Treatment of sludge from domestic on-site sanitation systems septic tanks and latrines

- septage -
**Septage** is domestic sludge from on-site sanitation and wastewater treatment systems

a) Latrines (faeces)

b) Septic tanks with soak pits

c) Grease traps (restaurants)

**Why septage disposal?** If:

a) No ground infiltration of the wastewater, due to blockage of the soak pit or high groundwater table cause overflow

b) Complaints about smell

c) Legal regulation for regular desludging
A) The emptying of the on-site tanks and haulage of the content is organized by private and municipal vacuum trucks; charges 2 – 10 USD/m³

B) In areas with high population density mostly the vacuum trucks don’t have any or only difficult access to the septic tanks
C) Disposal or treatment in municipal sewage or special sludge treatment plants, but also very often discharged into rivers or environment

D) Mostly the sludge treatment plants do corresponding with the required standard, because of overload, wrong design and operation
Septage accumulation in urban areas

- 300 – 1,000 l/(cap.*a) for the specific calculation
  - 1.5 – 5.0 m³/(household * a)
  - Ambient temperature → biodegradation
  - Design of the on-site system → size

- 60 – 100 l/(cap.*a) for the calculation of the sludge accumulation in a service area
  - Service area of 300,000 people = 50 – 90 m³/d
  - Density of sewer lines
  - Ground condition and climate
  - Urban structure (population density, trades, street and housing condition, etc.)
  - Legal regulations for operation of on-site sanitation systems

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## Faeces and septage characteristic

<table>
<thead>
<tr>
<th>Origin</th>
<th>Public and private pit latrine</th>
<th>Septic tanks</th>
<th>Normal domestic waste water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>High concentrated, low stabilized</td>
<td>Low concentrated, good stabilized</td>
<td></td>
</tr>
<tr>
<td>COD [mg/l]</td>
<td>20,000 – 50,000</td>
<td>3,000 – 10,000</td>
<td>500 – 2,500</td>
</tr>
<tr>
<td>BOD/COD</td>
<td>0.2 – 0.1</td>
<td>0.2 – 0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>NH4-N [mg/l]</td>
<td>2,000 – 5,000</td>
<td>300 – 1,000</td>
<td>30 – 70</td>
</tr>
<tr>
<td>TS</td>
<td>3.0 – 8.0%</td>
<td>0.5 – 3.0%</td>
<td>&lt;1.0%</td>
</tr>
<tr>
<td>oTS</td>
<td>0.75 – 0.85%</td>
<td>0.6 – 0.7%</td>
<td></td>
</tr>
<tr>
<td>Grease [% of oTS]</td>
<td>&lt; 5 %</td>
<td>10 – 30%</td>
<td>200 – 700</td>
</tr>
<tr>
<td>Helm.egg [no./l]</td>
<td>20,000 – 60,000</td>
<td>4,000</td>
<td>300 – 2,000</td>
</tr>
<tr>
<td>Biogas [m³/kg oTS]</td>
<td>0.35 – 0.5</td>
<td>0.1 – 0.2</td>
<td></td>
</tr>
<tr>
<td>Biogas [m³/m³]</td>
<td>8.0 – 10.0</td>
<td>0.5 – 2.0</td>
<td>0.1 – 0.3</td>
</tr>
</tbody>
</table>
Requirement on a sepatge treatment plant

- Central disposal and treatment station for faeces and septage
- Purification and desinfection of the wastewater (liquid fraction)
- Desinfection and processing of the solid fraction (bio-solid)

- Optional station for the treatment of organic industry sludge  → high biogas potential

- No odour emission near residences
- No ground and surface water pollution

- Low maintenances

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1. Truck 3.0 - 5.0 m³
2. Screen
3. Grease trap
4. Biogas reactor SRT 5 - 10 days
5. Anaerobic stabilization reactor SRT 15 - 20 days
6. Anaerobic reactor (DEWATS module) liquid treatment
7. Sand filter for dewatering of the stabilized sludge
8. Aerobic gravel filter and maturation for wastewater treatment

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Design for Biogas utilization

1. Screen installed in a channel
2. Grease trap with integrated grit chamber
4. Anaerobic stabilization reactor stabilization without inflow
5. Dom reactor for organic industry sludge
6. Baffled reactor for the anaerobic liquid treatment
7. Sand filter for dewatering of the stabilized sludge
8. Tunnel dryer for composting and disinfection
9. Aerobic maturation for the liquid phase
10. Biogas utilization for producing heat or electricity

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Biogas tank

Sludge stabilization and separation tank

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Biogas Utilization

Used for Light

Incineration of market waste

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Low stabilized, big cracks and big cluster

Good stabilized, small sludge cluster

Well stabilized, small sludge cluster (pig manure)
Treatment of Wastewater

Anaerobic baffled reactor for wastewater treatment
DEWATS module

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### Treatment of Wastewater

#### Input Features of a basic ILPT-plant

<table>
<thead>
<tr>
<th>Feature</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septage</td>
<td>18 Trucks per day, 72 m³/d</td>
</tr>
<tr>
<td>Industry Sludge</td>
<td>0 Trucks per day, 0 m³/d</td>
</tr>
</tbody>
</table>

#### Features of a basic ILPT-plant

<table>
<thead>
<tr>
<th>Feature</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Screening</td>
<td></td>
</tr>
<tr>
<td>- Grease Trap</td>
<td></td>
</tr>
<tr>
<td>- Biogas plant</td>
<td>150 m³</td>
</tr>
<tr>
<td>- Stabilization Reactors</td>
<td>292 m³</td>
</tr>
<tr>
<td>- Sludge Drying Bed</td>
<td>820 m²</td>
</tr>
<tr>
<td>- Baffled Reactor</td>
<td>210 m³</td>
</tr>
<tr>
<td>- Aerobic Gravel Filter</td>
<td>890 m²</td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Feature</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screenings</td>
<td>0.20 to/d</td>
</tr>
<tr>
<td>Grease</td>
<td>0.45 to/d</td>
</tr>
<tr>
<td>Biogas</td>
<td>80 m³/d</td>
</tr>
<tr>
<td>Compost</td>
<td>1.2. to/d</td>
</tr>
<tr>
<td>Water</td>
<td>67 m³/d</td>
</tr>
</tbody>
</table>

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