Treatment of Incoming sewage for rejuvenation of Sembakkam Lake, Chennai

Consultant Consortium
FINISH SOCIETY, ILIFO LTD & THE SOLUTIONS CENTRE

A presentation by
Dr. K. V. Emmanuel, Team Leader
Background of the Consultant Consortium

• Finish Society:
  ✓ Not for Profit company, originally established by Finish, The Netherlands.
  ✓ Projects worth 20 million Euro. Over one million sanitation systems, others: grey water recovery, lake rejuvenation etc.

• ILIFO Ltd:
  ✓ Not for profit company created by Industry. Effluent and ZLD projects worth > 400 million USD.
  ✓ More than 20 reed bed projects for sewage recycling.

• The Solutions Centre:
  ✓ Main business is grey water recycling through constructed wetlands.
  ✓ More than 50 Projects in India, Sri Lanka, Africa etc.
Important Considerations for STP design

• Target: Class D classification.

• No perennial flow. If sewage is diverted, lake might get dried up.

• High suspended solids in inlet, needs sedimentation to prevent choking.

• Direct storm water flow entry into lake preferred to prevent overloading of STP.

• All the overflows need to be over weirs and inlet to lake through outfalls.

• At present the lake is completely benthic with only little eutrophication.
Sewage treatment Scheme considered

- Treatment units for all 22 inlets to the lake. Major inlets are 14,16, 17 and 18.

- STPs planned at 14 (1 MLD) and combined one at 16,17 &18 (6 MLD).

- Small patch of settler & reed bed at others.

- Lift station to prevent water flooding in drains.

- Screens at inlet 17 and combined one at 16 & 18. Thereafter distribution chamber to respective STPs.

- Treated sewage discharge through 4 outfalls.

- PCB norms (20 mg/l BOD and 30 mg/l TSS) target.
Options considered for treatment of sewage

• **Option 1: Conventional Treatment** - conventional activated sludge system & nutrient removal, disinfection.

• **Option 2: Semi-mechanized treatment** - Up flow Anaerobic Sludge Blanket (UASB) reactor, aerated lagoon, nutrient removal

• **Option 3: Semi-natural treatment** - aerated lagoon, reed bed.

• **Option 4: Full natural treatment** - two stage reed bed and floating wetland.
## Comparison of options for STP

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Conventional Treatment (ASP)</th>
<th>UASB + aerated lagoon</th>
<th>Aerated Lagoon + Reed bed</th>
<th>Multi-stage Reed Bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation cost, INR in Lakhs</td>
<td>404</td>
<td>454</td>
<td>282</td>
<td>468</td>
</tr>
<tr>
<td>Operating cost/d, INR</td>
<td>15910</td>
<td>7774</td>
<td>4607</td>
<td>721</td>
</tr>
<tr>
<td>Area needed, acres</td>
<td>3.16</td>
<td>4.22</td>
<td>9.73</td>
<td>19.71</td>
</tr>
<tr>
<td>Merits</td>
<td>• Proven system</td>
<td>• Lower O &amp; M</td>
<td>• High nutrient/pathogen removal</td>
<td>• Lowest maintenance and monitoring, natural &amp; aesthetic.</td>
</tr>
<tr>
<td></td>
<td>• lowest space</td>
<td>• Compact &amp; elegant</td>
<td>• Low maintenance &amp; monitoring.</td>
<td></td>
</tr>
<tr>
<td>Demerits</td>
<td>• Highest monitoring &amp; maintenance, Sludge disposal, dependence on power.</td>
<td>• High monitoring &amp; maintenance, Sludge disposal chance for odour.</td>
<td>• Higher land requirement, Need power Need precision construction.</td>
<td>• Highest installation cost, very high area Need precision construction</td>
</tr>
</tbody>
</table>
Treatment scheme proposed

- High installation cost and huge land requirement prevents full natural treatment.
- Hence Reed bed with aerated lagoon is recommended.
- Construction: earthen bunds using the dredged out soil from the lake. Clay puddling to improve the imperviousness.
- Earth excavated from the lake fully used for reed bed platform, bunds & roads
- Sedimentation unit solely for the storm water to minimize the desludging frequency
- Treated water channel with lotuses or lilies.
Principle of Reed Bed Treatment

✓ Constructed Wetlands (CWL) a.k.a. reed beds: has filter media & reeds (wetland plants).

✓ Uses microbial population present around the roots and in the media.

✓ Removes organics, pathogens and nutrients

✓ The reeds transfer atmospheric air/oxygen through its roots.

✓ Phragmites Australis : most popular and effective
Lake rejuvenation

• Different options for lake rejuvenation considered with aeration, microbes etc.

• Installation of aerators difficult in the shallow lake.

• Natural rejuvenation takes time, yet it is cheapest, sustainable and simple.

• After commissioning of STP, phyto-plankton seeding & introduction of selective breeds of fish.

• Cycles of eutrophication possible. Lake may appear worse in between cycles.

• Overall rejuvenation process may take about 30-36 months to achieve Class D quality.
Thank You