



CHP Journal

January 2018

Newsletter of 2G Energy AG



Evo Energy Technologies successful partner for 2G in Australia

Company planning 2G system for pork producer Rivalea
Pages 8/9

New regulatory approach for 2G systems in isolated operation

2G is preparing for predictive maintenance with its own operational control unity

Page 4

Topic series 2017: The agenitor 400 series

Part 3: Turbochargers and gas mixing sections for higher degrees of effectiveness via efficient and clean combustion

Page 11

Brewed traditionally, cooled sustainability

Zötler Brewery receives the refined g-box 50 for the brewery

Page 16

Contents

Preface Page 3

From the world of 2G

New regulatory approach for 2G systems in isolated operation Page 4

2G partners

New 2G partner for the Russian market Page 5

New 2G partner in Italy Page 6

2G partners of IWK: Customer and partner event was a complete success Page 7

Evo Energy Technologies successful partner for 2G in Australia Page 8

Products and applications

Eco power supply thunders Downunder Page 9

Topic series 2017: The agenitor 400 series

Part 3: Turbocharging and gas mixing section Page 11

Green wherever you look Page 12

More efficient energy use ensures reduced energy costs Page 14

Brewed traditionally, cooled sustainability Page 16

Trade fairs and events

Energy revolution in South America Page 18

Successful trade fair appearance in Paris Page 19

Trade fair dates Page 19

Preface



Christian Grotholt

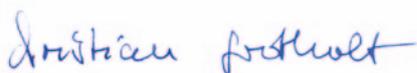
Dear reader,

The Parliamentary elections have already been over for several months. Although the formation of the government is still hanging in the balance, the paper from the exploratory talks, "From the Power Revolution to the Energy Revolution", is, however, showing that there is strong consensus between the SPD and CDU on the topics of energy policy and environmental protection, regardless of the political persuasion of the various protagonists.

That means there is hope that the energy revolution will again begin gaining momentum in Germany. Nevertheless, with all the enthusiasm for environmental protection, it is important not to lose our sense of reality. The path to take in the coming decades towards an energy supply that consists almost entirely of renewable energy will be a path of intelligent and decentralized network structures. The ability to generate power from biogas will provide an important control element in addition to wind and solar power. This means compensating for the volatility of producing electric power from photovoltaics and wind turbines, thus making renewable energies suitable for achieving baseload requirements. The E-world, taking place February 6-8 2018 in Essen, is a good opportunity to provide information on the latest developments in this area. I am happy to invite you to visit us at our booth, 2-327, in Hall 2, and I look forward to an exciting exchange of ideas.

We have been continuously building out our distribution channels as part of our partnership approach for some time now. Therefore, it is my pleasure to present our partners in the CHP Journal in no particular order. We almost take you along with us on our travels. Our colleagues from Evo Energy Technologies in Australia will begin the series "2G and Its Partners" and have already started operating several systems.

Have fun reading!

A handwritten signature in blue ink that reads "Christian Grotholt".

Christian Grotholt
CEO of 2G Energy AG

New regulatory approach for 2G systems in isolated operation

Custom software solution for highest system availability

2G Drives GmbH is the research and development company of the 2G Group and employs a total of around forty engineers. Its duties include the further development of its own engine series as well as more efficient CHP component designs. Seven developers are working on developing and maintaining system controllers and components as well as the subject of digitalization and intelligent data analysis.



Christian Möllers developed a regulatory approach for 2G systems in isolated operation as part of his master's work.

One of these designers is Christian Möllers. Christian started at 2G Drives in the beginning of 2017 as part of his final thesis work for his master's program on energy system technology. He focused his work on the development of a regulatory approach for 2G systems in isolated operation.

Isolated operation is commonly used in places where a power outage would result in high downtime costs or consequential



The new regulatory approach allows for multiple isolated 2G systems to be operated in parallel.

losses. Moreover, an isolated generator can ensure the supply of energy when this supply is unreliable. Compared to conventional systems, combined heat and power units offer the benefit of

“The entire system can be operated in a much more flexible manner.”

Christian Möllers | 2G Drives GmbH

economically generating thermal and electrical energy if the power fails, which can then be used in closed processes or fed into the power grid. The regulatory approach developed by Christian Möllers

allows for multiple isolated 2G systems to be operated in parallel. This ensures that the regulatory design is optimized for the respective engine configuration.

“Self-designed systems offer many advantages”, says Möllers. “By developing our own, we have more flexibility to serve changing market demands and customer requirements from over forty countries. The software was developed specially for the 2G product line and thus provides custom

solutions for the engines used by 2G.” After successfully completing his master’s program, Christian Möllers is now a full-time member of the software development team at 2G Drives. Strengthening the software team will mean an even stronger focus on the topics of digitalization and predictive maintenance in the future. This will also further increase system availability with the intelligent evaluation of system data.

New 2G partner for the Russian market

INTMA GmbH is a new 2G sales partner in Russia



“We are very happy to have a strong partner for the Russian CHP market on our side with INTMA”, delights Christian Grotholt, CEO of 2G Energy AG. INTMA GmbH, headquartered in Bielefeld, has been an official 2G sales partner since

mid-November. The company, a general contractor, specializes in carrying out technically complex engineering tasks for energy generation systems and automated control systems.

This subsidiary of JSC INTMA located in Russia manages sales from Germany for the entire Russian market and will also service installed 2Gs in the future.



New 2G partner in Italy

EnviTec Biogas and 2G seal the deal on a multi-year cooperation with a 2G partnership agreement



From the left: Christian Manca, Managing Director of 2G Italia, and Arne Weber, Technical Service Director, EnviTec Biogas Srl.

EnviTec Bio Srl has been an official partner of 2G Italia Srl since the end of September 2017. EnviTec Biogas handles the entire service process for its own 2G systems – from consultation, to sale, to maintaining and repairing an entire biogas system including the 2G combined heat and power unit. “Together, we have already realized multiple projects in Italy”, says the Managing Director of 2G Italia, Christian Manca. “I am very pleased to continue intensifying and expanding upon this partnership, which has already existed for many years, with this new collaborative effort.”



EnviTec Biogas was founded in 2002 in Germany and today is present in 14 countries around the world with its own companies, sales offices, strategic partnerships, and joint ventures.

2G partners of IWK: Customer and partner event was a complete success

90 participants learn about energy in Switzerland



Colorful audience at 2G partner IWK: 90 representatives accepted the invitation to the customer and partner event of the Swiss company IWK (Integrierte Wärme und Kraft AG) at the end of September. The participants were as diverse as the topics: Customers, government and professional association representatives, partners, shareholders, and university representatives participated in the event. Information on the topics of cogeneration and the 2050 Energy Strategy as well as their meaning for bioenergy, the energy future of CHP, and the technical challenges of a modern gas engine were discussed.



Following the informational event, participants had the opportunity to see the products and services of IWK up close. 2G also participated in the event with a g-box 20 and three representatives from Heek. CHP technology is on the rise, on that the participants agree: "With the 2050 Energy Strategy, meaning additional financing for compensating for electricity fed into the grid, moving away from nuclear power, and partial CO₂ exemptions for natural gas CHP, we are very optimistic about the future", sums up Stefan Schaffner, Managing Director at IWK.

Evo Energy Technologies successful partner for 2G in Australia

2G partner for 3 years - multiple facilities in operation



A dedicated team is working for and with 2G in Australia.

Evo Energy Technologies Pty Ltd is an Australian company headquartered in Brisbane that specializes in heat pumps, heat recovery and combined heat and power generation. "We offer the best solutions in terms of reducing energy costs and greenhouse gas emissions in Australia," says Travis McNeill, who founded the company in 2006.

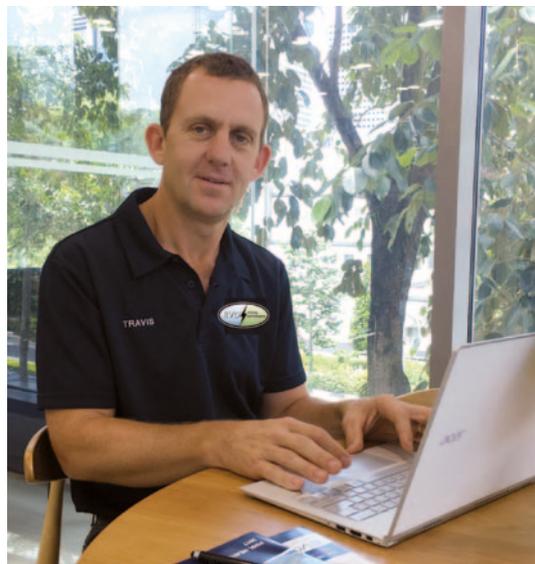
Evo is not just active in Australia, it also supplies its goods and services to New Zealand, Thailand, Vietnam and India.

The partnership between Evo and 2G was established in 2014. Since then, Travis McNeill and his team have been distributing the green cogeneration technology Down Under. They offer the whole 2G portfolio with power outputs from 20 to 2,000 kW. The Australia partner has also committed to servicing the systems sold.

Since the beginning of the partnership, Evo Energy Technologies has already put into operation a number of systems within the 100 kW to 550 kW power range. In the latest

project, a biogas plant at a pig breeding, rearing, slaughtering and processing facility in the state of New South Wales was fitted with an avus 500 plus which, with an electrical output of 500 kW per annum, will save around 28,000 tons of CO₂ emissions (see also the report further down on this page). Another nine cogeneration systems are scheduled for delivery and installation in 2018.

Read more about Evo Energy Technologies Pty Ltd in Brisbane, Australia:
www.evoet.com.au



“We look forward to delivering many more high quality 2G solutions to clients in Australia and surrounding regions,” says company founder Travis McNeill.

Eco power supply thunders Downunder

Agricultural business covers one quarter of its site energy requirements with an avus 500 plus

Location: Corowa, Australia
Operator: Rivalea Australia Pty Ltd
CHP type: avus 500 plus
Gas type: Biogas
Electr. Power: 500 kW
Therm. Power: 518 kW
Installation: 12 m container
Installer: Evo Energy Technologies



Rivalea (Australia) Pty Ltd is one of Australia’s leading pork producers. Headquartered in the Riverina district in the state of New South Wales, Rivalea operates a vertically integrated production system with stock feed mills, farrow to finish pig farms along with a network of contract grow out farms. The company also operates meat processing and distribution facilities. Rivalea has been operating for over 40 years and employs more than 1,100 people across its sites.

The installation of an avus 500 plus in April 2017 at one of the company’s biogas

plants provided Rivalea with an ecological and very cost-effective supply of energy. Around one quarter of the sites electricity requirements are met by the avus 500 plus with its electrical output of 500 kW. The gas required by the CHP is produced in a 40 ML covered anaerobic biogas lagoon located right next to the power unit. In contrast to a European digester plant, no additional thermal energy is used to support the fermentation process. Instead, an earthen lagoon is excavated from the abundant

commissioned. The client supplied a firm concrete base and connections to the mains power supply and the gas supply. The system is supplied with warm country package and combustion air cooling to allow full load operation even at high temperatures of 40 degrees. The biogas that forms in the lagoon is methane rich (70 %) with a sulfur content of 1500 ppm. The warm and wet biogas is routed through a gas cooling plant and then finally into an activated carbon filter which



Rivalea's new ecological power supply reduces its annual CO₂ production by 28,000 tons.

land and completely sealed with a special plastic cover to form a covered anaerobic lagoon. Effluent from the piggery sheds flows through the large lagoon. The gas is captured under the cover and piped to the CHP and a flare station.

The 2G system was installed in a 12 metre long container and delivered ready to be

reduces sulfur content of < 100 ppm ready for combustion in the avus 500 plus.

Rivalea is very proud of its new ecological power supply and biogas lagoon which reduces its annual CO₂ emissions by 28,000 tonnes by destroying methane and avoiding power consumption from the national grid.



Topic series 2017: The agenitor 400 series

The successful agenitor 400 series stands for excellent efficiency paired with the highest reliability. It is the result of a series of optimizations in gas engine technology that are being introduced in this topic series. Today's issue focuses on the turbocharger of the CHP engine and the gas mixing section.

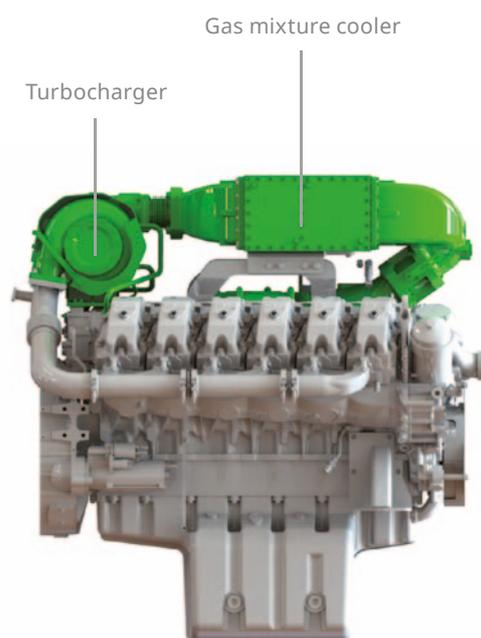
Part 3: Turbocharger and gas mixing section

For higher degrees of effectiveness via efficient and clean combustion

The turbocharger of a CHP engine is essential for efficient and clean combustion. The gas mixing section after the turbocharger cools the gas mixture in order to avoid knocking the engine. It also increases the thermal efficiency of the CHP.

The turbocharger used in the agenitor 400 series by 2G consists of a turbine and a compressor, connected via a drive shaft. The turbine is driven by the engine exhaust and drives the compressor via the shaft. By compressing the gas mixture to 2 bar, its temperature is increased to 180 °C. Compared to other manufacturers, 2G employs one large turbocharger in its V engines instead of 2 small turbochargers. This results in two significant advantages: On one hand, the smaller surface area of one of the large turbochargers increases the efficiency of the turbine and the compressor. On the other hand, the turbocharger installed by 2G can be adapted to the conditions of the 2G system and configured individually, thus ensuring constant and reliable functionality.

At 180 °C, the compressed gas is fed into the first level of the two-level gas mixture cooler. The first level consists of a copper-nickel alloy and cools the gas to 80 °C via



Turbochargers and gas mixture cooler were optimized for the agenitor 400 series.

the connection to the engine circuit. At the same time, the fluid in the engine circuit is warmed, thus increasing the thermal efficiency of the entire CHP unit. The copper-nickel alloy was chosen for the first level of the gas mixture cooler due to its excellent thermal conductivity. The temperatures of the gas mixture at this level are still so high that the gas and the moisture included therein will not condense, meaning abrasive components contained in the gas (with biogas: sulfur, chlorine) cannot engage the material. The gas mixture is then fed into the second level that is made of stainless steel. Stainless steel is less sensitive to abrasive components such as chlorine or sulfur,

which may attack the material when the gas mixture is cooled to 45 °C. After the second level, the cooled gas mixture is fed into various components that guide the mixture into the engine for combustion. These components are also designed by 2G to have the optimal flow and are manufactured with easy-to-service aluminium.

Green wherever you look

Happy at the Ökohof Liescher in Mecklenburg with the g-box

Location:	Teterow
Operator:	Ökohof Liescher GbR
CHP type:	g-box 20
Gas type:	Natural gas
Electr. output:	20 kW
Therm. output:	43 kW
Installation:	Basic container
Installer:	AGENS Energie GmbH

The Ökohof Liescher is located near the city of Teterow in a grassland and pasture landscape of the Mecklenburgische Schweiz Nature Park. The organic farm specializes in Suckler Cow husbandry and hog feeding.

With this operation, the Liescher family focuses not only on the proper treatment of the animals, but also organic and economic energy generation. To this end, they began operating a g-box 20 at their organic farm in May 2017. The system, with an electric output of 20 kW (32.0 % electric efficiency) and a thermal output of 43 kW (70.4 % thermal efficiency), provides the farmstead and stables with electric



Beaming faces of the owner Ulrike Liescher and her daughter: We focus on ecology here; with animals and energy.

“The g-box fits our organic farm perfectly and supports precisely what we do everyday.”

Ulrike Liescher | Owner
Ökohof Liescher

and thermal energy. The system is heat-operated so that excess energy generated is fed into the local power grid and compensated for accordingly. The g-box 20 was installed in a six meter long container directly next to the stables in order to avoid

any conduction losses. The 2G container is excellent at stifling the sound emitted by the system; the 2G cannot be heard by the human ear outside the container since the g-box 20 was placed in a sound capsule which was then, in turn, installed in the container. An additional benefit of the container design is that 2G preassembles the container units and delivers the container with the module, meaning the system can be brought into operation after a short installation process.

More efficient energy use means reduced energy costs

Ecological revolution: Lippstadt counts on the agenitor 408 and the patruus 400



The patruus 400 was installed in a container below the roof of the former sewage sludge storage and is easy to maintain.

Location:	Lippstadt
Operator:	Stadtentwässerung Lippstadt AöR
CHP type:	agenitor 408, patruus 400
Gas type:	Biogas, natural gas
Electr. output:	360 kW, 400 kW
Therm. output:	381 kW, 504 kW
Installation:	2 x Basic container

“The energy concept supported by the 2Gs is highly convincing: economically and ecologically.”

Karl-Heinz Schwartz | Manager
Stadtentwässerung Lippstadt AöR

STADTENTWÄSSERUNG
LIPPSTADT AöR

The central sewage plant in Lippstadt was built in 1986 and was designed to clean the sewage from around 130,000 residents. A great deal of electric and thermal energy is required to clean this sewage and to operate the sewage plant of the city of Lippstadt in general. The annual costs of supplying basic power and for disposing of the resulting sewage sludge are therefore high.

With the commissioning of an agenitor 408 (electric output of 360 kW and thermal output of 381 kW) in April 2017 and a patruus 400 (electric output of 400 kW and thermal output of 504 kW) last November, the energy and disposal costs for the sewage sludge were reduced considerably, since the energy concept behind the installation of both 2Gs is an economic and ecological revolution.

The patruus, which is operated using natural gas, is tasked with drying the resulting

sewage sludge to a good 90 °C in cooperation with a drying system. By drying the sewage sludge, it loses more than three quarters of its weight. With an annual accumulation of around 5,000 tons of sewage sludge at the sewage plant in Lippstadt alone the weight of the sludge can thus be reduced by around 1,200 tons.

But it's not just the weight that sinks; the volume is also reduced. This results in considerable reductions to transport costs. However, drying has an additional benefit: By removing the liquid contained within the sewage sludge, the energy value of the material increases. The resulting material is primarily of interest to thermal recyclers who can generate electric and thermal energy from it. And it could provide a solution for the period following the decision already made in politics to deactivate all German coal-fired power plants. For example, one



The central sewage plant in Lippstadt was designed to clean the sewage from around 130,000 residents.

could use the dried sewage sludge as a combustible material for the heating ovens at cement factories.

The electric energy generated by the patruus 400 covers the energy needs of the sewage plant. The 2G was installed in a container under the roof that had previously served as sludge storage without any need for maintenance.

The second CHP, an agenitor 408, replaced an old CHP. The agenitor was also installed in a container that was placed next to the two digestion towers of the sewage plant. The CHP is operated using the sewage gas produced in the digestion towers. The electric energy generated by the CHP is used to operate the sewage plant and covers

around 80 % of power needs. The thermal energy generated supports the biological decay processes in the digestion towers. By using the highly efficient agenitor 408, the amount of energy generated for the same operating hours can be increased by around 500,000 kWh compared to the old CHP. This means cost savings of 90,000 euros annually.

Both combined heat and power units contribute considerably to reducing the energy costs of the sewage plant, thus also helping to protect the environment.

Brewed traditionally, cooled sustainability

Oldest family brewery in the world excited by the refined g-box 50

Location:	Rettenberg
Operator:	Privat-Brauerei Zötler GmbH
Designer:	Geiger Unternehmensgruppe
CHP type:	g-box 50 HT
Gas type:	Natural gas
Electr. output:	50 kW
Therm. output:	85 kW
Installation:	Engine room



The Privat-Brauerei Zötler GmbH is a brewery in Rettenberg in the district of Oberallgäu. Founded in the year 1447, it is one of the oldest family breweries in Germany. Around 65,000 hl of various types of beer are produced annually.

The energy costs to provide the basic power to operate it are some of the largest cost items for the brewery in addition to personnel and raw material costs. Zötler therefore looked for an opportunity to generate its own energy, independently and more efficiently.

The Zötler Bier company obtains power and refrigeration from the refined 2G system.



Markus Würz



“With the g-box 50 HT, we got exactly the CHP that we needed. We are super pleased!”

Markus Würz | Production Manager
Privat-Brauerei Zötler

However, they were not only looking for an energy source to generate power for basic operations, they were also looking to supply refrigeration to the brewed beer in order to cool it to 0 to 1 °C.

“After a long search for a CHP manufacturer that could face this challenge, we came into contact with 2G,” explains Production Manager Markus Würz. In the end, the g-box 50, which was already part of the 2G product portfolio, was refined into a high-temperature variant and brought into operation in October 2017. Project planning was handled by the Geiger Group.

The complete module (g-box 50 HT) has an inlet temperature of 95 °C with an electric output of 50 kW and a thermal output of 85 kW. The power generated by the g-box 50 is used in its entirety by the brewery, thus fully utilizing the device. The thermal energy is fed into an absorption chiller from the Zimmerman company, which in turn uses the high thermal energy to generate refrigeration of up to -5 °C, cooling down the beer. The results are plain to see: The brewery saves around 400,000 kWh annually with the new investment of a g-box, which is almost half of its power needs. In addition, the chiller can be relieved of 60,000 to 80,000 kWh with the help of this absorption refrigeration system. The g-box 50 HT thus reduces annual CO₂ emissions by around 135 tons. This, in turn, not only reduces the brewery’s production and operating costs, but also protects the environment.

Energy revolution in South America

Food producer from Chile visited 2G



The photo has gone around the world recently: In the Atacama Desert in Northern Chile, the first of 10,000 planned parabolic reflectors direct the world's strongest solar radiation onto a receptor on a 200-meter high tower where it heats a saline solution. The first solar tower power plant in Latin America should be on the grid by 2019. Without any government support at all. And that is just one example of many. The interest in renewable energy is enormous in Chile. Stefan Liesner, Head of Business Development at 2G, experienced that for himself when he greeted a delegation from Chile in Heek last October.

The visit was organized by the Chambers of Commerce of Chile and of Germany. The guests, all active in the energy-intensive food industry, followed the tour through the 2G production halls with great interest. "German technology is a synonym for good quality and high reliability in Chile as well", says Stefan Liesner.

Successful participation in trade fair in Paris

2G Energie SAS presenting the g-box 20 at the interclima+elec

The interclima+elec, a leading event for energy-efficient construction in France, took place from November 7th to the 10th in Paris. The French 2G subsidiary, 2G Energie SAS, was present at the trade fair with its own booth. Since signing the new C16 agreement, which governs the compensation for electricity fed into the grid for combined heat and power units in the power range of 1 to 1,000 kW, operating smaller CHP units is also economically attractive.

2G Energie SAS presented the g-box 20, with an electric output of 20 kW and a thermal output of 43 kW, at the interclima. "The trade fair was seen as a complete success for the French subsidiary," says Jürgen Klein, Managing Director of 2G Energie SAS.

Visit us at the trade fair!

The next trade fair dates

31/01 - 03/02/2018	Fiera Agricola	Verona	Italy
06/02 - 08/02/2018	E-world energy & water	Essen	Germany
06/02 - 08/02/2018	RegioAgrar Augsburg	Augsburg	Germany
07/02 - 08/02/2018	Energy Now	Telford	England
06/03 - 09/03/2018	SHK	Essen	Germany
18/04 - 19/04/2018	CPD Energy	Coventry	England
02/05 - 03/05/2018	All Energy	Glasgow	Scotland
14/05 - 18/05/2018	IFAT	Munich	Germany
11/07 - 12/07/2018	UK AD & WORLD BIOGAS EXPO	Birmingham	England

CHP Journal

Legal information

Publisher

2G Energy AG
Benzstraße 3 | 48619 Heek | Germany
Phone +49 (0) 2568 9347-0
info@2-g.com | www.2-g.com

Editorial office

Julian Efker | j.efker@2-g.de
Julia Wülker | j.wuelker@2-g.de

Design and typesetting

Werbeagentur Holl
www.werbeagentur-holl.de



2G Locations



2G Partners