

References

Combined Heat and Power units



COGENERATION

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SERVICES

FRIEDHELM LOH GROUP

Recommended by experienced customers

Würz CHP units work according to the principle of combined heat and power. They produce both current and heat at the same time – or cooling energy through conversion of the heat. Their base components are an engine and a power generator. The engine drives the power generator which produces power either for internal use or for distribution into the public grid. At the same time heat is dissipated by the running engine – within the cooling cycle of the engine (up to 90 °C) and in the exhaust fumes (up to 500 °C). This heat is put to use by heat exchangers and is utilised mostly for the heating or cooling of buildings.

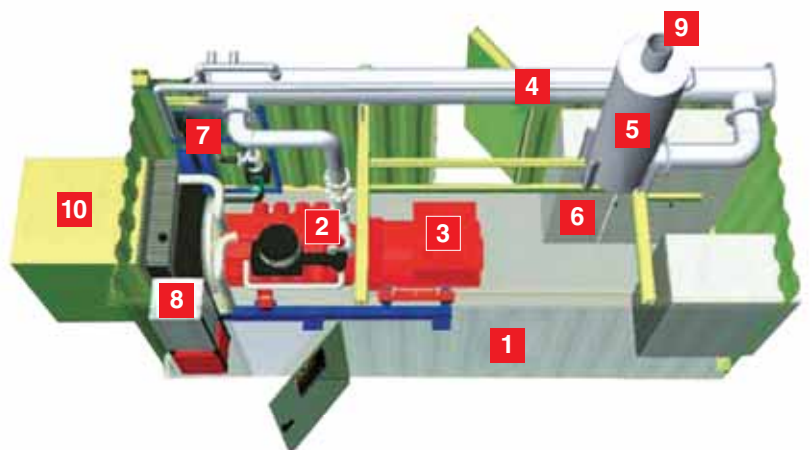
As an experienced specialist in the development, project planning, manufacture and service of high-value CHP units we can deliver to you ready-to-connect solutions adapted to your power, heating and cooling needs. Our products range from small compact installations, through complete container solutions (also for mains-independent supply) up to linked, large installations with a modular design. We design, produce and deliver your system exactly as you need it. For example, with absorbers for cooling energy production (climate control) or additional modules for a reduction in reactive power, an increase in thermal power or for the stabilisation of the electrical power at extremely high external temperatures.

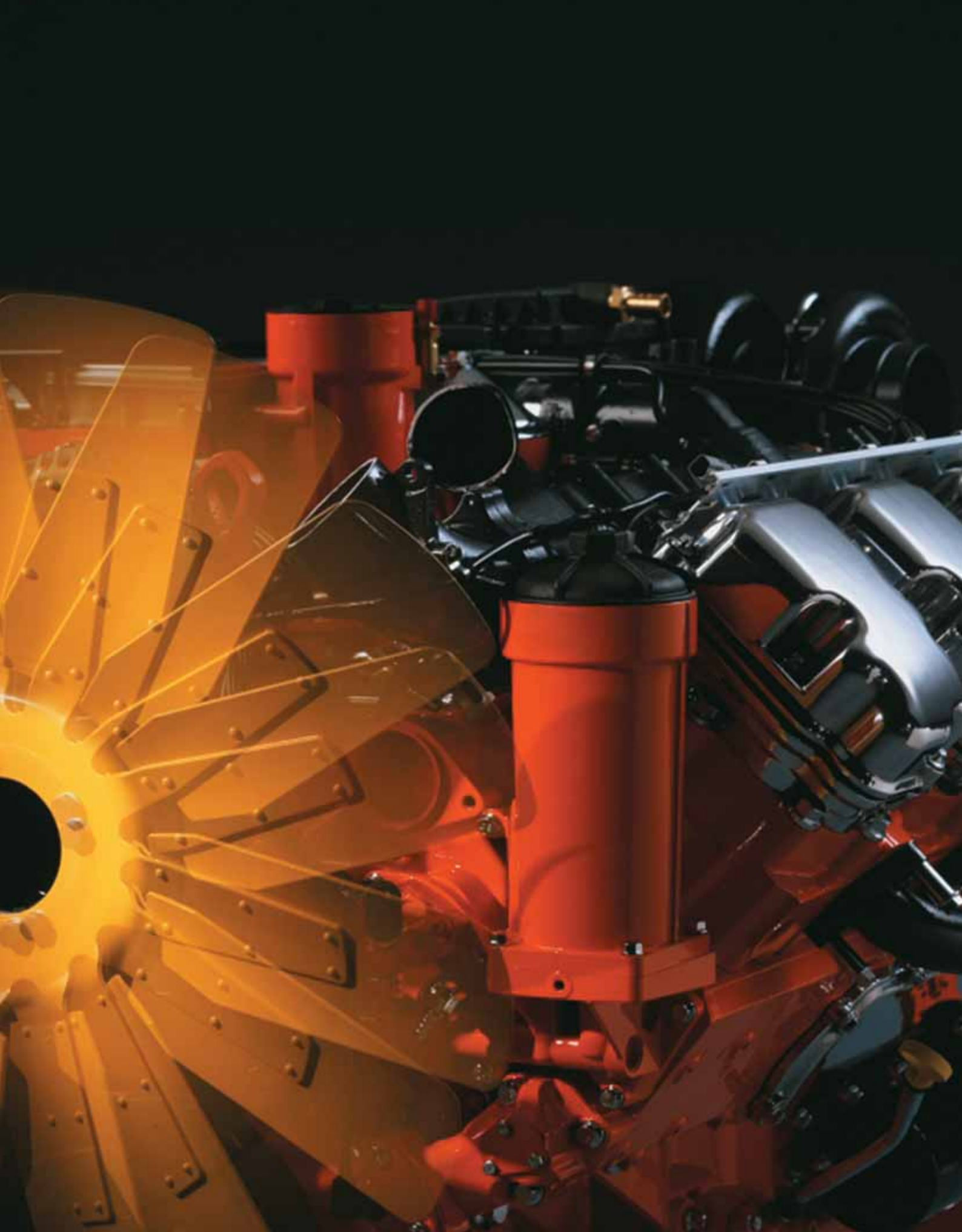
Take advantage of our experience and skills – in addition to our products we can provide support, where desired, in the form of site analysis, planning, project management, setting-up and commissioning in addition to round-the-clock service and maintenance of the CHP units.

In this brochure we will demonstrate to you the various possibilities for the use of CHP units – from nursing homes and garden-centres to industrial applications.

Container configuration

- 1** CHP unit container
- 2** Engine
- 3** Generator
- 4** Exhaust gas heat exchanger
- 5** Noise suppresser
- 6** Control and switching centre
- 7** Heating module (plate heat exchanger)
- 8** Fuel preparation module (FPM)
Tank heating and fuel preparation module are only needed if running with plant oil
- 9** Exhaust chimney
- 10** Air inlet and outlet connections





SOLAR THERMAL ENERGY

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Westerwälder Eisenwerk GmbH, Weitefeld

The requirements

Westerwälder Eisenwerk GmbH (WEW) has been producing welded tanks for over 65 years. Since 2007 it has been the leading producer of tank containers, equipment and storage systems, together with Welfit Oddy under the umbrella of Buhold Industries B.V. It is intended that office and factory buildings and the drying room of the paint plant be supplied with heat at a lower cost than previously by using a Würz CHP unit. The fuel tanks and buffer tanks produced by WEW itself are intended to serve as reference objects. It is of particular importance to the company management to achieve an ecological balance with the CHP unit by burning almost CO₂-neutral vegetable oil.

The implementation

The RPS-120 vegetable-oil-powered CHP unit was set up as a container version and linked to the existing heating control centre which itself is connected to the office and factory buildings via supply cables. The CHP unit fuel preparation module enables the use of rapeseed, palm, soya and fuel oils as well as bio-diesel and diesel fuels without needing to reconfigure the engine. Commissioning took place in December 2007.



Technical specifications	RPS-120 CHP unit
Electrically generated continuous performance	120 kW
Thermally generated continuous performance	approx. 124 kW
Hourly fuel consumption	approx. 28.8 kg
Electrical efficiency	approx. 40.5%
Thermal efficiency	approx. 39.2%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 250,000
Operational hours	11,675 hrs
Electricity produced	1,352,609 kWh
Heat produced	approx. 1,390,300 kWh
Fuel consumption	approx. 324.6 t
Operating costs (fuel and maintenance)	approx. € 254,274
Income from the sale of power	approx. € 268,220
Income from the use of heat	approx. € 76,467
Income from refund on mineral oil tax	approx. € 17,353
Total income	€ 362,040
Estimated surplus to this point	€ 107,766

* Average revenue from electricity 19.83 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	approx. 6 years
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120 kW vegetable-oil-powered CHP unit, heating control centre, fuel tank and buffer tank



A view into the interior of the soundproof container

Rittal GmbH & Co. KG, Herborn

The requirements

With 10,000 employees Rittal is the largest company within the Friedhelm Loh Group and is one of the international market leaders for enclosure and housing systems. It is planned that the CHP unit be used for the heating of a paint plant. The paint unit operates throughout the year on a 3-shift system. It is intended that the CHP unit significantly reduces the operating costs of the paint plant. The electricity produced will be distributed into the public grid and compensation provided in line with the German Renewable Energy Act (EEG).

The implementation

The RPS-340 Würz vegetable-oil-powered CHP unit was set up as a container version with a separate heated supply tank for the fuel. All fuel pipes are fitted with a heat tracing system. The CHP unit fuel preparation module enables the use of rapeseed, palm, soya and fuel oils as well as bio-diesel and diesel fuels without needing to reconfigure the engine. Commissioning was in December 2006 – since then the installation has run using palm oil and the engine has had 20,000 hours of operation without the need for revision! Through the use of the CHP unit the operating costs of the paint plant were able to be significantly reduced. And the investment in the CHP unit and periphery equipment have achieved payback in line with the time period envisaged by Würz.



Technical specifications	RPS-340 CHP unit
Electrically generated continuous performance	340 kW
Thermally generated continuous performance	approx. 346 kW
Hourly fuel consumption	approx. 77 kg
Electrical efficiency	approx. 43%
Thermal efficiency	approx. 41%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 400,000
Operational hours	22,611 hrs
Electricity produced	7,688,025 kWh
Heat produced	approx. 7,823,400 kWh
Fuel consumption	approx. 1,791.3 t
Operating costs (fuel and maintenance)	approx. € 1,410,362
Income from the sale of electricity	approx. € 1,418,441
Income from the use of heat	approx. € 430,287
Income from refund on mineral oil tax	approx. € 95,763
Total income	€ 1,944,491
Estimated surplus to this point	€ 534,129

* Average revenue from electricity 18.45 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	less than 3 years
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RPS-340 CHP unit with 36 m³ large vegetable oil storage tank



Linking to the paint plant

Wepler Filter GmbH, Oberursel

The requirements

Wepler Filter GmbH has its core business as an internationally oriented specialist for precision and micro filter equipment. Its major customers are the automotive industry and medical applications. It is intended that the CHP unit be used for the provision of heat to the building and to power an absorption cooler. The heat from the CHP unit is transformed into cooling energy and is then used for the cooling of polymer injection moulding machines. The electricity produced will be distributed into the public grid and compensation provided in line with the German Renewable Energy Act (EEG).

The implementation

The Würz RPS-340 vegetable-oil-powered CHP unit was set up as a container version. Re-cooling equipment for the absorption cooler is installed on the roof of the building. A 45 m³ large heated fuel tank and a 60 m³ large buffer tank are constructed under the ground. All fuel pipes are fitted with a heat tracing system. The CHP unit fuel preparation module enables the use of rapeseed, palm, soya and fuel oils as well as bio-diesel and diesel fuels without needing to reconfigure the engine. Commissioning was on 18 July 2008. The CHP unit is powered by palm oil and operates so reliably that the existing building heating system was eliminated.



Technical specifications	RPS-340 CHP unit
Electrically generated continuous performance	340 kW
Thermally generated continuous performance	approx. 346 kW
Hourly fuel consumption	approx. 77 kg
Electrical efficiency	approx. 43%
Thermal efficiency	approx. 41%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 450,000
Operational hours	11,756 hrs
Electricity produced	4,029,806 kWh
Heat produced	approx. 4,114,600 kWh
Fuel consumption	approx. 938.9 t
Operating costs (fuel and maintenance)	approx. € 739,239
Income from the sale of electricity	approx. € 743,499
Income from the use of heat	approx. € 226,303
Income from refund on mineral oil tax	approx. € 50,194
Total income	€ 1,019,736
Estimated surplus to this point	€ 280,497

* Average revenue from electricity 18.45 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	approx. 4 years
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RPS-340 CHP unit in a container with re-cooling equipment on the roof



Absorption cooler with approximately 220 kW of cooling capability

Mählmann Gartenbau, Lindern

The requirements

The horticultural company, Mählmann, is one of the largest producers of flowers in the German region of Oldenburger Münsterland. The company sells over two million plants annually. The floor space of its greenhouses totals 35,000 m². Two CHP units are used for the provision of heating and for the operation of the assimilation lighting. A climate control computer is to manage the CHP units and ensure a constant temperature and optimal growth conditions for the plants. It is necessary to reduce the operating costs because of the competitive situation. Due to their love of nature, the horticultural company want the CHP unit to be powered using vegetable oil.

The implementation

Two Würz RPS-340 vegetable-oil-powered CHP units were set up in a double container in a factory building. All fuel pipes are fitted with a heat tracing system. The CHP unit fuel preparation module enables the use of rapeseed, palm, soya and fuel oils as well as bio-diesel and diesel fuels without needing to reconfigure the motor. Both CHP units were commissioned in 2006. Palm oil continues to be used as the fuel. The electricity produced is distributed into the public grid and compensation provided in line with the German Renewable Energy Act (EEG).



Technical specifications	RPS-340 CHP unit
Electrically generated continuous performance	2 x 340 kW
Thermally generated continuous performance	approx. 2 x 346 kW
Hourly fuel consumption	approx. 2 x 77 kg
Electrical efficiency	approx. 43%
Thermal efficiency	approx. 41%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil
After three years of operation, the maintenance concept was changed to pure remote monitoring. All repair and maintenance work is undertaken today by the customer.

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 600,000
Operating hours of the double unit	42,801 hrs
Electricity produced	14,524,444 kWh
Heat produced	approx. 14,809,000 kWh
Fuel consumption	approx. 3,384.2 t
Operating costs (fuel and maintenance)	approx. € 2,664,512
Income from the sale of electricity	approx. € 2,679,760
Income from the use of heat	approx. € 518,315
Income from refund on mineral oil tax	approx. € 180,919
Total income	€ 3,378,994
Estimated surplus to this point	€ 714,482

* Average revenue from electricity 18.45 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	approx. 4 years
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Dual installation with 2 CHP units each with 340 kW in a common container



Fuel tank with a 60 m³ capacity

AZURIT Hildegardis senior citizen's centre, Langenbach

The requirements

The Azurit Group is the provider of in-patient facilities and services for the care of the elderly. The Azurit Hildegardis senior citizen's centre has 232 care places and 12 residential assisted living facilities. In addition to the care centre it has a cafeteria, a swimming pool and a hairdressing salon. It is intended that through the use of a CHP unit the operating costs for the heating of the senior citizen's centre, including the swimming pool, are significantly reduced. The electricity produced by the CHP unit is planned to be distributed into the public grid and recompensed in line with the German Renewable Energy Act (EEG).

The implementation

A Würz RPS-340 vegetable-oil-powered CHP unit was connected to the heating system of the senior citizen's centre. The CHP unit is fitted with automatic equipment for changing engine lubricating oil. The container and peripheral equipment are placed behind a 4.5 m high protective wall. In addition, soundproofing measures reduce the engine exhaust emissions. The CHP unit was put into operation in September 2008. Until now palm oil has been used as the fuel and in future cold-pressed rapeseed oil will be used.



Technical specifications	RPS-340 CHP unit
Electrically generated continuous performance	340 kW
Thermally generated continuous performance	approx. 346 kW
Hourly fuel consumption	approx. 77 kg
Electrical efficiency	approx. 43%
Thermal efficiency	approx. 41%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 400,000
Operating hours of the double unit	12,596 hrs
Electricity produced	4,196,275 kWh
Heat produced	approx. 4,300,000 kWh
Fuel consumption	approx. 978 t
Operating costs (fuel and maintenance)	approx. € 769,980
Income from the sale of electricity	approx. € 774,212
Income from the use of heat	approx. € 236,500
Income from refund on mineral oil tax	approx. € 52,284
Total income	€ 1,062,996
Estimated surplus to this point	€ 293,016

* Average revenue from electricity 18.45 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	approx. 4 years
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340 kW vegetable-oil-powered CHP unit with a 50 m³ buffer tank and a 50 m³ fuel tank



Rear view of the CHP unit

Alfred Grosser School Centre, Bad Bergzabern

The requirements

The Alfred Grosser School Centre comprises a secondary school, an intermediate school and a grammar school. Within the building complex are an auditorium, a gymnasium and sports halls for the local population. In addition, the school centre has open-air and indoor swimming pools. It is intended through the use of a Würz GmbH CHP unit that the running operating costs for the heating of the school centre, the sports halls and the open-air and indoor pools be significantly reduced. The payment for the electricity is planned to be made in line with the German Renewable Energy Act (EEG).

The implementation

A Würz RPS-120 vegetable-oil-powered CHP unit was incorporated into the heating complex of the school centre. The vegetable oil is pumped from the externally located fuel tank through a filtration plant and stored temporarily in a settling tank before it is fed to the engine. A fan management system developed by Würz ensures, in combination with air outlet connections, that the room temperature remains constant. The CHP unit was commissioned in 2009. A remote access system has been installed on a PC of the operator for the monitoring and adjustment of running operations.



Technical specifications	RPS-120 CHP unit
Electrically generated continuous performance	120 kW
Thermally generated continuous performance	124 kW
Hourly fuel consumption	approx. 28.8 kg
Electrical efficiency	approx. 40.5%
Thermal efficiency	approx. 39.2%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 01.08.2010)	
Total investment in CHP unit and peripheral equipment	approx. € 200,000
Operating hours of the double unit	10,386 hrs
Electricity produced	1,205,348 kWh
Heat produced	approx. 1,245,500 kWh
Fuel consumption	approx. 289.3 t
Operating costs (fuel and maintenance)	approx. € 226,616
Income from the sale of electricity	approx. € 249,145
Income from the use of heat	approx. € 68,503
Income from refund on mineral oil tax	approx. € 15,466
Total income	€ 310,585
Estimated surplus to this point	€ 83,969

* Average revenue from electricity 20.67 Ct/kWh, maintenance cost 3.2 Ct/kWh, average fuel price for 3 years 650 €/t, heat price 5.5 Ct/kWh, mineral oil tax refund 5.50 €/MWh

Payback period	approx. 4 years
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Exhaust gas routing system in the heating building



Operating and display unit on the enclosure of the CHP unit

Residential building of Wärme Kontor Freiburg GmbH, Freiburg

The requirements

Wärme Kontor Freiburg GmbH is a part of the Unmüßig Group and carries out the planning and realisation of energy concepts for property units in addition to the supply and operation of energy generation plants within buildings. Within this, the main focus of their supply concepts for heating, cooling and electricity is on renewable energy sources. It is intended that four residential buildings in the Innere Elben housing area with an overall living area of 4,300 sqm be supplied with heating and electricity by a natural-gas-powered CHP unit and a natural gas heating system.

The implementation

The Würz EF-30G natural-gas-powered CHP unit is incorporated into the heating control centre of one of the residential buildings. The CHP unit supplies 30 kW of electricity and 67 kW of heat at the same time. The installation has an overall efficiency rate of up to 90% so that the energy input is utilised in an optimal manner. The CHP unit has a noise emission level of only 53 dB(A) measured directly at the installation and is thus one of the quietest pieces of equipment of its kind. The electricity generated by the CHP unit is used partially internally – any surplus electricity is distributed into the public grid and compensation provided in line with the Combined Heat and Power Law. A particular incentive is provided by the CHP market incentive programme which offers an investment grant of 13,225 euros. The installation was commissioned in July 2009.



Technical specifications	EF-30G CHP unit
Electrically generated continuous performance	30 kW
Thermally generated continuous performance	approx. 67 kW
Hourly fuel consumption	approx. 108 kW
Electrical efficiency	approx. 90%
Thermal efficiency	approx. 22%

Full repair contract
Remote monitoring
24-hour service hotline
Optimisation of the running operation of the equipment
Supply of replacement parts
Maintenance, repair, cleaning (e.g. heat exchanger)
Replacement of the engine in cases of damage or low performance
Supply and disposal of engine lubricating oil

Operating efficiency forecast* (Status 31.12.10)	
Total investment in CHP unit and peripheral equipment	€ 75,000 less € 13,225 (grant from market incentive programme)
Operating hours of the double unit	7,900 hrs
Electricity produced	180,000 kWh
Heat produced	402,000 kWh
Fuel consumption	647,800 kWh
Operating costs (fuel and maintenance)	€ 38,109
Income from the sale of electricity	€ 27,207.60
Income from the use of heat	€ 29,489
Income from refund on mineral oil tax	€ 22,110
Total income	€ 3,563
Estimated surplus to this point	€ 17,051.80

* Natural gas price 4,2 cents per kWh (e.g. Maingau), maintenance cost 1,38 € per operating hour, heating price 5,5 cents per kWh, mineral oil tax refund: 0,0055 € per kWh, internal electricity consumption of 50% of electricity produced, internal electricity price 18 cents per kWh, CHP payment for electricity 5,11 cents per kWh, average price of EEX 4,54 cents per kWh (from the last 3 quarters), grid usage fee: 0,005 cents per kWh

Payback period	without taking into account the support from the market incentive programme approx. 7 years
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30 kW natural-gas-powered CHP unit in the heating cellar



Settings on the operating and display unit of the CHP unit

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Faster – better – worldwide.

“Rittal – The System.”

Faster – better – worldwide: Everything we do centres around the benefits to you. For you, we have developed a perfectly coordinated system platform that unites innovative products, pioneering engineering solutions and comprehensive service. We plan and implement your infrastructure, ensure reliable power distribution, boost energy efficiency through innovative climate control, and develop complete data centres.

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Better

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- Country-specific expertise from Rittal industry experts
- International approvals provide peace of mind

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