What is ORC?

ORC stands for Organic Rankine Cycle. This is a classic condensation cycle. However, instead of water vapour, an organic substance is used as the medium. Thus it is the transformation of thermal energy into electricity. The reason why another medium is used rather than water is simple. An ORC device works with such input temperatures and such temperature levels which a standard steam cycle cannot cope with effectively.

An ORC unit uses flue gases from a hot-biomass boiler as an input medium. The flue gases in the heat exchanger (evaporator) heat the operating medium of an ORC system and it leads to a large expansion on the turbine blades. This way, the whole system begins to produce electricity. Excess heat from the cooling system is then used as useful heat for heating buildings, dryers, etc. Depending on the use of energy block it uses two types of ORC systems: ORC TRIOGEN and ORC DURR.

Why produce electricity and heat from biomass using technology of Energoblock B:POWER?

Operating the technology the producer of electricity and heat from biomass obtains the possibility of partial or full independence from prices of electrical and thermal energy. Furthermore, the operator of such technology is provided with:

- Significant economic benefits
- Variability of possible technical solutions
- Easy implementation into existing systems of electricity and heat
- Possibility to obtain support for electricity energy and heat from biomass in the form of CHP
- Easy installation with little use of space
- Minimum operation and maintenance costs

Electricity production from ORC

<table>
<thead>
<tr>
<th>Electricity production from ORC</th>
<th>Energy in hot water</th>
<th>Temperature of water with ORC</th>
</tr>
</thead>
<tbody>
<tr>
<td>40kWel PtG</td>
<td>180kWth</td>
<td>up to 90°C</td>
</tr>
<tr>
<td>70kWel PtG</td>
<td>320kWth</td>
<td>up to 90°C</td>
</tr>
<tr>
<td>120kWel PtG</td>
<td>520kWth</td>
<td>up to 90°C</td>
</tr>
<tr>
<td>130kWel PtG</td>
<td>650kWth</td>
<td>up to 85°C</td>
</tr>
<tr>
<td>250kWel PtG</td>
<td>1000kWth</td>
<td>up to 90°C</td>
</tr>
<tr>
<td>350kWel PtG</td>
<td>1400kWth</td>
<td>up to 90°C</td>
</tr>
<tr>
<td>500kWel PtG</td>
<td>2000kWth</td>
<td>up to 90°C</td>
</tr>
</tbody>
</table>

Note.: ORC series marked with italics utilize thermal oil.

Combined production of electricity and heat - operation philosophy

Solution concept of combined production of electricity and heat consists in the online coverage of consuming electricity and heat in time. These two commodities are not primarily separated from one another but the necessity of the best operational efficiency is taken into account. The technology does not choose the policy to maximize sales of electrical power into distribution network, but on the contrary, to consume the biggest share of electric power on spot. This leads to a sharp reduction in costs for the purchase of electricity and considerable savings. Then all operational support, such as CHP, etc., are a pleasant bonus for the operator, but not a vital component of revenues.

Feedstock into boiler is wood chips, wood waste material from production or sawdust with humidity up to 55%. The temperature of the flue gas supplied to the ORC is about 520°C.
Energoblock is a hot-air boiler with a thermal 2MWth grid power, ORC module, and a bypass flue gas/water heat exchanger. The reasons to choose this concept are the following:

- Full control band of heating supply in the summer and winter season.
- Permanent heat supply in case of a service shutdown of ORC.

The boiler is connected to the heat management, where there are a flue gas/water exchanger and an ORC system for generating electricity and hot water.

Regulation and preparation of hot water respond to the current heating system needs and hot water consumption. There is no need to install any additional backup systems or hot water tanks.

**CASE STUDY - ENERGOBLOCK**

**1,2 MWth, 130 kWel**

**ENERGOBLOCK ORC B:POWER**

**1,5 MWth internal fuel gas/water exchanger**

**Flue gas branch for ORC approx. 2,5kg/s, 530°C**

**Combi 2MW grid heater**

**up to 1,2MWth/80°C**

**650kWth/80°C**

**ORC TRIOGEN WB-I**

**Proportion of the supply:**

1. Delivery of the first technology and construction is complete – turnkey.
2. We will help with administrative acts associated with the project (permits, connection to AC power energy, building permits, applications for subsidies...).
3. We cooperate with companies dealing with preparation for applying investment subsidies.
4. We guarantee subsequent professional maintenance and 24/7 availability of our technicians.

**QUESTIONS & ANSWERS TO THE CASE STUDY**

**How does an investor find out whether the technology is useful for them?**

1. I own a technology that consumes heat (drying oven for wood, etc.), or a central heating system (DH), with all-year-round and heat delivery?
2. Do I need in average at least 600Kw heat/hour? (You can check the label and boiler annual operation, or the drying oven labels, etc.)
3. Do I have space for placing ORC Energoblock sized 20 x 20 m?
4. Is there also a distribution system located near the place?

**Proportion of the supply:**

1. Delivery of the first technology and construction is complete – turnkey.
2. We will help with administrative acts associated with the project (permits, connection to AC power energy, building permits, applications for subsidies...).
3. We cooperate with companies dealing with preparation for applying investment subsidies.
4. We guarantee subsequent professional maintenance and 24/7 availability of our technicians.

**What other questions must also be considered and what are the possible answers?**

1. **I have biomass but I’m not sure that it is suitable for this technology, I do not know whether I have a sufficient amount.**
   Required fuel is waste wood biomass with a moisture content of 55%, sawdust, wood chips, etc. The annual consumption of one block ORC is up to 3 000 tones of woodmass with a moisture content of about 50%.

2. **I don’t know my heat consumption exactly.**
   If no records of annual heat consumption are kept, two things are sufficient at the start - the label performance of an existing power boiler, if it is installed and an annual fuel consumption, i.e. for example gas consumption, etc.

3. **I have my own electricity consumption. Can I use this source for covering this consumption?**
   YES. This is the ideal situation. The greater the percentage of covering their own electricity consumption from production in Energoblock the better for the whole economics of the project. In the case, one unit produces approximately 130kW electricity hourly electricity, which is available for own consumption project.

**WE WILL BE HAPPY TO PROVIDE ALSO YOU WITH THE SPECIFIC SOLUTION!**

**B:POWER, a.s.**

**U Borové 69**

**580 01 Havlíčkův Brod**

**CONTACT US!**

**Tel.: 569 777 777**

**E-mail:**

*info@bpower.cz*

**www.bpower.cz**