



HEAT
RECOVERY SOLUTIONS



CETY/HRS Clean Cycle generators create additional power from waste heat with no additional emissions

San Giorgio S.p.a Wood panel manufacturing plant Villanterio, Italy



CETY/HRS Clean Cycle power generator converts heat from biomass boiler into 125 kW of electricity.

Since it began operations in December 2013 the San Giorgio in Villanterio Italy, They need heat for their manufacturing process and the manufacturing process produces significant biomass waste, so they installed a 3MW biomass boiler which is producing superheated water at 160°C. The boiler is oversized for the need of the process. The max load was about 2MW (before the Clean Cycle), and, since it is very variable, sometimes during the night it was necessary to waste part of the heat, because biomass boilers should work always with the load over 50%. The Clean Cycle is using 1 MW Thermal at a flow of 6kg/s.

The Clean Cycle ORC was purchased for the following purposes: to stabilize the load with a constant base demand and to produce energy by exploiting the biomass waste. They have recently purchased a second unit that will harness the extra biomass waste when the process demand is not as high.

By generating power that is then sold to the electricity grid for a feed-in tariff set by the Italian government, the CETY/HRS Clean Cycle generators have effectively created a new revenue stream for San Giorgios operations – while producing no additional emissions. Without requiring any incremental fuel for its operation, the Clean Cycle system has boosted total energy efficiency for the plant.

CLEAN CYCLE ORC PERFORMANCE DATA

UNIT: J15969



REFERENCE MONTH	AVERAGE ENVIRONMENTAL TEMPERATURE [°C]	AVERAGE ENVIRONMENTAL RELATIVE HUMIDITY [%]	H ₂ O EVAP IN AVERAGE TEMPERATURE [°C]	H ₂ O EVAP OUT AVERAGE TEMPERATURE [°C]	H ₂ O COND IN AVERAGE TEMPERATURE [°C]	H ₂ O COND OUT AVERAGE TEMPERATURE [°C]	GRID POWER [kw]	OPERATING HOURS [h]	AVAILABLE OPERATING HOURS [h]	OPERATING [%]	MAIN REASON FOR STOPS
September 2020	21	54	135,6	129,0	22,8	29,7	108,5	708	720	98%	Electricity network disturbs
October 2020	13	69	136,4	133,4	21,4	28,0	107,8	728	744	98%	ORC maintenance
November 2020	9	66	138,9	134,3	20,8	28,1	104,3	716	720	99%	Electricity network disturbs
December 2020	4	74	138,2	133,2	20,0	27,6	106,2	617	744	83%	Factory closed for Winter Holiday
January 2021	3	65	118,3	109,1	16,5	22,2	102,6	620	744	83%	Factory closed for Winter Holiday
February 2021	7	57	133,3	123,5	18,6	25,1	107,2	660	672	98%	Electricity network disturbs
March 2021	9	44	134,2	122,5	18,6	25,3	109,2	717	744	96%	Electricity network disturbs
April 2021	12	49	133,6	122,6	20,0	26,4	109,2	646	720	90%	Electricity network disturbs
May 2021	17	50	134,0	124,4	22,3	28,7	106,9	728	744	98%	Electricity network disturbs
June 2021	24	42	135,8	132,2	26,2	32,9	100,7	659	720	92%	Electricity network disturbs
July 2021	24	53	135,7	133,0	26,7	33,3	101,2	698	744	94%	Boiler Maintenance
August 2021	24	51	131,1	122,9	25,2	30,7	100,1	548	744	74%	Factory closed for summer Holiday

Balance of one year of opeating	H ₂ O EVAP IN AVERAGE TEMPERATURE [°C]	H ₂ O EVAP OUT AVERAGE TEMPERATURE [°C]	H ₂ O COND IN AVERAGE TEMPERATURE [°C]	H ₂ O COND OUT AVERAGE TEMPERATURE [°C]	GRID POWER [kw]	TOTAL OPERATING HOURS [h]	AVAILABLE OPERATING HOURS [h]	OPERATING [%]
	133,8	126,7	21,6	28,2	105,3	8045	8760	92%



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