Standards for textile effluent

Lecture-4
Nature of the problem

- Oils, fats and waxes inherent or added to fibres during processing.
- Vegetable or protein impurities associated with natural fibres.
- Monomer/oligomers associated with man-made fibres.
- Residual agricultural chemicals from cotton and linen production.
- Natural pigments, salt, and metals.
- Processing aids e.g., size, spinning oils, knitting oils.
- Preservatives such as PCP on imported cloth including pesticides on raw cotton.
- Detergents and surface active agents from washing, bleaching and scouring.
- Enzymes used for desizing but finding applications elsewhere in textiles as well.
- Peroxides and hypochlorites used as bleaching agents.
- Metals and alkaline salts from dyeing operations.
## Standard and Allowed for aqueous effluent discharge

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Standard/Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Below 42°C at point of discharge</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>Between 6-9 at the point of discharge</td>
</tr>
<tr>
<td><strong>BOD</strong></td>
<td>30mg/litre to surface water</td>
</tr>
<tr>
<td><strong>COD</strong></td>
<td>50mg/litre to surface water consented to sewer</td>
</tr>
<tr>
<td><strong>Suspended solids</strong></td>
<td>20mg/litre to surface water consented to sewer</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Below 1 ppm consented</td>
</tr>
<tr>
<td><strong>Toxic substances</strong></td>
<td>Restricted by legislation</td>
</tr>
<tr>
<td><strong>Volume and flow</strong></td>
<td>Basis for the charging consented</td>
</tr>
</tbody>
</table>
Treatment Systems

There are a number of reasons for the need for wastewater treatment

• For reduction of the amount of waste to an acceptable level

• For separation from the mixture of all potentially toxic components

• For destruction of all toxic properties reducing ecological problems

• Recovery of any valuable materials leading to recycling of water and chemicals

• For provision of acceptable materials for subsequent disposal
Strategy to follow

However any strategy must follow the following order while considering the work plan:

• Elimination of toxic and objectionable substances
• Reduction in use of toxic and objectionable substances
• Recycling of water and chemicals
• Appropriate method for disposal
## Technologies applicable to waste water treatment

<table>
<thead>
<tr>
<th>Physical</th>
<th>Chemical</th>
<th>Biological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtration</td>
<td>Neutralization</td>
<td>Aerobic digestion</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Oxidation</td>
<td>Anaerobic digestion</td>
</tr>
<tr>
<td>Gravity separation</td>
<td>Reduction</td>
<td>Plant absorption</td>
</tr>
<tr>
<td>Centrifugation</td>
<td>Hydrolysis</td>
<td>Percolating filters</td>
</tr>
<tr>
<td>Floatation</td>
<td>Electrical</td>
<td>Bioscrubbers</td>
</tr>
<tr>
<td>Equalization</td>
<td>Catalytic oxidation</td>
<td>Biofiltration</td>
</tr>
<tr>
<td>Precipitation etc.</td>
<td>Ozonolysis</td>
<td></td>
</tr>
<tr>
<td>Adsorption</td>
<td>Ion exchange</td>
<td></td>
</tr>
</tbody>
</table>
Objectives of the Treatment plants

• Designed to run with minimal of intervention

• Color removal achieved using Dissolved Air Floatation (DAF)

• Final polishing of discharge water with sand filter

• Changes in future BOD limits may be possible

• Allow operations to continue in the event of break down

• Prevent effluent from polluting the local river and meets consents for discharge to sewer
Schematic diagram of textile waste water treatment:

- Effluent
- Solids to landfill
- Nutrient
- Activated carbon
- Aeration tank
- pH Adjust
- Flocculation Mix
- Clarifier
- Centrifuge
- Discharge
Conditions

• The effluents discharged has to be consistent with a number of permitted standards

• Temperature at the point of discharge from machinery can be as high as 90 degrees

• Adjustment of pH is often required

• COD, BOD and suspended solids are subject to limits for discharge to surface waters
Effluent Treatment system for Rural Area

Here the main treatment is done by the aerobic digestion for bulk effluent, segregation of effluent streams allows the printing effluent to be treated chemically followed by separation using dissolved air floatation and subsequent recycling of water as shown in the next slide.
Effluent Treatment System Urban area

Effluent treatment system for Urban area for textile unit which uses reactive dyes would require a unit of Heat exchanger followed by a holding tank for initial holding, followed by an initial coarse filter followed by chemical dosing with lime, ferrous sulphate and sludge being dewatered and disposed to landfill, the water is adjusted for pH using carbon dioxide and finally discharged to river.
Aerobic vs Anaerobic Digestion

Conventional biological treatment systems have concentrated on activated sludge approach to reduce BOD and COD.
In aerobic treatment liquid waste are fed into reactor having microbial population, air is supplied to provide oxygen to the microbes and metabolize the organic molecules. This causes a large reduction in BOD, on the other hand anaerobic digestion for liquid waste treatment tends to be restricted to situations where energy recovery is attractive and where the discharge effluent is not subject to strict BOD limits
Alternatively anaerobic digestion might be used as an effluent pretreatment for high BOD prior to aerobic treatment