Processing garbage contaminated organic wastes for biogas production

FINSTERWALDER UMWELTTECHNIK

Introduction

Finsterwalder Umwelttechnik GmbH & Co. KG (FITEC) established 1997 is an engineering company working in two business fields:

- Planning anaerobic digestion plants (Biogas plants)
- Landfill reclamation and securing

BioPower Bernau GmbH & Co. KG is owned by FITEC and running a biogas plant for kitchen waste since year 2000.

To collect the food waste we installed a innovative collecting system that includes the cleaning of the waste bins on the truck.

Introduction

Anaerobic Digestion (AD) of wet organic wastes reduces greenhouse gas emissions and produces renewable energies, electricity and heat.

But it faces the problem of garbage that disturbs the mechanical function of the plants. Garbage like tins, plastics should not be in separate collected organic wastes. But unfortunately nowhere in the world people are accurate sorting their waste.

The following pictures of typical organic wastes that are appropriate for AD treatment give an idea how efficient garbage removal has to be.

Introduction

Typical contaminated organic wastes;

Food waste
from Restaurants

Food waste (expired stuff)
from Supermarkets

Organic waste, separate
collected from households

Task: Separate the garbage from the organic fraction

Principle idea of the FITEC System

The main point is accepting that there is no way to treat the waste so perfect, that all disturbing materials are removed before digesting.

The consequence was developing a reliable system to remove as much garbage as possible from the organic waste before digesting (pre-treatment) and second step developing a cleaning system for the digester (final treatment).

Following the garbage removal process

A) Conditioning the waste

Before pre-treating the organic waste material, it has to be conditioned by a shredder. We use a special shredder type working with hammer mill principle that is totally insensitive of metals or glass.

The whole waste as it is gets crushed and at the same time mixed with water up to a total solids content of 25%. Result of the conditioning is a pasty sludge that contains the garbage mostly in pieces larger than 25mm.

Following the garbage removal process

Intermediate hopper

Chain shredder

Conditioned waste

FITEC/PM pre-treatment

B) Separation of Solids

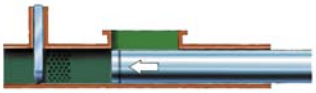
The conditioned sludge gets to the garbage removal system that is the first step of garbage removal of the FITEC process, the pre-treatment system.

The pre-treatment system was developed in cooperation with PUTZMEISTER AG. It is based on a modified piston pump. The modification concerns the control system of the machine, the gate valve, the screening cylinder and the piston head.

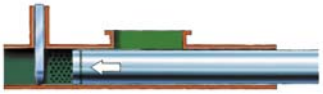
The working principle is described in the following 6 pictures:

FITEC/PM pre-treatment

Filling with conditioned waste



Pushing the conditioned waste into the filter



Pressing the pasty organics through the filter

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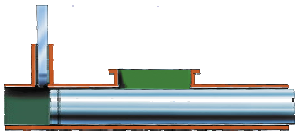
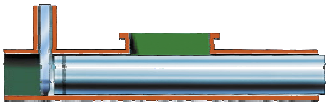
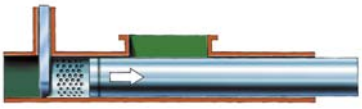


Open the gate valve. Pushing the remaining garbage into the heated pipe. Cleaning the filter.



Closing the gate valve.



Return to start for a new cycle.

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FITEC/PM pre-treatment

Installation of the pre-treatment process at Bioenergie Schlitters, Austria

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Pre-treating the conditioned organic waste leads to a fairly clean material that contains some plastic particles, sand, eggshells etc. This material is stored in an intermediate storage ready for sanitation.

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FITEC/PM pre-treatment

The Garbage with organic contaminants remains in the pipe and gets pumped through a double tube heat exchanger and heated up to temperatures over 70°C for more than 1 hour.

Fats and organics in the garbage get pasty and in a **second step of squeezing** the garbage fraction the rest of liquids get of. The remaining garbage fraction has a total solid content of 45% and contains very less of organics.

FITEC/PM pre-treatment

Separated garbage fraction after second press:

This fraction is, depending of the input material quality, less than 25% of the input.

Final cleaning step

C) Cleaning the digester

After sanitation the pre-treated organic matter is fed to the AD. But this sludge although contains some garbage, despite all affords of removing it. Depending on the input material this could be sand, glass particles, egg shells, parts of seashells, rubber rings or plastic particles that passed the filter. These materials would accumulate in the digester and cause problems. Heavy stuff sinks on the digesters floor and plastic swims up to the sludge surface.

Therefore FITEC developed a floor scraper for the daily cleaning of the digesters bottom and a skimming device to clean the sludge surface from up swimming plastics.

Final cleaning step

Result of the floor scraping

Result of Skimming

Biogas Installation Bioenergie Schlitters

Start up:
December 2007

Input materials:
Bio-wastes
Food waste
etc.

Treating Capacity:
Max. 10.000t/y
Actual doing 6000t/y

Electrical power:
330kW

Investment:
3 Mio €

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Thank you for your attention

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