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## State-of-the-art technology in rural Germany

**If you think that exceptional things take place only in exceptional locations, think again. In the village of Trechwitz, a rural area not far from the city of Potsdam in Germany, one of the most modern biogas plants in Europe is in operation because of the vast energy potential from manure.**

The successful development of these modern biogas plants started a few years ago, when the local farmers Hergen Wessels and his son Timo Wessels wanted to have a biogas plant for their own farm and realized that there was no technology designed to fit their plans. Therefore, they started to develop their own concept adapted specifically to their farm. The success that followed led Hergen Wessels and his son Timo to organize a group of companies to develop, operate and maintain biogas plants. At present, there are approx. 80 employees working in the different areas.

The first plant completed by these companies was in 2008, at Timo Wessels' farm.

The plant in Trechwitz was built to capitalize on the manure and slurry generated by a number of agricultural operations in and around the village. Among these operations are Wessels' own cow barns in Damsdorf, a riding stable in Trechwitz and a chicken farm in Damsdorf. In the summer of 2012, another cow barn was added on the site of the biogas plant itself, holding 120 cattle. When the biogas plant started operating in January 2012, corn and sugar beets were used in addition to manure and slurry. Facility Manager Radko Doldzhev explains: "After only a few months, we started to operate the plant completely without additional plant mass. Every day, we process 45 tons of manure and slurry. The logging of the supplied material is done automatically: the trucks drive up to the remote-controlled weighing machine and the data is immediately logged in the computer. We generate about 500 kilowatt-hours of power per hour. Since the plant has a total capacity of 800 kilowatt-hours, there is still potential to generate more electricity."



▲ From left to right: Facility manager Radko Doldzhev, Gerd Knospe (etalon), Rob Emrich (ElectraTherm) in front of the Green Machine



▲ Unit on the left: The Güntner GFH drycooler serves as oil-mixture cooler; unit on the right: The Güntner GFH drycooler serves as emergency cooler that can be used e. g. during maintenance work on the block heating station.



▲ The Güntner condenser GVD, specifically developed for the energy industry, cools the working fluid used in the ORC process.

## Power generation using an ORC plant

So, what is so special about this biogas plant? After all, there are already hundreds of them throughout Europe.

From the beginning, Timo Wessels put a strong focus on operating the plant with maximum energy efficiency. In cooperation with the company etalon GmbH from Potsdam, specialists in detecting and realizing energy saving potential, and the company ElectraTherm from Reno, Nevada, they put into operation a whole new concept of an ORC plant.

ORC stands for Organic Rankine Cycle and denotes a procedure to drive steam turbines with a working fluid other than steam. This process is used to generate electricity with the help of combined heat and power generation, e. g. in biogas plants.

## New technology by ElectraTherm

ElectraTherm has developed a compact ORC machine called the Green Machine that is able to generate electricity from low-temperature waste heat by using an organic working fluid. In order to achieve this, proprietary technology is used.

ElectraTherm utilizes low-temperature waste heat (77 – 116 °C) to excite a working fluid into pressurized vapor. As the vapor expands, it drives a twin screw power block, which spins an electric generator to produce fuel-free, emission-free electricity. The inclusion of the Green Machine ORC can increase engine electrical efficiency up to 8 % and utilizes heat that would otherwise go to waste.

Green Machines are sized up to 110 kW based on customer needs, and are available as turnkey packages. In addition to biogas, ElectraTherm's ORC technology works especially well with satellite combined heat and power (CHP), district heating systems and geothermal applications.

Rob Emrich, Vice President of Sales at ElectraTherm, says: "We put more than nine years of development work into our product line, and we are quite proud of it. The small-scale ORC market is still fairly new and this project is an excellent demonstration of our proven technology. This plant is one of 41 that is equipped with a Green Machine to date."

On top of the machine room, there are two drycoolers of the GFH series; a unit with one fan serving as oil-mixture cooler and a unit with four fans serving as emergency cooler. Before the Green Machine was installed, the entire waste heat of the motor was dissipated into the ambient air by the GFH drycooler with four fans. Since the installation of the Green Machine that uses the waste heat to generate electrical energy, this emergency cooler is only used during maintenance work on the block heating station.

## A special condenser for the energy industry

The working fluid used in the ORC process of the Green Machine is being cooled by a condenser of the Güntner series GVD which has been developed especially for the needs of the energy industry. This V-shape coil condenser has a very small footprint compared to its power density and can be adapted to any application due to its modular design. There are eight basic models with a high flexibility of fin and tube geometries and a large variety of heat exchanger coils allowing for the design of the optimally suited unit. Additionally, the units are delivered ready for operation, so that no installation of individual components on site is necessary. And despite their impressive size, the units are suited for transportation by truck.

### **Etalon GmbH**

The company Etalon GmbH, headquartered in Potsdam, Germany, has been helping clients since 1997 to find the perfect energy saving solution for their ventures. This includes investment in innovation, energy management and the optimization of building technology.

[www.etalon-energie.de](http://www.etalon-energie.de)

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### **ElectraTherm Inc.**

The company ElectraTherm Inc., headquartered in Reno, Nevada, was founded in 2005 and is a leader in small-scale waste heat recovery.

[www.electratherm.com](http://www.electratherm.com)

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### **Güntner GmbH & Co. KG**

Based in Fürstenfeldbruck near Munich, Germany, Güntner GmbH & Co. KG is a world leader in the manufacture of refrigeration and air conditioning equipment components. Decades of experience in the industry and the consistent integration of the latest technologies and research findings ensure the high quality standard of Güntner solutions.

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The plant in Trechwitz has been running absolutely smoothly since its commissioning. Last year, the plant was retrofitted and the Green Machine equipped with a sound-attenuated enclosure reducing the sound pressure level to 71.6 dBA. Meanwhile, this sound-attenuated enclosure belongs to the available standard options and ElectraTherm has extended its product line to offer a full range of ORC's, including 35 kW, 65 kW and 110 kW solutions available as stand alone or in series. For each capacity, Güntner offer the corresponding GVD cooler with the appropriate nominal capacity.

With the project being such a success, another 3 projects have been initiated since the beginning of 2012: a second plant – similar to the one in Trechwitz – is ready for final formal acceptance, a third one will soon be installed and, finally, the agreement for a fourth project will shortly be concluded and the plant is expected to be installed in autumn.