Clean power solutions with the Cyplan® ORC

Organic Rankine Cycle

The profitable way to generate electricity
Converting thermal energy into an asset: clean power and useful heat

Unlocking the electrical potential of thermal energy

One of the most significant challenges we are facing today is the reduction of greenhouse gas emissions. Companies constantly seek to optimize production facilities' energy efficiency and operating costs.

With its cutting-edge solutions based on the Cyplan® ORC, Dürr meets these needs. Organic Rankine Cycle is a key technology for generating electricity from heat sources with medium and low temperature levels.

In combination with renewable heat sources or utilizing excess heat of different origin, Cyplan® ORC solutions generate CO₂-free electricity. This allows companies to produce their own electricity, work more independently of external supply and reduce their carbon footprint.

WHY ORC?
The Organic Rankine Cycle technology ...  
- converts heat into electricity without CO₂ emissions  
- utilizes small thermal inputs and heat at temperature levels that are unattainable for conventional energy transformation methods  
- has potential for subsidies and fiscal benefits

WHY CYPLAN® ORC?
Cyplan® ORC systems stand for ...  
- financially attractive concepts  
- the highest efficiency in its class  
- superior flexibility for various heat sources  
- combined heat and power (CHP) solutions  
- over 10 years of experience  
- more than 1,000,000 operating hours

HEAT SOURCE
- Engines/CHP
- Pilanes
- Industry
- Gas turbines
- Geothermal systems
- Solar heat

ELECTRICITY
- Self-supply with electric power  
- Feed into public network

RESIDUAL HEAT
- Heating network supply  
- Drying processes  
- Fermenting processes  
- Greenhouses
Cyplan® ORC: How it works

The Organic Rankine Cycle (ORC) is a thermodynamic process similar to the well-known water-steam cycle, which forms the basis of conventional electricity generation in power plants. The main difference is that the ORC uses an organic fluid with a low boiling point. Consequently, ORC systems can operate at lower temperature levels compared to the conventional water-steam cycle.

Following continuous research and development in the field of ORC technology, Dürr has been able to patent an improved design. Dürr’s Cyplan® ORC systems offer significantly increased efficiency and higher flexibility.

STAND-OUT FEATURES
• Hermetically sealed cycle of working media
• Highly efficient single-stage expansion turbine
• Combined heat & power capability on high-temperature applications with secondary heat use up to 95°C
• Adaptability to various heat transfer media that deliver the heat to the ORC
• Selection from a range of working media suitable for various applications

Modules for all requirements
Cyplan® ORC modules are available as standardized prefabricated, pre-tested modules mounted on a steel frame with electrical output ranging from 50 kW to 500 kW. The six different module sizes available correspond to the power output of the turbogenerator.

Dürr also develops customized ORC solutions that combine standardized elements with components that are specially designed for a specific purpose.

PRODUCT FEATURES
• Compact skid-mounted units
• Easy transportation and integration
• Fully automated operation with remote control function
• Built according to industrial standards

The diverse Cyplan® ORC product portfolio enables a wide range of applications
Dürr’s Cyplan® ORC solutions for your business

FURNACES
A Cyplan® ORC module added to a furnace can be combined with any kind of incineration: wood-based fuel, waste from wood processing, sewage sludge, small-scale municipal waste, etc. Cyplan® ORC can also be integrated with innovative thermal processes such as pyrolysis and biochar:

- Energetic utilization of existing organic residues
- Suitable for all kinds of furnaces
- Secondary heat use downstream of ORC

GEO THERMAL
Dürr Cyplan® ORC plants can be utilized as modularized power plants, wellhead generators, upgrades for existing flash plants with an additional binary cycle or seasonal operation plants.

- Modular and flexible design
- Operation optimized through cascade alignment
- Suitable for operation in adverse outdoor environments

SOLAR THERMAL ENERGY
Cyplan® ORC can be applied to different types of solar energy plants as a high-temperature solution in combination with a secondary heat source or as a low-temperature solution after the thermal storage.

- Excellent part-load behavior
- No water consumption
- Key element for hybrid power plants

ENGINES / CHP UNITS
The Cyplan® ORC can be combined with all types of stationary gas and diesel engines such as biogas, sewage gas and landfill gas and has the potential to increase electrical output by up to 10%. Due to the direct evaporation technology the module is installed in the exhaust gas path between the engine and the stack:

- CHP capability
- Saves 3 – 5% of input fuel
- Electricity-producing heat exchanger with more than 95% heat usage

HEAT RECOVERY
Dürr can upcycle all kinds of heat above 90°C and transform it into electricity independent of the heat carrier (water, steam, thermal oil, hot gas).

- No intrusion into production process
- Reduces carbon footprint
- No operator needed

GAS TURBINES
Cyplan® ORC modules are an ideal add-on for small to medium-sized gas turbines running in open cycle. The potential output increase without additional fuel input is up to 25%.

- Fuel flexibility
- Direct evaporation
- Functions without water
Along with supplying outstanding equipment for green electricity generation, Dürr provides its clients with a comprehensive support throughout all project stages. Dürr offers cooperation from carrying out turnkey projects or providing supervision only for specific project stages to organizing training courses for the customer’s employees. The professional project management teams at Dürr guarantee transparency and seamless communication. At the same time Dürr commissions plants within the budget, scope and deadline agreed with the client.

3 STARTING IMPLEMENTATION

When it comes to order execution, planning is once again the key to success. To ensure smooth realization, Dürr keeps track of the process environment, which implies performing 3D layouts, P&IDs, calculation of thermal stress, pressure losses, static and dynamic analysis of piping systems.

4 ROLLING OUT

When manufacturing Cyplan® ORC modules and auxiliary equipment, Dürr combines in-house production and contributions from external partners. Strict quality management, continuous improvement of production processes and high standards for suppliers ensure the quality of the ready-made modules.

5 HITTING THE GROUND

Delivering the skid-mounted and pre-tested Cyplan® ORC module to the site allows fast and cost-effective installation. Dürr professionals execute proper and prompt commissioning. Post-commissioning training on the client site empowers customer employees for further successful module operation.
Invest in a sustainable future
... by investing in a sustainable solution that pays off and brings financial income.

POWER GENERATION
With self-generated electricity you will benefit from a range of attractive financial opportunities:
- Decrease your electricity bills and dependency on the public grid
- Make use of attractive Feed-in-Tariffs for green electricity
- Obtain subsidies or local tax advantages for sustainable technology implementation

USEFUL HEAT
Cyplan® ORC also provides advantages connected with utilization of the useful heat:
- Apply it in the follow up processes
- Sell it to the district heating network

CO₂ REDUCTION
Benefit from the significant reduction of your company’s carbon footprint.

TYPICAL BENEFITS USING TWO CYPLAN® ORC STANDARD MODULES AS EXAMPLES

<table>
<thead>
<tr>
<th>CYPLAN® ORC 120</th>
<th>Production</th>
<th>Savings</th>
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<tbody>
<tr>
<td></td>
<td>13,000 MWh Energy¹</td>
<td>-11,000 tons Carbon Dioxide¹</td>
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<tr>
<td></td>
<td>equiv. 350 Households²</td>
<td>equiv. 55,000,000 km⁴</td>
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<table>
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<th>CYPLAN® ORC 500</th>
<th>Production</th>
<th>Savings</th>
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<td></td>
<td>54,000 MWh Energy¹</td>
<td>-45,000 tons Carbon Dioxide¹</td>
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<tr>
<td></td>
<td>equiv. 1,500 Households²</td>
<td>equiv. 225,000,000 km⁴</td>
</tr>
</tbody>
</table>

¹ - Period of Observation: 15 years, 8000 hrs per year
² - Around 2,500 kWh consumption per household per year
³ - Based on 830 g / kWh of CO₂ emissions from coal fired power plants
⁴ - Based on 200 g / km of CO₂ emissions

Dürr’s customer service team provides expert support wherever you are in the world. Dürr is always on-site to help reduce production costs, increase plant availability and provide rapid technical support.

We offer a comprehensive service package that can be adjusted according to your specific requirements. Our services include prompt repair, preventive maintenance, consulting and upgrading of your individual plant.

Your partner for successful production

OUR SERVICE AT YOUR DEMAND
Ramp-up and launch management
Modifications and upgrades
Engineering with experience
Spare parts service
Expert engineering
Inspection and maintenance
Service locations all over the world
LEADING IN PRODUCTION EFFICIENCY