

Spotlight on: Turbine Technologies

Date 22.11.2019

In this “Spotlight on...” edition we provide you with an easy-to-read overview of gas and steam turbine technologies, telling you all you need to know about components and their operation. Having a basic understanding of the technology itself will provide a better comprehension of the core mission of this technology in the energy system.

How does it all work?

Gas and steam turbine technologies are an integral part of Europe’s energy generation. These technologies are recognised for delivering power and heat since decades. While their role changes, the functioning remains the same.

The basic concept: Turbines convert the kinetic energy of a moving fluid into mechanical energy through the rotation of a bladed rotor. This energy then drives a generator that produces electrical power.



Both – gas as well as steam turbines can use a variety of fluids. One main difference between gas and steam turbines: while the generation of heat takes place directly within the gas turbine by injecting a combustible gas, the hot fluid for the steam turbine is generated outside the steam turbine – with the help of different available heat sources.

EUTurbines

Transparency Register
ID number: 75093131694-63

www.euturbines.eu

European Association of Gas and Steam Turbine Manufacturers

President
Thomas Thiemann
Secretary General
Ralf Wezel

Lyoner Str. 18
60528 Frankfurt/Main
Germany
Phone +49 69 66 03-19 36
Fax +49 69 66 03-29 36
Patricia.seizer@euturbines.eu

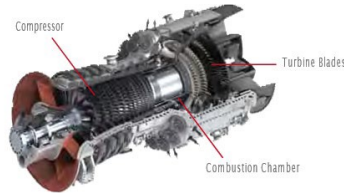
Boulevard A. Reyers 80
1030 Brussels,
Belgium
Phone +32 2 706-82 12
Fax +32 2 706-82 10
Magdalena.kurz@euturbines.eu

1. Gas Turbine

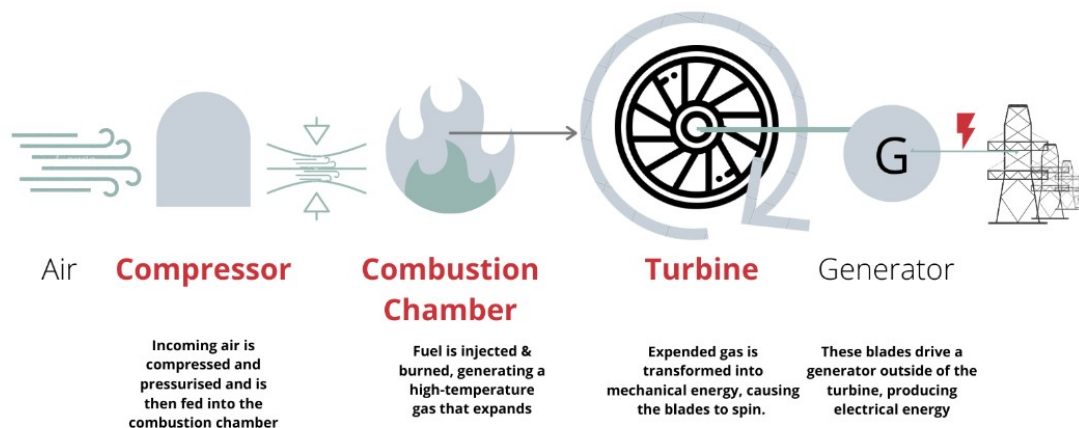
In order to comprehend gas turbine technology, it is important to understand its core components and their functioning.

Gas Turbine **components**:

- (1) Compressor
- (2) Combustion Chamber
- (3) Turbine Blades



A gas turbine is a type of internal combustion engine. It is normally driven by a high pressure, often high temperature gas. The basic power generation **operation** – which in turn mirrors the so-called **Open Cycle Power Plants (OCGT)**, an efficient fast-reacting gas-power plant with comparably low investment costs – can be described as follows:



Fuel flexibility

Gas turbines can work with a variety of energy sources, delivering flexible, fast and efficient power when needed and ensure security of supply and the stability of the grid. It is important to highlight that the technology may use fuels other than natural gas to operate. These may well be biomethane, synthetic methane or green hydrogen, which all allow for a climate-neutral power generation. The turbine [industry is committed](#) to further develop this core feature of fuel flexibility.

EUTurbines

Transparency Register
ID number: 75093131694-63

www.euturbines.eu

European Association of Gas and Steam Turbine Manufacturers

President
Thomas Thiemann
Secretary General
Ralf Wezel

Lyoner Str. 18
60528 Frankfurt/Main
Germany
Phone +49 69 66 03-19 36
Fax +49 69 66 03-29 36
Patricia.seizer@euturbines.eu

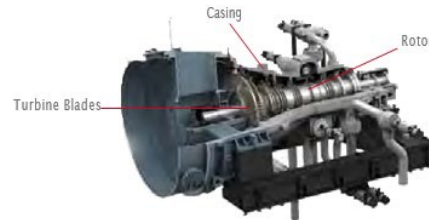
Boulevard A. Reyers 80
1030 Brussels,
Belgium
Phone +32 2 706-82 12
Fax +32 2 706-82 10
Magdalena.kurz@euturbines.eu

2. Steam Turbine

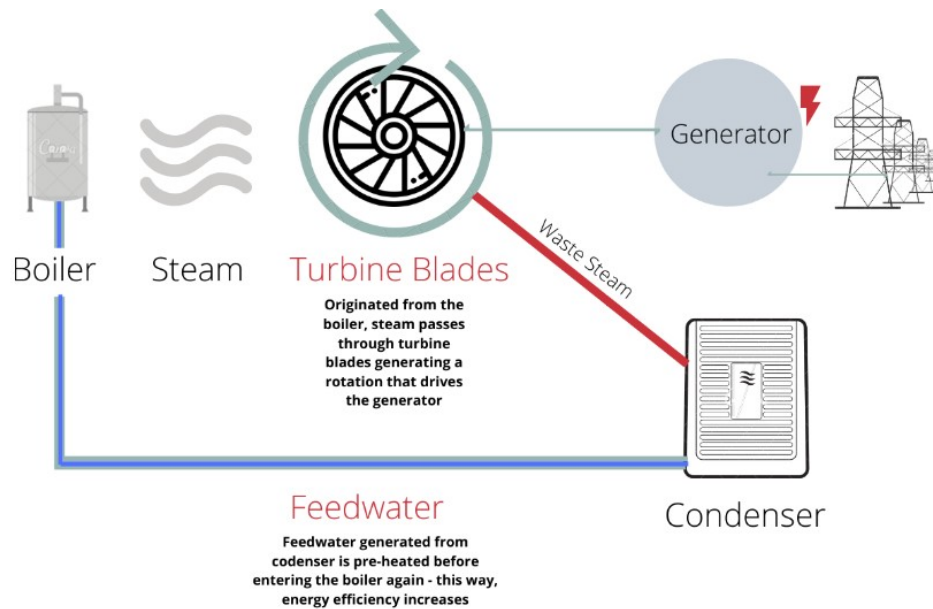
In order to comprehend steam turbine technology, it is important to understand its core components and their functioning.

Steam Turbine **components**:

- (1) Rotor
- (2) Turbine Blades
- (3) Casing



The basic power generation **operation** can be described as follows in the graphic below. Once the steam is created, it is used to drive the steam turbine.



Fuel flexibility

The process, in which the steam turbine itself is involved, is CO₂ neutral and is therefore a fuel-agnostic technology, not connected to fossil energy. The steam used can be produced through a wide range of sources, ranging from traditional to renewable sources, such as solar, geothermal, biomass as well as waste heat.

EUTurbines

Transparency Register
ID number: 75093131694-63

www.euturbines.eu

European Association of Gas and Steam Turbine Manufacturers

President
Thomas Thiemann
Secretary General
Ralf Wezel

Lyoner Str. 18
60528 Frankfurt/Main
Germany
Phone +49 69 66 03-19 36
Fax +49 69 66 03-29 36
Patricia.seizer@euturbines.eu

Boulevard A. Reyers 80
1030 Brussels,
Belgium
Phone +32 2 706-82 12
Fax +32 2 706-82 10
Magdalena.kurz@euturbines.eu

3. Combining turbines for increased Energy Efficiency

In order to achieve maximum efficiency levels, a gas turbine and a steam turbine can be used in conjunction in a Combined Cycle Power Plant (CCGT).

In this configuration, the gas turbine operates like in an open cycle power plant and delivers electricity. The waste heat of the gas turbine is then used to heat up water in a steam generator or boiler. This steam drives a steam turbine, which generates additional electricity.

The gas and the steam turbine are each connected to an own generator, but they can also be combined on a “single shaft” which is then connected to only one generator. The steam is reused in a closed cycle.

The turbine technologies have unique capabilities that are key for the well-functioning of the future EU energy system. Thanks to their operational and fuel flexibility they are future-proof and ready to contribute in the transition towards a decarbonised energy system and economy.

About EUTurbines

About EUTurbines is the only association of European gas and steam turbine manufacturers. Its members are Ansaldo Energia, Baker Hughes, Doosan Skoda Power, GE Power, MAN Energy Solutions, Mitsubishi Hitachi Power Systems, Siemens Gas & Power and Solar Turbines.

EUTurbines advocates an economic and legislative environment for European turbine manufacturers to develop and grow R&I and manufacturing in Europe and promotes the role of turbine-based power generation in a sustainable, decarbonised European and global energy mix.

EUTurbines

Transparency Register
ID number: 75093131694-63

www.euturbines.eu

European Association of Gas and Steam Turbine Manufacturers

President
Thomas Thiemann
Secretary General
Ralf Wezel

Lyoner Str. 18
60528 Frankfurt/Main
Germany
Phone +49 69 66 03-19 36
Fax +49 69 66 03-29 36
Patricia.seizer@euturbines.eu

Boulevard A. Reyers 80
1030 Brussels,
Belgium
Phone +32 2 706-82 12
Fax +32 2 706-82 10
Magdalena.kurz@euturbines.eu