From Toilet to Treatment: FSTP Design in Odisha

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Odisha Urban Sanitation Policy: new paradigm

• Odisha has **7.74 million** urban population living in **115 cities**
• Black water and greywater separation at source
• Sewer network with STPs established in 5 cities – **2.93 million inhab.**
• 110 cities implementing greywater management – **4.81 million inhab.**
• FSTP established in all 115 Cities
FSTP design considerations

- FSTP designed to meet the effluent parameters: BOD, COD, TSS
- Nutrient rich effluent reuse in landscaping
- Adoption of nature based technology
- FSTP location from city: 2 to 5 Km
- 2.5 Acre (1 Ha) FSTP land, many co-located with solid waste processing centre
- Design vetted by IIT Kharagpur
Faecal sludge generation in Septic Tanks (field data of Odisha)

- Septic tanks/ containment structures varying in size & not as per Standard
- FS volume in the septic tanks varies with storage duration in the given area
- Design value adopted for FS quantity: 150 L/capita.year
- From field data, after 3 years storage, FS quantity: 131 L/capita.year
- As per IS code, FS quantity: 76.65 L/capita.year
FS Treatment Process in Odisha

- Sludge drying bed technology + DEWATS
- ABR + AF
- Planted gravel filter + sand filter
- Polishing pond + cascade aeration
Faecal Sludge Treatment Plants in all Cities

- 115 cities: 120 nos. FSTPs
- Combined capacity: 2.087 MLD
- Operational: 113 FSTPs in 111 cities
Bhubaneswar FSTP Performance

COD removal in Settling-cum-thickening (STT) Tank and ABR

- **STT**
  
  \[ y = 0.9598x \]
  
  \[ R^2 = 0.9999 \]

- **ABR**
  
  \[ y = 0.6035x^{1.0605} \]
  
  \[ R^2 = 0.9614 \]
# Bhubaneswar FSTP Performance

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Test Results</th>
<th>Old Standard, 1986</th>
<th>MoEF Standard, 2017</th>
<th>NGT Order, 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw sludge</td>
<td>Treated effluent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH*</td>
<td>6.97</td>
<td>7.39</td>
<td>5.5 – 9.0</td>
<td>6.5-9.0</td>
</tr>
<tr>
<td>TSS (mg/L)*</td>
<td>615</td>
<td>10.3</td>
<td>100</td>
<td>&lt;100</td>
</tr>
<tr>
<td>COD (mg/L)*</td>
<td>8975</td>
<td>45</td>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td>BOD (mg/L)*</td>
<td>824</td>
<td>11</td>
<td>30</td>
<td>&lt;30</td>
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<tr>
<td>Ammoniacal Nitrogen as N (mg/L)**</td>
<td>201.61</td>
<td>40.94</td>
<td>&lt;50</td>
<td>-</td>
</tr>
<tr>
<td>TKN as N (mg/L)**</td>
<td>596.31</td>
<td>46.74</td>
<td>&lt;100</td>
<td>-</td>
</tr>
<tr>
<td>Total Nitrogen as N</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Phosphorous (mg/L)**</td>
<td>89.66</td>
<td>3.16</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Faecal Coliform (MPN/100 ml)**</td>
<td>1.3x10^7</td>
<td>5.7x10^3</td>
<td>-</td>
<td>&lt;1000</td>
</tr>
</tbody>
</table>

*OWSSB lab report, ** CSE lab report
FS Co-treatment (STP at Puri)

- **Faecal sludge**
  - COD: 7200 mg/l
  - BOD: 620 mg/l
  - TSS: 416 mg/l

- **Sewage**
  - COD: 240 mg/l
  - BOD: 141 mg/l
  - TSS: 500 mg/l

- **Treated effluent**
  - COD: 50 mg/l
  - BOD: 14 mg/l
  - TSS: 70 mg/l

- **Chlorination/discharge**

- **Settling-Thickening Tank**
- **Leachate sump**
- **Sludge Drying Bed**
- **Aerated Lagoon**

Flowchart:
- Faecal sludge to Settling-Thickening Tank
- Sewage to Leachate sump
- Sludge Drying Bed to Aerated Lagoon
- Aerated Lagoon to Treated effluent
- Chlorination/discharge
FSTP CAPEX in Odisha

**Construction Cost of FSTPs in Odisha**

- **Construction Cost (Rs Crore)**: The vertical axis represents the cost in crores, ranging from 0 to 4.5.
- **FSTP Capacity (KLD)**: The horizontal axis represents the capacity in KLD, ranging from 10 to 75.

The chart shows the variation of construction costs across different capacities, with error bars indicating the variability in the data.
O&M of FSTPs - 108 nos. Mission Shakti & Transgender Groups
Thank you