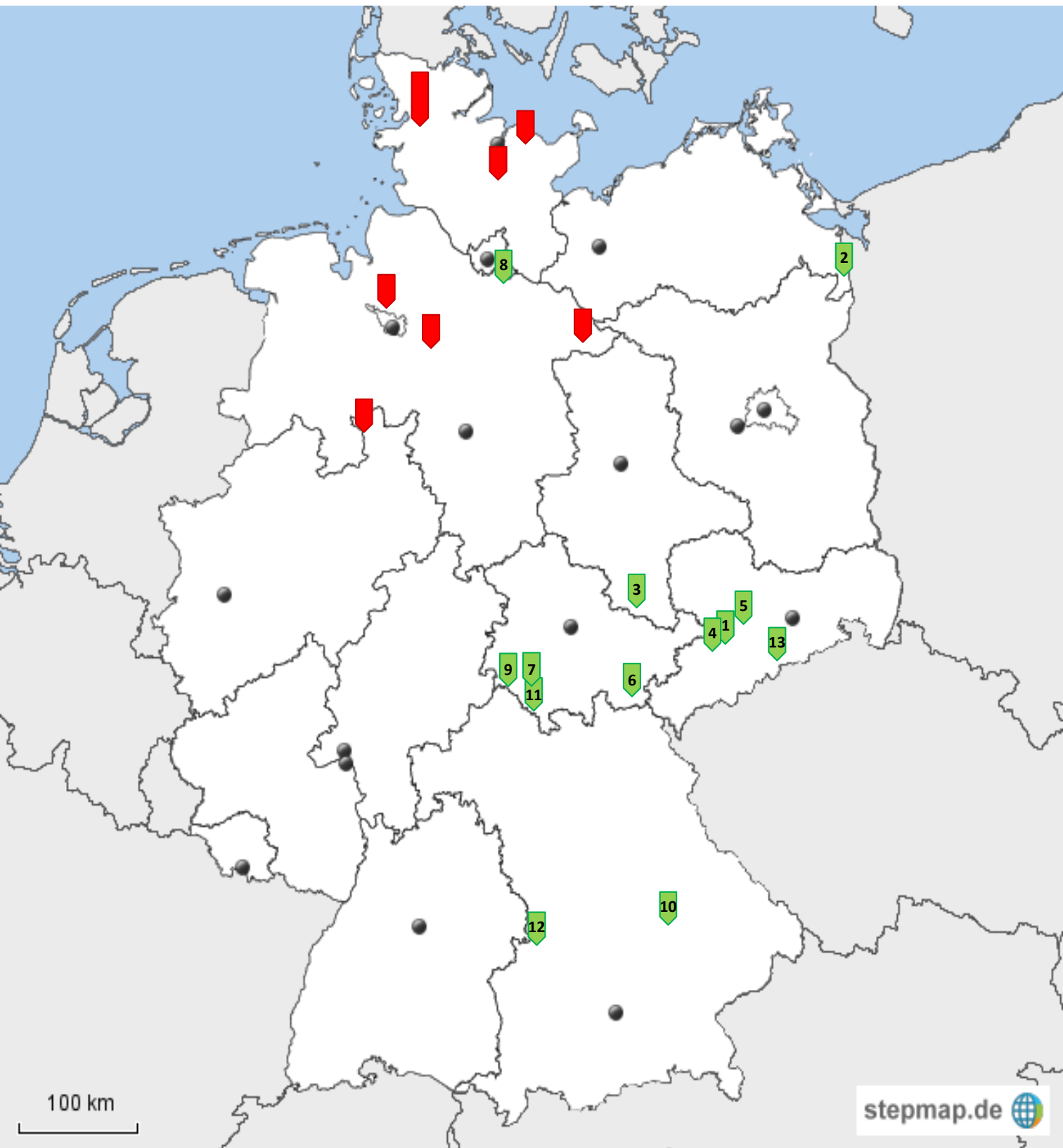
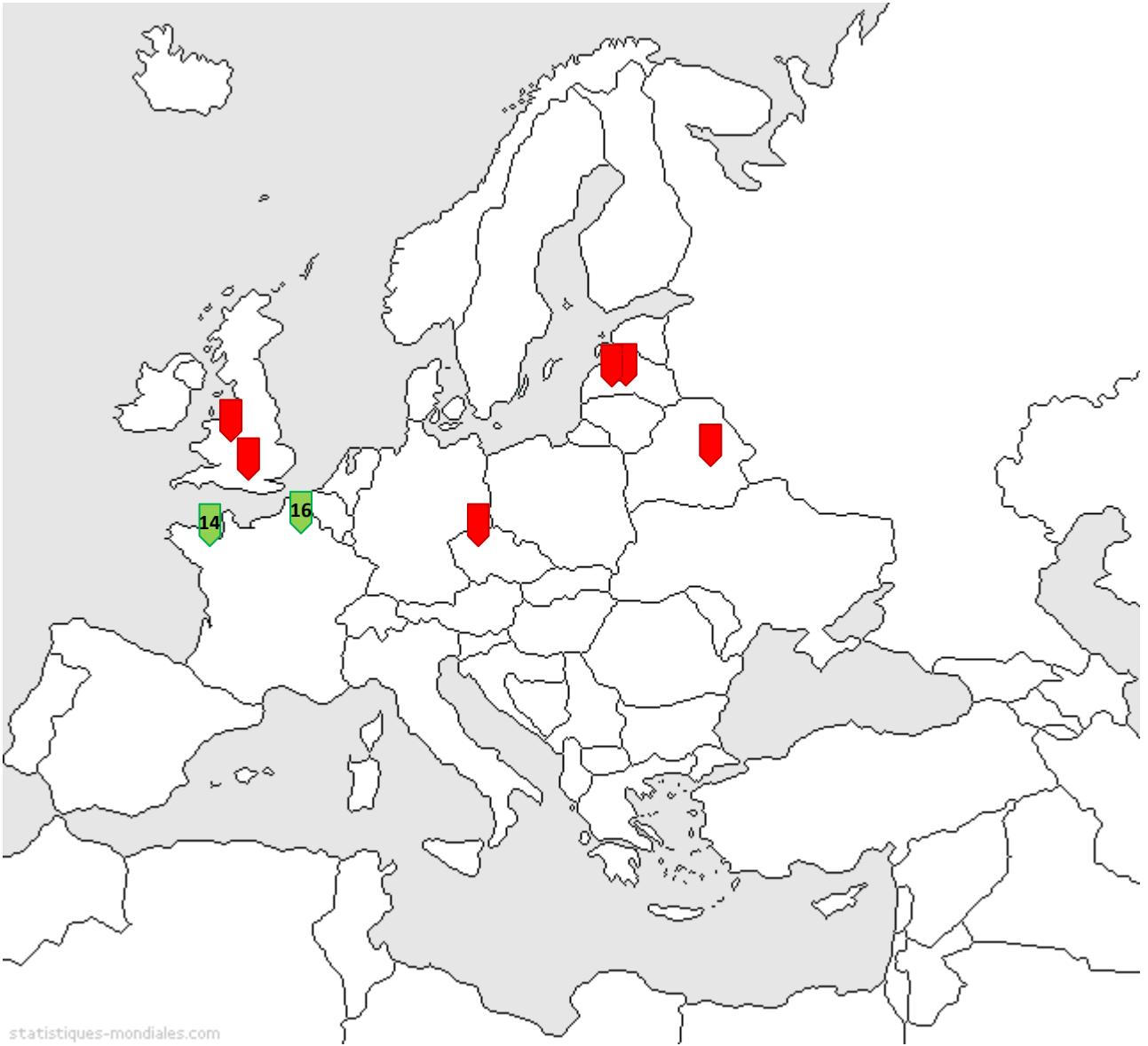


Map with references
Semi-aerobic Hydrolysis Facilities in Germany and around the world





Farmyard Sachsenland BGP Wittgensdorf



- **Agricultural establishment**
 - 3 000 ha agricultural area
 - 1 350 dairy cows
 - 1 200 pig fattening
 - butchery
 - Direct marketing at the farms shop
- **Biogas plant**
 - commissioning 2005
 - Electric capacity: **480 kW_{el}**
- **Thermal use**
 - Process
 - Drying of grain
- **Substrates**
 - Liquid manure from cows
 - Poultry manure
 - Corn silage
 - Waste from grain
- **Description of the plant**
 - 1 Hydrolysis **110 m³**, continuously feeding
 - 1 Digester: **800 m³**
 - 1 post Digester: **2 050 m³**
- **Description of the project**
 - **2002**: construction of the BGP by UTS
 - **2003**: Installation of the Hydrolysis in the pre Digester to enable biogas production
 - **2005**: construction of a ventilated pre-tank, Prototype of a semi-aerobic Hydrolysis
- **contact**
 - CEO Mr. Hoffmann
 - Tel.:03722 50480



Hydrolysis



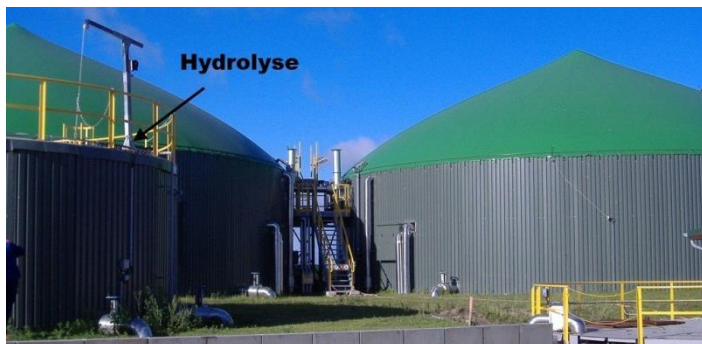
CHP-Unit



Discharge of sand and stones

Biogas Ramin GmbH

Casekow



• Agricultural establishment

- **Biogas Ramin GmbH:** affiliated company of Agrargenossenschaft **Raminer Agrar GmbH & Co. KG**
- 3 200 ha agricultural area, thereof 600 ha grassland
- 626 Ha corn, thereof 225 ha for the BGP
- 610 dairy cows, 200 mother cows, 1 700 fattened bulls, 800 offspring
- 10 000 fattening pigs
- 50 employees, 2 trainees

• Biogas plant

- commissioning: **2007**
- Electrical capacity: **526 kW_{el}**

• Thermal use

- Process
- buildings
- Drying of grain

• Substrates

- 56 m³/d liquid manure from cow and pig
- 17 t/d corn silage
- 5 t/d grass silage
- 2,5 t/d Poultry manure

• Description of the plant

- 1 mixing tank **80 m³**
- 1 Hydrolysis **200 m³**, continuously feeding
- 1 Digester, 1 post digester **2x 2 000 m³**
- 2 digestate storage: **2x 2 250 m³**

• contact

- CTO Mr. Sy
- Tel.:039749 20452



Hydrolysis



In the foreground: **mixing tank**
In the background: **interim storage**
At the right : **operations building**



CHP-Unit

AGRIWATT – Regenerative Technologie GmbH

Naumburg



• Agricultural establishment

- Die **AGRIWATT** Regenerative Technologien GmbH, a Joint Venture of the **Technischen Werke Naumburg GmbH** and the **Agrargesellschaft Prießnitz mbH (AGP)**
- AGP : 3070 ha agricultural area, thereof 2 960 ha farmland
- AGRIWATT manages a BGP 922 kW_{el} and a photovoltaic plant 985 kW_c

• Biogas plant

- commissioning: **2009**, : **2011 expansion**
- Electrical capacity : **580 kW_{el}**, **922 kW_{el}**

• Thermal use

- Process
- Heat grid Naumburg
- Heating of swimming bath

• Substrates

- 7 000 m³/a liquid manure from cow and pig
- 14 000 t/a corn silage

• Description of the plant

- 1 Hydrolysis, **200 m³**, continuously feeding
- 2 digester **1 884 m³**
- 1 post digester **3 963 m³**
- 1 digestate storage **3 963 m³**

• Description of the project

- 1. step: 2009: 1 CHP 190 kW_{el} und 1 Satellite-CHP 366 kW_{el} at the swimming bath, 2,2km away
- 2. step 2011: expansion, with a new digestate storage and a new Satellite-CHP 366 kW_{el}, 6,7 km away at a housing complex

• contact

- CEO Mr. Dr. Zier
- Tel.: 03445 2376 538



Hydrolysis



CHP-Unit
190 kW_{el}



In the foreground : solids dispenser
In the middle: **cesspit**
In the background : **digestate storage**

Production of fertilizer Grüna GmbH



Hydrolysis



Desulphurisation of the gas



Hammer mill

- **Commercial establishment**
 - Disposal of organic waste
 - Production of fertilizer of the digestate
 - 5 employees
- **Biogas plant**
 - Commissioning: **Mai 2008**
 - Electrical capacity: **511 kW_{el}**
- **Thermal use**
 - Process
 - buildings
 - Drying of grain
- **Substrates**
 - 7 670 t grass silage
 - 760 t grass
 - 3 600 t corn silage
- **Description of the plant**
 - 1 Hydrolysis: **250 m³**, 30°C , continuously feeding 12 x/d
 - 2 digester: **856 m³**, 44°C
 - 1 post digester: **1 800 m³**
 - 1 digestate storage: **2 800 m³**
 - Retention time: 20 days
- **Contact**
 - CEO Mr. Slesazcek
 - Tel.: 03718 577 605

Farmyard Sachsenland BGP Bräunsdorf



- **Agricultural establishment**
 - 3 000 ha agricultural area
 - 1 350 dairy cows
 - 1 200 fattening pigs
 - butchery
 - Direct marketing at the farms shop
- **Biogas plant (2/2)**
 - commissioning: 2009
 - Electrical capacity: 495 kW_{el}
- **Thermal use**
 - Process
 - buildings
 - Drying of grain
- **Substrate**
 - 93 t/d:
 - Liquid manure from cow
 - Solid manure from cow
 - Solid manure from pig
 - Poultry manure
 - corn silage
 - Grass silage
- **Description of the plant**
 - 2 Hydrolysis je 150 m³, continuously feeding
 - 2 digester je 2 000 m³
 - 2 post digester je 2 000 m³
- **Contact**
 - CEO Mr. Hoffmann
 - Tel.:03722 50480



Hydrolysis



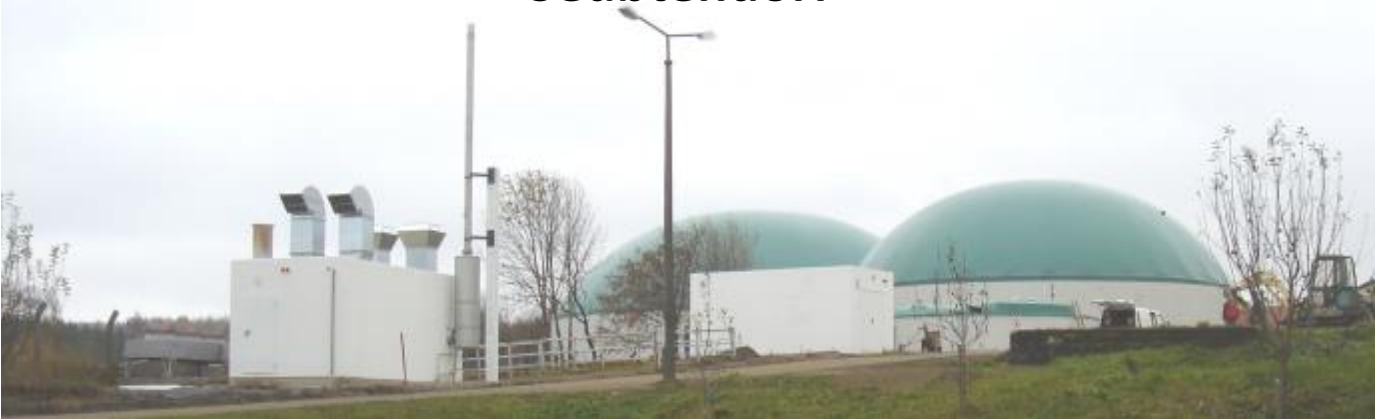
Digester



Distribution and digging in of digester

RINDERHOF-AGRAR GmbH

Seubtendorf



- **Agricultural establishment**
 - 1800 ha agricultural area, thereof 500 ha grass area
 - 1700 live stock unit: 630 dairy cows, 500 bulls, 600 offspring
 - 39 employees
- **Biogas plant**
 - Commissioning: **November 2009**
 - Electrical capacity: **366 kW_{el}**
 - Yearly capacity: **3,0 MWh_{el}**
- **Thermal use**
 - Process
 - buildings
 - Washing water for milking parlour
 - Drying of grain and wood chips
- **Substrates**
 - 35 000 m³ liquid manure
 - 1 000 to 2 500 t solid manure
 - 400 to 600 t grain
 - Up to 2 000 t grass silage
- **Description of the plant**
 - 1 Hydrolysis: **250 m³**, 30°C , discontinuously feeding 1x/d
 - 1 digester: **1 884 m³**, 44°C
 - 1 digestate storage: **2 880 m³**
 - Retention time: 50 days
- **Contact**
 - CEO Mr. Oswald
 - Tel.: 036646 22226



CHP-Unit
MAN, 366 kW_{el}



Hydrolysis
In the foreground: flap for daily feeding

ÖW-Ökozentrum Werratal/Thüringen GmbH Vachdorf



• Agricultural establishment

- 1 700 ha agricultural area
- 240 dairy cows, 270 mother cows
- offspring
- 100 sows
- 36 000 laying hen's
- photovoltaic plant : 830 kW_c

• Biogas plant

- Commissioning: **2010**
- Electrical capacity : **190 kW_{el}**

• Thermal use

- Process
- buildings
- Drying of grain
- Heating of elementary school

• Substrates

- 4 800 m³/a liquid manure of cows
- 4000 t/a Mist (cows, pigs, poultry)
- 500 t/a Grass silage
- Food remains

• Description of the plant

- 1 Hydrolysis: **200 m³**, discontinuously feeding
- 1 Digester: **1200 m³**
- 1 digestate storage: **3184 m³**
- mesophilic digestion

• Contact

- Planner Dr. Markert
- Tel.: 036966 80001



Digester, digestate storage and solar panels



Hydrolysis with closed and open flap for feeding



CHP-Unit in garage

Rehwinkel / Meyer Biogas Stelle GmbH & Co. KG Stelle



CHP-Unit in Container



Hydrolysis with solids dispenser

• Biogas plant

- commissioning: **2011**
- Electrical capacity: **500 kW_{el}**

• Thermal use

- Process
- Heating of the garden center (1,7 km away)

• Substrates

- 10 m³/d liquid manure from cow
- 24 t/d corn silage
- 4,2 t/d Grass silage
- 90 m³/d recirculation of digestate

• Description of the plant

- Pre tank: **130 m³**
- 1 Hydrolysis: **150 m³**, continuously feeding
- 1 Digester: **2 160 m³**
- 1 Post digester: **2 160 m³**
- 1 Digestate storage: **5 290 m³**

• Description of the project

- 1 CHP **140 kW_{el}** on site and 1 Satellite-CHP **360 kW_{el}**, 1,7 km away at garden center
- Biogas cleaning with bio filter

• Contact

- Operator Mr. Rehwinkel
- Tel.: 04174 4731



Digestate storage



Garden center

Agrargenossenschaft Helmershausen e.G.

Rhönblick



• Biogas plant

- commissioning: **2011**
- Electrical capacity: **366 kW_{el}**

• Thermal use

- Process
- Buildings
- Drying of grain
- Heat net of the town

• Substrates

- 9000 m³ liquid manure from cows
- 4200 t manure from cow and goat
- 2800 t Grass silage
- Grain silage

• Description of the plant

- 1 Hydrolysis **200 m³**, continuously feeding
- 1 Digester: **1884 m³**
- 1 Digestate storage: **5000 m³**
- Mesophilic digestion
- Total retention time: ca. 150 days

• Contact

- Planner Dr. Markert
- Tel.: 036966 80001



Hydrolysis



Solids dispenser



CHP-Unit in container and transformer station

BGP Christian Aumeier Schierling



- **Agricultural establishment**
 - 200 ha agricultural area
 - Biological establishment
- **Biogas plant**
 - commissioning: **2011**
 - Electrical capacity: **400 kW_{el}**
- **Thermal use**
 - Process
 - 3 apartment buildings
 - drying: corn, grain and wood chips
- **Substrates**
 - **23 t/d**, 100% renewable resources
 - 2/3 bio clover silage
 - 1/3 corn silage (conventional)
- **Description of the plant**
 - 1 Hydrolysis : **142 m³**, continuously feeding
 - 1 digester: **2 500 m³**
 - 1 digestate storage: **3 700 m³**
 - 1 Separator
- **Contact**
 - Owner Mr. Aumeier
 - Tel.: 0175 1626775



Post digester



Solids dispenser



Concrete roof of Hydrolysis

Landwirtschaftsbetrieb Kreckaue André Leipold Gompertshausen



- **Biogas plant**
 - commissioning: **2011**
 - Electrical capacity: **366 kW_{el}**
- **Thermal use**
 - Process
 - buildings
 - Buildings of the community
 - company
- **Substrates**
 - 3000 t liquid manure and manure
 - 4200 t Corn silage
- **Description of the plant**
 - 1 Hydrolysis : **200 m³**, discontinuously feeding 1x per day
 - 1 Digester: **1 400 m³**
 - 1 Digestate storage: **3 400 m³**
- **Description of the project**
 - Yearly electrical energy production: **3,1 Mwh_{el}**
- **Contact**
 - Planner Dr. Markert
 - Tel.: 036966 80001



CHP-Unit in Container
In the foreground: transformer station



In the foreground: **Bio filter**
In the middle: **Hydrolysis**
In the background: **Digester**

BGA der Biogas Meiningen GmbH & Co. KG

Rippershausen



• Company

- The municipal utility *Meiningen GmbH* operates in cooperation with the Agrargesellschaft *Herpf mbH*, under building a joint venture der *Biogas Meiningen GmbH & Co. KG*, a Biogas plant in Rippershausen.
- Herpf mbH : 7 locations, strip cultivation and livestock farming

• Biogas plant

- commissioning: **Nov. 2011**, full load **Feb. 2012**
- Electrical capacity: **1,216 MW_{el}**

• Thermal use

- Process
- Buildings of the community; swimming bath, school etc.

• Substrates

- 25 000 m³ liquid manure from cow
- 18 000 t manure from cow
- 8 500 t various Silages (corn, grass, grain)
- Green waste + material from landscape maintenance possible

• Description of the plant

- 1 storage pit for liquid manure: **750 m³**
- 1 mixing pit: **300 m³** (planned after Hydrolysis)
- 2 Digester **je 2 100 m³** (parallel)
- 1 Post Digester: **3 700 m³**
- 3 Digestate storage **je 4 500 m³**
- Silo with 3 chambers (total approx. 10.000 m³)
- Solid dispenser, **75 m³** in hall, shredder for solids **MEWA Bio-QZ**
- Mesophilic digestion, Digester and Post digester: 43 °C
- 6 double membrane roofs, approx. 14.000 m³ gas buffer (for 1 day)

• Description of the project

- 1 CHP-Unit at BGP (**366 kW_{el}**)
- Gas cleaning for **500 m³/h**. (Desulphurization, drying, compressing – partly redundant)
- 6,5 km biogas pipeline from BGP to Meiningen, underground, lots of hydraulic drillings:
- 1 Satellite-CHP **600 kW_{el}** (sports field), 1 Satellite CHP **250 kW_{el}** (graveyard)
- Thermal use via Satellite-CHP in Meiningen: 100 %

BGA Alois Abt Laugna



Pre tank, digester and post digester. Aerial photo of the plant before closing of the post digester

- **Biogas plant**
 - commissioning: **2012**
 - Electrical capacity: **500 kW_{el}**
- **Thermal use**
 - Process
 - Buildings of the community
- **Substrates**
 - 13,1 m³/d liquid manure of cows
 - 11,5 t/d Grass silage
 - 11,5 t/d Corn silage
 - 80 m³/d recirculation of digestate after Separator
- **Description of the plant**
 - 1 pre tank: **300 m³**
 - 1 Hydrolysis : **140 m³**, discontinuously feeding
 - 1 Digester: **855 m³**
 - 1 Post digester: **2 920 m³**
 - 1 Digestate storage: **1 645 m³**
 - 1 Separator
 - Digester: 54,5°C, Post digesterr: 48°C
- **Description of the project**
 - Recirculation of the digestate from the post digester in winter, from the digestate storage in summer
 - First Step: 280 kW_{el}
 - 2012: expansion to 500 kW_{el} with construction of a hydrolysis



Hydrolysis



Bio filter

Agrargenossenschaft Bergland Clausnitz



Biogas plant, 2001

- **Agricultural establishment**
 - ➔ 2 050 ha agricultural area, 1 200 life stock units
- **Biogas plant**
 - ➔ Commissioning wet digestion: 2001, CHP 225 kW_{el}
 - ➔ Commissioning hydrolysis: **2012**
 - ➔ Electrical capacity: **560 kW_{el}**
- **Thermal use**
 - ➔ Process
 - ➔ Warm water, buildings, 1 apartment house
 - ➔ Drying of grain, hay, rape
- **Substrate**
 - ➔ 90 m³/d liquid manure from cow
 - ➔ 7,4 t/d GPS
 - ➔ 2,3 t/d rape straw
 - ➔ 1 t/d waste of grain
- **Description of the plant**
 - ➔ Shredder for solids **MEWA Bio-QZ**
 - ➔ 1 mixing pit: **120 m³**
 - ➔ 1 Hydrolysis : **110 m³**, continuously feeding
 - ➔ 2 Digester, 1 Post digester **je 1 200 m³**
 - ➔ **20 000 m³** storage capacity
- **Description of the project**
 - ➔ 2001: wet digestion, CHP 225 kW_{el}
 - ➔ 2004: plant for dry digestion, extra-CHP220 kW_{el}
 - ➔ 2007: expansion with new digester. Replacement of CHP with a new one with 340 kW_{el}
 - ➔ 2012: reconstruction of the mixing pit as hydrolysis to reduce substrate costs by using rape straw and silage from material of landscape maintenance
- **Contact**
 - ➔ CEO Mr. Eckardt
 - ➔ Tel.: 037327 1403



Dry digester, 2004



Biogas plant, 2007



Converting the dry digester to a mixing pit, 2012



Desulphurization

SCEA du Pont Langlois, Condé-sur-Vire, France



Biogas plant, 2014

- **Agricultural establishment**

- 200 dairy cows
- 160 life stock units
- 82 000 laying hens
- 140 Ha agricultural area

- **Biogas plant**

- commissioning: **2013**
- Electrical capacity: **265 kWe**

- **Thermal use**

- Drying of digestate
- Heating of breeding building

- **Substrates**

- 3 350m³ liquid manure from cow
- 1 500 t manure from cow
- 1 500 t chicken manure
- 300 t Silage
- 2 000 t buttermilk
- 1 500 t fat

- **Description of the plant**

- 1 Hydrolysis: **70 m³**, continuously feeding
- 1 Digester: **1 665 m³**

- **Description of the project**

- Yearly energy supply: **2 120 000 kWh**

- **Contact**

- Planner AEB Méthafrance
- Tel.: (+33)2 96 500 507



Hydrolysis



Digester



Dispenser



Filter of exhaust air: Bio filter + active coil filter

BGP Renqiu, Renqiu, China



Burning of the straw on field



Laboratory tests regarding mono-digestion of corn straw

- **Biogas plant**

- commissioning: 2013

- Electrical capacity: 50 kWé

- **Thermal use**

- Process

- buildings

- **Substrates**

- Corn straw: 1095 t

- **Description of the plant**

- 1 Hydrolysis : 40 m³, continuously feeding

- 2 Digester, je 476 m³

- **Description of the project**

- Pilot plant for mono-digestion of corn straw

- Corn straw very fertile and is used very poorly



Biogas plant:

Hydrolysis (foreground)

Digester 2 (background)

Biogas storage (right)



Dispenser



Shredding of the straw