Effluent & Solid Waste Treatment Systems for Pulp & Paper Industries at VWEMCL
• Quality & Quantity of Effluent Generation from Pulp & Paper Sector.

• Treatment Systems for the Effluent from Pulp & Paper Sector.

WASTEWATER PRODUCING STEPS FROM PULP & PAPER MILL

Wood Preparation for Pulping → Solid, BOD, Color

Pulping wastepaper digester and Liquor Evaporator/Condensator → High strength BOD, reduced sulfur compounds, AOX, VOCs

Post pulping Process/washing → High strength BOD, reduced sulfur compounds, AOX, VOCs

Bleaching → BOD, Color, Chlorinated Compounds, AOX, VOCs

Paper Making → Solid, BOD, Color
Number of Pulp & Paper Industries in vapi GIDC in operation & Member of CETP

<table>
<thead>
<tr>
<th>Description</th>
<th>Kraft Paper</th>
<th>Duplex/New Printing Paper/Board</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulp &amp; Paper Industry</td>
<td>22</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>Base Volume (Approx) – Water consumption (MLD)</td>
<td>2.8</td>
<td>10.8</td>
<td>13.6</td>
</tr>
</tbody>
</table>

- Approx effluent generation 70 – 80 % of water consumption.
- Average Flow to CETP : 55 MLD
- Pulp & Paper industries contribute ~ 15-20% of Effluent to CETP
- CETP receives wastewater from pulp & paper industries mainly through direct underground pipeline/chamber & Pumping stations to CETP
## WASTEWATER CHARTERIZATION

<table>
<thead>
<tr>
<th>Category of Pulp &amp; Paper Industry</th>
<th>Water requirement (cubic Meter/Ton of Paper Produced) approx</th>
<th>Total Wastewater discharge (cum/Ton of Paper Produced) approx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrobased</td>
<td>300 - 350</td>
<td>200</td>
</tr>
<tr>
<td>Waste Paper Based</td>
<td>100-150</td>
<td>75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>CPCB Standard Discharge Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7 - 8.5</td>
</tr>
<tr>
<td>BOD (3 days at 27oc)</td>
<td>30</td>
</tr>
<tr>
<td>COD</td>
<td>250</td>
</tr>
</tbody>
</table>
QUALITY OF WASTE WATER

- The paper mill wastewater characteristically contains dark brown colour, very high level of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), due to presence of lignin and its derivatives from the raw cellulosic materials, chlorinated compounds, suspended solids (mainly fibres), fatty acids, tannins, resin acids, sulphur and sulphur compounds, adsorbable organic halide (AOX), pollutants.

- Theoretical wastewater are high organic content around 20 - 110 kg COD / air dried ton paper
Monitoring results of Pulp & Paper Industries From January 2012 – to Dec – 2012

- Total average COD loading : 22925.6 kg/day
- Total average TSS loading: 8664.5 kg/day

Observation: Wastewater characteristics effluent flow, COD and TSS loading in the treated effluent are statistically lower for Kraft Manufacturing Industries then Dulex/Newsprinting manufacturing units.
IMPACT ON CETP TREATMENT PERFORMANCE

- Impact on CETP performance:
- Chlorinated organic compounds
- Limited nutrients (N & P) present in the wastewater - reason for the growth of filamentous micro organisms & sludge bulking problem.
- Lignin compound found in wastewater which is difficult to degrade biologically.
TREATMENT OF PULP AND PAPER INDUSTRIES WASTEWATER

- Physical Methods
  - Sedimentation and Floatation

- Physico – Chemical Methods
  - Chemical flocculation
  - Activated Carbon Adsorption
  - Chemical Precipitation to remove colloids and color
TREATMENT OF PULP AND PAPER INDUSTRIES WASTEWATER

- Biological Treatment Methods
  • Anaerobic Lagoons
  • Stabilization Ponds
  • Aerated Lagoons
  • Activated Sludge Process
  • Plastic Media Tricking Filters
  • Rotating Biological Contractor
  • Anaerobic Contact Filter
INNOVATIVE TECHNOLOGY:

- Advance flocculation
- Ozone/AOP technology
- Membrane Technologies (Ultra Filtration, NF)
- Reverse Osmosis
- Chemical Oxidation
- Electrodialysis
INNOVATIVE TECHNOLOGY:

- POLYMER INDUCED FLOCULATION Treatment of Pulp and Paper Mill Wastewater by Polyacrylamide (PAM) in Polymer Induced Flocculation. Cationic polyacrylamide Organopol with very high molecular weight and low charge density is found to give the highest flocculation efficiency in the treatment of the paper mill wastewater.

- Ozonation is widely used chemical oxidation method to eliminate or reduce pollution caused by the effluents of the pulp and paper industry. It can achieve 95% of turbidity reduction, 98% of TSS removal, 93% of COD reduction.
SOLID WASTE PERSPECTIVE
RAW MATERIALS USED FOR MANUFACTURING OF PAPER

- Core Pipe
- Kraft Waste
- Paper Tube Waste
- Plain Waste
- P.O.Y. Waste
- Press Kraft Waste
- P.T.C. Waste
- Pulping Waste
- Super Plain Waste
- Soft Wood Pulp,
- Hard Wood Pulp
- Waste Paper,
- Poly Aluminium Chloride
LIST OF PRODUCTS MANUFACTURED IN PAPER INDUSTRY

- Absorbent Kraft
- Cream Wove
- One Time Carbon
- Thermal Paper
- Kraft Paper
- Tissue Paper
- M.G./M.F. White & Colour Paper
- M.G. Kraft Paper
- Laminated Paper
- Coated Paper
- Embossed Paper
CONTRIBUTION OF PAPER INDUSTRY IN TOTAL WASTE QUANTITY

• VWEMCL receives approx. 8000-10000 MT of waste every year
• It is around 8-10 % of total wastes received by the company
QUALITY OF PAPER WASTE IN SOLID WASTE PERSPECTIVE

- The waste from paper industry contains moisture in the range 35-70 %
- The Calorific Value of 1500-2400 cal/gm
- The organic content is slightly higher in paper Industry
MAJOR PROBLEMS IN PULP AND PAPER MILL SOLID WASTE DISPOSAL TO LANDFILL

• The paper industry waste takes time for drying hence operational problems in waste dumping and spreading in landflling operations occurs as wheels of transporting vehicles skid while dumping

• The waste contains colour and fiber clay including slowly bio-degradable organic such as cellulose, wood fibers and lignin
ALTERNATIVE SOLUTIONS FOR SOLID WASTE PRE-TREATMENTS BEFORE LANDFILLING

- Effective drying mechanisms can be adopted for moisture reductions
- The waste can be used for co-processing with cement industry after mixing or blending with relatively high CV wastes
- Treatment systems can be enhanced for the reduction of solid waste quantity at source
ALTERNATIVE SOLUTIONS FOR SOLID WASTE PRE-TREATMENTS BEFORE LANDFILLING

• Due to high CV contents briquettes can be prepared and used for further treatments

• Plastic waste generation is a major of the industry which can be used as an alternative fuel for cement or other kilns
THANK YOU