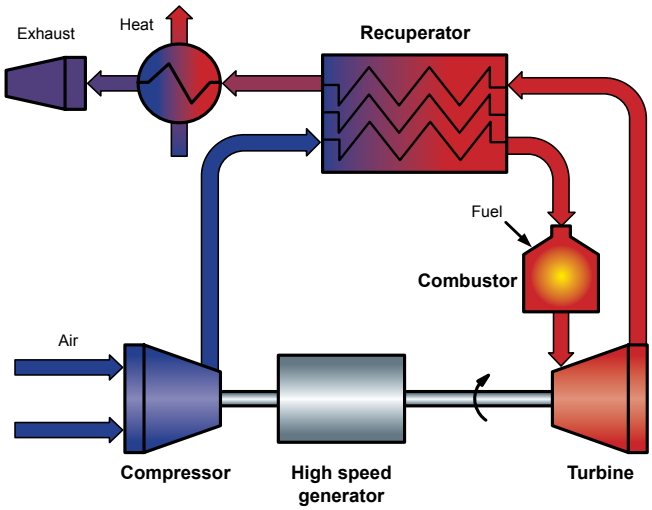
Technology

Combined Heat and Power (CHP)

The objective of Combined Heat and Power (CHP) is to generate electric power at locations where also a heat demand is present for either domestic or industrial heating. This way, CHP saves energy as the heat and transportation losses by large electric power stations are avoided.



Recuperated microturbine in a CHP configuration

Microturbines

The EnerTwin CHP system generates electric power using a 4 kW microturbine. Gas turbines are known for their high power to weight ratio and low maintenance costs. Using off-the-shelf turbocharger technology leads to low production costs. The turbomachinery components are optimised for the turbogenerator application.

Driving a high-speed generator at 240.000 rpm, the EnerTwin micro-CHP system has a net electric efficiency of >16% (20% shaft power efficiency on the turbogenerator). The limited turbomachinery cost and their very low maintenance requirements offer great potential for cost-effective micro-CHP systems. The generator is coupled to the microturbine by a unique in-house developed compact rotor concept. Due to the recuperator, part load efficiency can be kept close to the design point maximum.

Recuperator

The recuperator is an advanced heat exchanger recovering exhaust heat into the gas turbine working cycle, saving almost 50% of fuel compared to a system without a recuperator and providing a substantial increase in efficiency.

EnerTwin micro-CHP system

Generator

An efficient high-speed permanent magnet generator converts the mechanical power from the microturbine into electric power. The generator is fully integrated in the microturbine rotor system, avoiding costs and losses of additional bearings and couplings.

Heat exchanger

The efficient heat exchanger transfers heat from the microturbine exhaust to the micro-CHP heating system circuits.

Operation profile

The EnerTwin has a rapid sturt-up capability: less than 2 minutes. Moreover, power can be modulated down to about 30% without significant loss of efficiency.

Monitoring and control

The EnerTwin micro-CHP system has an on-line control and monitoring capability for remote operation, Virtual Power Plant and smart grid applications. This offers excellent installation and operation flexibility in cascade and other configurations.

Noise

Microturbines emit only high frequency noise that can effectively be damped. Compared to alternative concepts, the EnerTwin has very low noise emissions.

Benefits for the environment

The EnerTwin micro-CHP system offers a substantial contribution to CO_2 emission reduction. With MTT's clean low-NO_x combustor, other exhaust gas emissions levels are minimal.

Specifications

		Max.	Min.	
Performance at ISA *	Net electric power	3,2	1,0	kW
	Net thermal power	15,6 **	6,0	kW
	Power to heat ratio at max power	20		%
	Net grid output efficiency (electrical)	16		%
	Total efficiency	> 94 **		%
	iaw EcoDesign (EU 813/2013)	> 112		%
	Rotor speed	240.000	180.000	rpm
	Fuel flow (H gas, 38.5 MJ/nm^3)	1,87	0,84	nm^3/h
Fuel	Green gas / biomethane / natural gas / natural gas incl. 23% H_2 (hydrogen) mix / LNG / CNG			
Operating conditions	Ambient air pressure	0,8 - 1,1		bar
	Inlet air temperature	-20 - 40		^{0}C
	System room temperature	5 - 40		^{0}C
Heating system	Water flow rate	3 - 21		l/min
	Return water temperature	5 - 60		^{0}C
	Supply water temperature	5 - 80		^{0}C
	Water pressure	0,7 - 4		bar
Maintenance	Service interval	> 7500		hours
Emissions	NO_x	< 27		ppm @ 15% O_2
	CO	< 50		ppm @ 15% O_2
	CO_2 savings	9,5 ***		tons/year
	Noise	55		dB(A) 1m
Control	OpenTherm heating control interface			
	RS-485 Modbus remote control interface			
	0-10V building management system interface			
	MTT proprietary cascade operation control interface			
Installation	Dimensions (h x w x d)	995 x 600 x 1170		mm
	Weight (empty/with water and oil)	205 / 215		kg
	Gas connector	¾"		
	Water connector	¾"		
	Inlet air and flue gas pipes	DN 100 (parallel)		
	Grid connection	230 / 50		VAC / Hz

* *ISA conditions are 15 ^{0}C and 1.01325 bar dry air.*
** *Depending on heating system operating conditions such as water return temperature.*
*** *At 16.000 kWh electricity per year (5.000 running hours), compared to electricity generated by coal fired power plants.*

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