

World Biogas Association

Overview pre-treatment methods.

Mechanical and biological methods for pre-treatment

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Project manager Karl Jørgen Nielsen, PlanEnergi

www.planenergi.dk

email: kjn@planenergi.dk

phone +45 30604603

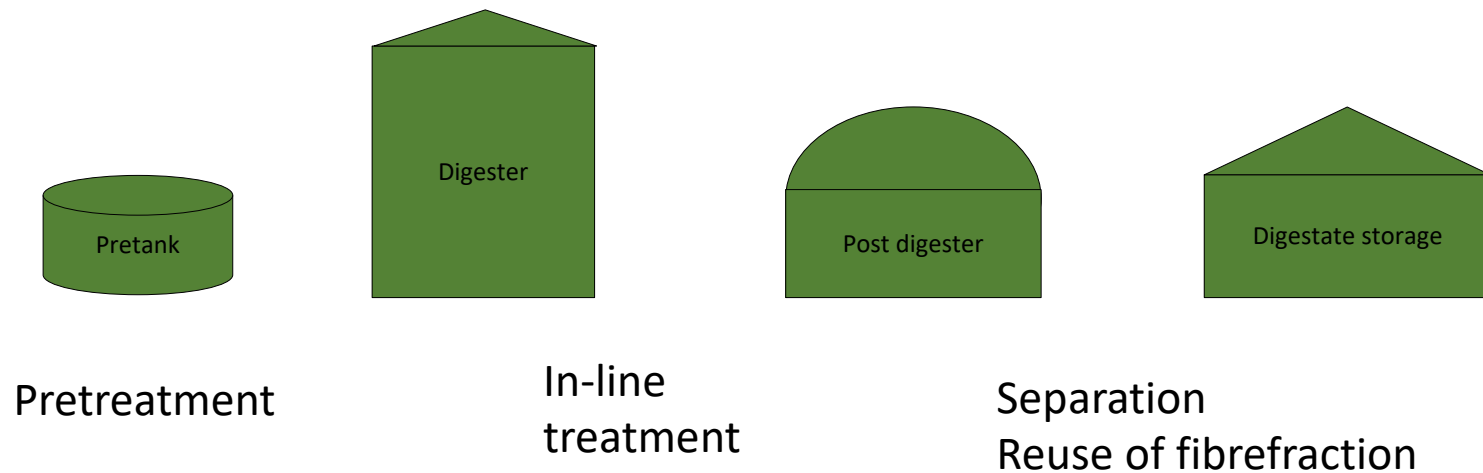
Topics

Pretreatment before feeding to the digester

In-line treatment

Treatment of degassed digestate

Biological pretreatment, silage



Automatic crane and pretreatment system to deep litter, maize, grass etc.

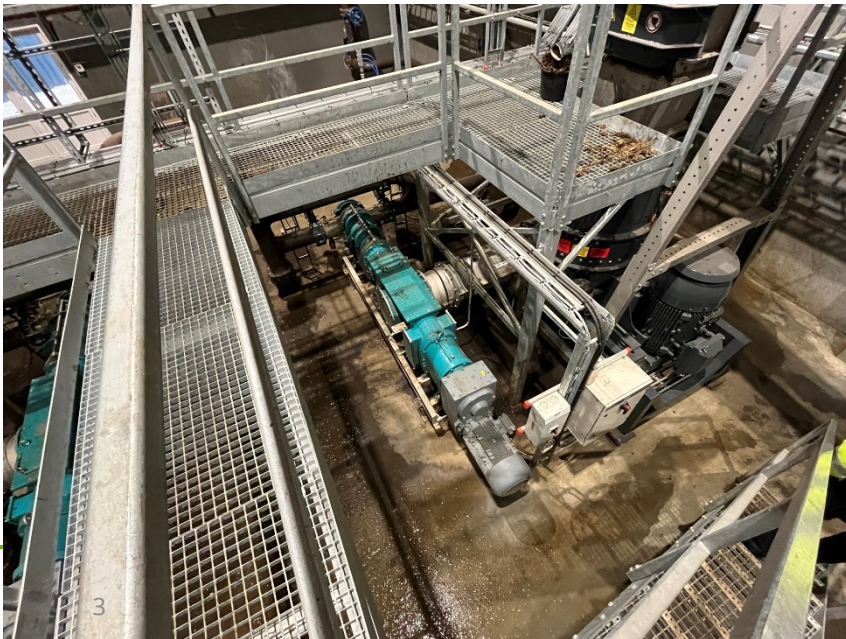


Biomixer in connection with a BHS biogrinder and a powerfeed to feed in the digesters.

The powerfeed is sensitive if the feedstock is too wet or too dry.

The grinder system is equipped with iron magnets to collect iron before it enters the grinder.

Stones and stainless steel is a challenge.



PreMix system

Vogelsang Premix

Installed in many danish biogas plants

Direct connection to Bio-Mix

Grass, maize, deep litter, straw etc.

Mixes the dry feedstock with digestate (10-12% dm) from the digester and pumps the mix into the digester.

Stonetrap systems manuel og automatic.



Batch pretreatment system

Envitec

Installed in several danish Envitec biogas plants

Direct connection to an outside Bio-Mixer

Grass, maize, deep litter etc.

Possibility to continue mixing until the feedstock has the required consistency.

Stonetrap in the Bottom



Challenges with deep litter

Deep litter primarily from cows and calf production, but also pigproduction, is a common feedstock.

- The dry matter content varies from approx. 20% to 40%
- A combination of long and short straw
- Foreign bodies is often seen. Stones, metal, plastic, rubber tyres, wood etc.
- Requires long retention time or efficient pretreatment
- A feedstock with high methane potential and many tonnes available.



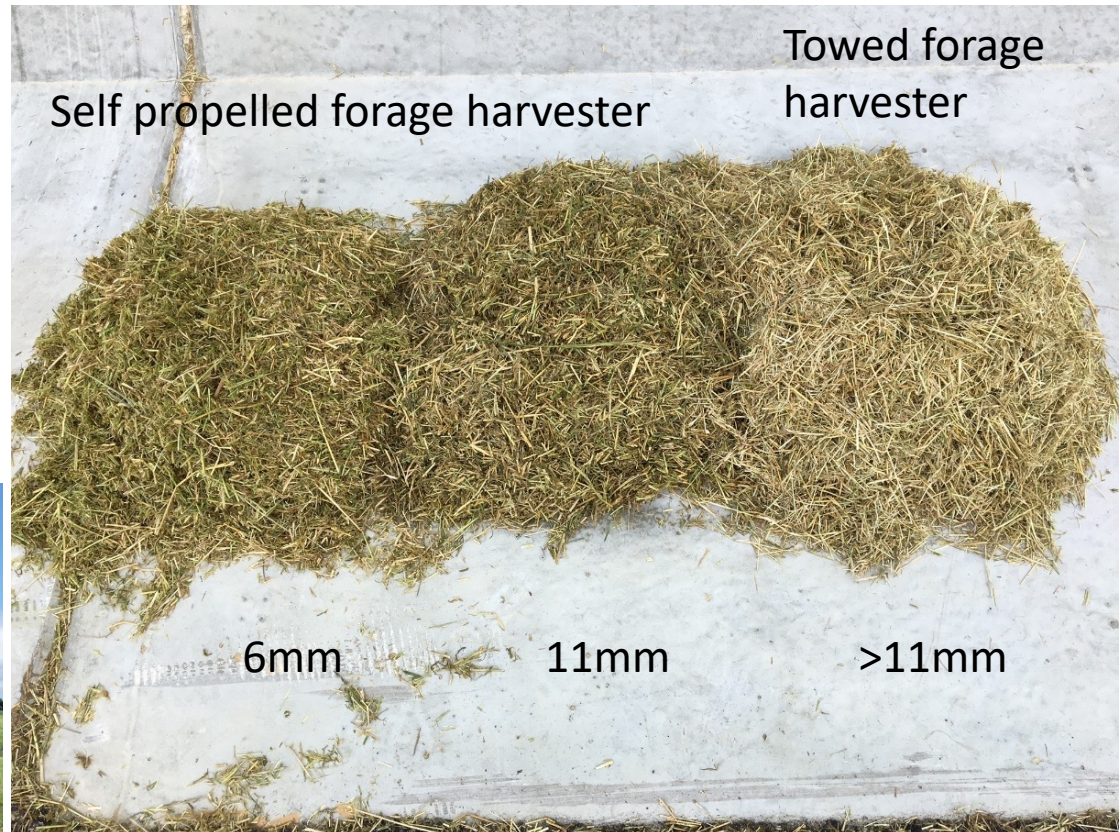
Straw from seed grass, the first treatment in the field

Using this feedstock for biogas is expanding.

Straw with dry matter content of 40 – 60% after harvest

Cut with self propelled forage harvester and made to silage

Short cut length is the cheapest pretreatment



Mobile crusher

Efficient pretreatment with high capacity

Possible to be equipped with Iron magnet belt, to separate iron

The machine crushes stones which is a benefit to avoid break down caused by trapped stones in the feed in line.

The disadvantage is that sharp crushed stones increases the wearing on especially rubber parts in pumps.

Preferred by several danish biogas plants while they can prepare crushed feedstock for 4-7 days, and downtime can be reduced.

Pretreatment cost approx. 10€ per tonnes feedstock including wheel loader.

The biogas plant still need a feed in line who can handle dry feedstock

Positive effect on reducing amount of straw in the degassed digestate.



Haybuster



Mobile crusher

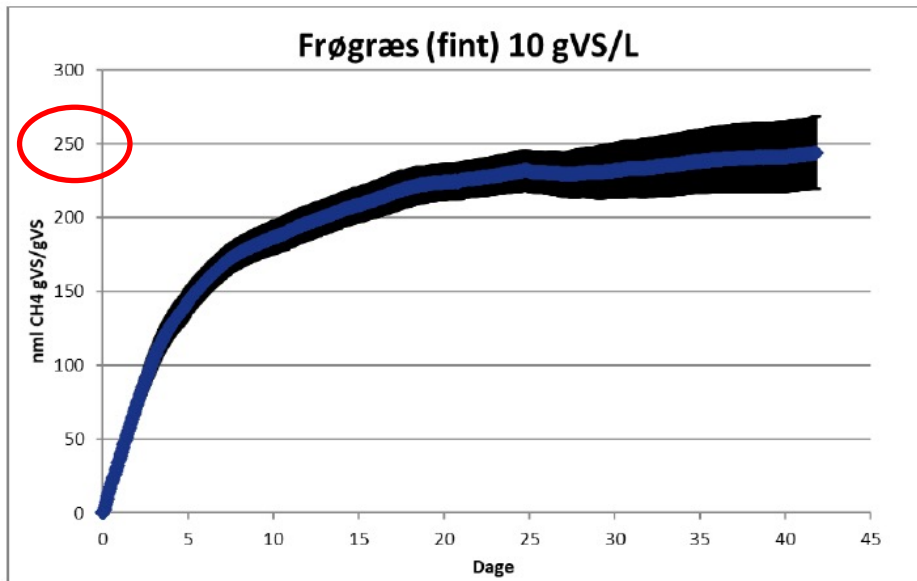
Straw from seed grass, effect of pretreatment

Anaerobic trials for 42 days retention time

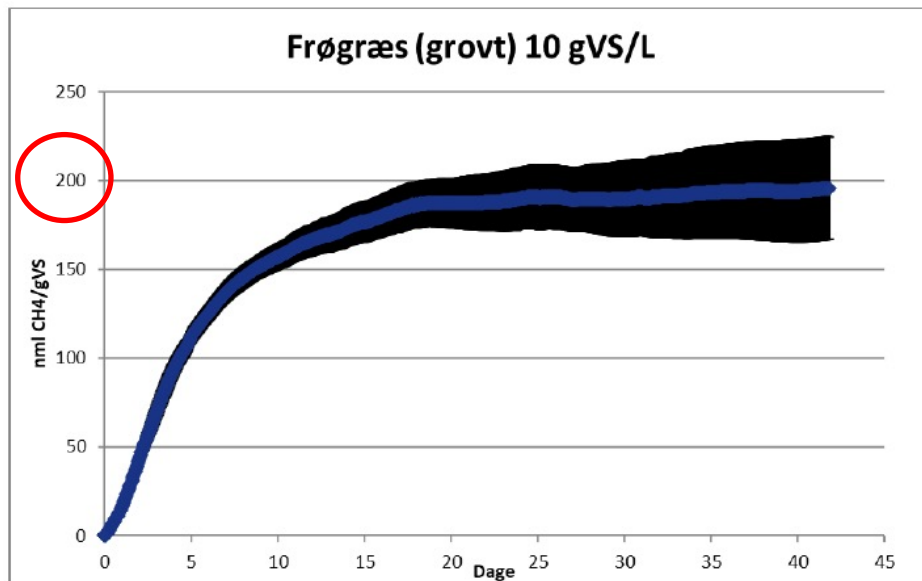
Feedstock	Dry matter content %	Volatile solids VS-%	Nml CH ₄ /g VS	Nm ³ CH ₄ /tonnes feedstock
With pretreatment	49.17	93.45	244	112
Without pretreatment	40.66	94.88	196	76



Accumulated methane production, thermophilic (black bars is standard deviation).



With crushing in mobil crusher



Without crushing in mobil crusher



Macerator

In-line treatment

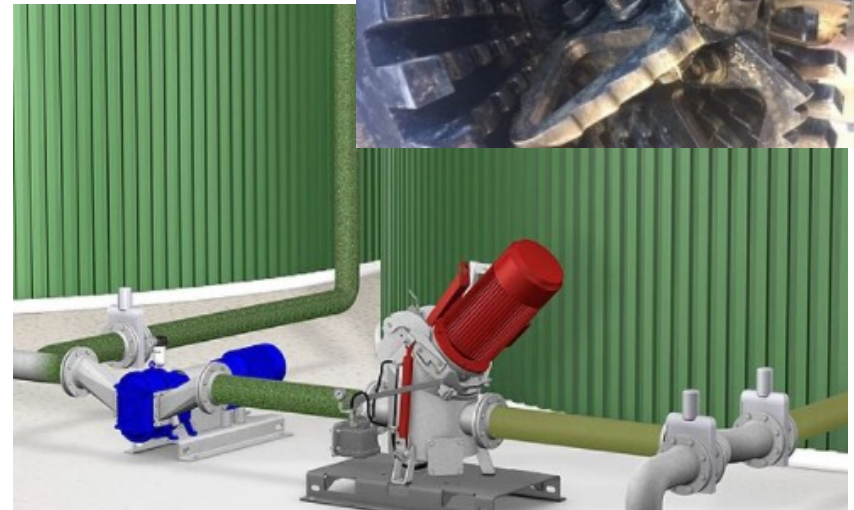
Systems to make In-line treatment of the digestate is increasing.

Makes it possible to increase the dry matter content in the digester with 1-2 %, and/or makes the degassed digestate more thin fluent.

Increases methane yield with 0.5 – 1.0 Nm³ methane per tonnes feedstock.



Grubbens Deflaker



Vogelsang Disruptor

Co-silage straw and sugar beets



Straw cut by a forage harvester and left in a pile on the field, will be mixed with washed and crushed sugar beets in the autumn. Instead of sugar beets it can be pulp from potatoes, sugar beets, wet grass etc.

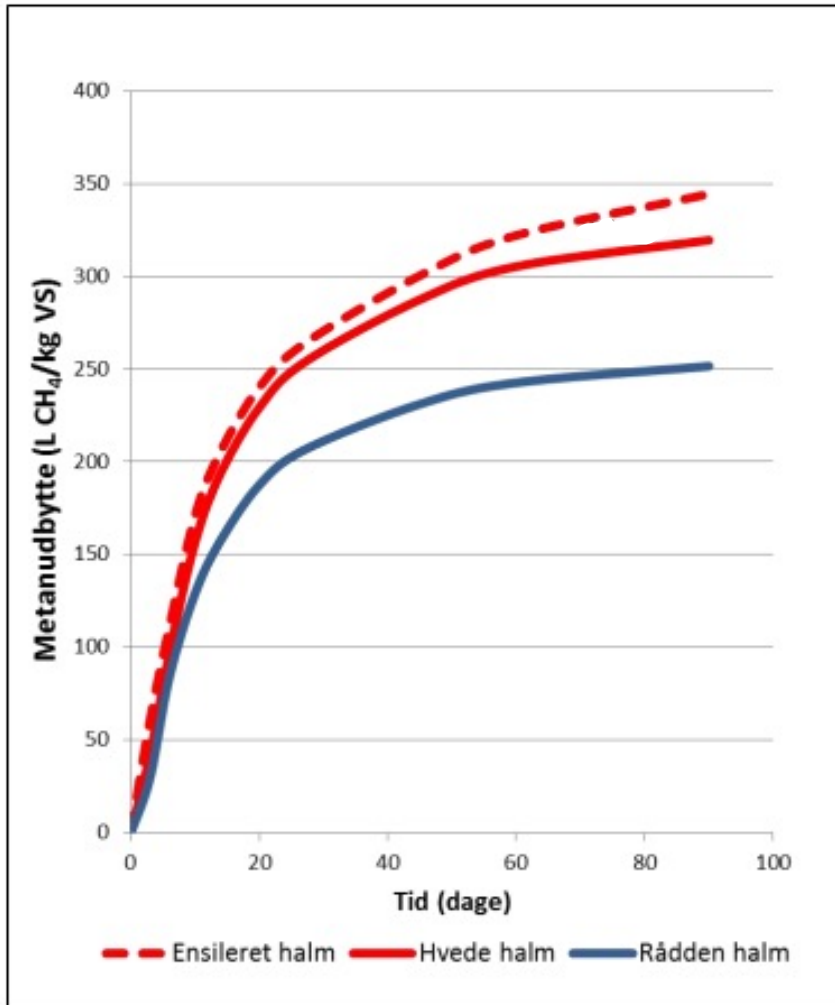
the co-silage of straw and sugar beets makes the sugar beets stock stable also during the summer.

A mix of 50% straw and 50% sugar beets makes a feedstock with a methane potential of 115-120 Nm³ methane per tonnes wet feedstock.



Straw in biogas – wet and rotten straw

Highest methane yield from straw silage



Henrik B. Møller, AU Foulum, Biogas Taskforce report 2016



Reduce the dry matter content in degassed digestate

With dry matter feed in up to 18%, and with 8 – 9% dm in degassed digestate it can be a challenge to reach a high exploitation of the nutrients in the digestate.

In-line treatment is one solution to reduce the dm content, and reach higher methane yield.

Separation of the digestate and partly reuse some of the fibre fraction again in the digester, and use the rest as fertilizer is another solution.

Reuse of 75% fibre fraction in the digester has in 2 biogas plants increased the methane yield with 1.6 and 3.0 Nm³/tonnes feedstock

Both systems are already integrated in some biogas plants.



Thank you for your attention

