Innovative Faecal Sludge (FS) Treatment – Appropriate Decentralised Treatment System Design

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Content:

1. FSM Projects & Experience
2. Lessons Learned – Challenges
3. Design Innovations
1. FSM Projects & Experience

Lusaka, Zambia (Partner WSUP):
• Implemented 2012

Dar es Salaam, Tanzania
• Implemented 2013

Maputo, Mozambique (Partner WSUP)
• Planned October 2013 – on hold during elections

Antananarivo (Partner WSUP)
• Planned implementation April 2015
Lusaka:
- 2012
- RV: 50m³
- LR: 0.8m³FS/d
- TS: 16.5%
- TVS: 37%
- SW: 22%+
- GPR: 0.3m³/m³(RV)d
- OLR: 1kg(VS)/m³
1. FSM Projects & Experience

Lusaka:
- 2013
- RV: 50m³
- ABRV: 25m³
- LR: 2-3m³FS/d
- TS: 5-6%
- TVS: 40%
- SW: 10%
- GPR: 0.2m³/m³(RV)d
- OLR: 1.2kg(VS)/m³
1. FSM Projects & Experience

Maputo:
- 2013
- D: 70+35 m³
- 4.6 m³ FS/d
- SW:? 
- On-side drying
- On hold - elections
## 2. Lessons Learned – Challenges

### Findings

- **Solid waste 20%+ (oil as well)**
  - Limits emptying tech.
  - Separation necessary

- **Inc. TS: 6%-18%**
  - Sludge accumulation
  - HRT decrease

- **Out. TS: 0.5%-7%**

- Peak load buffer required
  - ABR too sensitive

- **GPR: 0.2-0.3 m³/m³(RV)d ++**
# Findings

- **Solid waste 20%+ (oil as well)**
  - Limits emptying tech.
  - Separation necessary
- **Inc. TS: 6%-18%**
  - Sludge accumulation
  - HRT decrease
- **Out. TS: 0.5%-7%**
- **Peak load buffer required**
  - ABR too sensitive
- **GPR: 0.2-0.3m³/m³(RV)d ++**
## 2. Lessons Learned – Challenges

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<th>Conclusions</th>
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<tr>
<td>• Solid Waste</td>
</tr>
<tr>
<td>- Double Screen (3cm + 1cm)</td>
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<td>- Education</td>
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<tr>
<td>• Inc. TS: 6%-18%</td>
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<td>- Double Digester</td>
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<td>- Hydraulic Mixing</td>
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<tr>
<td>• Out. TS: 0.5%-7%</td>
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<td>- Double Digester</td>
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<td>- Bristol Filter</td>
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<tr>
<td>• No-ABR</td>
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<td>• Only institutional gas utilization</td>
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System Design Targets for Antananarivo:
1. Solid liquid separation
2. Max. resource recovery (Sludge, Biogas, Water)
3. Design Innovations

- 2015
- D: 2x25m³
- 1.6m³FS/d
- Displaced water reuse
- Onside drying + irrigation
- Hydraulic mixing trial
3. Design Innovations

- Irrigation outlet
- Gravity sludge extraction
- Receiving basin
- Displaced water storage
3. Design Innovations

Hydraulic Mixing – Biogas pump
- Mix accumulated sludge
- Accessible movable parts
- Low maintenance
- Increase BPR

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3. Design Innovations

Hydraulic Mixing – Biogas pump

- Hydraulic mixing – Biogas pump
- 15 m³ gas/d → 90 kWh/d
- Pump engine: 5 kW → η=20%
- 3 pump intervals/day (3x30 min)
- 38 kWh/d gas use for pumping
Thank you
- Hydraulic Mixing – Biogas pump

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<th>D002</th>
<th>V001-V004</th>
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<td>Dimensions Specification</td>
<td>$V=25m^3$, $r=2.20m$</td>
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<td>$D=4''$</td>
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<td>$P_{max}=5kW$, $\eta=20%$ ($pompe entre allies$)</td>
<td>Direct torque transmission from engine shaft to pump driving shaft ($D=4''$, $H=18m$, $Q=20m^3/h$, $\eta=20%$)</td>
<td>$D=4''$, $l=40m$</td>
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