Expert in Green energy

• Member of the LUKA & BRAMER GROUP, located in the Czech Republic

• Focus at:
  • The supply of technology for the use and processing of waste products
  • The supply and service of technological systems and equipment in the field of energy production
  • The supply and service of technological systems aimed at savings in the private and public sectors
  • Research and development of pyrolysis and depolymerization units

• Providing:
  • An experienced team of engineers with many years experience in the given field
  • Unique solutions for each technological system
The conversion of waste heat into electric energy
ORC - Organic Rankin Cycle

- Rankin cycle => similar to steam cycle (condensation cycle)
- Working fluid => mixture of organic compounds
- Working fluid => lower evaporating temperature comparing to water
- Heat utilization in range 80°C – 150°C
- Conversion of unused (waste) heat into electric energy
- Zero CO₂ emissions
The cycle begins with the pump, which pumps the operating fluid in the internal circuit of the device to the evaporator. The evaporator is also supplied with the waste heat which heats up the working fluid and starts to evaporate. Saturated high-pressure gas at the outlet of the evaporator is send to the expander. The expanding gas spins the expander connected to the generator, thereby producing electrical energy. Supersaturated gas at low pressure exits the expander and condenses in the condenser. The working fluid leaving the condenser is pumped round again, and the cycle repeats.
“Fuel” for the ORC

Waste heat which has no further use is wasted on cooling or released into the atmosphere

• **Co-generation units**: diesel, gas, bio-gas...
• **Low pressure steam**: from the turbine, from production processes ...
• **Industrial processes**: chemical companies, refineries, glassworks, metalworks, foundries...
• **Combustion processes**: electric power stations, boiler rooms, furnaces, cement works...
• **Geothermal sources and solar heat sources**
“Fuel” for the ORC

• Hot water
  Specific heat capacity: 4.19 kJ/kgK

• Thermal oil
  Specific heat capacity: 2.5 kJ/kgK

• Low pressure steam
  Steam heat: 2106 kJ/kg at 150°C

• Exhaust gases
  The need for installation of the heat exchanger for exhaust gases / water
ORC E-Rational performance series

LT 111, < 1,6 MWe: 55 - 75 - 90 - 110 - 132 kW
LT 241, < 4,0 MWe: 200 - 220 - 250 - 280 - 315 - 355 kW
LT 442, < 7,0 MWe: 2x132 - 2x160 - 2x185 - 2x200 - 2x220 - 2x250 - 2x280 - 2x315 kW

HT 111, < 1,5 MWe: 90 - 110 - 132 - 160 - 185 kW
HT 121, < 2,0 MWe: 160 - 185 - 200 - 220 - 250 - 280 kW
HT 221, < 3,0 MWe: 185 - 200 - 220 - 250 - 280 - 315 - 355 - 370 kW
HT 241, < 4,0 MWe: 280 - 315 - 355 - 370 - 400 - 450 - 500 kW
HT 442, < 6,0 MWe: 2x185 - 2x200 - 2x220 - 2x250 - 2x280 - 2x315 - 2x355 - 2x370 kW
Characteristics of ORC E-Rational units

• Output range: 55 kW – 740 kW
• Modular construction
• E-Rational screw Expander
• Low revolutions <3100 rpm
• Asynchronous generator
• Seamless connectivity to the network
• Remote access and monitoring
• Lubrication system within the framework of operating materials
• Indoor or outdoor design
• Effectivity 6 – 13 % according to working environment
Applied norms for ORC E-Rational

- Engineering directive – 2006/42/EG ✓
- EMC directive – 2004/108/EG ✓
- Directive for low voltages – 2014/35/EG ✓
- Directive for pressurized equipment – 2014/68/EU ✓
- Safety level – IP55 ✓
ORC E-Rational types

ORC 10 ft.
indoor design

ORC 20 ft.
outdoor design
ORC E-Rational types

ORC 40 ft.  outdoor design
Proviron chemical company, Ostend, Belgium

- Exothermal process
- Using waste steam
  - pressure 3.5 bar, flow 3.5 ton/hour
- Cooling: cold water
- Production: 200 kWe
- Annual production: >1 500 MWh
- Reduced CO$_2$ emissions > 1000 ton/year
- Water savings: > 27 000 year
- ORC type 4000 - 250 kWe
- In operation from 05/2012
Alstom engineering company, Norway

- Using waste heat from the processing of aluminium
- ORC type 1000 - 90 kWe
- Hot water: 90°C / 70°C
- Heat output: 350 - 1000 kWth
- Cooling: cold water from the fjords 13°C
- Production of electricity 30 - 70 kWe according to heat input
- In operation from 06/2013
Quévy biogas plant, Belgium

- 3 x CHP Deutz, installed output: 2432 kWe / 2650 kWth
- ORC installed instead of dry coolers
- Use of waste heat:
  - Hot water from the CHP engine, 90°C/70°C
- Production: 40 kWe
- Annual production: >340 MWh
- Reduced CO₂ emissions >240 ton/year
- ORC type 1000 - 55 kWe
- In operation from 06/2012
Reference installation – biomass electric power station 1

Holzheizkraftwerk Hövelhof, Germany

- 5 MWth boiler for biomass
- 1 Mwe Turboden high-heat ORC (300°C)
- Cold side of Turboden unit is the heat input for E-Rational ORC
- ORC type 4000 - 315 kWe
- Hot water 90°C/70°C
- Production: 270 kWe
- Cooling: dry cooler
- In operation from 04/2014
Holzheizkraftwerk Oerlinghausen, Germany

- 3 MWth boiler for biomass
- 620 kWe Turboden high-heat ORC (300°C)
- Cold side of ORC Turboden supplied into district heating
- Excess heat from district heating is input for E-Rational
- ORC type 1000 - 90 kWe
- Hot water 90°C/70°C
- Production: 270 kWe
- Cooling: dry cooler
- In operation from 03/2013
Thank you for your attention

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