How the solids content of food waste drives technology decisions

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YIELD & FITEC

- Yield Biogas was founded in 2007 to represent FITEC in NA.
- Focused on selling specialized pre-treatment systems to remove contaminants from complex organic waste streams.
- Solutions include: Separation presses, ball valve pumps, self cleaning fermenters & pasteurization systems.
- Provide technical support through Dr. Digester services.
- Services include:
  - Feedstock audits
  - Market strategies
  - Project feasibility studies
  - Operational & system design support
  - Biological system remediation
YIELD & THONI

• Yield recently became the Thoni rep in NA.
• Thoni is an integrated Al recycling, fabricating & plant engineering company with it’s head office in located in Telfs, Tyrol Austria.
• Thoni has several manufacturing facilities largely for auto parts with locations in Telfs, Landeck| AT, Kempten| DE, Rovereto| IT.
• Founded 1964 by Arthur Thöni & 100% family owned with 500 employees.
• Env. & engineering division designs and builds the TTV plug flow, thermophilic digester for the waste sector.
• Has approx. 40 food waste reference plants.
What are the merits of AD as an organics management solution?

AD is a resilient technology that fits into the critical theme of climate change infrastructure;

- Recovers nutrients, water & organic matter.
- Reduce GHG emissions or generates offsets/credits.
- Produces a flexible renewable fuel.
- (Can) Improve organics diversion rates.
- (Can) Increase farm gate revenues.
- (Can) Improve the economics at wwtp’s.
Recent trends in the biogas market

Biogas projects are taking many forms:

- Focus on nutrient & odour management
- More urban based digesters, commercial & municipal
- Co-digestion of food waste at WWTP AD’s
- Mixing of waste streams (US but not so much in CAN)
- Organic fraction of municipal solid waste (primarily in CA, HI)
- De-centralization of pre-processing and digestion:
  - POP’s: Points of pre-processing (urban transfer stations)
  - POD’s: Points of digestion (agricultural sites for economical digestate management)
Need to match the right process with the waste stream

- **Municipal SSO TS**: 20-42%;
  Contaminants up to 35% of the TS

- **Kitchens, restaurants & supermarkets TS**: 15-22%;
  Contaminants up to 25% of the TS

- **Packaged & expired food wastes TS**: 20-35%;
  Contaminants up to 35% of the TS
Average composition of source separated urban food waste

21% Carbohydrates, Fats & Proteins

Compounds used by anaerobes contained in organic wastes to produce methane. The only fraction of organic waste that contributes to renewable fuel production.

3% Contaminants

Contaminants such as plastic, metal, glass etc. This fraction varies widely based on source of organics and local diversion policies.

4% Minerals & non-digestible organic fraction

Contains compounds like NPK, Ca etc., typically in mineralized/plant available forms.

72% Water

Food waste is largely made up of water. Water is expensive to dispose of, thus AD systems need to minimize it’s use in processes. Specific equipment and process choices will affect how much additional water is used. Limited recycling of digestate due to residual TS, viscosity and nitrogen loading.
Contaminants in the total solids

Typical contaminants in food waste: glass, wood sand, plates, cutlery, plastic bags, bones, egg shells, cardboard, cans etc.

Contaminants increase the total solids content of the waste stream and create critical equipment and process decisions.

All contaminants can ultimately be separated based on density differences into two categories: Light and heavy fractions.

Pre-treatment of feedstock or post-treatment of digestate is necessary in all cases in order to produce a clean residual product suitable for further value added capture.
Eventually what goes in must come out

Heavy fraction sediment/grit removed by the floor scraper

Floating layer removed by the tank skimmer
Finsterwalder Umwelttechnik (FITEC) established in 1997 is an engineering company specializing in AD.

Main areas of expertise are in:

- The designing of biogas plants for the anaerobic digestion of urban organic waste.
- The manufacture of specialty equipment to handle and separate contaminants from urban organic waste.

FITEC has designed and built 14 AD’s across Europe, UK and China with a range in capacity from 6,000 to 70,000 t/a.

FITEC owns & operates it’s own food waste biogas plant with it’s core technologies tracking long term performance.
Shredding, homogenization and contaminant separation
Pasteurization for viscous and highly abrasive food waste slurries
FITEC Self Cleaning Anaerobic Digester

- Grit pump/cellar
- Sediment trap
- Agitators
- Tank skimmer
- Floor scraper
Thoni TTV – high solids plug flow digester

**benefits**

- maximized gas yield
- hygenization
- high total solids content
- Insensitive to impurities

**Output**

- concrete or steel casing
- paddle agitator
- steel bottom shape
- inspection tunnel both sides

**Input**

**useful volume**

- = 85% fill level

<table>
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<th>useful volume</th>
<th>Capacity</th>
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<tr>
<td>1,830 yd³</td>
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• Digester specially developed for organics from MSW
• continuous digester feeding
  → stabilized gas production and biology
• digester is mixed mechanically
  → lowest energy consumption
  → fixed residence time
• heating by hot water
  → simple heat supply
• non sensitive to impurities
  → < 4 inch in average
  → single pieces up to 12 inch
  → heavy big impurities < 10%
• slim longitudinal construction
  → high earthquake resistance
  → easy foundation, low ground load
• easy access to the digester in case of emergency
• digester fabricated by Thöni
  → special warranty period on agitator
Summary

• Critical to know the details of the organic waste stream(s).
• Terms like ‘wet’ and ‘dry’ when referencing AD technologies leads to confusion.
• Need to have a reasonable digestate management plan and the digestate must be free from contaminants.
• Avoid system that use a lot of process water.
• Remember that with AD what goes in must come out.
• Choosing an AD system that is appropriately suited to the waste stream.
THANK YOU!

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