



# EnviTec Biogas – the allrounder with global experience

*February 2021*

# Agenda

- 1 **Company profile**
- 2 Biogas – an allrounder
- 3 Technology
- 4 Manufacture EnviThan
- 5 Service
- 6 EnviTec – Indian market
- 7 References

# EnviTec Biogas AG

## Our company at a glance



- EnviTec Biogas is a full-service biogas provider who covers the entire value chain for the production and processing of biogas
- Market leader in Europe
- Since July 2007 listed on the Frankfurt Stock Exchange
- Headquarter in Lohne (Germany)
- 213.6 Mio. Euro turnover in 2019
- Thereof abroad 76.3 Mio. Euro in 2019
- 13.1 Mio. Euro EBIT in 2019
- About 430 employees worldwide



## Key investment criteria

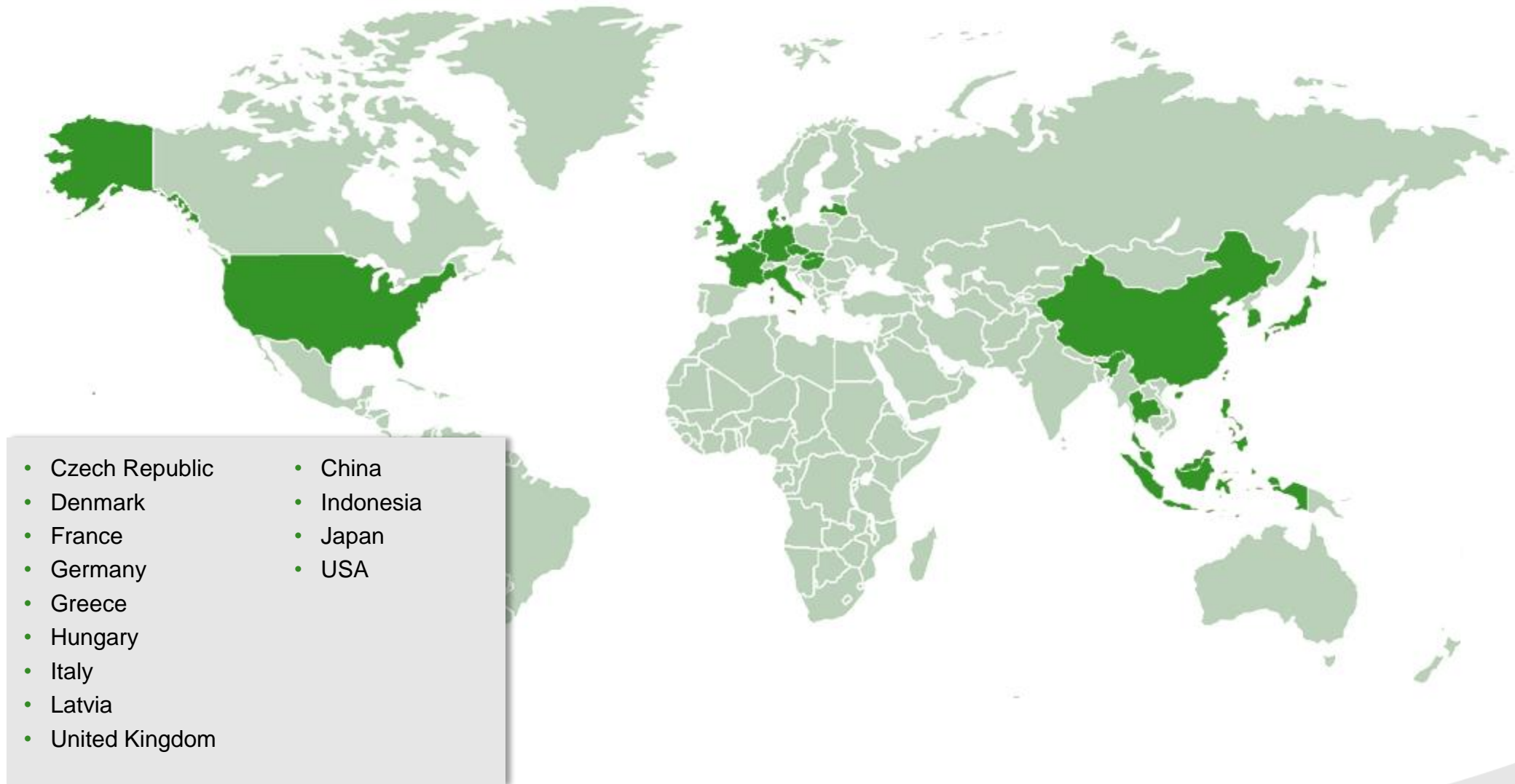


- ✓ Highest installed capacity in the biogas sector  
*(more than 675 modules worldwide with an installed capacity of >470 MW)*
- ✓ From small plants to large-scale projects  
*(biogas plants from 250 kWel to 20 MWel // EnviThan gas upgrading from 75 Nm<sup>3</sup>/h biomethane to 5000 Nm<sup>3</sup>/h)*
- ✓ 24-hour service
- ✓ Financial stability
- ✓ Seasoned international expertise



# EnviTec Biogas AG

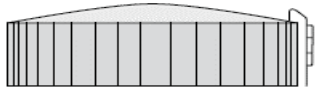
## Subsidiaries & strategic cooperations in 13 countries



# Our business segments

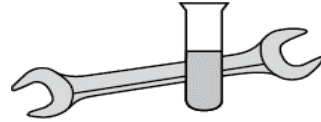
Tailor-made solutions along the entire value chain for the production of biogas

## PLANT CONSTRUCTION



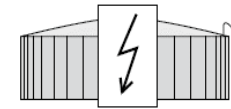
- Engineering
- Permission
- Implementation
- Commissioning
- Repowering

## SERVICE



- Biological service
- Technical service

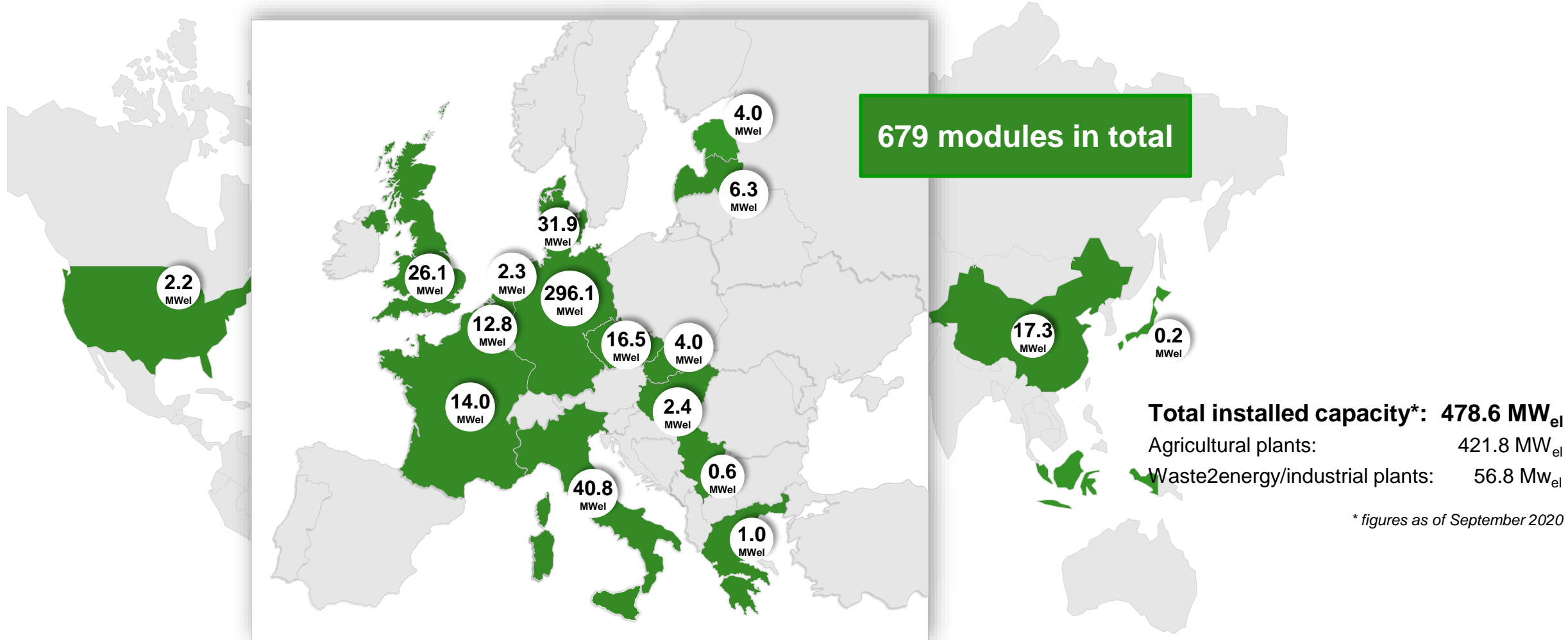
## OWN PLANT OPERATION



- Operation and own investments
  - Plant management
  - Purchase of raw material
  - Logistic
- (only in Germany)*
- Direct marketing of electricity
  - Purchase and sales of biomethane
  - Green heat from biomethane CHP

# No. 1 provider of turnkey biogas plants in Europe

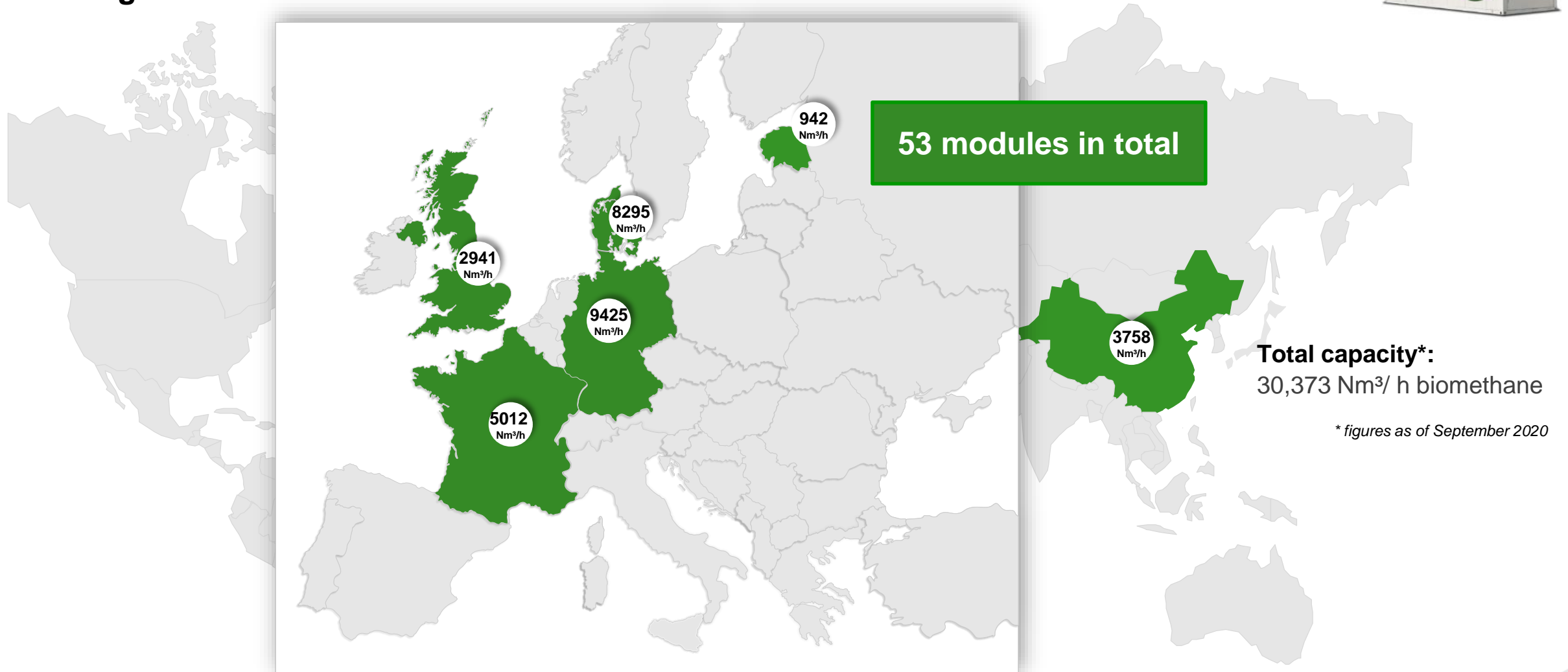
## EnviTec plants in operation



Biogas plants built by EnviTec generate about **4.2 billion kilowatt-hour CO<sub>2</sub>-neutral electricity** per year, providing more than **1.35 million households!**

# EnviThan gas upgrading

## A global success



 Our EnviThan plants provide more than **375,000 households** with green energy! (→ this is equivalent to a country like Mauritius)



# Our strong partner network



Delegations of German Industry & Commerce  
German Industry & Commerce Co. Ltd  
Beijing • Shanghai • Guangzhou • Hong Kong SAR • Germany

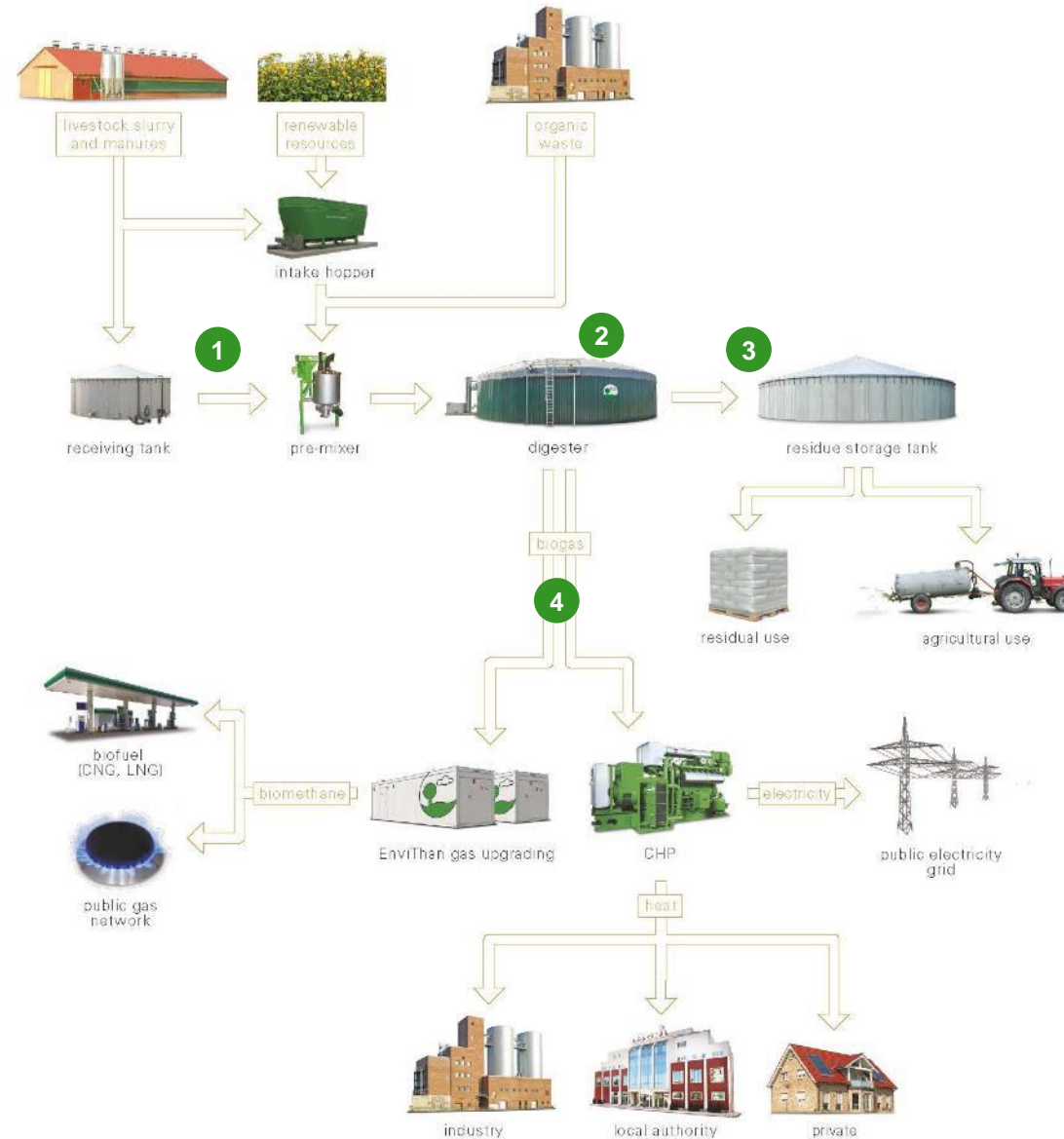


# Agenda

- 1 Company profile
- 2 **Biogas – an allrounder**
- 3 Technology
- 4 Manufacture EnviThan
- 5 Service
- 6 EnviTec – Indian market
- 7 References

# Biogas – an allrounder

## Process of energy generation



- 1 Preparation and pre-treatment of feedstock
- 2 Biogas production through fermentation
- 3 Fermented residue storage
- 4 Biogas utilization

# Biogas – an allrounder

## Different input materials

- Renewable raw materials from agriculture (all kind of green mass, crops, maize) → straw is hard to digest
  - often expensive because they are grown separately
- agricultural waste (poultry dung, chicken dung, cow dung, cow manure, grain dust, press mud, sugarcane)
  - often cheap and easy to collect
- Municipal waste, vegetable market waste, waste generated at hotels or commercial locations...
  - Good gas yields but the waste must be sorted → also some difficult biological aspects

# Biogas – an allrounder

## Biogas utilisation - different options



- Electricity and heat → CHP
- Biomethan → purification of the raw gas → feed into the gas grid
- Further processing to **CNG** and **LNG**
- Utilisation of raw gas for hydrogen (H<sub>2</sub>) (future)

# Agenda

- 1 Company profile
- 2 Biogas – an allrounder
- 3 **Technology**
- 4 Manufacture EnviThan
- 5 Service
- 6 EnviTec – Indian market
- 7 References

# First Class Technology

## Our concept for your success:

- + High quality standards, maximum safety
- + Flexibility through tailor-made concepts
- + High efficiency and reliability of EnviTec plants
- + Innovative and award-winning technology
- + Long-term and own plant operation experience
- + Everything from one source

*(Concept development - turnkey plant construction - commissioning - full service)*



# Gas storage

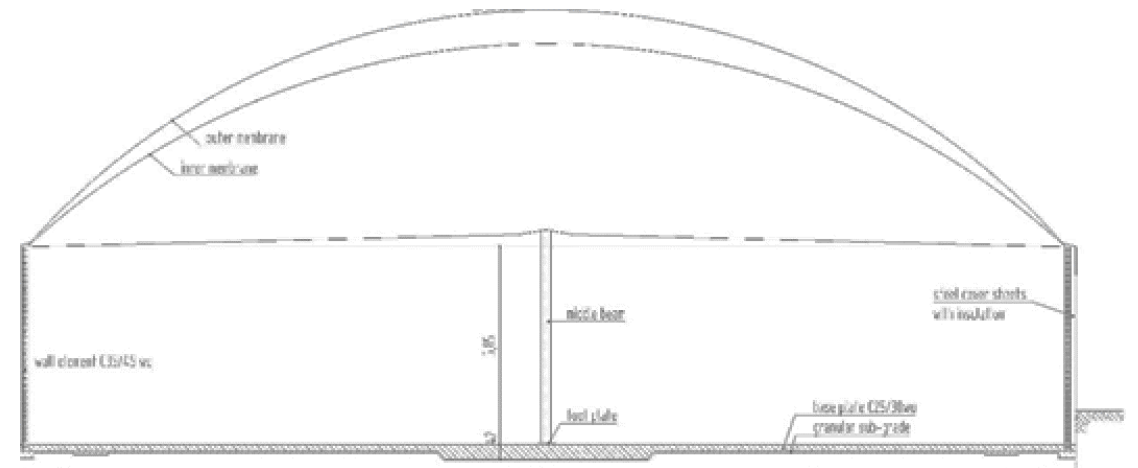
## Roof



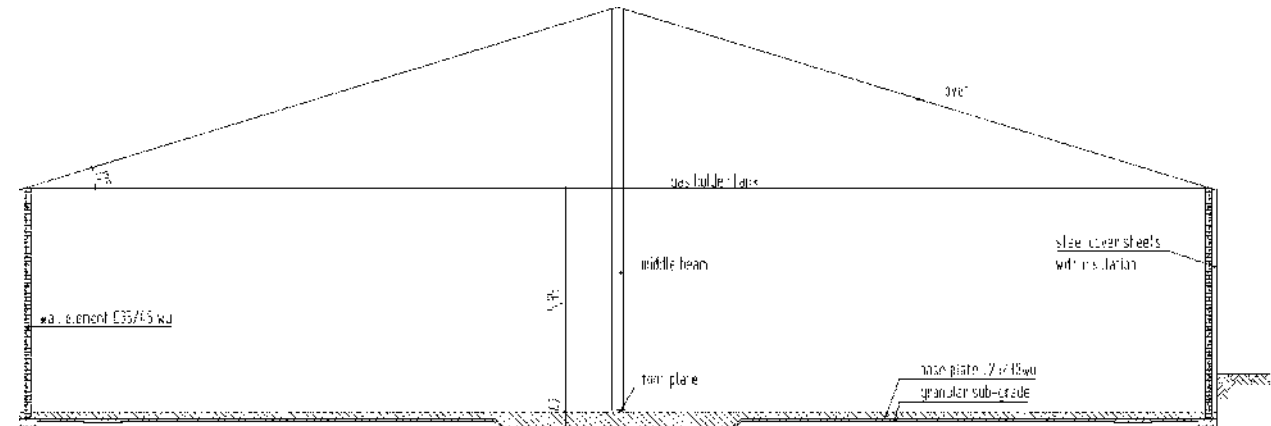
### Advantages of our technology:

- + Flexible storage volume
- + Gas-tight cover to minimize odour emissions
- + Extremely strong and long-lasting
- + Different static loads for wind and snow
- + Different kinds of roofs are available

#### • Air-blown Cover



#### • Gas-tight cover with internal gas holder







# Digester

## Tank construction

### Advantages of our technology:

- + Own tank construction  
(EnviTec-Greten Behälterbau GmbH & Co. KG)
- + High proven quality
- + Use of pre-fabricated concrete elements from stock
- + Fast construction time
- + Flexibility and scalability





# Pre-Mixing and Homogenisation

## Kreis-Dissolver

### Advantages of our technology:

- + High performance mixing technology for substrate pretreatment
- + Patented system / process developed by EnviTec and Niemann
- + Multi-feed capable
- + Removal of impurities (like stones)
- + Easy stirring in the digester
- + Optimal mixture ratio of the substrate
- + Optimized homogenisation = higher gas yield





## Pre-Mixing and feeding of input materials

### Börger Powerfeed feeding system

- 3rd Generation of the Power Feed Twin System
- Can feed multiple fermenters
- Recirculate direct from the digester or liquid slurry's is used as transport liquid
- System can be adjusted to different input materials

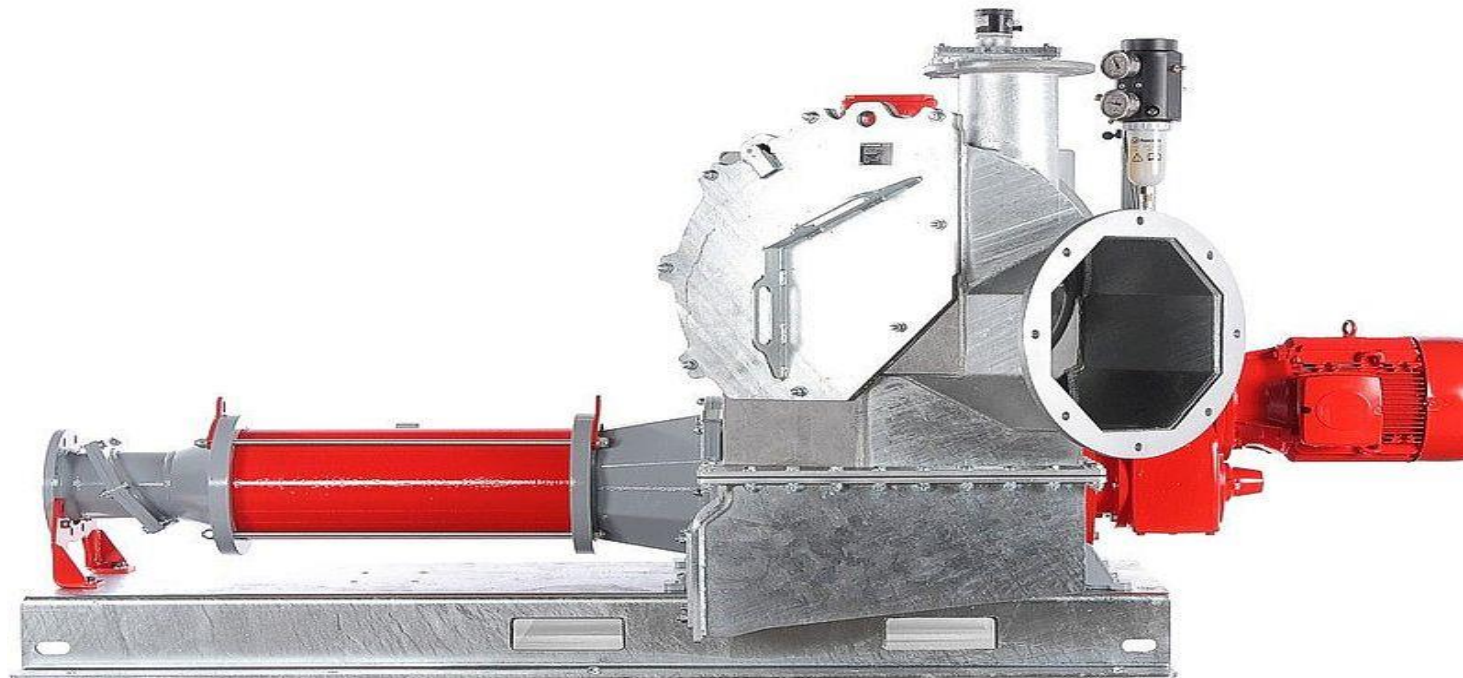




## Pre-Mixing and feeding of input materials

### Vogelsang Pre-Mix feeding system

- Can feed multiple fermenters
- Downstream pump, recirculate is used as mixing material in the Rota Cut
- System can use different input materials
- Automatic removal of impurities (stones, wood pieces etc.)



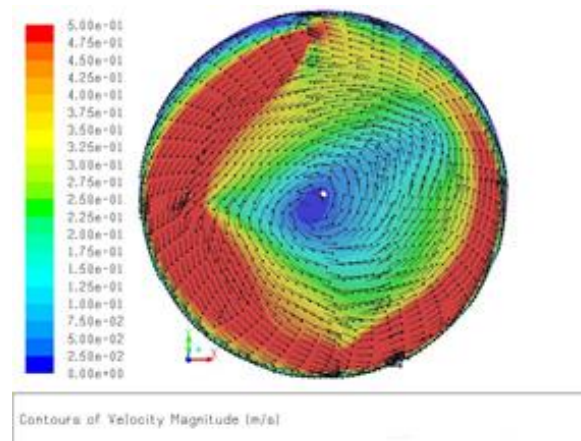


# Agitator

## Mid-size agitators, Submersible agitator

### Advantages of our technology:

- + Agitators adjustable (in height and laterally) to individual operating conditions
- + Completely stirred digester
- + Use of different agitators for best performance
- + Optimized energy costs
- + Easy to maintain and long maintenance intervals





# Engine

## Combined Heat and Power unit (CHP)

### Advantages of our technology:

- + Long-life cycle
- + High capacity and efficiency
- + Strong partnership with the internationally leading manufacturer of CHP (2G Energietechnik GmbH / Jenbacher)
- + EnviTec experts carry out engine maintenance and overhaul for all biogas plants with Jenbacher co-generation plants

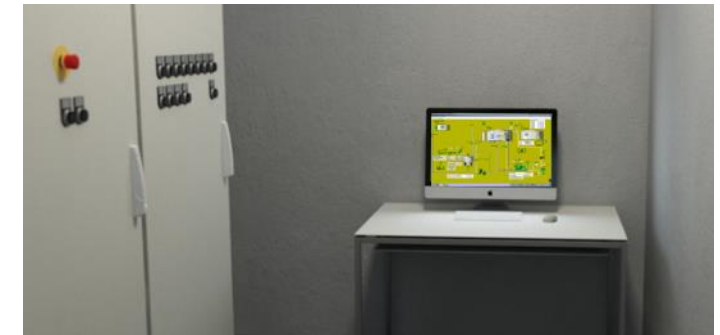
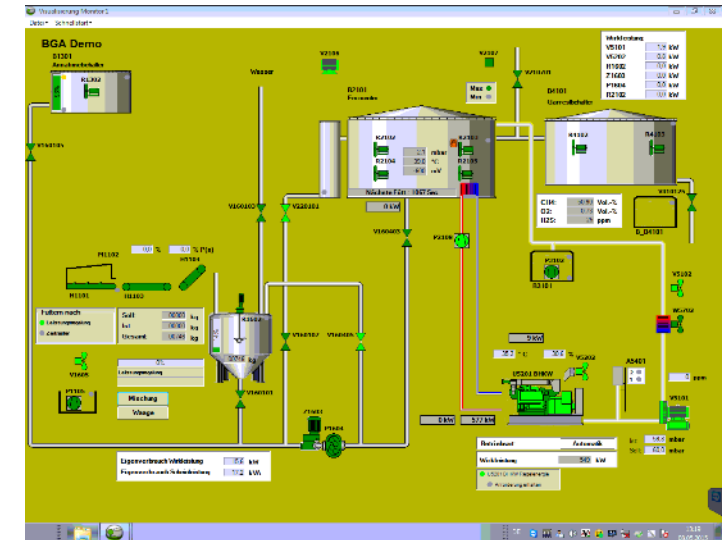


# Plant control

## Electrical Control System

### Advantages of our technology:

- + Schematic representation of the BGP with indication of the current status of the individual units
- + Display of 50 measured values  
*(including operating processes, feed processes, gas production, tank levels etc.)*
- + External dial-in via app
- + Automatic alarm system in case of any disruption  
*(automatic alarm messages can be sent on operators mobile devices)*
- + Memory > 2 years data storage (5 years optional)
- + Adjustability of various systems parameters  
*(automatic adjustment of the feeding-target and actual values)*



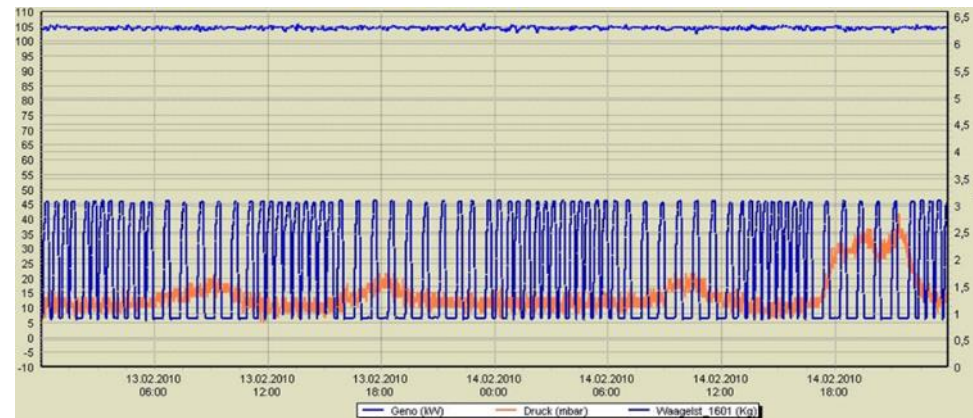
# Feeding

## EnviTec Feedcontrol and Redox Measurement



### Advantages of our technology:

- + Optimized feeding intervals and automatic control
- + Raising efficiency up to 10 %
- + Constant gas production (day and night)
- + Sensor for online process control inside the fermenter guarantees high process stability and reliability
- + Saving substrates
- + Gas storage is used most efficiently





# Gas upgrading

EnviThan - along the entire value chain of biomethane



## EnviThan

### Pre-treatment



We have the solution, whatever your starting point (biogas, land fill gas, wastewater gas).

### Gas upgrading



From small plants to large-scale projects, we have the made-to-measure (and scalable) solution.

### Gas usage



Biomethane as a fuel or for generating power and heat? We have the right model, whatever your industry. And we're thinking ahead, too – additional revenue with CO<sub>2</sub> recovery!

# Gas upgrading

## EnviThan – simple and flexible



### Our concept:

- Container solution with several service openings
- Insulated standardized container
- Patented Evonik 3 stage Membranes setup
- The compressor waste heat is available for other applications
- 20% extra membrane slots for future opportunities & flexibility
- Vacuum pump for operation flexibility



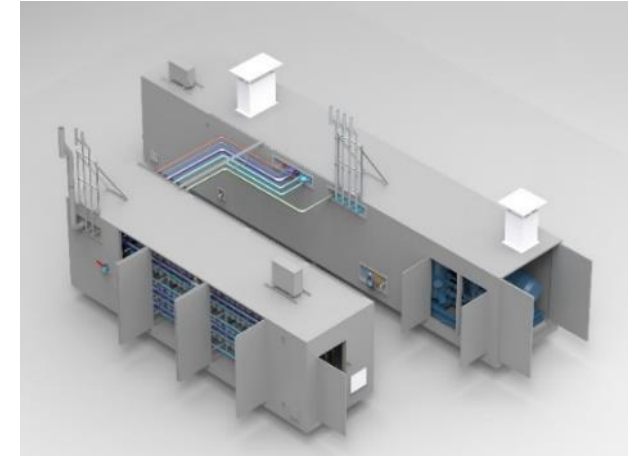
# Gas upgrading

## EnviThan gas upgrading



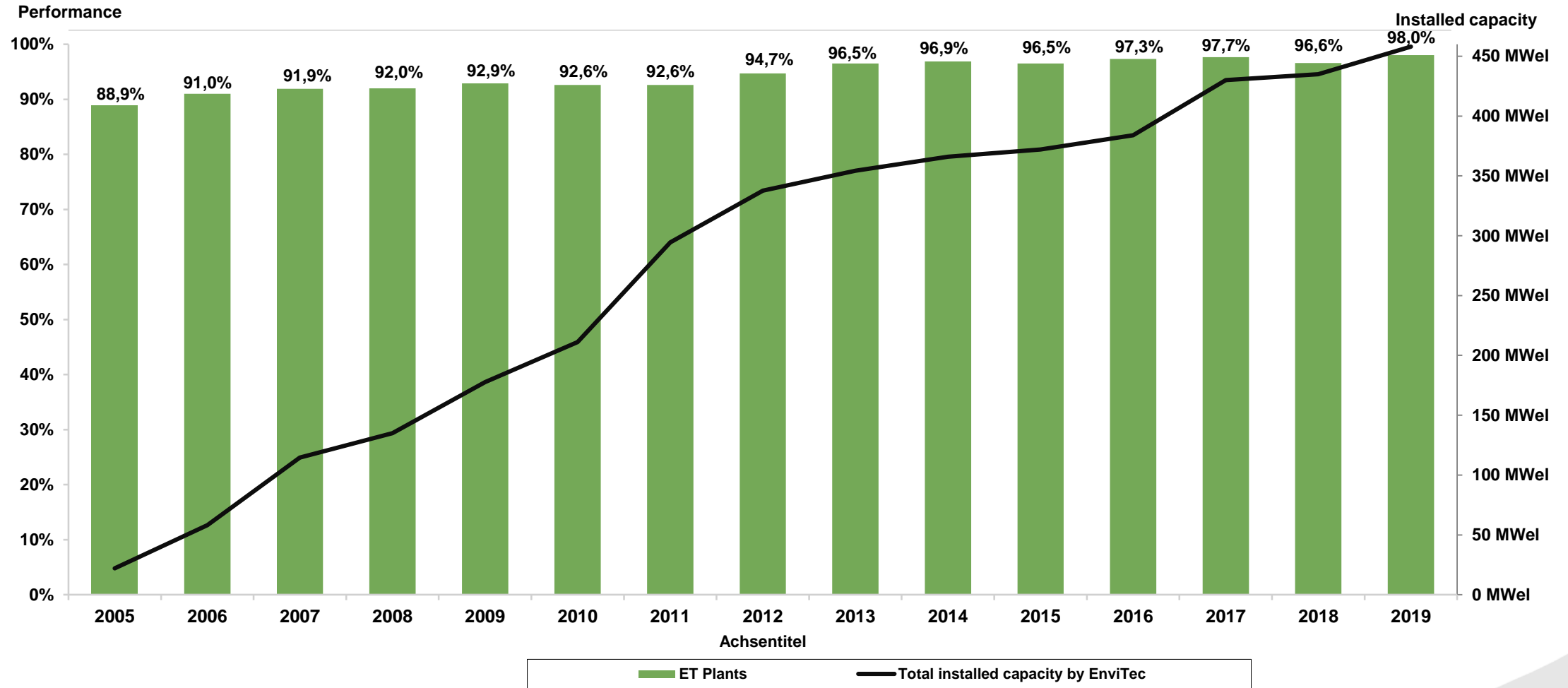
### Your advantages at a glance:

- + Straightforward, compact and modular design
- + Rapid controllability for short start-up times
- + Extremely efficient thanks to membrane separation
- + Top quality and maximum safety – Made in Germany!
- + Worldwide expertise
- + Strong partnerships with leading technology providers
- + Small footprint



# First Class Technology

## Efficiency of EnviTec plants



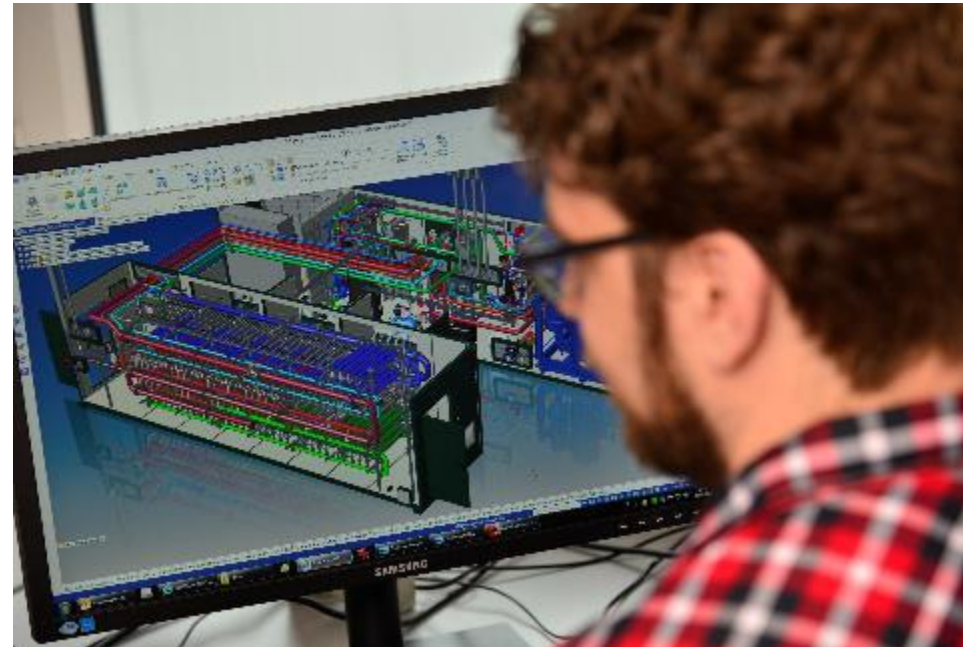
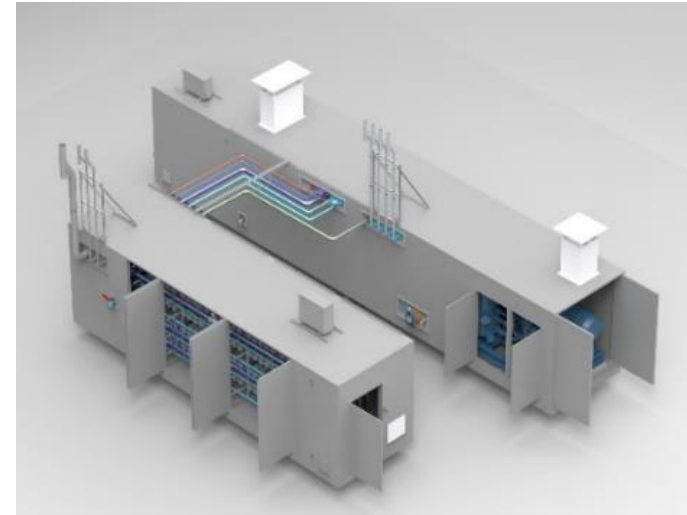
# Agenda

- 1 Company profile
- 2 Biogas – an allrounder
- 3 Technology
- 4 **Manufacture EnviThan**
- 5 Service
- 6 EnviTec – Indian market
- 7 References

# Manufacture EnviThan

## EnviThan gas upgrading

- Production hall in Saerbeck
- EnviThan- , heating- and oxygen container
- Booster station container
- all containers are developed by EnviTec
  - Flexible and short delivery time (~6 month)
- Each year we produce around 15 container





# Manufacture EnviThan

## Production in Saerbeck

- Membranes are delivered
- 3 stage membrane system in the
- Each membrane can be switched
- Delivery of the finished EnviThan
- Final design on the plant



# Agenda

- 1 Company profile
- 2 Biogas – an allrounder
- 3 Technology
- 4 Manufacture EnviThan
- 5 **Service**
- 6 EnviTec – Indian market
- 7 References



# EnviTec Service

## Our service portfolio

### Technical Service

- Regular service and maintenance of all plant components (incl. CHP)
- Possibility to choose partial service based on the specific tasks performed, or full service with the repair risk assumed by EnviTec
- Hotline accessible 24/7
- Comprehensive spare parts warehouse and online shop



### Biological Service

- Support by our scientific specialists before and during the commissioning of your plant
- Training of your employees
- Daily online-control of biological processes during the operation
- Examination of the substrates and residual effluents as well as gas production and the capacity utilization of your plant
- Ongoing optimization of plant operation through individual mixing and recipe suggestions

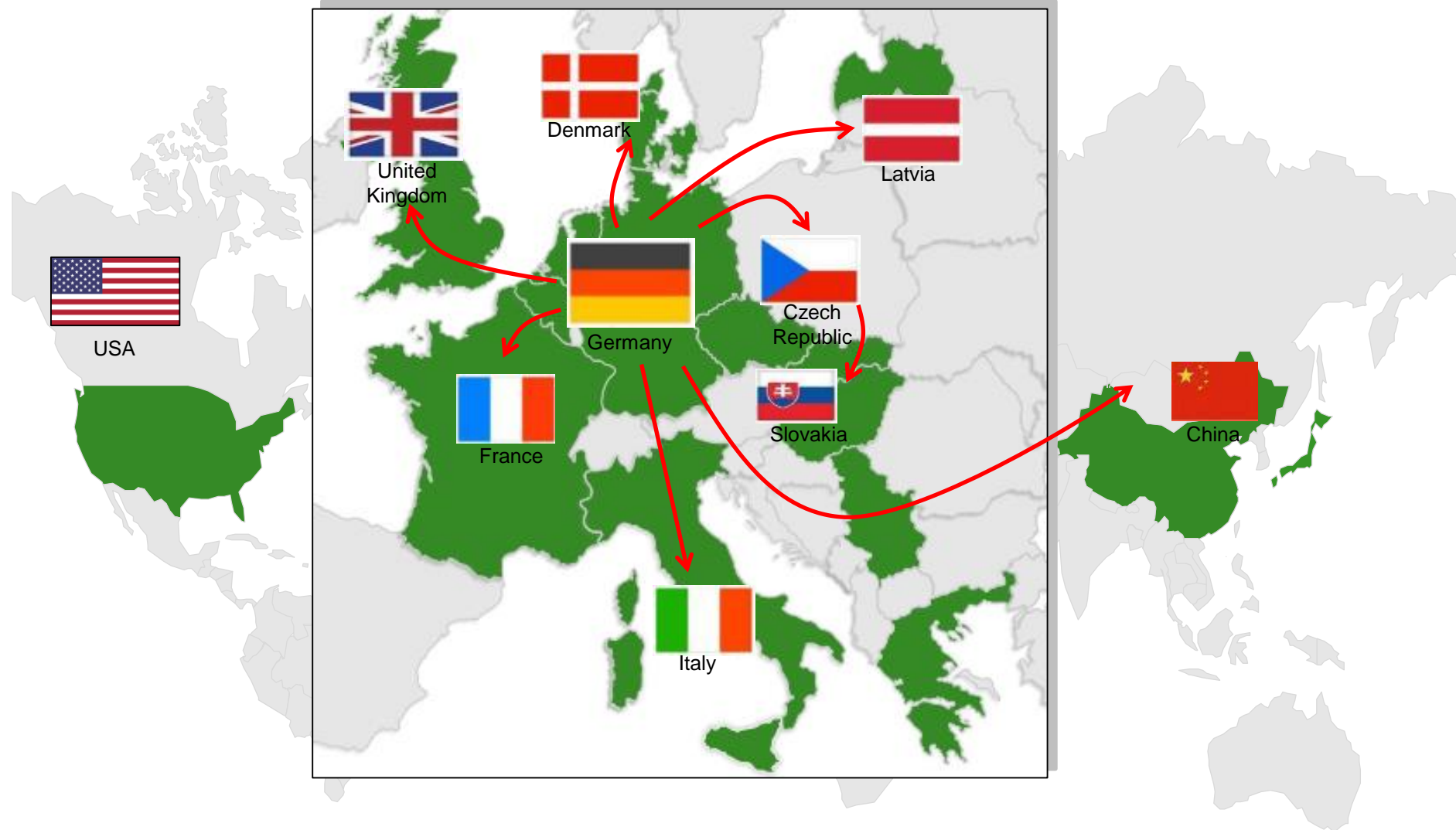


# EnviTec Service

## Your benefits at a glance

- + Service from a single source  
(Spare parts, maintenance, consulting, biological laboratory)
  - + Onsite availability  
(Hands-on Service in DE, IT, CZ, DK, UK, FR, LV)
  - + Round-the-clock service  
(24h-hotline, online monitoring, online shop)
  - + Long experience  
(more than 500 operators around the world rely on our expertise)
- High plant capacity utilization
  - Less downtime
  - Better profitability





## Standard Service Works on Gasupgrading System

### ▪ Service schedules and works

- Service works < 3 months (*mainly smaller inspections!*) → **Customer's obligations**
- Service works ≥ 3 months → **ETS obligations**

### ▪ Main components: (*only scheduled maintenances, no unscheduled maintenances*)

- |                               |   |  |
|-------------------------------|---|--|
| • Gas cooling                 | annually                                    | General check (e.g. check/refill cooling liquid; filter change, etc.)<br><i>(executed from supplier, not ETS)</i>                |
| • Gas cleaning<br>("raw gas") | on demand<br><i>(usually once per year)</i> | Change of complete filter (active carbon & filter)<br><i>(executed from supplier, not ETS)</i>                                   |
| • Compressor                  | every 3 months                              | Change of up- & downstream oil filter<br>Inspection tour (e.g.: function & system check) elements<br>Lubricate of motor bearings |
|                               | every 6 months                              | Change of oil separation filter  |
|                               | annually                                    | Oil change of compressor   |

## Standard Service Works on Gasupgrading System

▪ **Main components:** *(only scheduled maintenances, no unscheduled maintenances)*

- |   |                |  |
|---|----------------|--|
| • Vacuum pump                             | annually       | Oil change<br>Inspection tour (e.g.: function & system check)  |
| • Fine oil separation                     | every 3 months | Change of fine oil separation filter<br>Inspection tour (e.g.: function & system check)  |
|   | annually       | Change of active carbon (“cleaned gas”)  |
| • Membranes                               |                | !No service necessary!<br><i>In case of reduced capacity: Change or add additional membranes</i>                                 |
| • Union gas analysis                      | every 3 months | Calibrate of devices<br>Inspection tour (e.g.: function & system check)<br>Smaller works   |
| • GFG gas analysis                        | every 3 months | Calibrate of devices<br>Inspection tour (e.g.: function & system check)<br>Smaller works   |
|   | annually       | System Check   |
| • Additional smaller service works/checks |                | Condensate trap, dirt trap, several valves & pipes, heat exchanger, ventilators, air condition unit, electr. installations, etc. |

## Plant downtimes & technician(s) working hours

- 3 months maintenance      approx. 4h downtime and approx. 6h of technician on site
- 6 months maintenance      approx. 6h downtime and approx. 8h of technician on site
- 12 months maintenance      approx. 8-10h downtime and approx. 14-16h technician(s) on site
- Stage overhaul      approx. 2 days downtime
  - Removal of stage
  - Transport to supplier
  - Overhaul at factory
  - Transport back to plant
  - Mounting of overhauled stage



# Agenda

- 1 Company profile
- 2 Biogas – an allrounder
- 3 Technology
- 4 Manufacture EnviThan
- 5 Service
- 6 **EnviTec – Indian market**
- 6 References

## EnviTec – Indian market

### Issue in the Indian biogas market

- **Logistics/ size of plants**
- **Input material**
- **Financing/ pricing for biogas plants**



# EnviTec – Indian market

## Issue in the Indian biogas market

- **Logistics/ size of plants**

- Handling the big amount of input materials → logistic concepts for plants are needed
- Most of the requests are for plants that have to produce 2to up to 10to/day BioCNG
  - with automated systems this is no problem → higher CAPEX
- Example: to produce 8to of BioCNG each day you need nearly 172.000to/a of input material

Input material	To/a
Poultry dung	15.000
Dairy cows slurry	44.600
Fattening bull dung	51.500
Vegetable market waste	18.500
Water	42.600

- Location for the plant is very necessary → near AMPC´s ?
  - Waste must be sorted (free from wood, metal, plastic, glas)
- Electricity must be available on plant site

## Issue in the Indian biogas market

- **Input material**

- Often we got requests for mono-digestion of paddy straw → EnviTec's technique based on liquid digestion (~7,5% dry matter content)
  - We don't know any plant in India which runs only with paddy straw
- Issues with paddy straw:
  - Heavy to digest → high lignin amount, high dry matter content
  - You need a big amount of water to reach 7,5% DM in the digester
  - Mono digestion not easy to handle
- Easy material to digest are dung, manure, green mass, vegetable waste → easier operation
- With simple input materials, less to no disruptions in operation are to be expected → influence on the economic efficiency

## Issue in the Indian biogas market

- **Financing/ pricing for biogas plants**

- Costs of a plant which is ready to produce 8to/day CNG (only EnviTec) ~6-7 Mio. € ( depends on input material)
  - In addition to the EnviTec costs, you have to calculate approx. 3 Mio. € (piping, mounting works, fieldcabeling, road works, foundation)
- Costs for input material often underestimated - important when considering economic efficiency
- In order to get better interest rates, proper concepts must be presented to the banks → EnviTec can help with concepts and references all over the world
- Benefits of financing concepts from abroad

# Agenda

- 1 Company profile
- 2 Biogas – an allrounder
- 3 Technology
- 4 Manufacture EnviThan
- 5 Service
- 6 EnviTec – Indian market
- 6 **References**

# Our customer



L'ORÉAL



FRI-EL GREENPOWER  
THE CLEAN ENERGY COMPANY

COFELY  
GDF SUEZ



## References // Agricultural biogas plants

### Digestion facility brings in revenues and helps boost the image of agriculture



*»The project has been very successful and we would certainly do the same again.«*

Gavin Davies, Farms Manager,  
Stowell Farm

**Location:** Pewsey, Wiltshire (UK)

**Capacity:** 500 kWel

**Input material:** Cow slurry, agricultural waste and sustainable cropping

#### **Features:**

- Digestate separated and used as fertilizer helping to improve soil conditions
- 15 % of energy produced is re-used on farm
- The plant is running with performance at an average of more than 97 per cent.

## References // Agricultural biogas plants

### Biogas helps to achieve local energy independence

**Location:** Saerbeck (Germany)

**Capacity:** 2 x 526 kWel, 2 x 1.500 kWel

**In operation since:** December 2011

**Input material:** Liquid manure,  
renewable raw material

#### Features:

- CHP I: Heat for the fermentation process
- CHP II: external CHP, heat for the digestate dryer
- The biogas plant is part of the bioenergy park in Saerbeck. Through a combination of renewable energies, this bioenergy park is significantly reducing the municipality's dependence on fossil fuels. It is producing electricity for more than 19.000 households - while Saerbeck only has 7.000 by itself.



## References // Agricultural biogas plants

### High efficiency and competitive edge thanks to free-of-charge waste heat

**Location:** Volta Mantovana (Italy)

**Capacity:** 999 kWel

**In operation since:** July 2009

**Input material:** Liquid manure (cattle), droppings, renewable raw material

#### Features:

- Performance of about 99 % due to Feedcontrol
- Feed-in of 8 Mio kWh/ year into the public grid
- Further cost savings by use of waste heat to heat the residential building





## References // Waste2Energy

### Unpacking and cleaning of waste materials

**Location:** Ribeauvillé (France)

**Capacity:** 1,4 MWe1

**In operation since:** January 2012

**Input material:** Waste from food, liquid manure, renewable raw material

#### Features:

- Pasteurisation
- Heat transport to swimming pool of casino
- Heating of residential building



## References // Waste2Energy

### Small building area – maximum efficiency

**Location:** Kishiwada (Osaka, Japan)

**Capacity:** 249 kWel

**In operation since:** March 2015

**Input material:** Food waste

#### Features:

- Complete container solution
- Power to the public grid
- Heat utilization by the adjacent factory



## References // Waste2Energy

### Industrial usage: Heat and electricity for L'Oreal

**Location:** Libramont, Wallonian (Belgium)

**Capacity:** 3,2 MWe1

**In operation since:** July 2009

**Input material:** Maize, waste from food, fats

#### Features:

- Direct supply of energy to adjacent industry
- CHPs are located at the facility of L'Oréal
- L'Oréal uses electricity, heat and steam (steam boiler)



## References // Large-scale projects

### Industrial project – Klarsee BioEnergie Park

**Location:** Penkun (Germany)

**Capacity:** 40 x 500 kWel

**In operation since:** November 2007

**Input material:** renewable raw material

#### Features:

- Klarsee BioEnergie Park comprises a network of 40 independent 500-kW biogas facilities
- At full operation, the bioenergy plant meets the annual electricity needs of about 50,000 households (160,000 KW h)
- Synergy effect due to modular design
- Optimization of logistic process



## References // Large-scale projects

### Industrial project – Güstrow BioEnergie Park

**Location:** Güstrow (Germany)

**Capacity:** 5 x 2,4 MWeI

**In operation since:** December 2009

**Input material:** liquid manure, renewable raw material

#### Features:

- The world's largest plant for treatment of biogas to natural gas quality
- Production of 46 million m<sup>3</sup> of biomethane per year
- This corresponds to about 160 million kilowatt/hours per year of power (electricity) and 180 million kilowatt/hours per year of thermal energy (heat) - enough to satisfy the entire energy needs of a medium-sized city with more than 50,000 households.



## References // Biomethane

### Energy for 2,150 households: our flagship project in Icknield (UK)

**Location:** Ipsden, Oxfordshire (UK)

**Capacity:** 1,6 Mwe1

**In operation since:** December 2014

**Input material:** Pig slurry, farm by-products, energy crops

#### Features:

- Production of 700 Nm<sup>3</sup>/ h biomethane
- 360 kWel CHP
- Supply natural gas to 2,150 households
- Digestate as fertiliser



## References // Biomethane

### From the source to the steering wheel: EnviThan makes inroads into fuel market

**Location:** Penglai City (China)

**Capacity:** 2 x 1,000 Nm<sup>3</sup>/h biomethane

**In operation since:** March 2017

**Input material:** Poultry litter from the owner's approx.  
6 million head of poultry

#### Features:

- Integrated model, from crude gas upgrading to fuel production
- Two EnviThan plants with a total biomethane output of 2,000 Nm<sup>3</sup>/h
- The bio CNG is distributed as a clean passenger car fuel from the company's own filling station in the nearby city of Yantai.



## References // Biomethane

### Compact, modular design offers customers maximum flexibility

**Location:** Senlis (France)

**Capacity:** 400 Nm<sup>3</sup>/h biomethane

**Input material:** Silage, sugar beet pulp, agricultural waste

#### Features:

- EnviTec's first gas upgrading plant in France
- Construction period of just 10 months
- Modular design and built-in performance reserves offer a straightforward approach to expanding capacity





## References // Biomethane

### Own investment in our gas upgrading plants

**Location:** Forst (Germany)

**Capacity:** 3,3 MWeI

**In operation since:** September 2014

**Input material:** Poultry dung,  
renewable raw material

#### Features:

- Company-owned operation of EnviTec Biogas AG
- Production of 700 Nm<sup>3</sup>/ h biomethane
- 60,000 megawatt hours of green energy
- 549 kWel CHP



## References // Biomethane

**Proven technology + reliable after sales service = satisfied customer!**



**Location:** Hammel (Denmark)

**Capacity:** 1335 Nm<sup>3</sup>/h biomethane

**Input material:** Grass silage, sugar beet, straw, turkey litter and glycerine

**Features:** Our customer is Denmark's largest land-owner, with over 10,000 hectares to its name. Apart from our efficient EnviThan technology, we also impressed the client as a solid partner with a portfolio of successful international references. EnviTec's flexibility and the reliability of our gas upgrading plants, plus our comprehensive – and local – after sales service were decisive factors for winning this contract. And we continue to impress: the customer has already made multiple expansions to the plant.

## References // Biomethane

### Driving biogas – our flagship project in the province of Hebei (China)

**Location:** Dingzhou (China)

**Capacity:** 400 Nm<sup>3</sup>/h biomethane

**In operation since:** August 2017

**Input material:** cattle slurry, corn stover/silage

#### Features:

- Output of around 13.500.000 Nm<sup>3</sup> of raw gas per year
- The biomethane produced is filled as compressed natural gas (CNG) into a CNG trailer for subsequent distribution as a fuel.
- The biogas plant was intended as flagship project: The adjoining Visitor Centre, including lab and central control room, has been designed and built to ensure that visitors can view the mixing line and technical systems via a glass-walled corridor and tunnel.



## References // Biomethane

### Compact, modular design offers customers maximum flexibility

**Location:** Sindal (Denmark)

**Capacity:** 940 Nm<sup>3</sup>/h biomethane

**In operation since:** June 2017

**Input material:** Mix of manure, fish oil, water, dung, straw, grass silage, olive residue, etc.

#### Features:

- Thermophilic anaerobic plant operation (52 °C)
- Flexible input system with cross-feeding of solid/liquid batches as required
- Large goods receipt unit for input materials
- Intelligent heating model using efficient heat recovery with heat pumps and substrate water heat exchanger
- 940 Nm<sup>3</sup>/h biomethane fed into gas grid with no further adjustment to calorific value





**We are looking forward to discussing your project now!**