



1 Evaporator ORC process with waste heat supply from a gas piston engine.

2 IR image of the ORC turbine in operation.

ORC PLANTS 20-120 kW_{EL}

PILOT APPLICATIONS: ELECTRICITY FROM WASTE HEAT AT BIOGAS PISTON ENGINES

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Waste heat is generated during power generation and in industrial high temperature processes. If the output of the electricity generated by waste heat is below 300 kW_{el}, an economic utilization of the waste heat is not possible. Operators of biogas plants are familiar with this problem. Fraunhofer UMSICHT is developing small Organic Rankine Cycle (ORC) plants which promise to change that: they utilize waste heat by converting it into electricity without any restrictions, increasing the economic efficiency of the system and lowering the CO₂ output.

In Germany alone, approx. 6,000 biogas plants are in operation. At a large number of them, the CHP waste heat is lost unutilized, for the most part. ORC plants convert the waste heat flows of the engines into valuable electrical power output.

Keywords

- High temperature module for waste heat utilization 400-530 °C
 - 60-120 kW_{el, ORC} from 430-670 kW_{th} (Type A-100) for biogas piston engines of 800-1400 kW_{el}
 - 30-60 kW_{el, ORC} from 215-335 kW_{th} (Type A-50) for biogas piston engines of 400-700 kW_{el}
- Low temperature module for hot water drive 85-95 °C
 - 25-50 kW_{el, ORC} from 420-625 kW_{th} (Type W-25) for biogas piston engines of 500-800 kW_{el}

Industrial sectors

- CHP plant builders, engine manufacturers
- Project developers, biogas plant operators
- Biogas plant construction
- Wood-fired power plants, industrial waste heat generators



- 1 Fraunhofer UMSICHT's ORC maintenance vehicle.
- 2 Installation of the ORC turbine.

Technological specifications

- **New**
Highly efficient, low-wear turbo generator without transmission with static sealing surfaces, exclusively
- **Low internal power consumption**
Without thermal oil loop, high enthalpy gradient in the turbine, highly efficient feed pump and - where applicable - direct condensation
- **Safe**
CE-compliant in accordance with PED 97/23/EG
- **Piston engine compatible**
Low pressure differential and operation above acid dew point on the waste heat side
- **Power grid compliant**
Adheres to EMC directive 89/336/EWG, low-voltage directive 73/23/EWG and VDEW low voltage guideline
- **Preassembled**
Ready for on-site installation
- **Fully automatic und remote controlled**
due to SPS control and communication module

Our service

- Design, construction and delivery of ORC plants, ready to operate, function, all from one source (from the type program that is currently being setup, pre-commercial pilot series)
- Feasibility studies, advance planning of systems for converting waste heat into electricity, e. g. on motors, turbines, wood-firing systems, industrial waste heat sources
- Durability test of ORC working fluids
- ORC process simulation, component design
- Flow simulation (turbines, heat exchangers)
- Problem diagnosis and optimization of existing ORC plants

Your benefit

- **Operator**
 - High added value due to conversion of waste heat into electricity
 - Participation in the optimization of ORC systems and - where applicable - reduced risk due to sponsoring of ORC plants during the development/testing stage
 - Short amortization periods due to power generation instead of long-term binding heat supply contracts
- **Plant construction**
 - Increase of the efficiency of systems due to bottoming cycle
 - Strategic expansion of the product portfolio



Fraunhofer UMSICHT manufactures small ORC plants for conversion of heat into electricity, consults on application and sizing questions and plans your application.