

**Kanadevia  
INOVA**

# **Kanadevia Inova Schmack Biogas S.r.l.**

Wet AD Technology

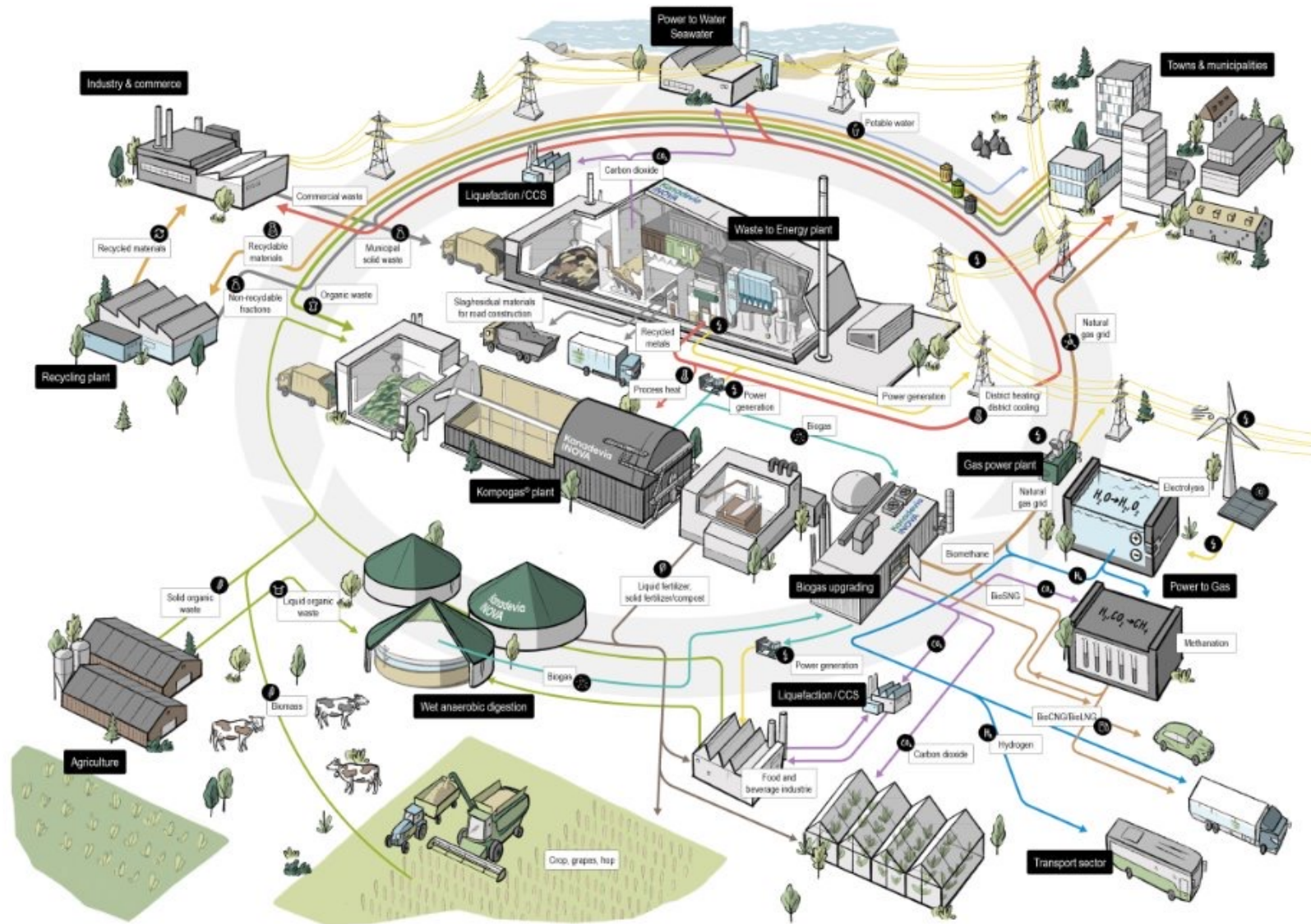
---

**Andrea Gozzi**

Regional Sales Manager & Business Development



# Plant of the future or the urban waste energy network



# Anaerobic Digestion for Agriculture

## Efficient and sustainable utilization of agricultural residues

### Anaerobic digestion plants for livestock farms and liquid agricultural residues



- **COCCUS® Mini** (75-190 kW)
- **COCCUS® S** (custom made)
- **COCCUS® Titan** (starting from 250 kW and biomethane)

### Anaerobic digestion plants for solid agricultural residues:



- **EUCOmpact** (75-100 kW)
- **EUCO® Mono** and **COCCUS® S** (custom made)
- **COCCUS® Mini** (75-190 kW)
- **EUCO® Titan** (starting from 250 kW and biomethane)

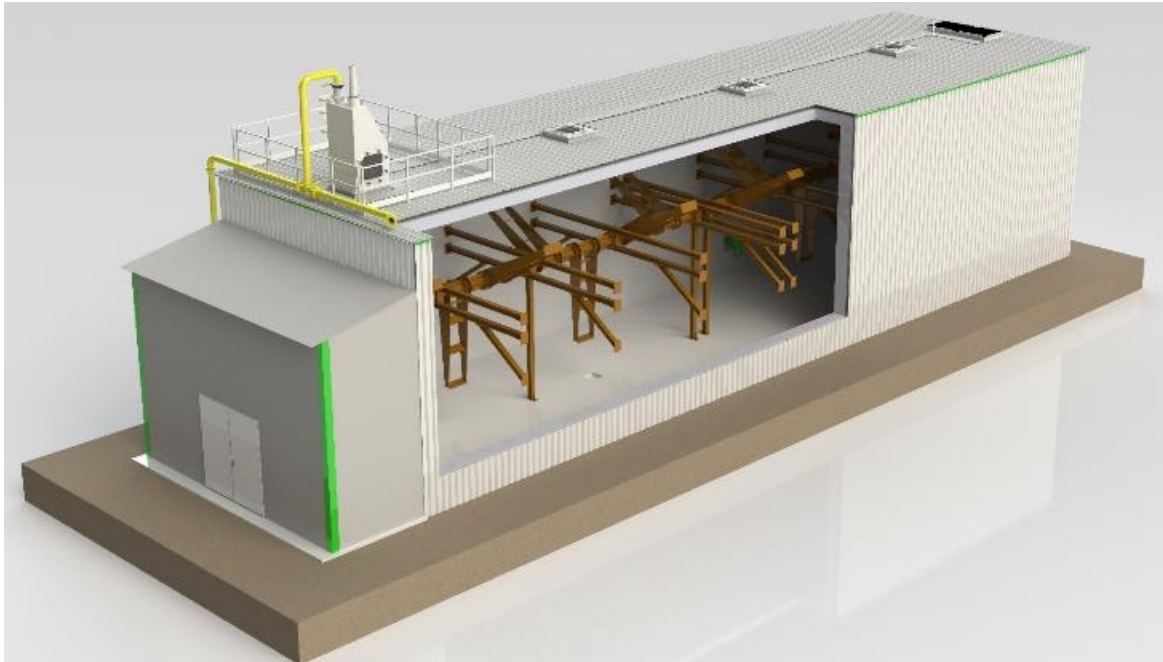
### Anaerobic digestion plants for energy crops:



- **EUCOmpact** (75-100 kW)
- **EUCO® Mono** (custom made)
- **EUCO® Titan** (starting from 250 kW and biomethane)

# Anaerobic Digestion for Agriculture - technology

## Plug-flow digester EUCO



### The EUCO plug-flow digester

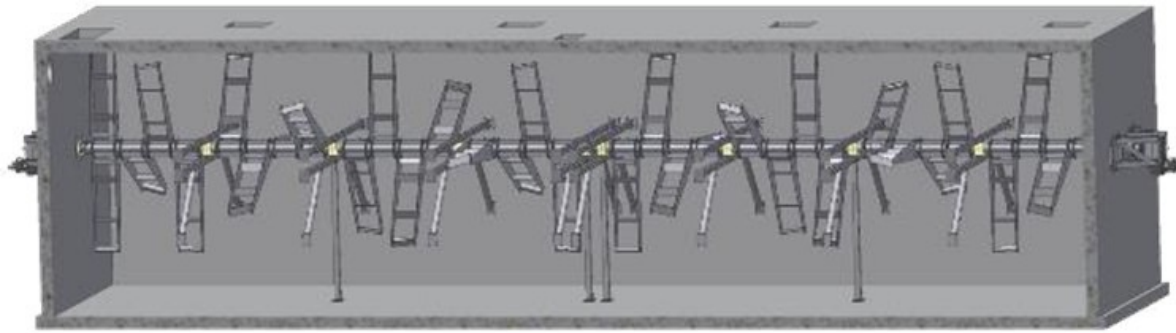
The **EUCO<sup>®</sup> Titan** plant has been continuously developed since the company was founded in 1995.

In its waste version, the plant is made up of horizontal **EUCO<sup>®</sup>** plug-flow fermenters and **COCCUS<sup>®</sup>** post-digesters, which number and size varies according to the biomass used and the size of the CHP or biogas upgrading plant.

This type of plant is available for electricity production from **300 kW up to 1 MW and more**, as well as for **biomethane** upgrading.

# Anaerobic Digestion for Agriculture - technology

## Plug-flow digester EUCO



The **EUCO<sup>®</sup> high-performance digester** is both technically and microbiologically superior to conventional tank digesters. Its **elongated horizontal form** was developed to ferment biomass with very **high percentage of dry matter**.

In the EUCO<sup>®</sup>, a **horizontal paddle agitator** mixes solid feedstock with pre-fermented material. The agitator is driven on both ends by a 3kW planetary drive unit. The positioning of the agitator and its individual paddles in the digester provide **optimum mixing** and allow operation with high volume loads.

The main function of the EUCO<sup>®</sup> is to liquefy (**hydrolysis**) the solid feedstock to provide the second-stage digester with well broken-down material. As a result of hydrolysis and the homogenisation of the feedstock, less mixing is required at the second stage. However, the EUCO<sup>®</sup> is not merely a hydrolysing digester, it even produces approximately 50% of the biogas yield. This feature of the EUCO<sup>®</sup> allows **greater flexibility** in your choice of feedstock. In combination with the second-stage digester, maximum gas yields can be achieved.

# Anaerobic Digestion for Agriculture - technology

## Plug-flow digester EUCO – How it works

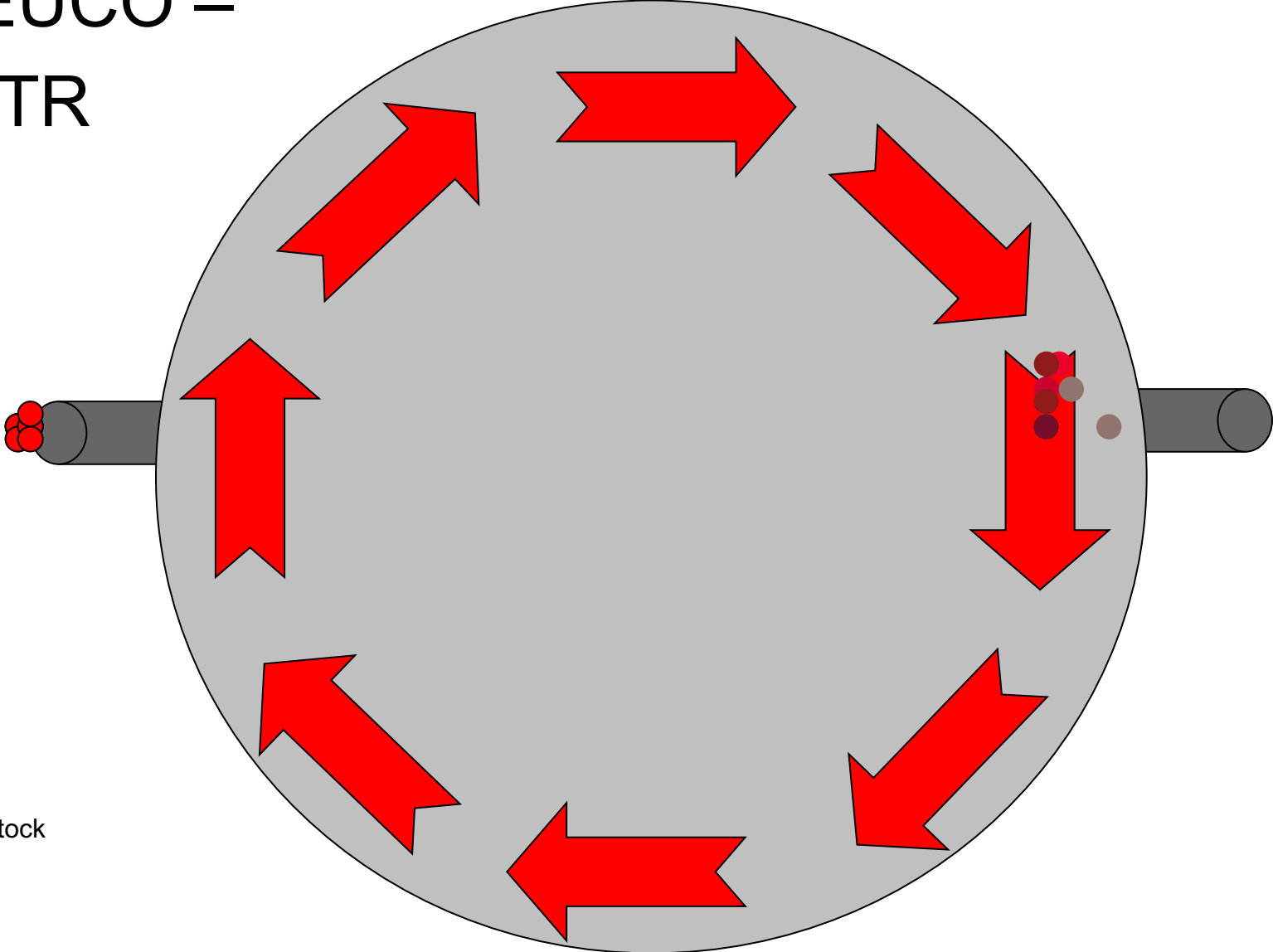


● Fresh feedstock

● Digested feedstock

# Anaerobic Digestion for Agriculture - technology

Plug-flow digester EUCO –  
differences with CSTR  
digester



● Fresh feedstock

● Digested feedstock

# Anaerobic Digestion for Agriculture - technology

## Plug-flow digester EUCO – benefits of EUCO mixer



- Even temperature distribution
- No floating layer build up
- No sinking layer build up / minimization of sedimentation
- Continual gas extraction
- Even mixing of fresh feedstock with
- digestate
- Stable biological process management



### **The result: maximum efficiency**

The EUCO digester offers the greatest feedstock flexibility, maximum volume loads combined with consistent and stable biogas production.

# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS

The tank digester **COCCUS**<sup>®</sup> is the **second stage fermenter** where the EUCO<sup>®</sup> is also present. It becomes the **main fermenter** where there is no solid biomass or their quantity is insufficient to justify the use of the continuous flow fermenter.

It consists of a fermenter with a gross volume between 800 and 1200 m<sup>3</sup> (COCCUS Mini, with a single REMEX<sup>®</sup> mixer) or between 1600 and 5500 m<sup>3</sup> (COCCUS, with two, three or four REMEX<sup>®</sup> mixers).

Wall heating and large blade agitators REMEX<sup>®</sup> allow ideal heating and agitation of the substrate to maximize biogas production.



# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS – REMEX agitators

A reliable and sturdy agitator is the motor of every biogas plant. It ensures that the substrate is uniformly mixed. Sinking or floating layers are thus not able to form, and the gases are stirred out.

The continuously running paddle agitator Remex<sup>®</sup> is particularly well suited for renewable resources and liquid manure. The slow and steady agitation process is gentle to bacteria and thus ensures optimal fermentation. Stoppages (that promote the formation of swimming layers) are therefore not necessary. A particular advantage is the very low electricity consumption.

Maintenance work is possible at any time without any problems. All electrical component parts as well as the drive motor and the agitator's gearbox are located outside the fermenter and are thus easily accessible.



# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS – REMEX agitators

### Benefits:

- Extremely low parasitic load
- Very sturdy and durable
- Self-lubricating polyamide bearing
- Horizontal and vertical mixing
- Exterior motor and gear
- Low failure rate
- Low maintenance



# Anaerobic Digestion for Agriculture - technology

## How CSTR digesters work

- CSTR fermenters can have different geometries:
  - Fermenters with development in height
  - Fermenters 1:1
  - Fermenters with development in width
  
- Tank geometries greatly influence the technical and biological functioning of the digester

# Anaerobic Digestion for Agriculture - technology

## How CSTR digesters work

### Fermenters with development in height

#### Features

- They are fermenters with a narrow base and vertical development
- They are usually made of steel
- They have vertical mixing from above
- They are suitable for very liquid supplies

#### Advantages

- They occupy a small area

#### Disadvantages

- If the feeding surface is too dense, you have to dilute it very much.
- High cost of soil consolidation to withstand loads
- No integrated gasometer and therefore no desulphurization



# Anaerobic Digestion for Agriculture - technology

## How CSTR digesters work

### Fermenters 1:1

#### Features

- They are fermenters with radius/height ratio close to 1
- They are usually equipped with paddle stirrers
- They are suitable for a wide variety of feeding plans
- They are made of reinforced concrete

#### Advantages

- They control the digestion flows of the biomass in the feed
- Optimal temperature control
- Work with dense materials and low recirculation
- Integrated gasometer and desulphurisation

#### Disadvantages

- They are more expensive than digesters with width development



# Anaerobic Digestion for Agriculture - technology

## How CSTR digesters work

### Fermenters with development in width

#### Features

- They are wide and low fermenters.
- They usually mount submersible mixers
- They usually use a desulphurization net
- They are made of reinforced concrete
- Heating system usually in steel

#### Advantages

- Optimize construction costs

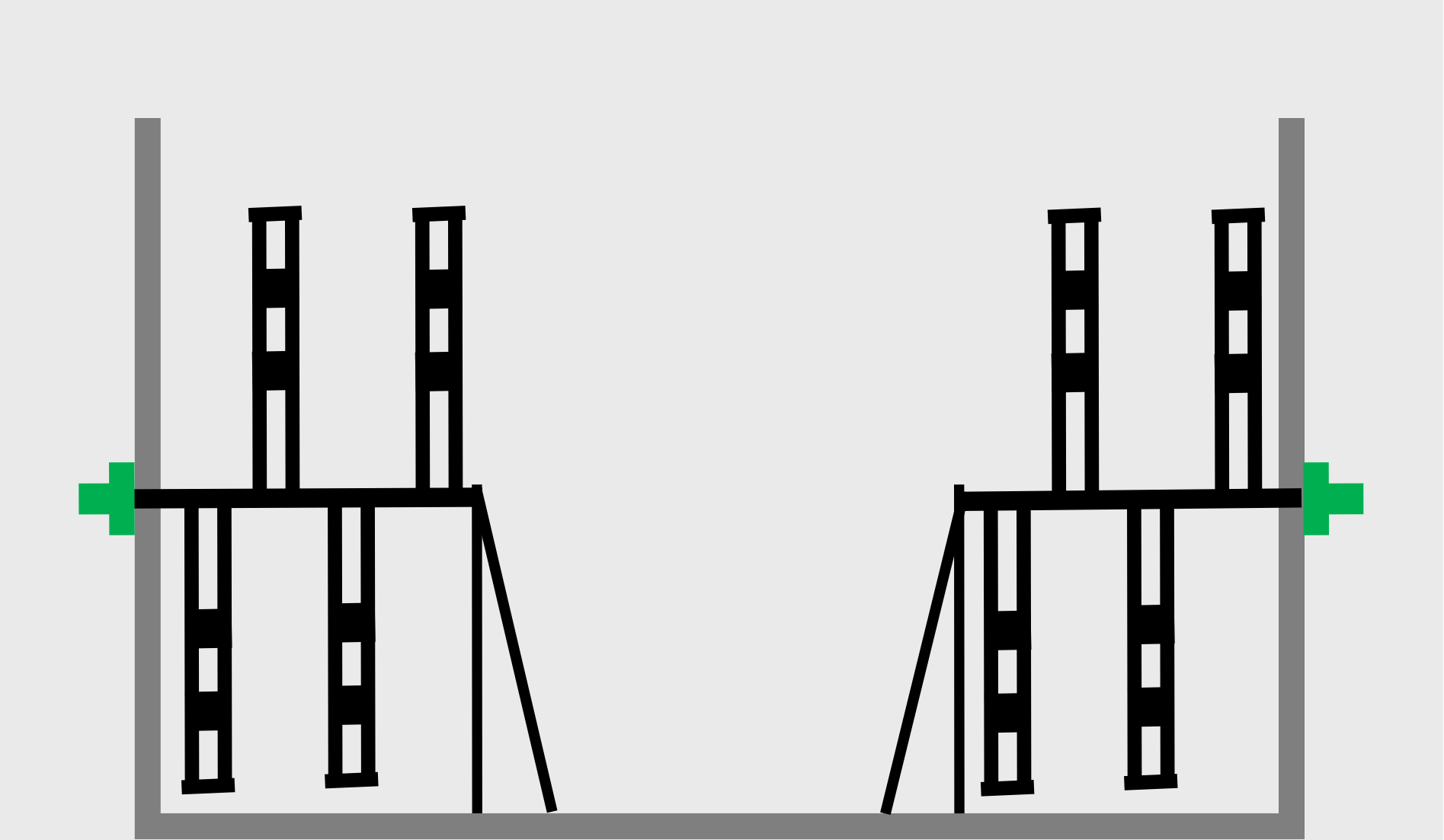
#### Disadvantages

- The temperature in the middle of the digester is lower
- Requires diluted power supplies
- High heat loss from above
- There is no control of biomass digestion flows



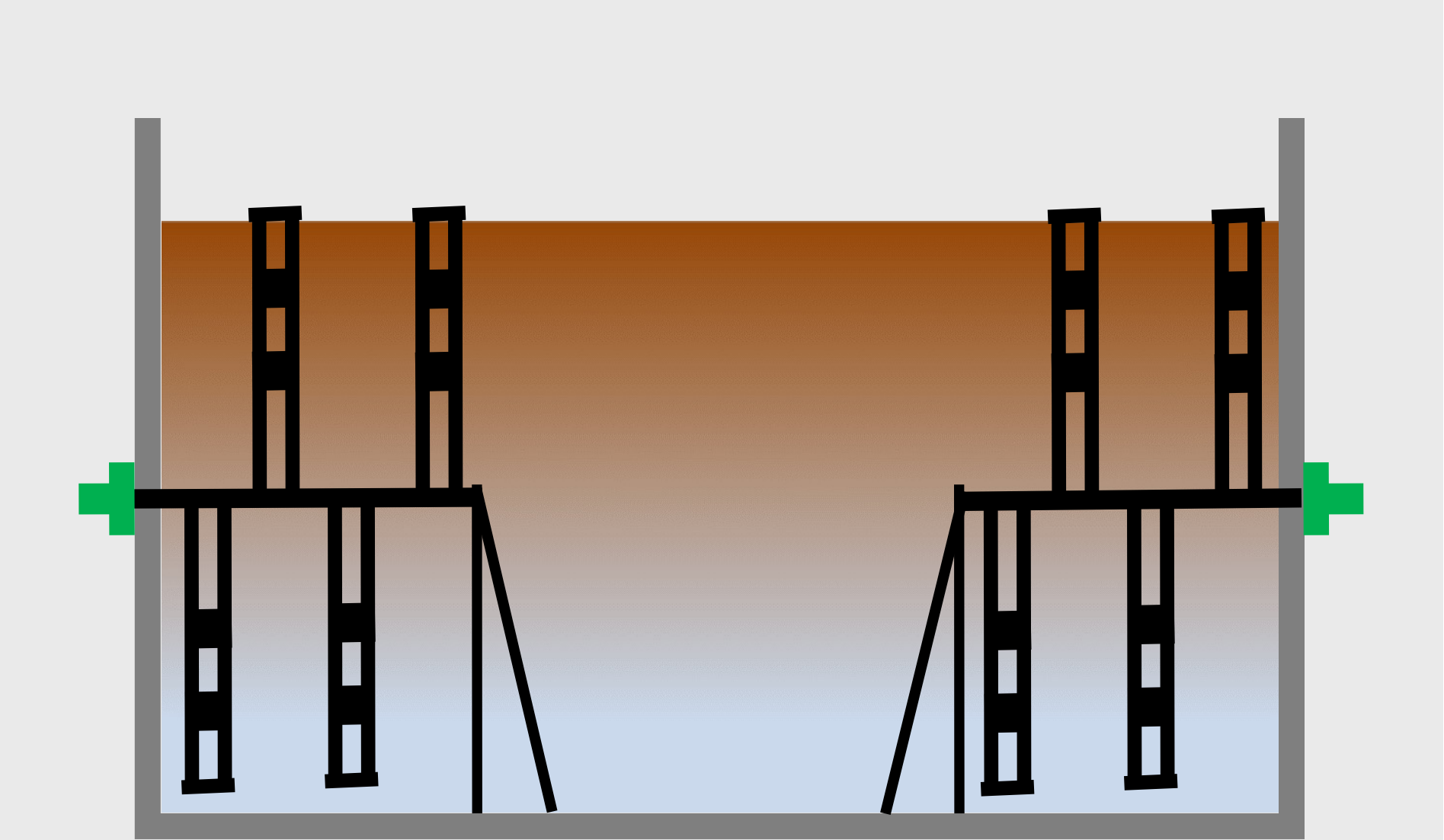
# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS



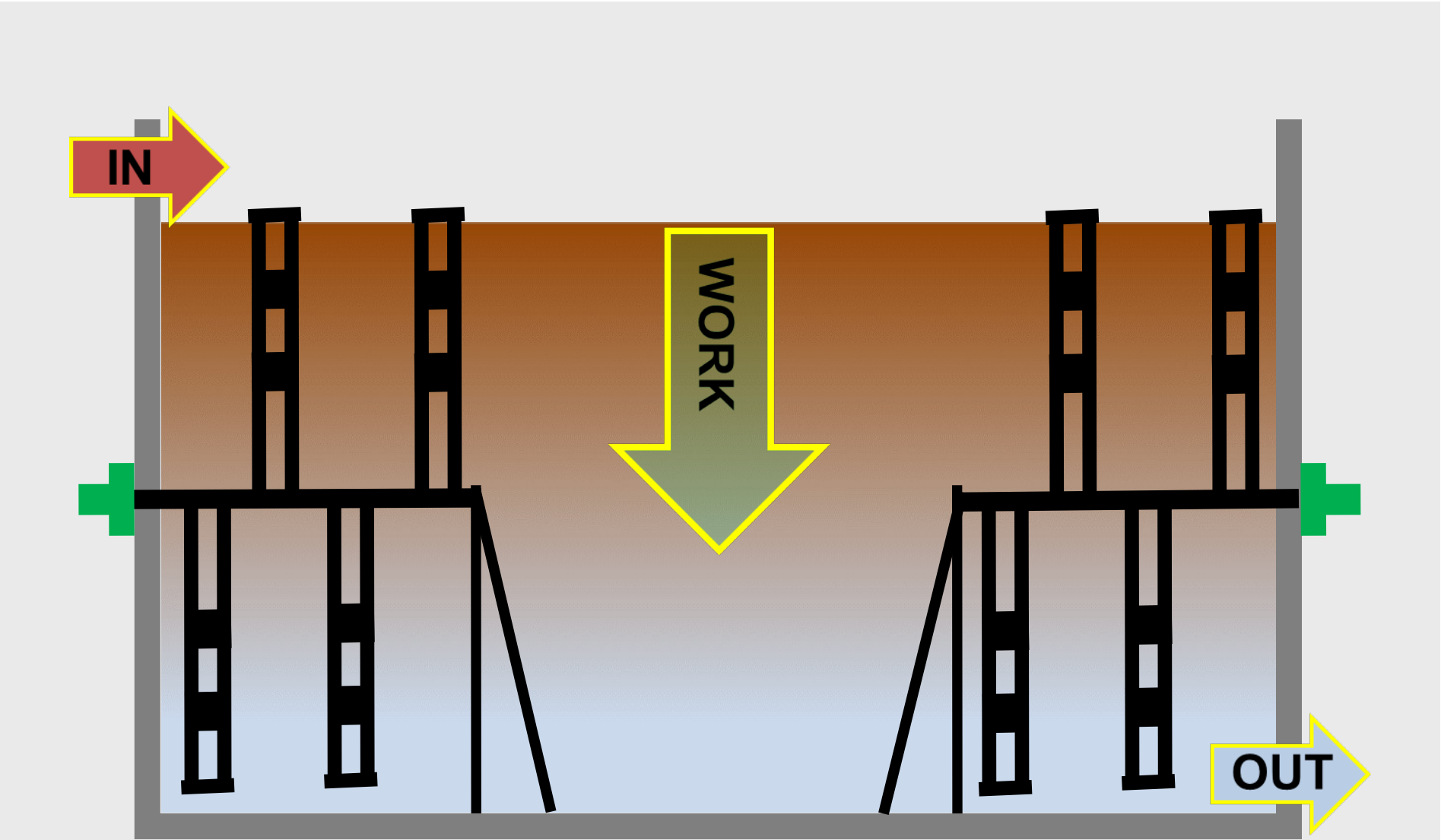
# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS



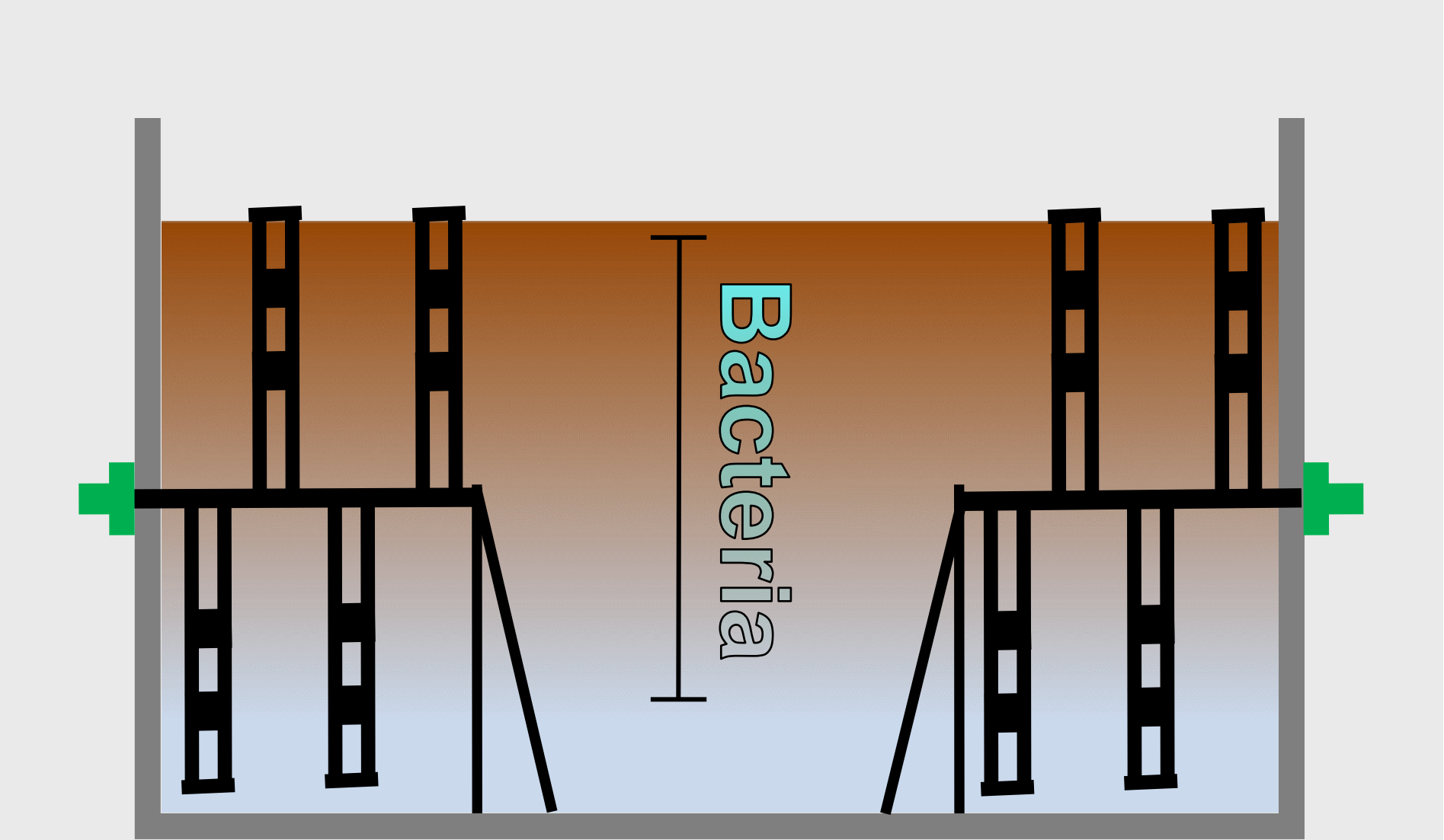
# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS



# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS



# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS - sizing

Comparison of HRT and sizing between a Coccus Titan plant and a plant with submersible mixers technology

250 m<sup>3</sup>/h biomethane plant with the following feeding plane:

Raw material	Qty [t/a]	% of total	SS
Cattle manure	7.000	20,59%	24%
Cattle slurry	10.000	29,41%	8%
Corn silage	8.000	23,53%	33%
Beet pulp	9.000	26,47%	23%
<b>Total</b>	<b>34,000 t/a</b>		<b>Average: 21%</b>

Technical parameters:

	Coccus Titan with Remex	Fermenter with submersible mixers
Max HRT	4 kg oDM/m <sup>3</sup> /d	2.5 kg oDM/m <sup>3</sup> /d
Max average dry matter in the fermenter	9,5%	6,5%
Max average dry matter in fed biomasses	22/23%	12%

# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS - sizing

Parameter	Coccus Titan	Submersible mixers
Digesters	2 x <b>2700</b>	2 x <b>4000</b>
Recirculation of separated liquid	15 m <sup>3</sup> /day	55 m <sup>3</sup> /day
Dilution with water	-	27 m <sup>3</sup> /day
Theoretical HRT	59	89
Real HRT	<b>49</b>	<b>44</b>
Volumetric organic load	3,7 Kg oDM/m <sup>3</sup> d	2,6 Kg oDM/m <sup>3</sup> d
DM average in fed biomasses	21%	12%

# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS - sizing

To have stable biological parameters, a plant mixed with submersible mixers needs about 3000 m<sup>3</sup> more than the digestion volume of a Coccus Titan plant.

**+60% volume required**

Despite the larger volume, the HRT of the plant is 5 days less

**-10% HRT even with 3000 m<sup>3</sup> more volume**

# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS - sizing

Parameter	Coccus Titan	Submersible mixers
Digesters	2 x 2700	2 x 2700
Recirculation of separated liquid	15 m <sup>3</sup> /day	55 m <sup>3</sup> /day
Dilution water	-	27 m <sup>3</sup> /day
Theoretical HRT	59	59
Real HRT	<b>49 days</b>	<b>29 days</b> ←
Volumetric organic load	3,7 Kg oDM/m <sup>3</sup> d	<b>3,7 Kg oDM/m<sup>3</sup> d</b> ←
DM average in fed biomasses	21%	12%

# Anaerobic Digestion for Agriculture - technology

## CSTR digester COCCUS - sizing

If the same volume is maintained, the plant will be biologically unstable and over time will reach the biological block.

The organic load of 3.7 is too high compared to the maximum value tolerated by the submersible mixers

**+ 50% organic overloading**

The HRT of the plant with submersible mixers is far below the Coccus Titan plant, 29 days (vs. 44 days).

**-40% HRT**

With such a low HRT, a lower biomass yield can be expected.

**- 5% / -7% biogas yield of the biomass**

**Kanadevia**  
**INOVA**

**We care.**  
**We deliver.**  
**We innovate.**

**Andrea Gozzi**

Regional Sales Manager

[Andrea.Gozzi@kanadevia-inova.com](mailto:Andrea.Gozzi@kanadevia-inova.com)