WEBER ENTEC

INCREASE OF BIOGAS YIELD THROUGH ULTRASOUND

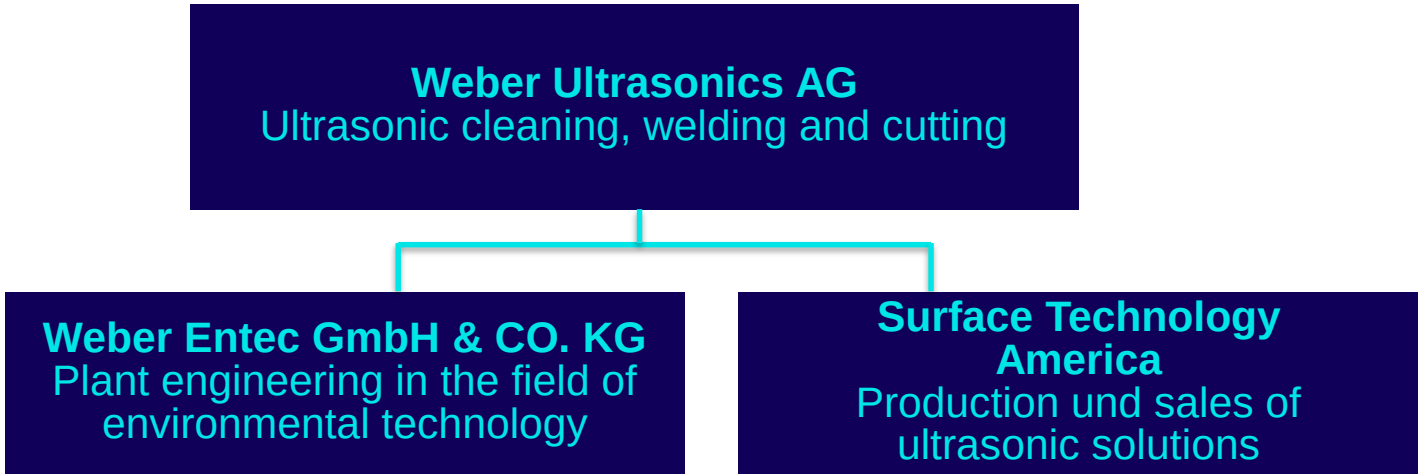
ANTING GRAMS

HEAD OF SALES

THAI-GERMAN TECHNOLOGY CONFERENCE BIOGAS

11/2017

STRATEGY: UNITED COMPETENCE IN ULTRASOUND



WEBER ULTRASONICS PORTFOLIO

Solving complex tasks in ultrasonic cleaning, ultrasonic welding or in environmental technology is all in a day´s work for us. With a broad range of products, Weber Ultrasonics offers innovative ultrasonic components ideally tailored to the diverse requirements.

APPLICATION OF ULTRASOUND DISINTEGRATION

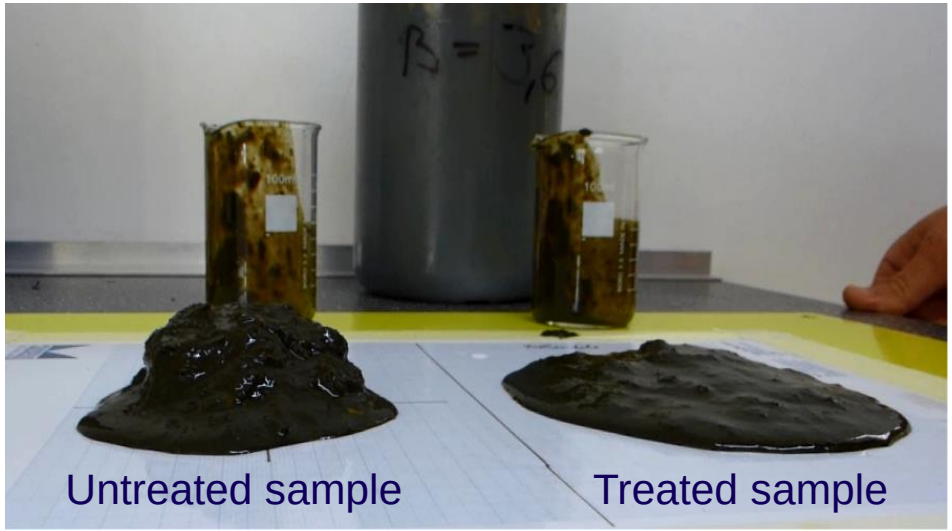
BIOGAS PLANTS

- Increase of biogas production
- Reduction of feed stock at equal performance
- Acceleration of organic degradation
- Consistent decrease of viscosity
- Reduction of pump- and stirring energy demand

WWTPs

- Increase of biogas production
- Reduction of sludge to be diposed
- Consistent decrease of viscosity
- Improved decanting
- Elimination of foam / fibrous bacteria

IMPROVED FLOW PROPERTIES



Direct comparison of the untreated and treated sample just after operation of the disintegration machine

After BioPush Treatment:

- Reduced viscosity
- Improved flow properties
- Decrease of energy consumption (pumping, stirring)
- More stable biology
- Higher proportion of difficult substrate usable (grass, manure,…)

EFFECTS OF THE ULTRASOUND DISINTEGRATION

PHYSICAL PRINCIPLE – CAVITATION

Ultrasound liberates enzymes and shears up the substrates

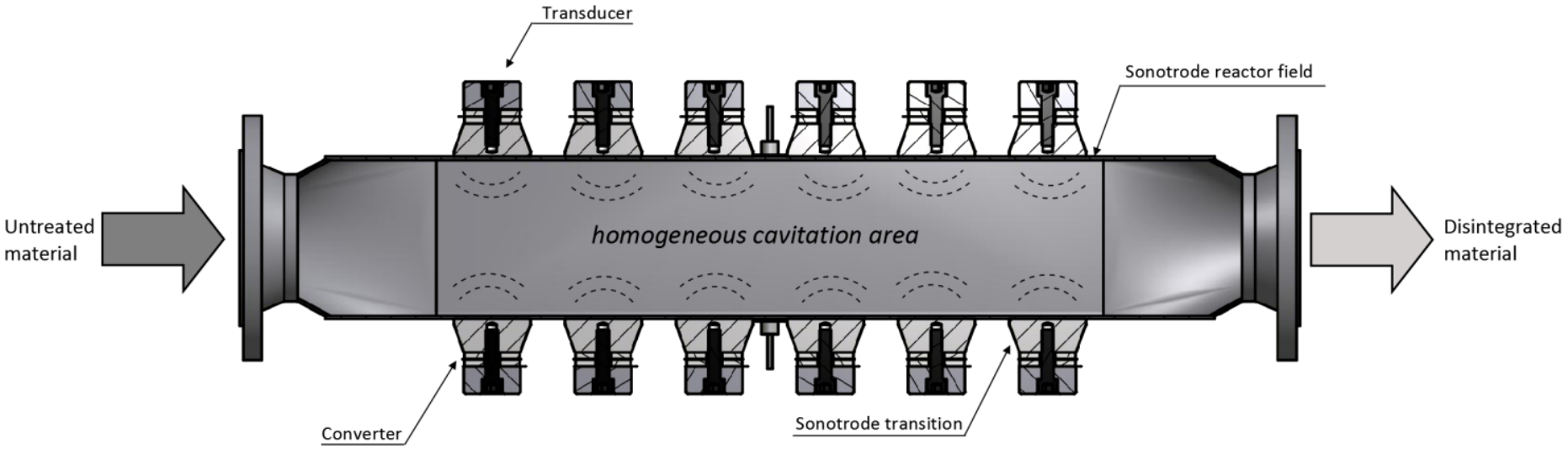
Physical principle: Cavitation

Short term local µm-radius

- Extreme high temperature (up to 5.000 C°)
- Extreme high pressure (up to 1.000 bar)
- Extreme high acceleration ⟶ Shear forces

Multiply enlarged cavitation bubble in the moment of implosion

ULTRASOUND REACTOR BIOPUSH – THE NEXT GENERATION ULTRASOUND



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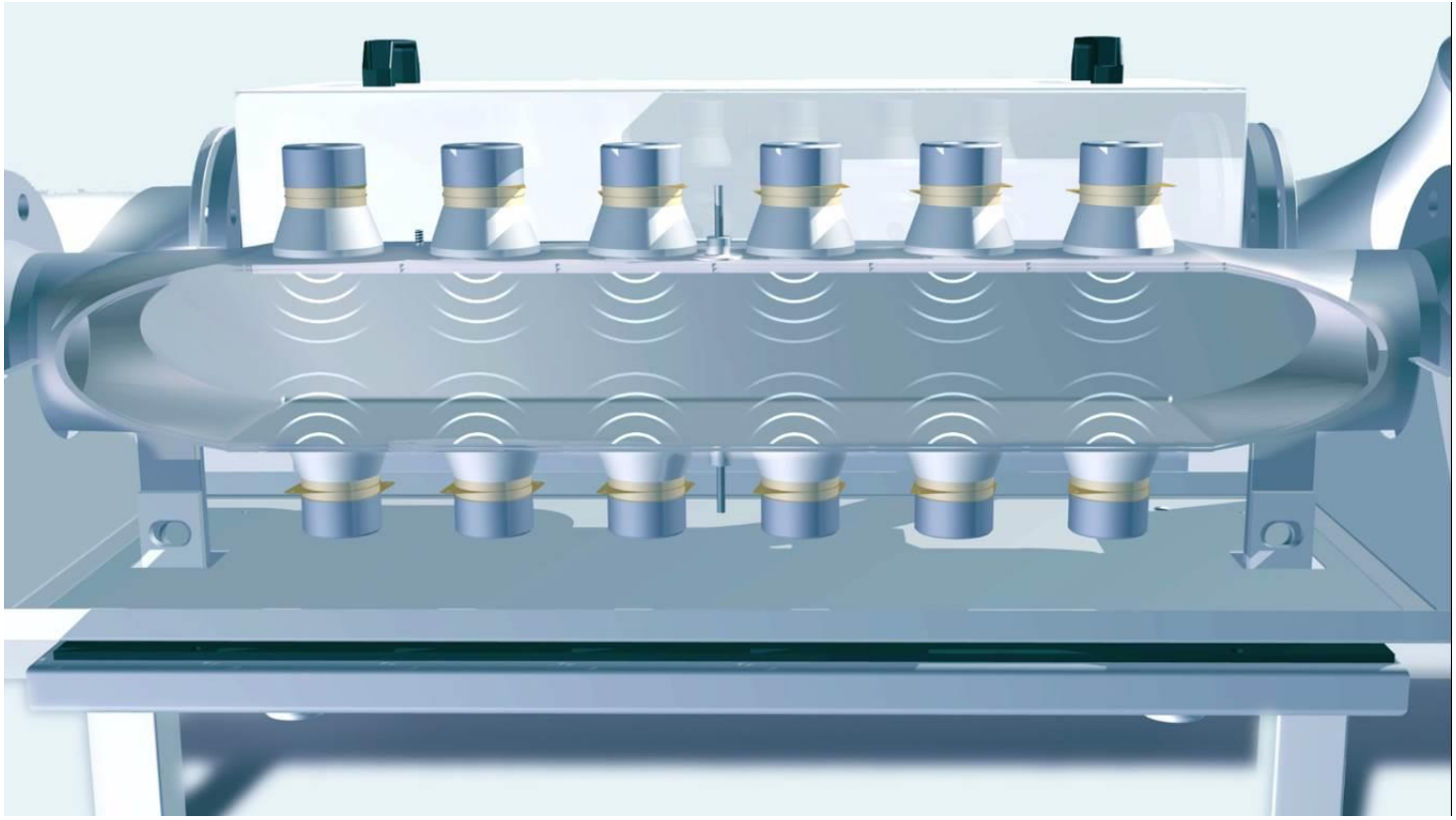

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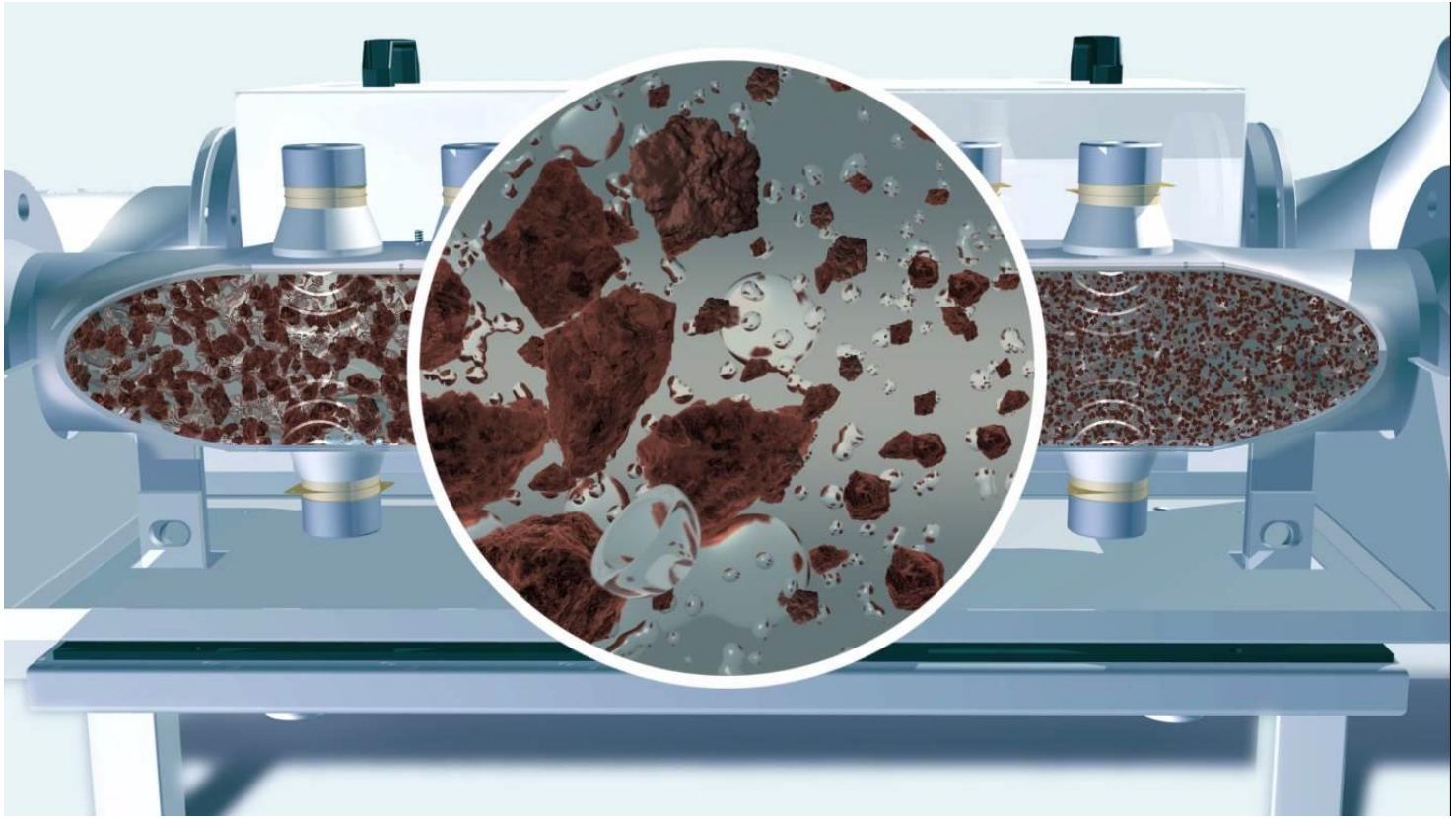


ULTRASOUND REACTOR BIOPUSH – THE NEXT GENERATION ULTRASOUND

- Designed specifically for agricultural and municipal fermentation plants
- Treatment of non homogenous substrates with high demand of total solids (up to 15% TR)
- 2.000 W or 3.000 W ultrasonic energy input per flow cell
- Optimized energy input because of homogenous ultrasonic field
- Absolutely maintenance free
- High operational safety – 100% clogging free
- High durability (up to 3 years and more)

GENERAL MACHINE DESIGN – DESIUS

1 Ultrasound unit

Cell rupture and surface augmentation

Mobilization of Exo-Enzymes

Sustained decrease of viscosity in fermenter

Ultrasonic power 2 kW per unit

High durability – up to 3 years and more

2 Mechanical Pre- treatment

Improved sound efficiency and machine protection RotaCut 3.000

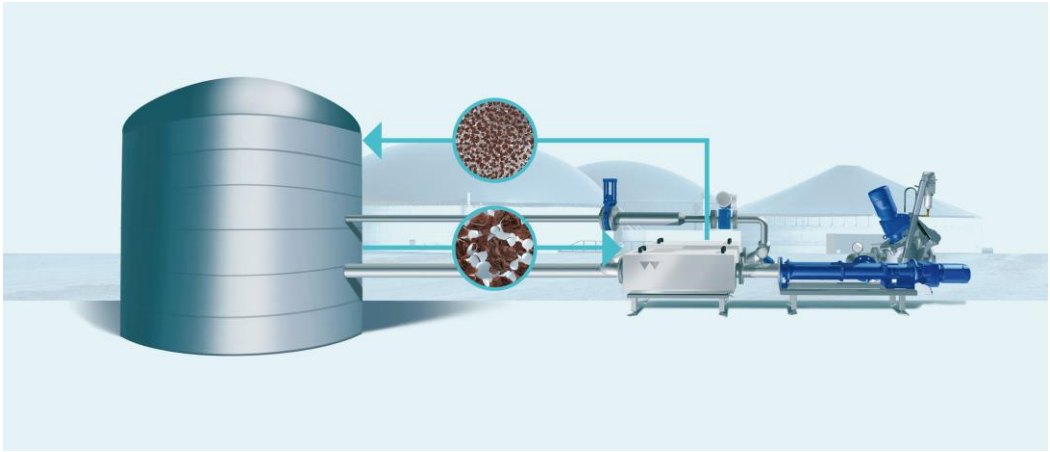
3 Feeding pump

Excentric screw pump 0.5 to 2.6 m^3/h

4 Sensors

2 x pressure gages,
2 x temperature sensor,
1 x flow meter

POSSIBLE INTEGRATION EXAMPLES IN BIOGAS PLANTS



Main digester Ultrasound disintegration unit

REFERENCE LIST CASE STUDIES

BIOGAS PLANT 716 kW BIOENERGIEDORF JÜHNDE

Jühnde is Germany‘s first bio-energy-village

- Founded in the year 2005
- 30.000 interested visitors until now
- Only in Germany 150 villages followed this model

BIOGAS PLANT 716 kW BIOENERGIEDORF JÜHNDE

Aim of ultrasound disintegration plant :

- Higher gas production
- Improved flow properties of biomass
- More stable biology
- Decrease of energy consumption
- Less wear and tear on pump and stirring aggregates

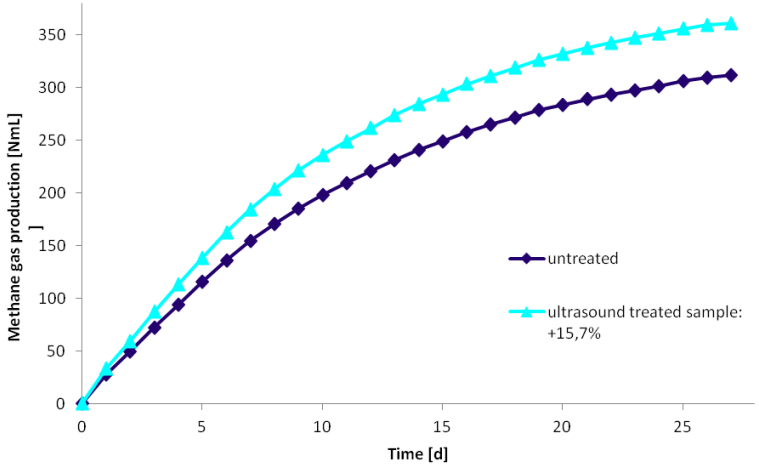
BIOGAS PLANT 716 kW BIOENERGIEDORF JÜHNDE

Location	D-Jühnde
CHP	716 kW
Ultrasound power	4 kW
Feed stock	Maize silage, grass, manure

BIOGAS PLANT 716 kW BIOENERGIEDORF JÜHNDE

Result:

- 15% higher gas production
- Improved flow properties



→ The guaranteed performance improvement was clearly exceeded and the performance proof provided by an independent 3rd party laboratory.

BIOGAS PLANT 716 kW BIOENERGIEDORF JÜHNDE

BIOGAS PLANT THAILAND

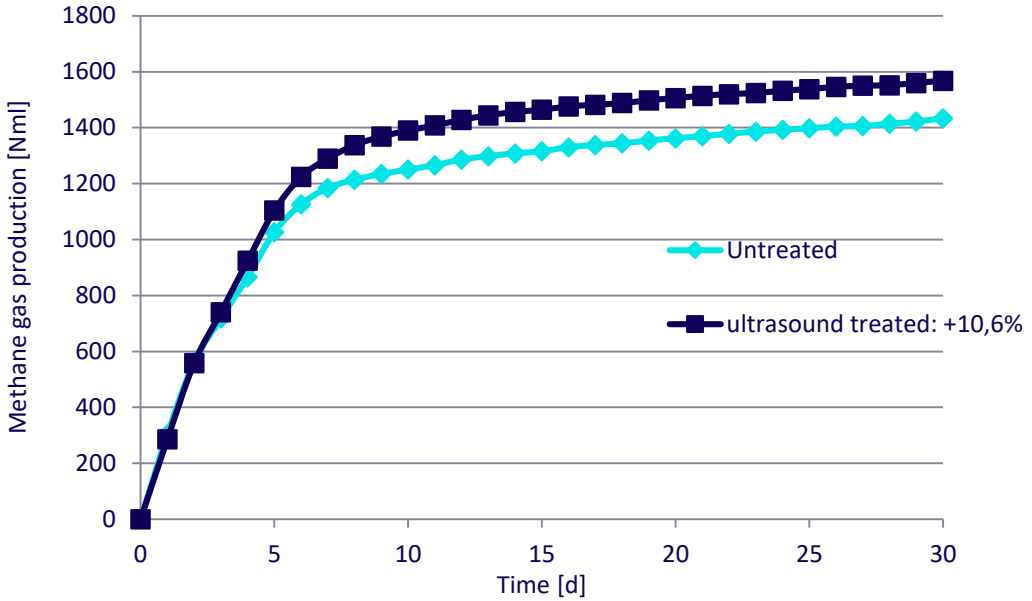
Location	TH - Surat Thani
Ultrasound power	6 kW
Feed stock	POME, Decanter cake

BIOGAS PLANT THAILAND

BIOGAS PLANT THAILAND

Result:

- 11% higher gas production



WWTP SINGAPORE

Aim: More biogas, reduction of disposal costs (less sludge)

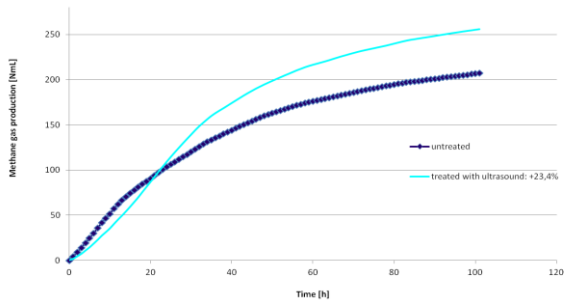
Location	Singapore
Population equivalents	1.500.000
Ultrasound power	32 kW

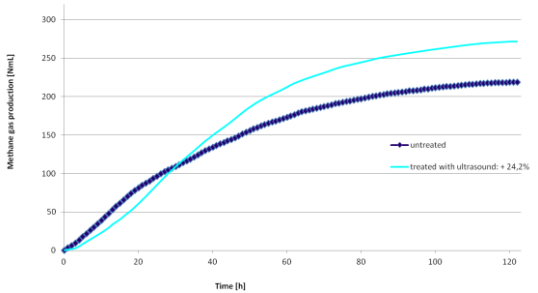
Over a period of 8 weeks, various samples were taken and the increase of gas yield of the ultrasound treated samples compared to the untreated samples.

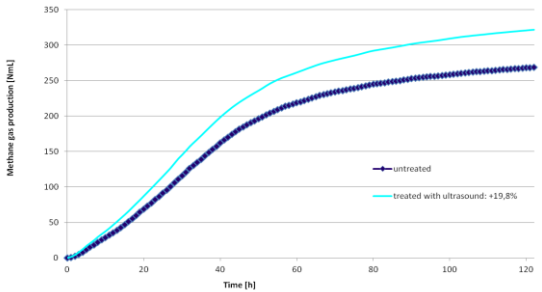
A selection of these tests is to find on the next slide.

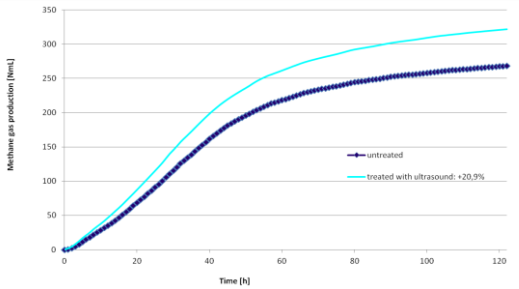
WWTP SINGAPORE

Result: An independent laboratory confirmed the average performance increase as 22%.









THANK YOU

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