Waste Fermentation and Sand – no Problem?

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Outline

1. Anaerobic digestion of OFMSW
2. New Demands on Biomass Treatment
3. Mechanical Treatment
   • Pre-treatment
   • Contraries Removal
     • Dry Anaerobic Digestion
     • Wet Anaerobic Digestion
     • Wash Processes
4. Progress in Wet Mechanical Treatment
Anaerobic Digestion of OFMSW

Anaerobic Digestion has been widely implemented over the past 20 years alongside composting. Substrates range from sewage sludge to OFMSW.

<table>
<thead>
<tr>
<th>Year</th>
<th>Substrate</th>
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<tbody>
<tr>
<td>1920</td>
<td>Sewage Sludge</td>
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<tr>
<td>1975</td>
<td>Manure</td>
</tr>
<tr>
<td>1985</td>
<td>Organic Industrial Waste, Co-Fermentate</td>
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<tr>
<td>1990</td>
<td>Biowaste</td>
</tr>
<tr>
<td>1995</td>
<td>OFMSW</td>
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Technical requirements for plant equipment increase with the proportion of „contraries“ such as glass, stones, sand and plastics:

**Function:**
Removal of contraries for protection of equipment

**Status quo:**
Frequent plant downtime in Anaerobic Digestion of OFMSW

„Problems can never be solved by thinking the same way they were raised.“
- Albert Einstein -
New Demands on Biomass Treatment

Energy Efficiency
- Optimizing of total energy efficiency instead of maximum biogas yield
- Only the wet, particle free, anaerobic digestible fraction to Fermentation
- Dry organic fractions into Waste-to-Energy or Recycling
  - no Incineration of Manure – no Fermentation of Wood

Waste Management
- Priority of Recycling over energy recovery
  - Biogas production not ultimate goal
Pollutants are incorporated into organic matter by Biological Treatment, result is low product quality: Compost, Biomass-to-Energy, RDF, Fiber-Recycling, plastics, wood
- Reduction of salt by washing and maximum mechanical dewatering instead of drying
  - no Biological Treatment of utilizable organics

Emissions
- Minimum odor emissions for public acceptance
- Minimum CO₂-emissions: Minimizing energy consumption and unused energy from composting
  - Composting is not technology of choice
Mechanical Treatment ⇒ AD-Technologies

Pre-Treatment

Sieve-Drum

< 80 mm (< 40–120 mm)

Fe/NE-Metal

> 80 mm

20% – 50%

Waste-to-Energy

Recycling

Wet

Dry

Contraries
Removal

Dry

Fermentation

Contraries
Removal

Dry

Contraries
Removal

Dry

Fermentation

Wet

Contraries
Removal

Mechanical
Dewatering

Composting,
Drying

Mechanical
Dewatering

Composting,
Drying

Dry

Contraries
Removal

Wet

Contraries
Removal

Dry

Contraries
Removal

Dry

Contraries
Removal

Wet

Contraries
Removal

Mechanical
Dewatering

Composting,
Drying

Mechanical
Dewatering

Composting,
Drying

Dry

Contraries
Removal

Percolation,
Hydrolysis

Dry

Contraries
Removal

UASB,
Fixed Bed

Wet

Contraries
Removal

Wet

Contraries
Removal

Dry

Contraries
Removal

Composting/
Drying

Dry

Contraries
Removal

Dry

Contraries
Removal

Recycling

Composting,
Drying

Dry

Contraries
Removal

EcoEnergy

Environment & Energy
Wet Contraries Removal for Wet-Fermentation

Waste

Sreening/Grinding → Mixer → Sand Removal → Anaerobic Digestion

Low-Density Material

Scum Layer?

Dry Matter

45 – 20 % DM

20 – 14 % DM

14 – 7 % DM

7 – 3 % DM

Viscosity and Density
**Washing Processes - Examples**

**Aquatherm, AN Biotec**
- Retention Time: 6h
- Waste Water → UASB → Biogas → Sludge → Composting
- < 80 mm

**BTA**
- Retention Time: 3d - 4d
- Waste Water → Fixed Bed Reactor → Biogas → Sludge → Composting
- Plastics, Wood → Sand Separation → Stones → Hydrolysis

**IMK**
- Retention Time: 3d
- Waste Water → UASB → Biogas → Sludge → Composting
- < 80 mm
- 1-stage Sand Separation → Sand → Fibers

**Percolation**
- Retention Time: 2d – 3d
- Waste Water → UASB → Biogas → Sludge
- < 120 mm
- Ballistic Separator → 40°C → 2-stage Sand Separation
- Dry-Contrary Removal → Recyclables, RDF, Landfill
- Composting Drying
NMT Process - EcoEnergy

Retention Time: 10 min

< 80mm

Stones

> 70°C

Plastics

Wood

Waste Water

Biogas

Sludge

55°C

2 Stage Separation

Screening

Drying Pelletizing

BIOFLUFF® Pellets

BIOFLUFF® Fuel

BIOFLUFF® Fertilizer

Waste

< 80 mm

Screening

Drying/Pelletizing

1. Stage

2. Stage

3. Stage

Wash Water

BIOFLUFF®

Sand

BIOFLUFF®

Stones

Gravel

Plastics, Wood

Biogas

Water

Fertilizer

Sludge

Sand

Water

Waste

< 80 mm

BIOFLUFF®

Stones

Gravel

Plastics, Wood

Biogas

Water

Fertilizer

Sludge

BIOFLUFF®
Thank you for your attention!

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