Rural FSM – Journey thus far

June 25, 2020
Rural FSM

Need for sustainable rural sanitation

Need to go beyond toilets & look into the sanitation chain

Non-existent sewerage system in rural. Need to focus on safe management of faecal waste from on-site containment systems

Onsite sanitation systems: need parallel development of faecal sludge treatment to stop illegal & unsafe ways to dispose faecal matter

Capture > Containment > Emptying > Transport > Treatment > Safe reuse or disposal
FSM services Planning

Critical factors

Sanitation technologies deployed

Potential risk of increase in caste based manual scavenging

Diversity of rural habitations
Simple steps of Assessment

1. Assessment of onsite technologies deployed
2. Mapping scope for Retrofitting
3. Possibility for co-treatment in a STP close by
4. Decentralised, low cost solutions for sparsely populated and difficult terrains
5. Technology centric solutions for large villages and census towns (Rural + Peri Urban models)
6. Develop and establish institutional architecture
Retrofitting

Possible strategies

- Converting single pit latrines to twin pit, by adding an additional pit
- Correcting defective septic tanks (e.g. adding soak pit for discharge, adding the chamber separation wall, sealing the bottom, etc.)
- Improving twin pits (e.g. ensuring functional junction chamber, honeycombing or perforations in pit wall, adequate distance between pits, safe distance from water sources, etc.)
- Installation/retrofitting of alternative twin pit diversion mechanisms which are easy and safe to install and use, for example SATO V trap
- Improving technologies and replacing leach-pit latrines with appropriate technologies in challenging geographies such as high water table, rocky areas, etc. (example bio toilets, composting toilets, raised toilets, etc.)
FSM Solution for single village: Planted Drying Bed and Co-composting

Capacity designed: 3 KLD
Land requirement: 300-375 sq ft.
CAPEX: Approx. INR 1-1.2 lakh
Construction time: Approx 25 days
Key features

- Also referred as planted dewatering bed/vertical flow wetland/sludge drying reed bed.
- These are basically bed of porous media (sand and gravel) that are planted with *Cana, Typha, Elephant ear* plant etc.
- Faecal sludge is dewatered and stabilized through physical and biological mechanisms.
- Dried faecal matter can be co-composted or can directly be used in field.
Option for In-situ FSM: Evapotranspiration Faecal Digester

**Capacity & Size**
- Institutional EFD: 30-100 Users, 20-35 feet
- Household EFD: 6-8 users, 7-9 feet

**Cost of EDF**
- Institutional: INR 20,000 to 35,000
- HH: INR 5000-7000
- For Group of HHs: INR 1.2 lakh (including cost of pipe network)

**Used this model for**
- 9 Residential Schools (#3 in Kanker, CG #4 Nashik, #1 Ahmednagar and #1 in Dumka, Jharkhand)
- 1 Community Toilet (in Durg, CG)
- 1 District Hospital (Kanker)
- A group of 8 houses having space crunch (Kanker)
- 10 Individual houses (Kanker)
Option for In-situ FSM: Evapotranspiration
Faecal Digester
## Rural FSM Pilots

<table>
<thead>
<tr>
<th>State</th>
<th>District</th>
<th>Location</th>
<th>FSM Cluster</th>
<th>Design Population</th>
<th>Land Ownership</th>
<th>Capacity</th>
<th>FSM Model</th>
<th>Management of FSTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madhya Pradesh</td>
<td>Indore</td>
<td>Kalilibod</td>
<td>3 GPs</td>
<td>45,870</td>
<td>0.3 Acres/ 1200 Sqm/ Kalilibod Panchayat</td>
<td>3 KLD</td>
<td>Rural</td>
<td>Panchayat / Sanitation workers of SLRM centre</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>Durg</td>
<td>Kumhari</td>
<td>7 GPs+ Kumhari Nagar Palika Parishad</td>
<td>66,784</td>
<td>0.6 Acres/2400 sqm/ Kumhari Nagar Palika Parishad</td>
<td>6 KLD</td>
<td>Rural + Peri Urban</td>
<td>Panchayat / Sanitation workers of SLRM centre</td>
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<tr>
<td></td>
<td>Patora</td>
<td>5 GPs</td>
<td></td>
<td>13,877</td>
<td>0.07 Acres/ 280 sqm/ Patora Panchayat</td>
<td>9 KL per week</td>
<td>Rural Model</td>
<td>Panchayat / Sanitation workers of SLRM centre</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>Amethi</td>
<td>Benipur</td>
<td>11 GPs + Amethi Nagar Panchayat</td>
<td>73,677</td>
<td>0.5 Acres/ 2000 sqm/ Benipur Panchayat</td>
<td>3 KLD</td>
<td>Rural + Peri urban</td>
<td>Benipur Panchayat</td>
</tr>
</tbody>
</table>
FSTP Patora

Design Population: 13,877

Cluster of Gram Panchayats: 5

Capacity designed: 9 KL per week

Desludging service: Private operators and by Utai Nagar Panchayat (one Desludging vehicle 3000 Litres)

Key features of FSTP Patora

- Construction using only local materials
- Screen customized to be made using concrete – Reducing risk of theft of metal screens
- Elevated Splash plate provided to enable even distribution across the bed
- Treated effluent can be used within facility for landscaping
- Open area within the plant can be used for conducting Panchayat events
FSTP Kumhari

Design Population (till 2030 + incl 5% floating Population): 66,784

Cluster of Gram Panchayats: 7

Capacity designed: 6 KLD

Desludging service: Kumhari Nagar Palika Parishad (one Desludging vehicle 3,000 Litres)

Key Features

- Low CAPEX (Designed as a model for rural FSTP)
- Low/minimal OPEX (Nature based treatment, Gravity flow)
- Easy and user-friendly operation and maintenance
- Robust for varying quality of faecal sludge
- Scope for future expansion within same land parcel
Population Projected of cluster (Design Year 2030+ 5% Floating Population) = 45,870

Cluster of Gram Panchayats: 3

Capacity of proposed FSTP: 3 KLD

Desludging Service: Pitampura ULB (3,000 Litres capacity) + Private operators

Kali Billod Cluster is a group/cluster, with a total of three Gram Panchayats (GPs) in rural Indore. The three GPs being considered namely,
1. Kali Billod
2. Ranmal Billod
3. Salampur
FSTP Benipur

Population Projected of Cluster (Design Year 2030 + including 5% Floating Population) = 73,677

Cluster of Gram Panchayats: 11

Capacity of proposed FSTP: 3 KLD

Desludging Service: Two desludging vehicles of Amethi Nagar Panchayat (3000 Litres capacity each) + Private operators

DPR In Progress

Amethi Cluster' includes Amethi Nagar Panchayat (NP) and eleven adjacent Gram Panchayat (GPs). The Eleven GPs are:
Jangal Ramnagar, Jangal Tikri, Tikariya, Saraikhema, Mehmudpur, Parsawa, Kharauna, Thaura, Sarwanpur, Raibha, and Benipur
1. Rapid Assessment – Cluster Identification
2. Land Identification – Technical Land Assessment
3. Baseline Survey and Pit Emptier Mapping
4. Process Design – FSTP components
5. DPR – Detailed Drawings / BoQ, Costings
6. Tender / Contracting

Community Engagement

Process Steps for Hardware
<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity</th>
<th>FSTP Components</th>
<th>CAPEX</th>
<th>Per capita CAPEX</th>
<th>OPEX</th>
<th>Per capita OPEX</th>
</tr>
</thead>
</table>
| FSTP Kalibilod | 3 KLD    | Planted Drying Bed  
Planted Gravel Filter  
Polishing Pond                | 28 Lakhs | INR 204 per capita | 4 Lakhs | INR 29 per capita |
| FSTP Kumhari     | 6 KLD    | Planted Drying Bed  
**Anaerobic Filter**  
Planted Gravel Filter  
Polishing Pond                | 33 Lakhs | INR 90 per capita | 3.5 Lakhs | INR 10 per capita |
| FSTP Patora      | 9 KL per week  | Planted Drying Bed  
Integrated Settler &  
Anaerobic Filter  
Constructed Wetland  
Polishing Pond                | 19 Lakhs | INR 136 per capita | 2.5 Lakhs | INR 18 per capita |
| FSTP Benipur     | 3 KLD    | **Anaerobic Stabilization Reactor**  
Planted Drying Bed  
Anaerobic Filter  
Planted Gravel Filter  
Polishing Pond                | DPR Under progress |                |        |                  |
Matrix of choices for rural FSM

<table>
<thead>
<tr>
<th>Type of rural habitation</th>
<th>Characteristics</th>
<th>Sanitation considerations</th>
<th>Containment</th>
<th>Emptying + Transportation</th>
<th>Treatment + Reuse/Disposal</th>
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<tbody>
<tr>
<td>Urban-like rural settlements</td>
<td>Census towns; or very large and dense villages, including those near state or national highways</td>
<td>Prevalence of septic tanks. Twin pits not feasible/adequate</td>
<td>Enforce septic tank regulations.</td>
<td>Mechanical emptying by private sector (regulated), with incentives to reach surrounding villages.</td>
<td>Faecal sludge pre-treatment followed by feeding into any existing waste water treatment plant nearby. Bespoke faecal sludge treatment plants (co-composting, fuel production, etc.). Co-treatment with greywater in stabilisation ponds.</td>
</tr>
<tr>
<td>Dense rural settlements</td>
<td>Villages with medium population size, high population density and closely located habitations.</td>
<td>Presence of septic tanks. Twin pits possibly not feasible/adequate.</td>
<td>Enforce septic tank regulations. Twin pit improvements.</td>
<td>Cluster areas and explore public-private partnerships to empty and transport faecal sludge.</td>
<td>Bespoke faecal sludge treatment plants or stabilisation ponds (as above). Deep row entrenchment.</td>
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<tr>
<td>Compact rural settlements</td>
<td>Villages with low population size and density, and closely located habitations</td>
<td>Mix of containment technology options</td>
<td>Enforce septic tank regulations. Improvements in existing twin pit latrines.</td>
<td>Scheduled desludging by one honey-sucker per block (public) Safe emptying, without caste underpinnings</td>
<td>Deep row trenching. Planted drying beds. Evapotranspiration FD. Identify safe ways to dispose waste in agricultural fields, in coordination with agriculture sector</td>
</tr>
<tr>
<td>Sparse rural settlements</td>
<td>Villages with very low population size and density (forest villages or those with scattered habitations)</td>
<td>Mix of containment technologies. Twin pits ideal</td>
<td>Promotion of twin pit latrines, improvements in existing twin pits.</td>
<td>Safe emptying, without caste underpinnings</td>
<td>Trenches, planted drying beds, evapotranspiration FD. Identify safe ways to dispose waste in agricultural fields, in coordination with agriculture sector</td>
</tr>
<tr>
<td>Rural settlements in challenging geographies</td>
<td>High water table, riverbanks, coastal, flood-prone, rocky, remote areas, etc.</td>
<td>High cost of safe sanitation services</td>
<td>Improve technologies adequate for specific geography.</td>
<td>Context-dependent solutions with intensive external support</td>
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</tr>
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</table>
In conclusion

- Importance of being technology agnostic
- Capital expenditure, Operating expenditure, Land, Energy requirements, complexity of maintenance – important considerations
- Risk of underutilisation of capacity – plan for expansion
- Four key elements –
  - Mobilisation for community ownerships and operation and maintenance
  - Appropriate technological choice – do not over engineer
  - Financial viability
  - Regulation
WaterAid India has been working for three decades and focused on clean water, decent toilets and good hygiene (WASH) – the three essentials that unlock progress for people, communities and economies.

VK Madhavan

Know more about our work at www.wateraidindia.in