Converting Feecal sludge to Fuel: a new Management Solution?

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Background

- Adding value to FS end products a challenge

- Constraints related to regulations in agriculture an opportunity for using sludge and FS as fuel

- In 2006 European cement industries saved 5Mt coal and reduced CO2 emissions for about 8 Mt (Cembureau, 2009)
Background

- Calorific value comparison

CV (MJ/kg)

- heavy oil
- natural gas
- petcoke
- sawdust
- straw/hay
- wood
- FS
- charcoal
- SS
Situation in Senegal

- Area: 196,722 Km²
- Population: 13,500,000 Hbts
- Sahelian Climate
- FS production: 4.2 Mm³/y
- FS production in Dakar: 1895m³/d
- FS discharged Evt: 834m³/d

- Energy imports Net: 52.8% (2011) (% of energy use)
- Fossil fuel cons: 53.2% (2011)
Collaborating with a local company

One step of the process, heating waste oil up to 360°C, using part of collected waste oil

Provided, adapting equipments, Dry FS could replace existing fuel

Waste oil refining
Optimizing FS handling

- The briqueting machine

Cakes: 95wt% dryness
CV: 12.3 MJ/kg

Cubes: 91wt % dryness
CV: 12.3 MJ/kg

Briquettes: 94wt % dryness
CV: 16.3 MJ/kg
Pilot kiln design for heating waste oil

- Combustion chamber
- Loading drawer
- Ventilation
- Cold Oil
- Hot Oil
- Oil pre-heating
- Gas trap

W A B E F
COMMUNICATION & VISIBILITY PLAN
GRANT CONTRACT #: FED/2013/330-225
Temperature profiles

Tktn: mean t° on top (525mm from the fire)
Tkbn: mean t° bottom (175mm from the fire)
Performance of the kiln

*Residu.*

<table>
<thead>
<tr>
<th>Combustion residue</th>
<th>Amount (wt%)</th>
<th>Sand (wt%)</th>
<th>Not burned in the kiln but in an oven (550°C/3 h)(wt%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>charcoal</td>
<td>27</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>cubes</td>
<td>48</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>briquettes</td>
<td>50</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>cakes</td>
<td>42</td>
<td>21</td>
<td>3</td>
</tr>
</tbody>
</table>
Monitoring gas emissions

**Combustion of briquettes**

- CO2 K (ppm)
- CO2 A (ppm)
- Humidity K %
- Humidity A %

**Charcoal combustion**

- CO2 F (ppm)
- CO2 A (ppm)
- Humidity K %
- Humidity A %

**Combustion of cakes**

- CO2 K (ppm)
- CO2 A (ppm)
- Humidity K %
- Humidity A %

**Combustion of cubes**

- CO2 K (ppm)
- CO2 A (ppm)
- Humidity K %
- Humidity A %
Conclusions

- *In Senegal, about 70% rely on onsite sanitation.* Half of them use manual emptiers due to high cost of mechanic emptying. Our research aims to add value to FSM so that it can impact financially the all chain and reduce the cost of mechanic emptying.

- This research demonstrated FS can be used as viable solid fuel

- Ciment industries, waste oil generation, ovens (bakeries) constitute a significant market that could provide incentives to improve collection, transport and treatment of FS
Thank you for your attention

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