ZUCCATO ENERGIA

CLEAN ELECTRICITY FROM UNUSED POWER

POWER GENERATION FROM WASTE

ORGANIC RANKINE CYCLE TECHNOLOGY

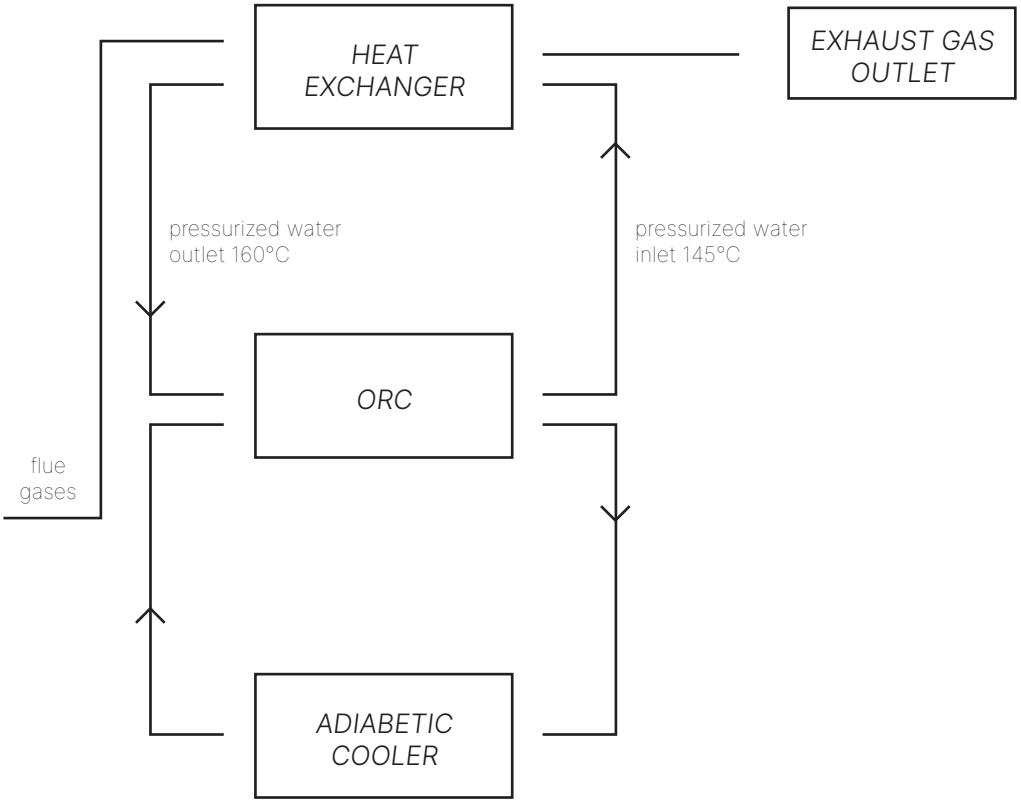
PRINCIPLE OF OPERATION

The ORC systems by Zuccato Energia can recover energy from most industrial processes involving heat, such as incenerators.

By installing heat exchangers in the flue gas circuit of a waste disposal plant equipped with an incenerator, enough thermal energy can be recovered to drive the same number of ZE-150-LT ORC modules , which can output up to 3 GW/year of electricity to the power grid.

Even an end-of life waste disposal site can become a power generation plant, by using an ORC module to recover the heat from the combustion of flared-off waste gas too weak to operate a normal genset.

INCENERATOR



Scheme of a functioning ORC application in a waste diposal plant.

CASE STUDY

OBJECTIVES:

- *Recover wasted heat from incenirator oven and convert it into electricity.*
- *Options for low operating temperatures.*
- *Produce clean electricity with zero emission.*

THE PLANT:

The cogeneration plant was configured to meet the energy needs of the waste disposal company. The Heat Recovery System operates by taking the high-temperature fumes from the incinerator oven, thanks to an overheated water heat exchanger, and distributing them to the ORC system to produce electricity. Excess heat is dissipated using an adiabatic Dry Cooler.

The plant is designed for heat recovery and complete with a fume purification system with continuous monitoring of the emissions to the chimney.

Heat from a heat source evaporates, through an evaporator heat exchanger, a low-boiling-point working fluid which expands spinning a turbine attached to an alternator generating electric power . The working fluid is then condensed in a condenser heat exchanger and residual heat is dissipated by using an external cooling system such as an evaporative cooling tower or a dry cooler.

LT SERIES

Designed using the most advanced technologies, the LT-Series ORC modules from Zuccato Energia are a compact and efficient solution for small-scale primary power generation.

Available in a wide range of models ranging from 75 to 495 kWe, and able to operate efficiently even under partial load conditions (i.e. lower than nominal thermal power input), these systems' ideal fields of application are in association with biomass-fueled boilers, as well as in waste heat recovery applications from ovens and industrial processes.

General specifications	ZE-75-LT	ZE-100-LT	ZE-150-LT	ZE-175-LT	ZE-200-LT	ZE-250-LT	ZE-500-LT
Thermal power input	550 kWt	740 kWt	1100 kWt	1280 kWt	1400 kWt	1560 kWt	2909 kWt
Electric power output	75 kWe	100 kWe	150 kWe	175 kWe	200 kWe	250 kWe	495 kWe
System efficiency	13.60 %	13.50 %	13.60 %	13.60 %	14.30 %	16.00 %	17.00 %
Skid dimensions (L x W x H)	4.1 x 2.0 x 2.7 m	5.6 x 2.3 x 2.7 m					10.3 x 4.5 x2.9 m
Weight (incl. working fluid)	4000 Kg	6500 Kg	6200 Kg				21500 Kg
Vector fluid							
Vector fluid	Presurrized water						Diathermic Oil
Vector fluid input temperature	≥160°C					175°C	225°C
Vector fluid output temperature	145°C		140°C		145°C		103°C
Vector fluid nominal flowrate	8.49 kg/s	11.91 kg/s	13.14 kg/s	14.88 kg/s	21.65 kg/s	12.00 kg/s	11.28 kg/s
Condensation Stage							
Thermal power dissipation	471 kWt	640 kWt	940 kWt	1075 kWt	1180 kWt	1300 kWt	2391kWt
Cooling water input temperature	32°C	26°C				28°C*	32°C
Cooling water output temperature	40°C	36°C				40°C*	48°C
Cooling water nominal flowrate	14.07 kg/s	15.60 kg/s	22.46 kg/s	25.69 kg/s	28.25 kg/s	25.91 kg/s*	35.38 kg/s
Turbine							
Type	Single stage, radial inflow turbine with fixed nozzles, directly coupled to generator						
Working fluid temperature	145°C input / ~ 100°C output						180°C input / ~ 100°C output
Stage pressure	PS16 (tested up to 24 bar)						PS40
Materials	CNC Machined steel body / Aluminium alloy impeller						
Working Fluid							
Type	Environmentally friendly, non-flammable HFC mixture						
Operating temperature range	60°C ≤ T ≤ 165°C						60°C ≤ T ≤ 185°C
Operating pressure	≤ 20 bar						≤ 30 bar
Toxicity / Biodegradability / Ozone layer impact	Non-toxic / Full eco-compatibility / Ozone-friendly						

*Available also with a direct condenser - no cooling circuit is required

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