# Efficient use of waste heat in production processes

Energy recovery systems from GEA using ORC technology

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# Discover the benefits of ORC technology

Energy-intensive processes generate high amounts of waste heat emissions that are often unexploited. Using the thermal energy from these emissions makes sense, both economically, with regard to steadily rising energy costs, and ecologically, given increasingly strict environmental regulations. GEA offers gas cleaning and energy recovery systems that employ ORC (Organic Rankine Cycle) technology, proven to be the most efficient solution for energy production.

## ONE SOLUTION – FIVE ADVANTAGES:

- ORC technology works at low pressures and temperatures, in contrast to other solutions
- High efficiency of the entire production system – approximately 25% of the exhaust heat is used
- High serviceability
- High flexibility of the various modules, ideal for retrofitting in narrow spaces
- Quick ROI (Return on Investment), sustainable reduction of energy costs

*Waste heat exchanger (horizontal gas flow)*

ORC energy recovery systems from GEA produce economical electricity for use in further production processes. Moreover, this solution contributes to the reduction of the facility's $CO_2$ footprint, since it generates no additional $CO_2$ emissions. Our experts will gladly calculate the economical and environmental efficiency of your project given its configuration and your local circumstances beforehand. This way you will know how long it will take for the project to pay for itself.

## A sensible investment in utilization of waste heat will pay off in any situation:

- New construction of production lines and systems
- Modernization of gas cleaning systems
- Retrofitting of gas cleaning systems

### USE WITH RAW GAS

Highest temperature in the entire process, thus high efficiency. Cleaning system required.

### USE WITH CLEAN GAS

Further use of the remaining temperature level possible.

### BOTH METHODS IN COMBINATION

The higher investment pays off because of the high overall efficiency in the shortest time.

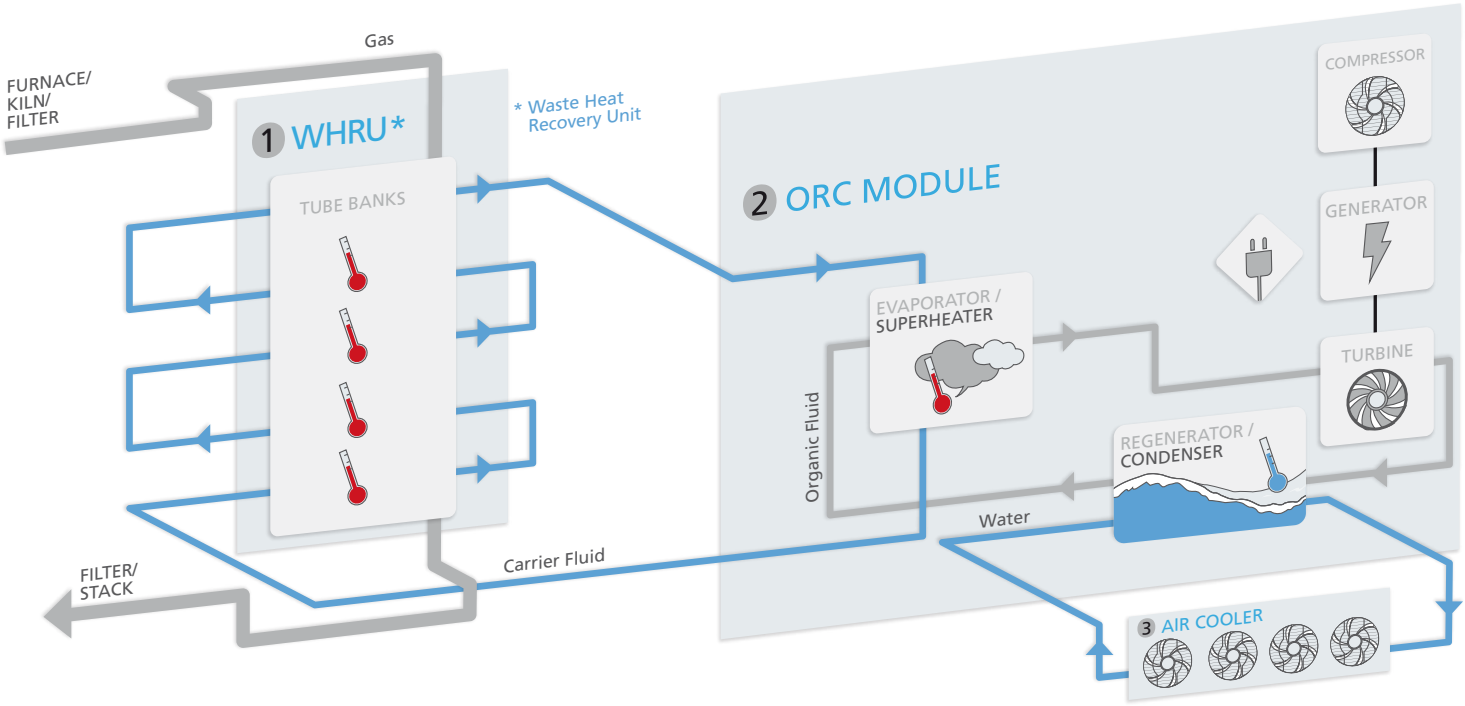


Diagram of the energy recovery cycle downstream of the gas cleaning system

## The GEA energy recovery system

### 1. THE WASTE HEAT RECOVERY UNIT (WHRU)

The WHRU absorbs the waste heat from production or gas cleaning processes. The unit contains a number of tube banks, depending on the required cooling temperature. Tubes contain a carrier fluid (thermal oil with a boiling point above 350°C) which absorbs the heat from the gas with high efficiency. This setup allows for a flexible configuration of the ORC module.

### 2 THE ORC MODULE

In the ORC module, the heat carrier fluid from the WHRU initially passes a further heat exchange step with an organic fluid (e.g., silicon oil), which evaporates in the evaporator / super heater, driving a turbine with a coupled generator to produce electricity. The cooled-down thermal oil returns to the WHRU. An emergency cooler and three-way valves control the thermal oil temperature and flow to the ORC module. The organic fluid vapor exhausted from the turbine returns to liquid phase in the water-cooled condenser and is pumped back to the evaporator, passing through the regenerator.
It is possible to couple a compressor to the ORC turbine in order to efficiently and directly produce compressed air for the plant.

### 3 WATER COOLING SYSTEM

The water leaving the ORC module condenser is cooled down by dissipating the heat to ambient air in a closed circuit by means of adiabatic or dry air coolers, or by means of open loop or closed loop wet cooling towers.

### CLEANING SYSTEM

If the WHRU operates with raw gas from production processes, a self-contained cleaning system has proven to be useful to prevent substances like sodium pyrosulfate ($Na_2S_2O_7$) and sodium bisulfate ($NaHSO_4$) from baking at the tube banks.

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