tts boilers

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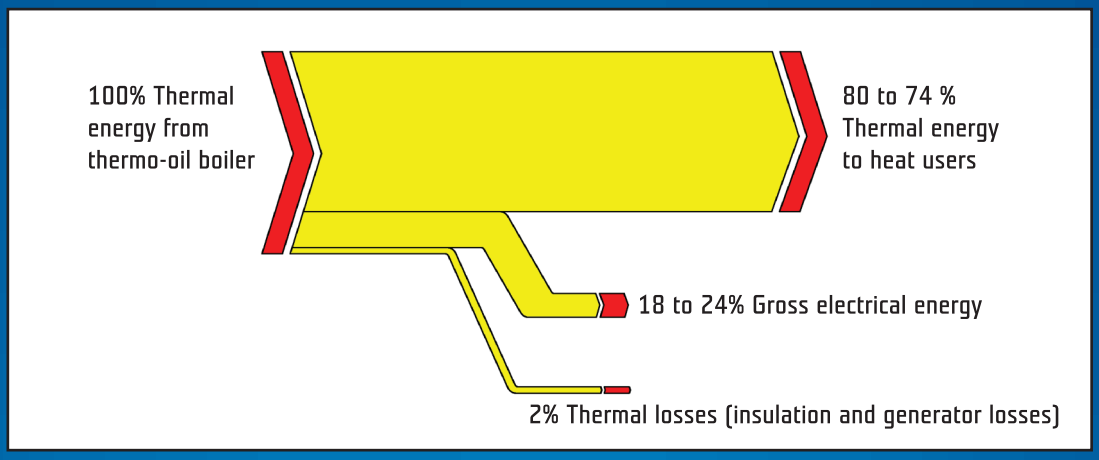
TURBODEN
a group company of MITSUBISHI HEAVY INDUSTRIES, LTD.

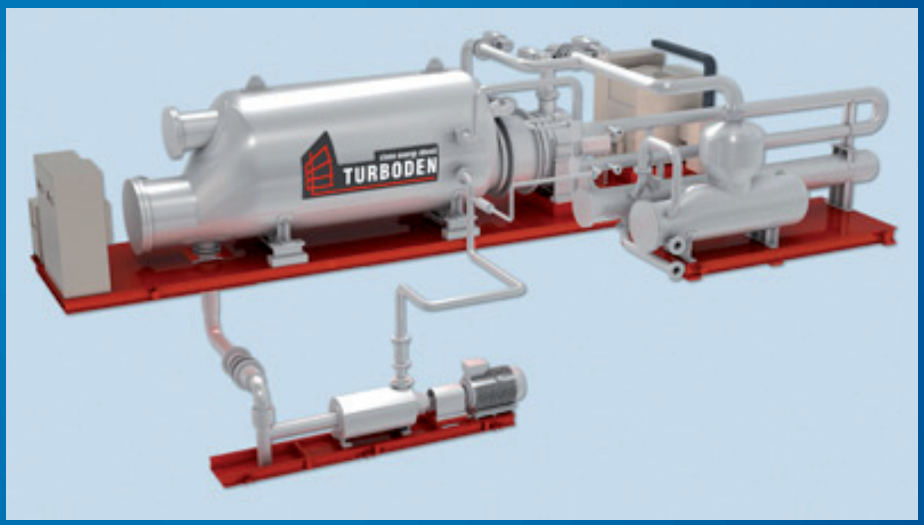
ORC units for cogeneration from biomass

Cogeneration ORC (Organic Rankin Cycle) units can produce heat and electrical energy with user friendly operation. The generated electrical power usually ranges from 600 kW to 3 MW. ORC Split system allows maximization of electric power production from a given biomass consumption due to a more efficient exploitation of thermal power from the boiler.



Description of ORC (Organic Rankin Cycle)

Equipment with the help of the cogeneration process produces electrical power and heat power from biomass (e.g. wood chips). Biomass is combusted in a boiler. Hot gases in the exchanger transfer heat to the oil circulation (thermo-oil). The remaining heat is further reduced in the water exchanger (economiser), waste gases are, after cleaning in the filter, led out to the surrounding environment by a chimney. The thermo-oil circuit creates a source of energy for the production of electrical power in the ORC equipment. This is equipped with closed circulation in which silicon oil is driven by evaporation to a block turbo-generator. Then the steam condenses, heat energy is released in the form of hot water back into the heating network. In the water exchanger (economiser) of the boiler for biomass there is the water circuit further heated to the required value.



Applications

- District Heating Networks
- Timber drying in sawmills
- Drying of sawdust in factories produce wooden pellets

Thermodynamic ORC principle

The turbogenerator uses the high temperature thermo-oil to preheat and vaporize a suitable organic working fluid in the evaporator. The organic fluid vapor powers the turbine, which is directly coupled to the organic generator through an elastic coupling. The exhaust vapor flows through the regenerator where it heats the organic liquid. The vapor is then condensed in the condenser (cooled by the water flow). The organic fluid liquid is finally pumped to the evaporator, thus completing the sequence of operations in the close-loop circuit.

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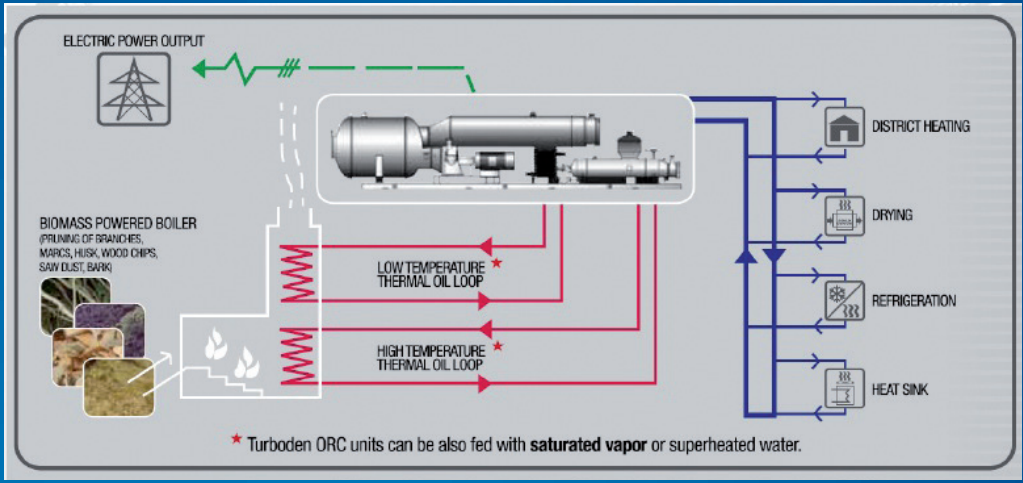
Technical and operational advantages

- High cycle efficiency
- Very high turbine efficiency (up to 90%)
- Low mechanical stress of the turbine due to the low peripheral speed
- No corrosion of blades, thanks to the absence of moisture in the vapor nozzles
- Automatic and continuous operation without needed of an operator attendance
- Partial load operation down to 10% of nominal power
- High efficiency even at partial load
- Quiet operation and long life



Standard sizes and typical performances of ORC units

	Jednotka	TD 6 CHP Split	TD 7 CHP Split	TD 10 CHP Split	TD 14 CHP Split	TD 18 CHP Split	TD 22 CHP LV Split	TD 12 HRS	TD 24 HRS
INPUT – termo-oil									
Nominal temperature „HT" loop (in/out)	°C	312/252	312/252	310/250	310/250	312/252	309/249	310/212	310/212
Thermal power input „HT" loop	kW	3 056	3 572	4 685	6 130	8 935	10 975	4 817	9 634
Nominal temperature „LT" loop (in/out)	°C	252/132	252/132	250/130	250/130	252/132	249/130	-	-
Thermal power input „LT" loop	kW	283	338	450	585	855	1 045	-	-
Overall thermal power input	kW	3 339	3 910	5 135	6 715	9 790	12 020	4 817	9 634
OUTPUT – hot water									
Hot water temperature (in/out)	°C	60/80	60/80	60/80	60/80	60/90	60/90	25/35	24/37
Thermal power to water circuit	kW	2 689	3 146	4 095	5 341	7 843	9 598	3 632	7 310
PERFORMANCE									
Gross active electric power	kW	619	729	1 000	1 317	1 862	2 319	1 188	2 336
Gross electric efficiency	%	18,5	18,6	19,5	19,6	19,0	19,3	24,7	24,2
Captive power consumption	kW	32	40	51	62	87	98	49	92
Net active electric power	kW	587	689	949	1 255	1 775	2 221	1 139	2 244
Net electric efficiency	%	17,6	17,6	18,5	18,7	18,1	18,5	23,6	23,3
Electric generator		50Hz, 400V	50Hz, 400V	50Hz, 400V	50Hz, 400V	50Hz, 660V	50Hz, 660V	50Hz, 400V	50Hz, 660V
		60Hz, 480V	60Hz, 480V	60Hz, 480V	60Hz, 480V	60Hz, 4160V	60Hz, 4160V	60Hz, 480V	60Hz, 4160V
Biomass consumption	kg/h	1 459	1 709	2 244	2 935	4 279	5 253	2 316	4 632

Split system allows maximization of electrical power production with given biomass consumption.

LV = Low Voltage

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