

## Microturbines

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**Definition of the Microgasturbine**

**Key Products and Producers**

**Scientific and Marketing Programs**

# Properties of Microturbines

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**Electrical Power Output 30-500 kW<sub>el</sub>**

**Compact, simple Design (Turbocharger), no cooling water, sometimes no oil (air bearings)**

**Due to low turbine inlet temperatures (ca.950°C) no need for turbine cooling**

**Low pressure rate (2-4), single stage**

**Cheap design possible**

**Low maintenance costs**

**Due to the use of a recuperator competitive efficiency (about 30%<sub>el</sub>.)**

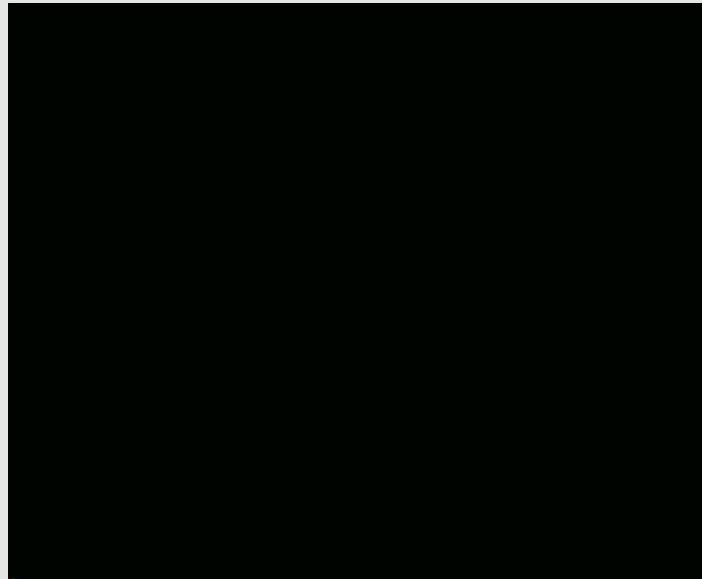
**Excess heat in only one medium (exhaust), at a useful temperature level (250°C)**

**Continuous combustion, very good emissions, multi fuel capability, wide power modulation (up to 10)**

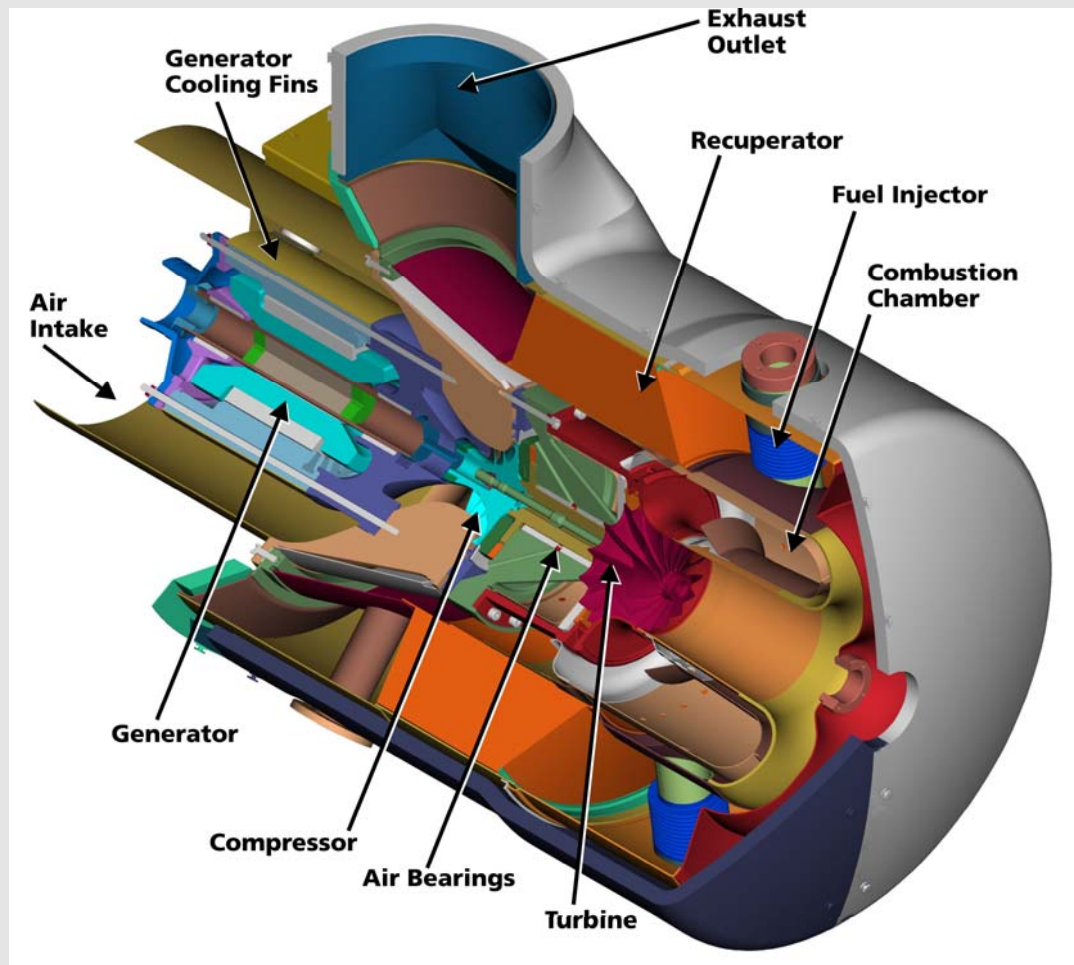
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# Microturbines

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# Microturbines



# Capstone

## CAPSTONE



C30 Biogas

C65

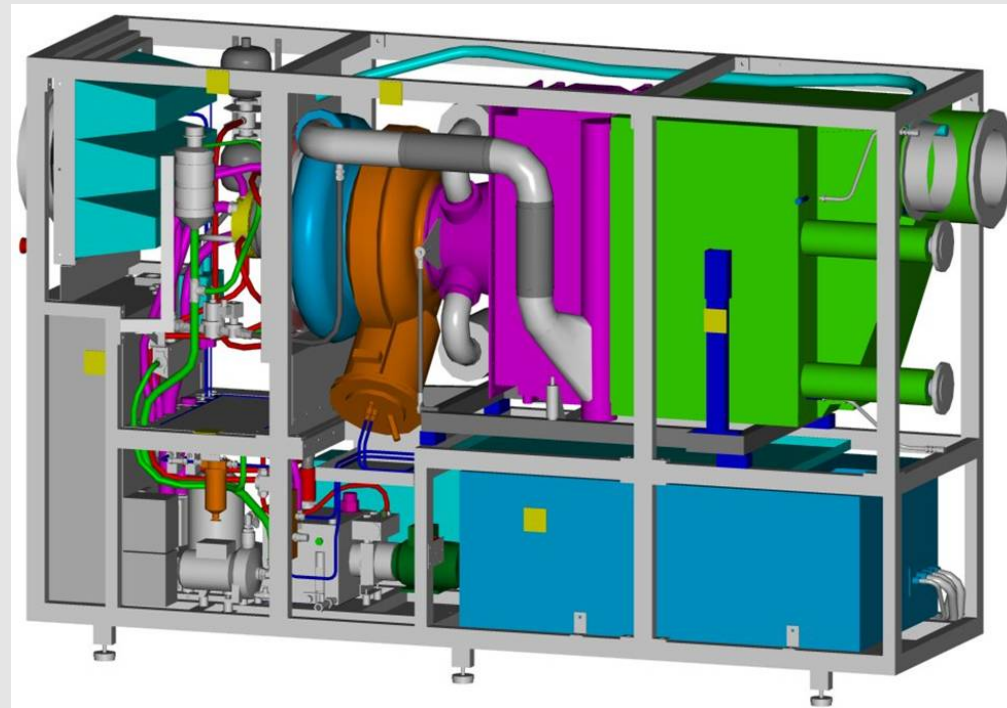


# Capstone

Producer	Capstone	Capstone
Typ	C30	C65
Fuel	Biogas	Biogas
El Power	30kW	65kW
Thermal Power	91kW	135kW
Efficiency el.	26%	28%
Efficiencye th.		

# Turbec

## Turbec

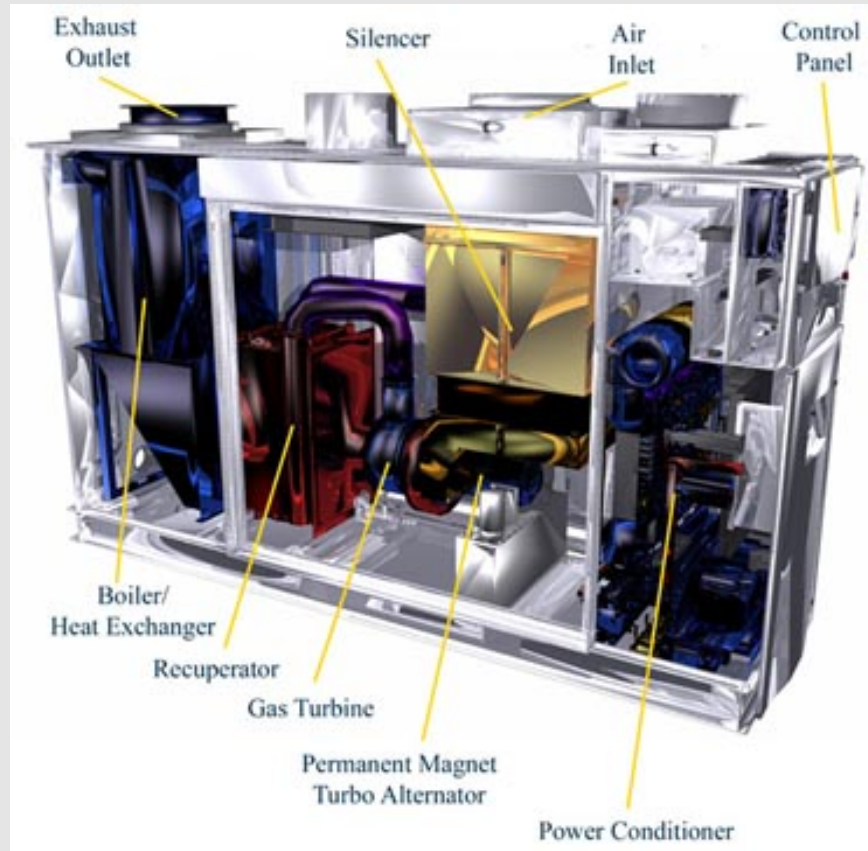


# Turbec

<b>Producer</b>	<b>Turbec</b>	<b>Turbec</b>
<b>Typ</b>	<b>LTM 100</b>	<b>NTM 100</b>
<b>Fuel</b>	<b>Biogas</b>	<b>Natural Gas</b>
<b>El Power</b>	<b>95kW</b>	<b>100kW</b>
<b>Thermal Power</b>	<b>141kW</b>	<b>152kW</b>
<b>Efficiency el.</b>	<b>30%</b>	<b>30%</b>
<b>Efficiencye th.</b>	<b>45%</b>	<b>46%</b>

# Bowman

## Bowman



# Microturbines

<b>Producer</b>	<b>Bowman</b>	<b>Bowman</b>
<b>Typ</b>	<b>TG80RC-G-R</b>	<b>TG80RC-G</b>
<b>Fuel</b>	<b>NG</b>	<b>NG</b>
<b>El Power</b>	<b>80kW</b>	<b>80kW</b>
<b>Thermal Power</b>	<b>136-216kW</b>	<b>136kW</b>
<b>Efficiency el.</b>	<b>22-28</b>	<b>28%</b>
<b>Efficiency th.</b>		

# Scientific and Market Programms

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## Marketing Activities

- **OMES**
- **Hessen Initiative**

## Scientific Activities

- **ATZ Pebble Heated Microturbine**
- **ISET Biogas Powered Microturbine**
- **Nowum Rapeseed oil powered Microturbine**

# OMES

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Most technical and environmental goals were achieved, and unit cost seems OK

Remaining problems with economic parameters like overall efficiency, O/M costs - and installation costs:

- Overall efficiency is very dependent of inlet water temperature, which carefully must be taken into account by planning new installations.
- O/M costs are likely to be reduced as the number of micro turbines increase.
- Installation costs variation 640 - 1620 €/kW. 100 - 300 €/kW, was OMES specific costs (measurement, data transmission etc.). The observed level will be reduced when "plug and play" micro turbine installations can be made, and/or authorities will be accustomed to the micro turbine installations.

**The OMES project showed that the micro turbine technology is reliable and working satisfactory.**

**Installation costs must be reduced to give the micro turbine a commercial break through.**

# Hessen

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**10 Projects get 50% of the price of the turbine paid by the state**

**Only 9 Projects were able to fulfil all requirements**

**Only 3 are in production at the moment**

**Many Problems with the installation in one of the projects**

# Scientific and Market Programs

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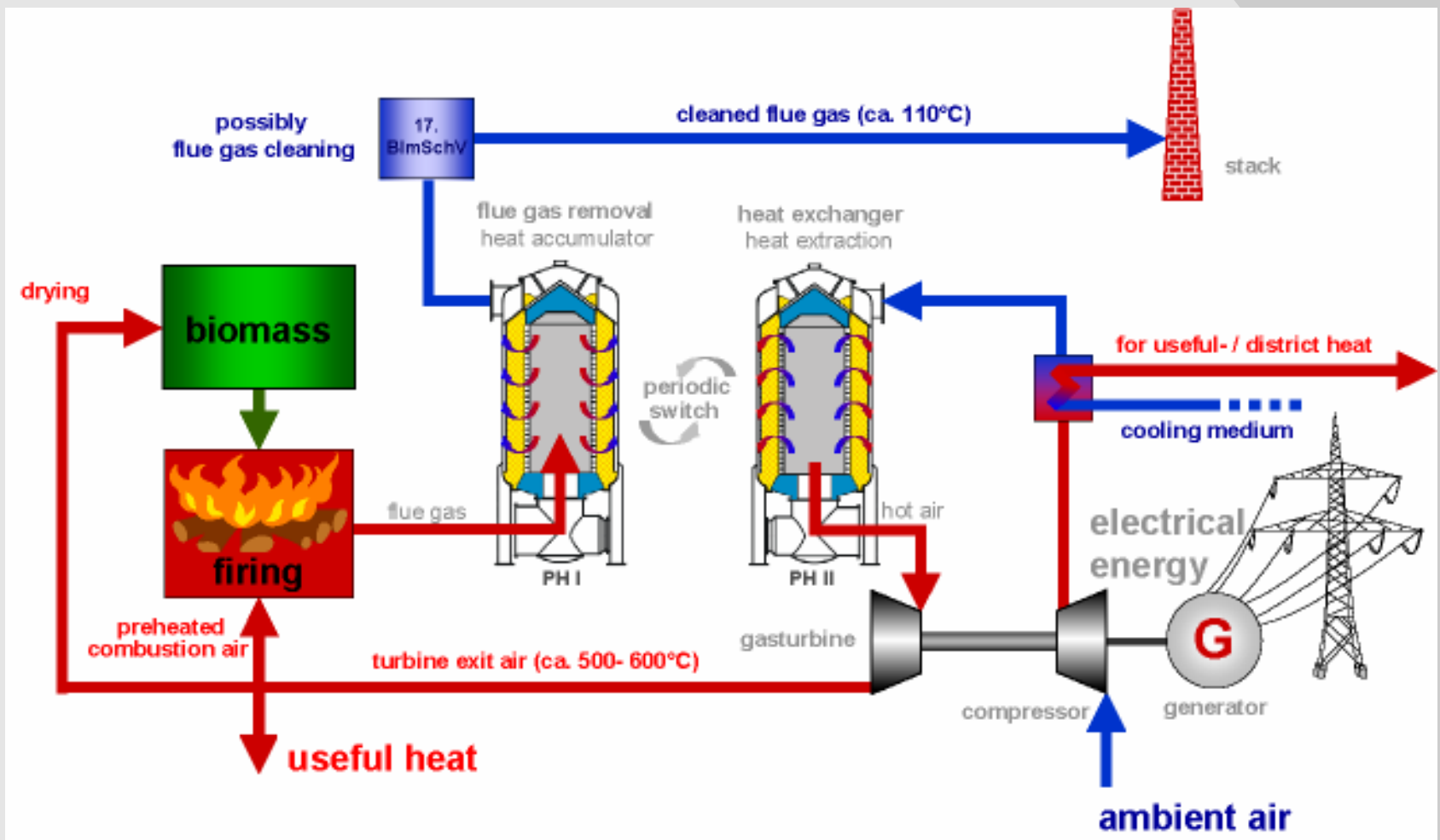
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# Pebble Heated Microturbine by ATZ



# The C30 of ISET at the Eichhof Biogas Plant



# Nowum Rapeseed Oil powered Microturbine

