. Figure 1 shows the schematic diagram of oxidation ditch model. The brush type rotors were used as surface aerators. The bubble aeration was also provided in addition to rotors. Oxygen transfer coefficient (Kla) has been computed for both the cases i.e without bubble aeration and with bubble aeration. Comparative performance of oxidation ditch was studied with domestic wastewater.

Results

Table 1 shows the dissolve oxygen test readings for the rotor performance without bubble aeration with following conditions.

<table>
<thead>
<tr>
<th>Time in minute</th>
<th>Dissolved oxygen in mg/l</th>
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<tr>
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</tr>
<tr>
<td>15</td>
<td>1.2</td>
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<tr>
<td>30</td>
<td>1.5</td>
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<tr>
<td>45</td>
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<td>285</td>
<td>5.8</td>
</tr>
<tr>
<td>300</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Table 1. Performance of brush aerator

Figure 1. Schematic diagram of oxidation ditch model
Table 3. shows the abstract of performance of oxidation ditch and Figure 3 shows the efficiency of the oxidation ditch process.

Discussion
From the result of dissolved oxygen test, it is clear that oxygen transfer rate can be increased with supporting bubble aeration. Oxygen transfer coefficient (Kla) for brush aerator was found to be 1.15/hr. and with combination of bubble aeration it was - 1.7/hr. This results to oxygenation capacity oferation system as 1.02 g/hr. and 1.41 g/hr. respectively. Regarding performance of oxidation ditch with reference to domestic wastewater treatment, COD removal efficiency was observed as 100 per cent for influent COD of 270 mg/l and 95 per cent for influent COD of 600 mg/l.

Limitations
- Due to practical difficulties it was not possible to have aeration period of 24 hrs., hence aeration was carried out in working hours only i.e for 8 hours.
- Model was of fill and draw type.

Concluding remarks
Oxygen transfer rate of the conventional aeration system of oxidation ditch can be improved by supporting bubble aeration and ultimately COD removal efficiency may be achieved to its maximum value.

Acknowledgement
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References

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Figure 2. Dissolved oxygen (D.O.) for aeration system

Figure 3. Performance of oxidation ditch with bubble aeration