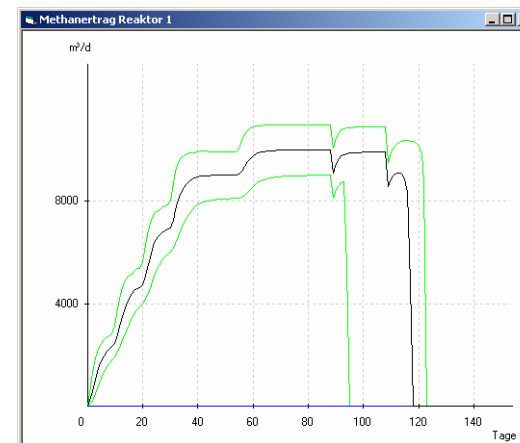


Digesting Organic Wastes

Long Term Experiences of a Biogas Plant Operator



Adequate machinery



Biological stability

This Project (Contract No. EIE/07/2 14) is supported by:

Intelligent Energy  **Europe**

Content

Types of organic wastes

- Source separated organics from households (green bin)
- Food waste
- Grocery store waste

BioPower Plant: Strategy of handling contaminations

- From bio-waste
- Of the digester

Supervising and controlling the biological process

- Analyzing the stability with BioTip

Types of organic waste



SSO (green bin):

Dry substance matter (DM): 35-42%

Contaminations up to 35% of DM

- wood
- plastic
- metals
- sand
- etc...

Types of organic waste



Food waste:

Dry substance matter (DM): 20-30%

Contaminations up to 25% of DM

- dishes, cutlery etc.
- plastic bags
- bones, egg- and seashells
- glass
- etc...

Types of organic waste



Grocery store waste:

Dry substance matter (DM): 20-35%

Contaminations up to 35% of DM

- plastic
- card board
- egg- and seashells
- glass, tins
- etc.

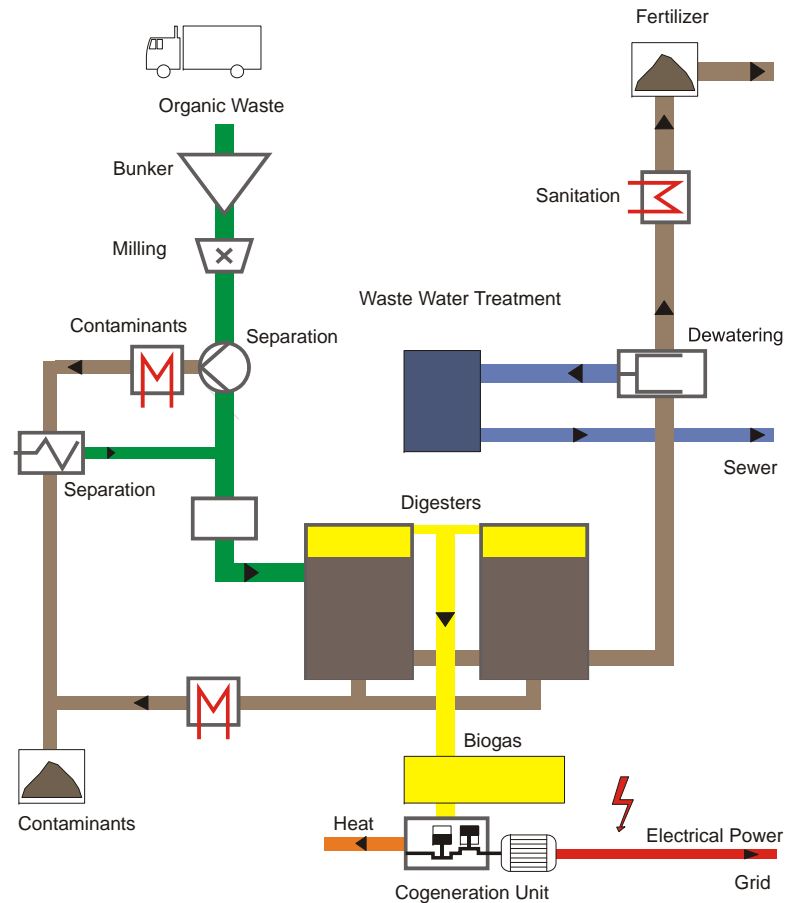
Example BioPower Bernau GmbH & Co. KG

- **BioPower Bernau GmbH & Co. KG in Bavaria/Germany**
- **Biogas plant is running since the year 2000**
- **Treating 6000t/a kitchen- and grocery store waste**
- **Cogeneration unit with 250kW electrical power**
- **Reduces the emission of 700t/a CO₂**



BioPower Bernau GmbH & Co. KG

Process diagram:



Central task: Removal of contaminations

The Input Material



Contaminants like bones, package, dishes, cutlery etc.

leads to damages for the equipment.



Central task: Removal of contaminations

Damages

Pump wrapped in plastic foil and
blocked by a spoon.



blocked by a spoon.



Central task: Removal of contaminations

Damages

Broken Agitators



Central task: Removal of contaminations

Damages

Destroyed Rotary Lobe after pumping organic waste for about 10 hours.



Central task: Removal of contaminations

Strategic approach of handling Contaminations in BioPower plant:

- 1. Protection of systems from undefined contaminations (size and amount) using a pre-treatment system to clean the waste.**
- 2. Removing of unavoidable remaining contaminations from the digesters without interruption of biogas production.**

Removing of contaminations

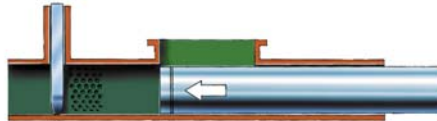
Pre-treatment of the waste:

- Conditioning to a dry matter content of $DM < 25\%$ by adding recycled water
- Shredder and mix the waste
- Separate contaminations as far as possible using a press system
- The amount of remaining contaminations is between 1 and 3%.
This is mainly small plastic parts, glass, pieces of bones, eggshells, sand etc.

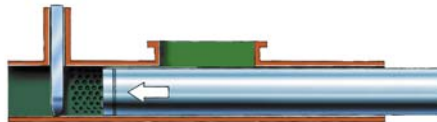
Removing of contaminations, working principle:



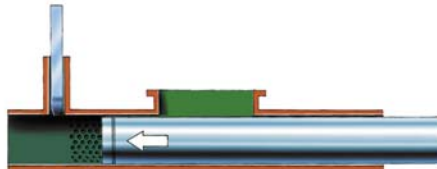
1. Press fills with conditioned waste.



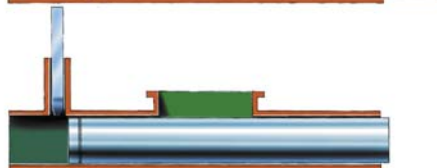
2. The piston moves forward and pushes the waste into the cylinder



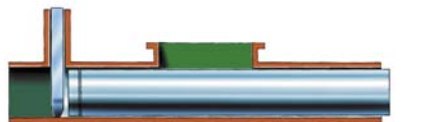
3. The piston squeezes the material. Liquid and pasty fraction is pressed through the filter. Contaminations remain in the press.



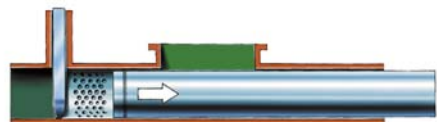
4. The gate valve opens.



5. The piston pushes the contaminations into the tube.



6. The gate valve opens.

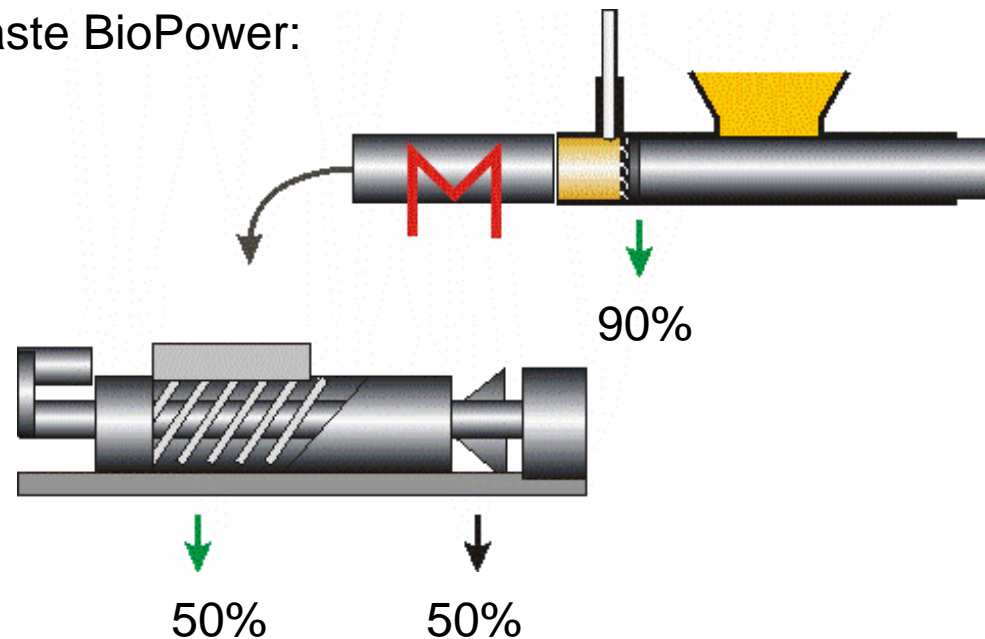


7. The piston moves back into start position

ME 70927

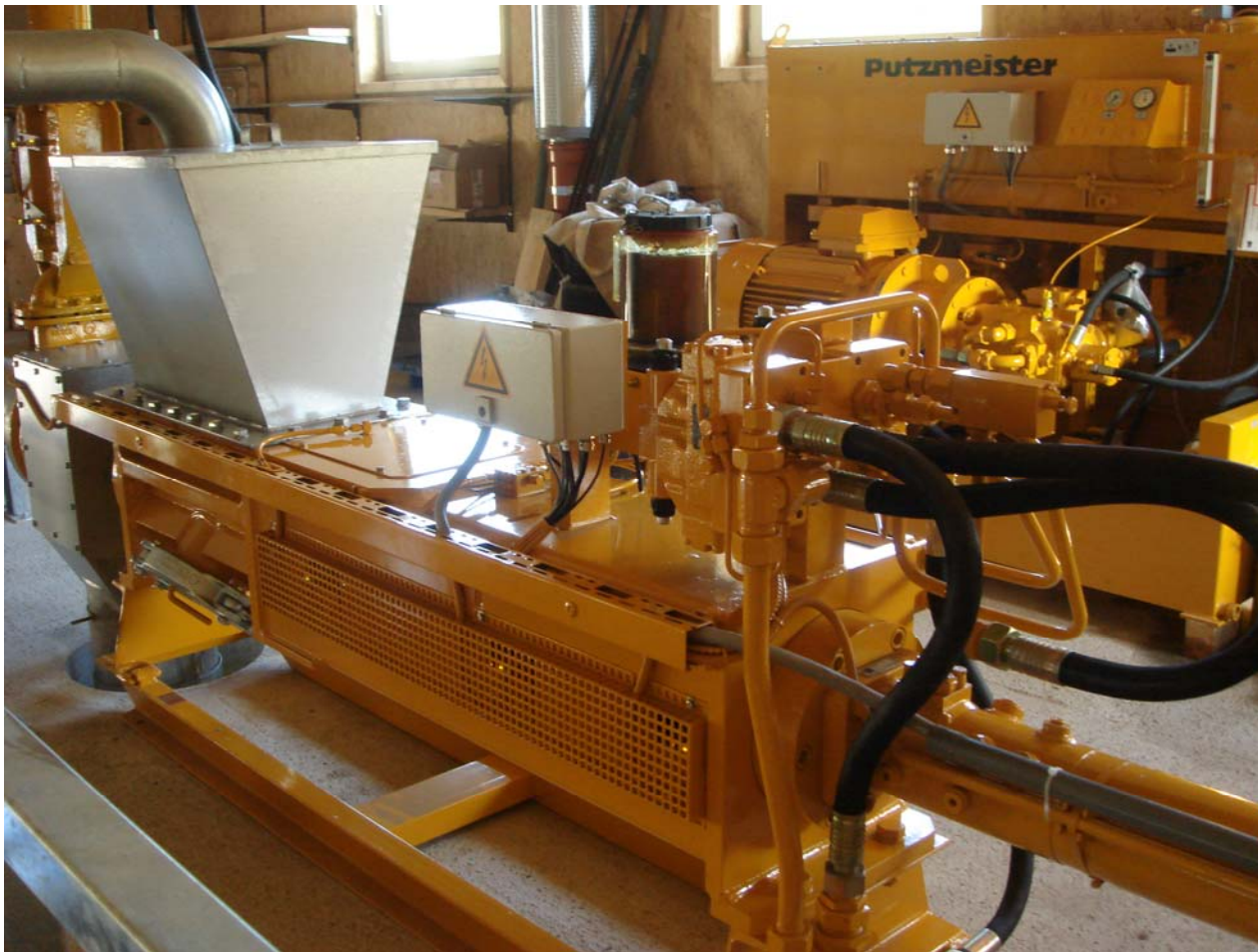
Removing of contaminations, mass balance

Example food waste BioPower:



The Material is pressed a second time for example by a screw press, reducing the weight by 50% again. The efficiency and the mass of reject always depends on the quality of the waste.

Example of a separation unit



Grocery store waste after pre-treatment



Output of contaminations



**Squeezed
contamination are
delivered via pipes
into the collecting
container**

Output of contaminations

View into a container with contaminations



Removing of contaminations

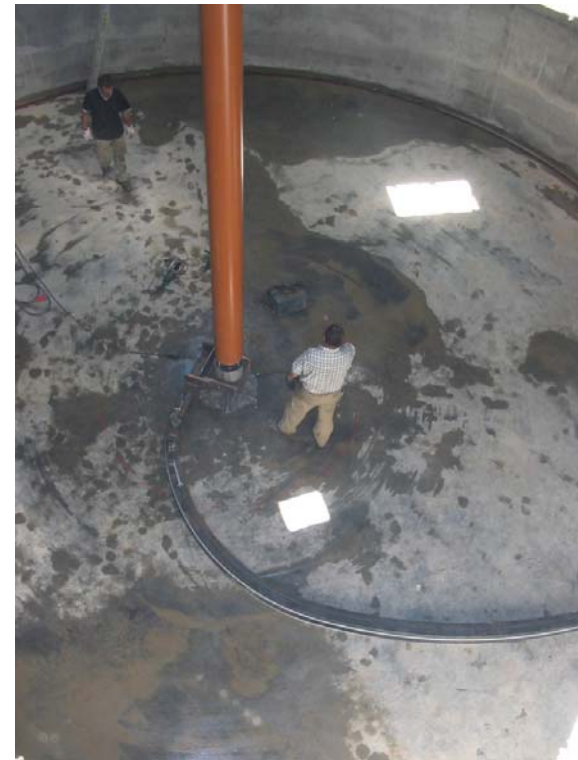
After the pre-treatment the remaining liquid to pasty material which goes to the fermentation process holds less than 1% of contaminant. Mostly composed of small particles from packing foil, eggshell, broken glass and other material, small enough to pass the screens.

To keep the digesters from silting with these sediments or plugging with the floating material there are systems to keep the digester clean needed.

Removing contaminations

Take out of settlements:

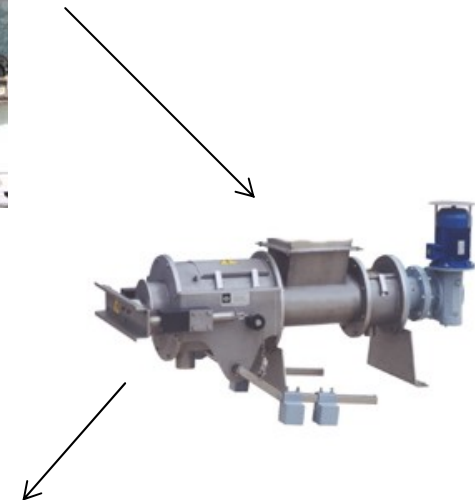
The floor scraper wipes
Sediments into an floor outlet
from were the sediment is
pumped into a classifier.



Removing contaminations

Gas proof separation :

Floating material is skimmed from the surface and pumped to a sieve. Due to its construction the skimming unit is self regulating and gas proof.



Summary

Step 1: **Shredder and mix**
TS-Content ~25%



Step 2: **Separation of big contaminations**



Step 3: **Removing fine contaminations**
from digester



Biological stability of the AD-Process

Starting with biomass components

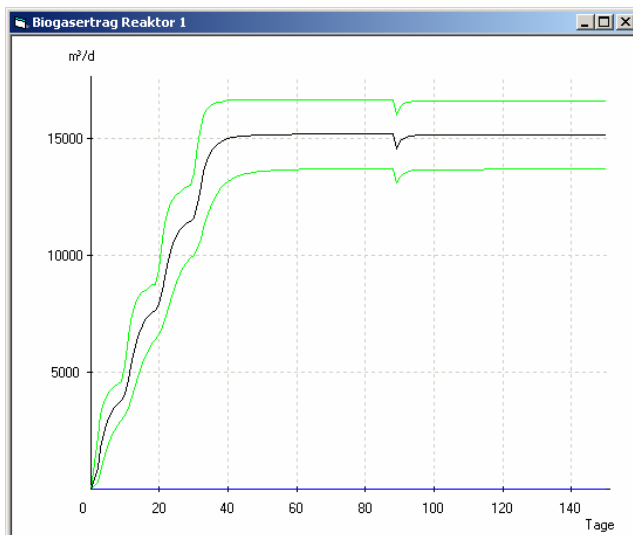
- Carbohydrates
- Proteins
- Fats
- AD-Inert Material
- Water content

and technical data of the AD-plant, e.g. digester volumes, the degradation process is simulated with the simulation tool BioTip. BioTip is a result of High Tech Offensive Future Bavaria funded by Bavarian Ministry of Economics in collaboration with BIFA Augsburg.

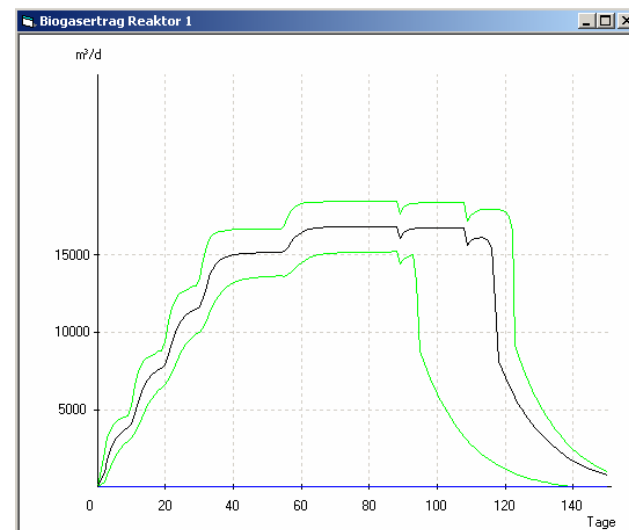


Biological stability of the process

The degradation process is simulated using BioTip. With the results all necessary information to judge on the AD-process is generated. This is Gas yields, gas quality, buffer capacity, pH-value etc.



Stabile system



Instable system

Summary

- 1) Long term treating of organic wastes needs a good strategy for contaminants removal.
- 2) Analysis and simulation of the biological processes helps to prevent and solve malfunctions in the biological process. A detailed analysis of the feedstock is necessary. General advises are often misleading.

Thank you for your attention.



This Project (Contract No. EIE/07/214) is supported by:

