

Bio-fuelled Micro Gas Turbines in Europe

Market Opportunities and R & D Requirements

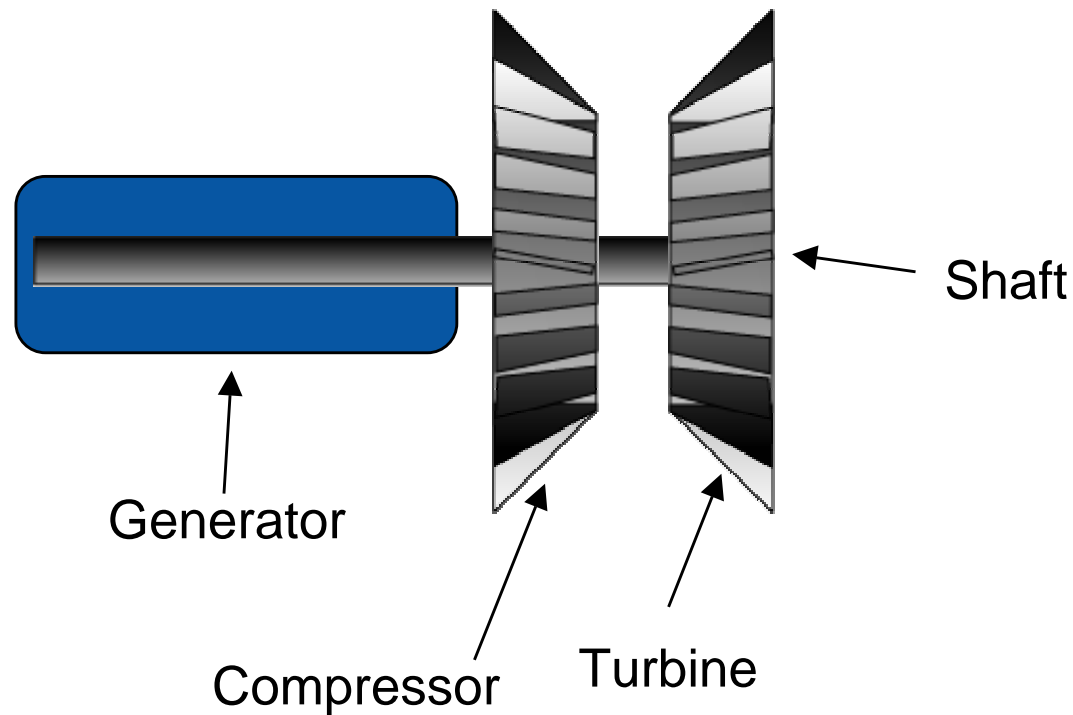
Status of biofuelled Turbec microturbines

Turbec Spa, Italy
Enrico Bianchi

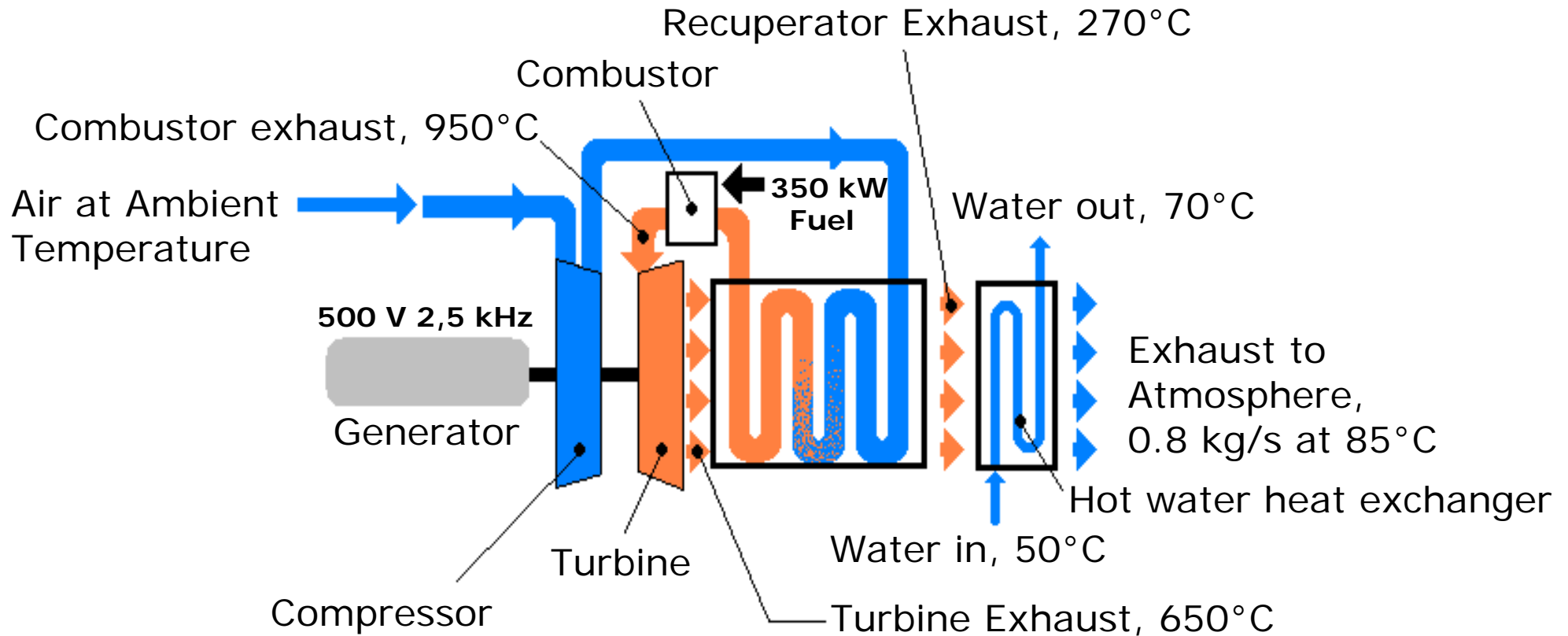


What is a Microturbine?

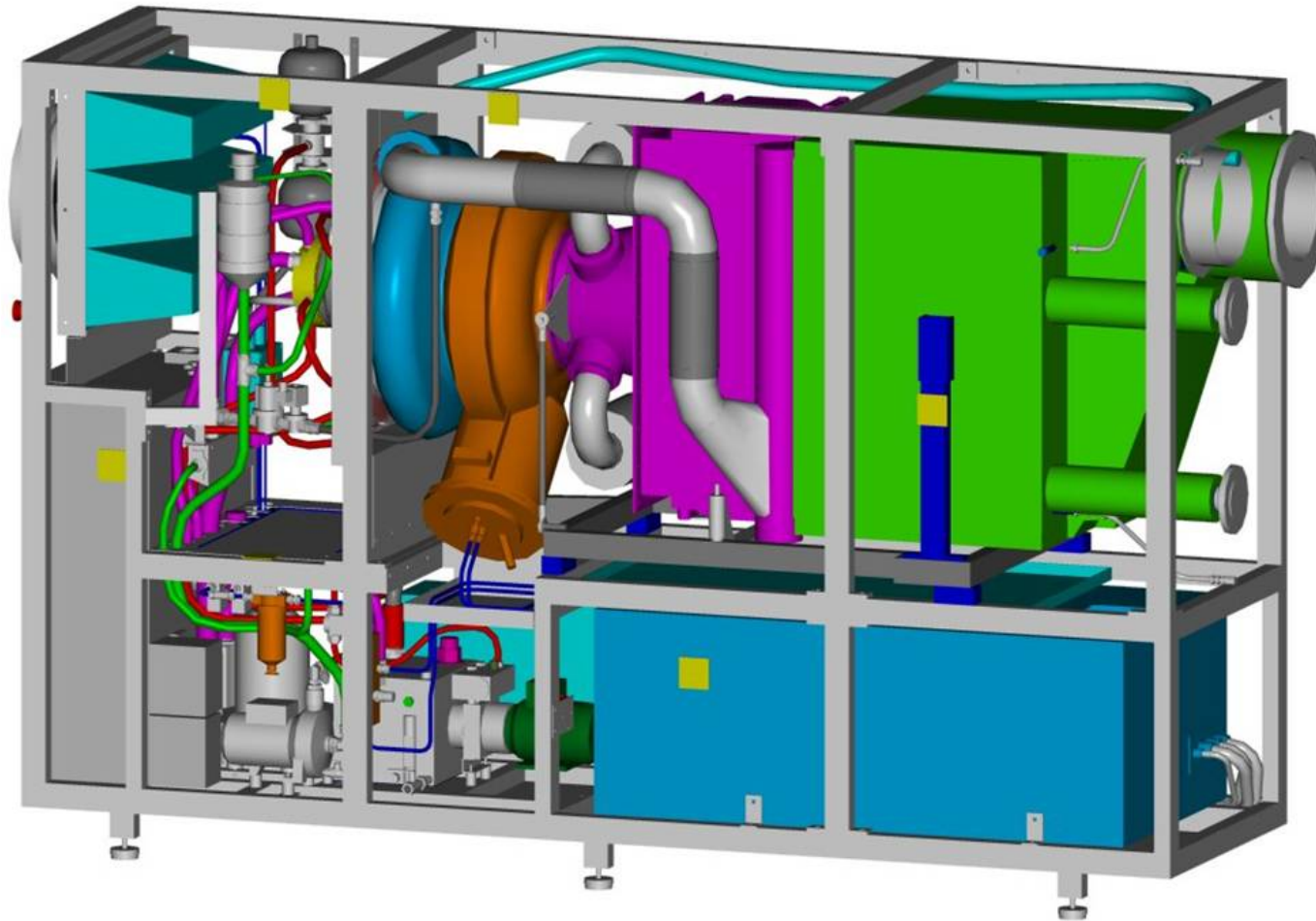
*A small and simple gas turbine
driving a high speed generator*



The thermodynamic cycle

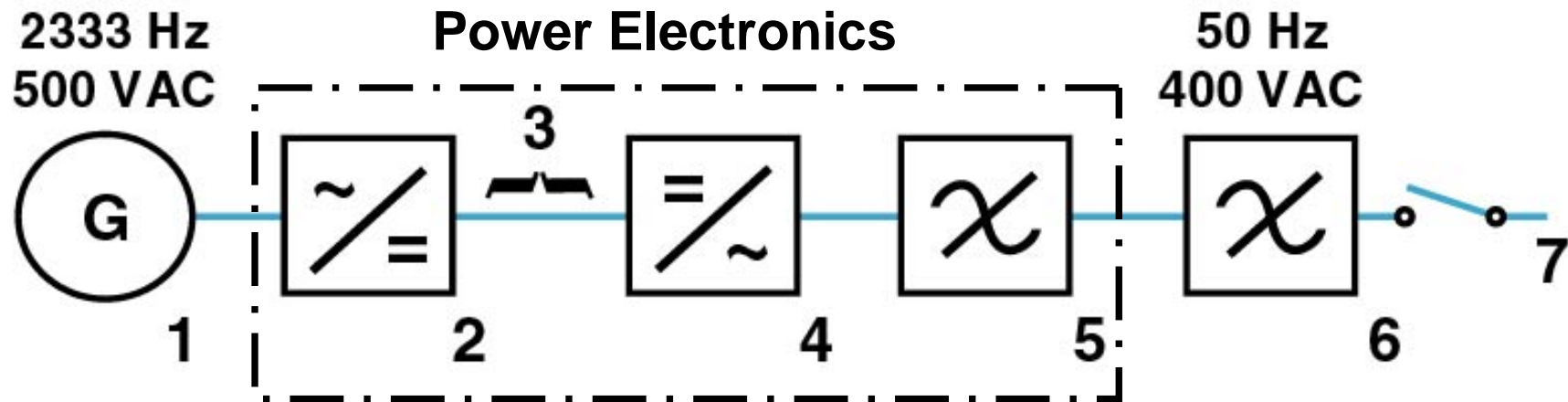


T100 CHP Main Components



- Generator
- Gas turbine
- Recuperator
- Heat exchanger
- Control System
- Combustor
- Power electronics

The electrical System

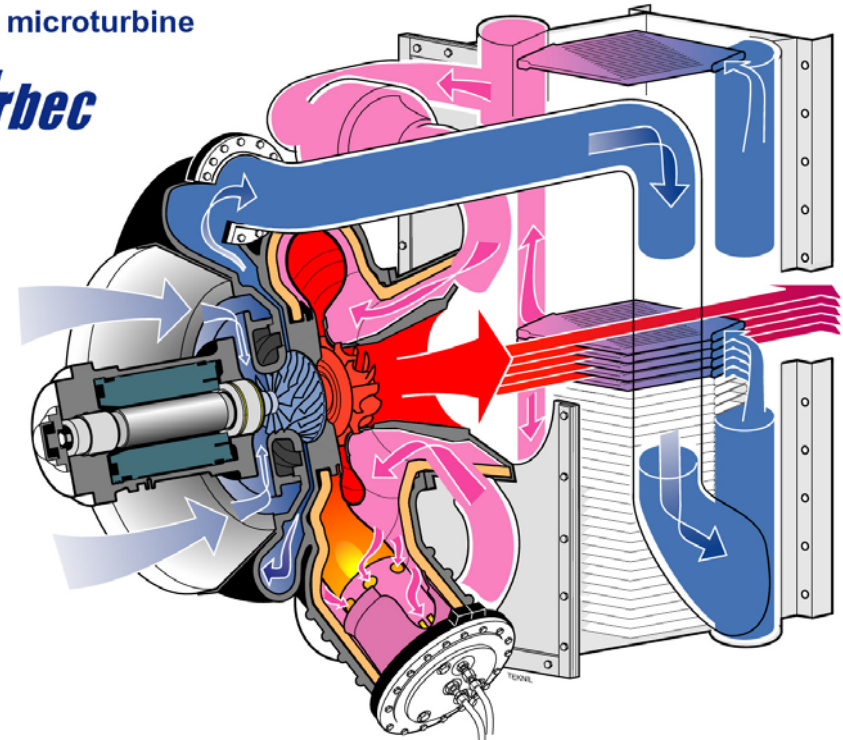


- | | |
|-------------------------------|-------------------------|
| 1. Generator | 5. Line filter |
| 2. Rectifier/ Start converter | 6. EMC filter |
| 3. DC bus | 7. Main circuit breaker |
| 4. Converter | |

Improving T100 Microturbine

T100 microturbine

turbec



- **Power production only**
- **Blackstart and stand alone**
- **Easy installation with new package**
- **Biogas**
- **Liquid fuels**

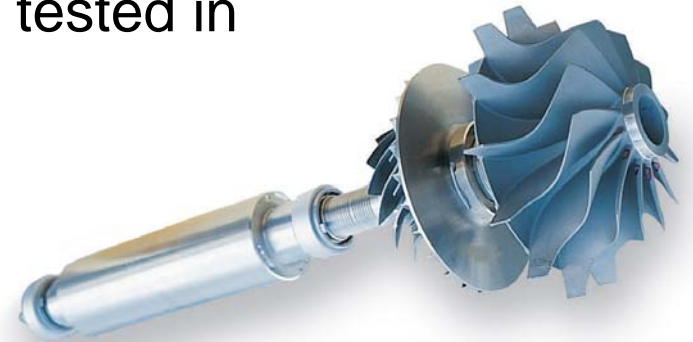
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Biofuels development

The use of biogas to fuel T100 micro turbine is an excellent way of utilizing the biogas. The general idea is to keep the installation easy it is not economically viable to do to heavy pretreatment installations.

Turbec biogas applications have currently been tested in two types of gas: sewage gas and landfill gas.

Sewage gas has typically 60-65% Methane
Landfill gas ranges from 35-55% Methane



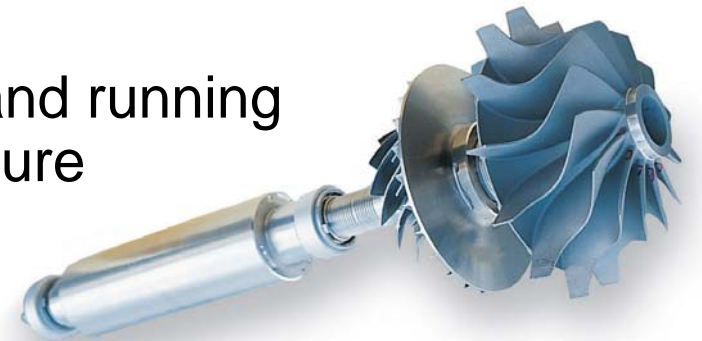
Biofuels development

The Turbec T100 uses filtering down to 1 micron and apart from this the system removes water directly in the gas compressor

In some cases, small changes are needed in the fuel system and in the combustion chamber.

Today Turbec has 8 biogas installations up and running and one plant in Sweden for evaluation of future solutions

Liquid fuels and biofuels are an R&D priority which is addressed thanks to strong automotive background



Turbec Reference list

Country	Units
Great Britain	24
Switzerland	16
Germany	8
Italy	11
Japan	9
USA	6
France	4
Sweden	3
Ireland	9
Denmark	7
Holland	2
Norway	2
Finland	1
Austria	2
Belgium	1
Total	105

Applications	Units
Building Heating	22
Laboratory, Test	14
Greenhouses	10
Hospital	10
Biogas	9
Absorption Chiller	7
Swimming Pool	4
District Heating	15
Hotel	6
Industry	6
Gas Reduction Station	2
Total	105

Operating Hours Experience

Total Accumulated	748 885	hours
Leading Unit	24 000	hours



Thank you for your attention

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