Anaerobic digestion of organic waste

Waste to energy

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Introduction

We at EnviCare® distinguish from a technological point of view between biogas from renewables, co-fermentation bound to a waste water treatment plant and anaerobic digestion of biowaste.

All these facilities have been recognized by the United Nations Development Programme as useful decentralized sources of energy supply and they show the quality of a non fluctuating basic energy source.

Anaerobic digestion (AD) technology helps to reduce emissions of greenhouse gasses in many ways[1]:

- Replacement of fossil fuels
- Reducing methane emission from landfills
- Displacing chemical fertilizers
- Reducing vehicle movements
- Reducing electrical grid transportation losses

Take over and pre-treatment

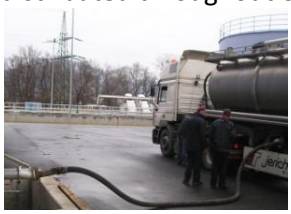
The level of contamination of the feedstock material is one of the key considerations. It usually has significant levels of contaminants such as plastic, glass or metals and they have to be removed prior to entering the digesters.

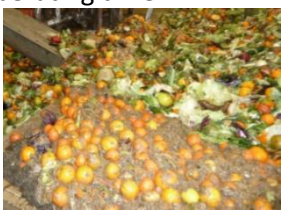
Directly after taking over the material in a bunker it is transported with a crane to a massive shredder.

After this step the material is pressed with a piston pump through a special screening unit to remove all physical contaminants larger than 12 mm, such as metals, ceramics and plastics.

Intermediate storage

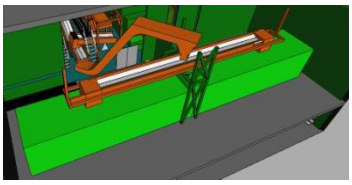
Collection of organic waste and transportation to the plant cannot be expected as evenly distributed throughout operating time.





Also large fluctuations in quality and quantity of the waste must be assumed. An adequate and tailor made internal buffering and mixing system is therefore crucial for a well and evenly functioning system with a defined energy output, since the anaerobic process depends on a steady feed.

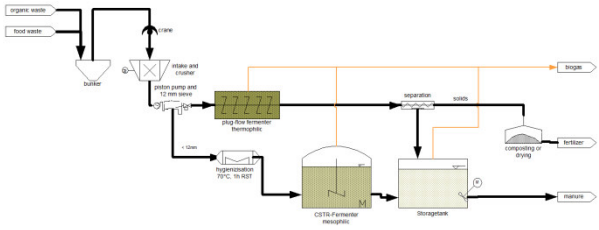
[1] Parts of the subsequent text taken from Wikipedia, 2011




Also the definition of sampling points and strict quality surveillance are essential.

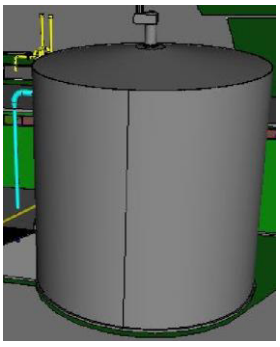
Anaerobic Fermentation

The coarse fraction of the material is directly pumped into a horizontal plug-flow type of fermenter (high-solids, dry substrate) while some recyclate is added to the fine fraction, which is then pumped into the CSTR type digester (low-solids, wet substrate) where anaerobic treatment takes place.



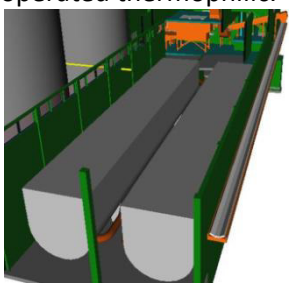
In a general attempt to **keep the system as simple as possible** we favour one stage systems without hydrolysis, but instead design the system in a straight forward approach with as little moving parts as possible.

For an anaerobic digestion of the fraction smaller 12 mm we recommend CSTR fermenters with a H/D relation close to 1, because the mixing pattern can be controlled far better by using one central stirrer compared to conventional agricultural style fermenters with a lower H/D relation and more stirrers.




The CSTR fermenter needs to be equipped with an in-situ grit and sand removal. It is operated at mesophilic conditions and therefore a conventional hygienisation (70°C @ 1h) unit is necessary to fulfil the valid guidelines.

A plug-flow reactor is less sensible to fibres or coarse particles and therefore we favor this design for the treatment of the sieving residues (fraction larger 12 mm). This high-solids and high viscosity fermenter is equipped with a strong and slow motion horizontal stirring device and is operated thermophilic.



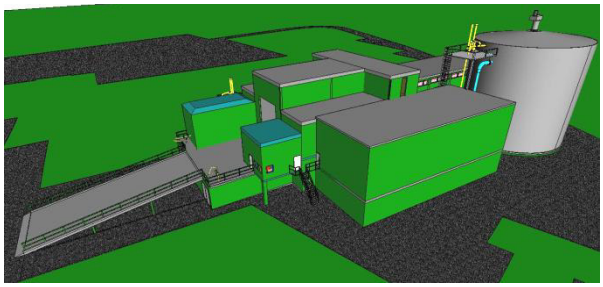

Handling of residues

Of course depending on the nature of feed substrates the residues should normally recycled and re-used in agriculture as fertilizers.

Since the output of the plug flow fermenter is too wet to be handled effectively it needs to be separated prior to any further composting or drying.

Site design

Of course the whole facility must be installed in a proper industrial style building and the malodorous air must be collected directly at the source and treated in e.g. a scrubber/biofilter.



EnviCare® offers years of knowledge in development, design, installation and operational practice in environmental technology.

We take care of your environment!