



IBBA

INTER BALTIC BIOGAS ARENA

Landia[®]

GasMix

Presenter: Thorkild Maagaard, Export Sales Director

Landia[®]

The Challenge



How to handle and utilize lignocellulosic substrates in biogas plants?



AARHUS
UNIVERSITY

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Findings revealed on the performance of
Landia GasMix digester mixing system
Alastair James Ward, Aarhus University



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What is Landia GasMix?

Landia GasMix is a Patent Pending Digester Mixing System

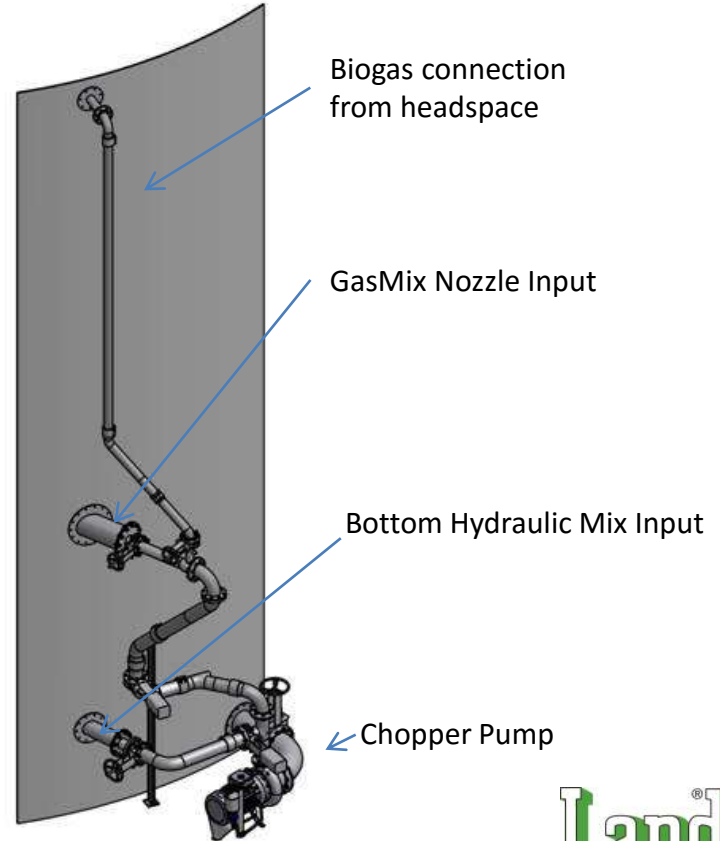
Externally mounted – no parts inside the digester

Venturi upstream of GasMix draws headspace biogas into liquid stream

Mixing by means of mixture of biogas and liquid

Part of the GasMix is Chopper Pump with effective chopping device in terms of cutting blades

More than 200 GasMix sold worldwide



Examples of Landia GasMix Applications



Pre-treatment



Digester Mixing



Sludge Mixing- and Treatment

Processes examined

1. Energi Viborg Spildevand A/S wastewater treatment plant: GasMix fitted to paired anaerobic digesters treating primary and secondary sludge and waste grease
2. Madsen Bioenergi I/S agricultural biogas plant: GasMix fitted to paired heat exchange tanks upstream of primary anaerobic digestion tanks
3. LBT Agro K/S agricultural biogas plant: GasMix fitted to one of three anaerobic digester tanks for evaluation prior to GasMix being fitted to all tanks

1. Energi Viborg Spildevand, Waste Water Treatment Plant

Parallel paired reactors @ 1600m³ each
37°C operating temperature
HRT 20 days
GasMix fitted to R1 – R2 hydraulically mixed
TS ~2%

**The methane production from R1 with
GasMix was 2.7% greater than R2**



2. Madsen Bioenergi

Treats 285 tons cattle and pig slurry, deep litter manure and maize silage daily

Single mixing tank feeds two heat exchangers (HE) of 25m³. HE1 fitted with GasMix system - HE2 fitted with pump mixing. TS 11%

Process maintains two line parallel operation to main digesters and post digesters before being mixed in final storage tanks (all 4600m³ 30 day HRT in each)



Very comparable process lines fed from the same mixing tank

Samples taken for viscosity measurement

Electrical power consumption to the GasMix Chopper Pump measured throughout the heat exchange process

Gas flow rate is not measured for individual reactors but a mass balance of volatile solids was made



Viscosity Measurements

Visibly very different, also "feels" different

Viscosity in HE2 (no GasMix) was 46% greater than HE1



HE1

HE2



Plant Mixing Requirements

The plant operator has felt confident to reduce the mixing in the digesters and post digesters following GasMix application in the HE1 unit:

Tank	Operation time (mins)	Pause time (mins)	Mixing power per day (kWh)	Saving per day (kWh)
R1	100	140	750	150
R2	120	120	900	
ET1	110	130	660	60
ET2	120	120	720	

Mass Balance

Samples collected on different dates had different TS and VS but input to the HE tanks was almost identical on each occasion

There was a 11% greater removal of VS in the post digester that used HE1 (GasMix)

No significant difference was found in the main reactors, suggesting the more slowly degradable material was affected by GasMix

3. LBT Agro

- › Treats around 250 tons of liquid manure, deep litter, glycerol and a variety of agricultural wastes daily
- › Three parallel reactors of 1500m³ each plus post digestion/storage
- › Thermophilic operation 50°C
- › Gas scrubbing and grid injection

Data collected showed that the GasMix reactor had a 10.8% greater methane production than those without



What does GasMix do?

Improves mixing of floating layers by reducing density near the surface: floating material sinks into reactor

~ 11% greater methane production / VS reduction on high TS agricultural plants

Smaller advantage on sludge reactors (TS only 1.9%)

Pre-treatment effect on the substrate, more noticeable on lignocellulosic material

The Landia GasMix system causes particle size reduction and reduction in cellulose crystallinity

Summary of GasMix Advantages

Increased biogas production

Greater VS removal

Reduced viscosity =
lower mixing requirements

