



GAS FLOW TO THE TURBINE



Power Plants

“The technical solution offered by Flexim with the FLUXUS® G721 enabled us to install a reliably working flow measurement without having to interrupt production. The Flexim team was always available to us and supported us in every way, from selecting the product to commissioning and checking the measurement.”



Thierry Fougedoire,
Maintenance Dept.,
ENGIE Thermique France.



Measuring Task

Mass flow measurement of natural gas in the inlet to the gas turbine of the ENGIE Combigoife power plant

ENGIE has set itself the goal of taking a leading role in the energy transition.

The group's strategy is based on developing low-carbon business areas and developing gas infrastructures and integrated solutions for its customers.

In addition to power generation by conventional thermal power plants, ENGIE also operates natural gas combined cycle power plants and combined heat and power plants to enable diversified power generation with low CO2 emissions. The special thing about these power plants is that they improve energy efficiency and ensure a reliable power supply. In addition, they can be operated extremely flexibly and thus react quickly to peaks in power consumption.

The gas and steam power plant combines the use of a gas turbine with a conventional steam turbine. Due to the high energy efficiency of almost 58%, the combined use of gas and steam helps to reduce greenhouse gas and CO2 emissions.

The heart of every combined cycle power plant is its gas turbine. The gas turbine of the Combigoife power plant is supplied with fuel via two 6" lines.

To improve combustion, the gas is heated in two stages, first to 100 °F and then to 300 °F. In order to regulate the turbine, the flow rates on the two supply lines must be measured. For this purpose, turbine wheel meters were permanently installed in the two lines with flanges.

These mechanical flowmeters require a lot of maintenance because they have to be lubricated regularly. Despite regular lubrication, the turbine meters often seize up, which leads to a measurement failure. ENGIE had to remove these flowmeters once a year in order to send them to the manufacturer for maintenance and overhaul. So the plant engineers were looking for a way to replace the mechanical flowmeters with another measurement technique that would require less maintenance and affect the operation of the plant – and therefore electricity generation – as little as possible.



Solution

Flexim's non-intrusive measurement technology has proven to be the ideal solution for this measurement task. One of the characteristic advantages of clamp-on ultrasonic measurement technology is that it can be thoroughly tested for

its suitability on-site without any disruption to system operation. In a preliminary on-site test, the Flexim France service team was able to show that the non-intrusive gas flow measurement with FLUXUS® G works extremely well. At the same time, they were able to determine the ideal installation locations that best take the disturbed flow conditions into account.

Due to the convincing test measurements, ENGIE decided to replace the turbine meters with two stationary FLUXUS® G721 ultrasonic measuring systems from Flexim. For the transducers, the GRK1S52 type was chosen. These transducers work with Lamb waves and thus ensure a strong measurement signal over the entire temperature range and overall operating states, including shutdowns and restart processes.

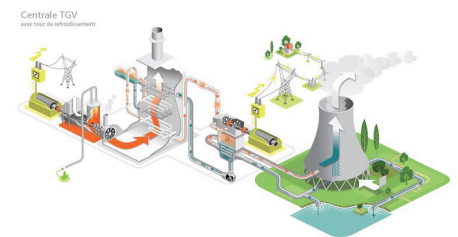
The transmitters have inputs for pressure and temperature. By calculating the measured values for pressure and temperature, the transmitter can output the standard volume or mass flow of the gas. For this purpose, Flexim has created an individual data set for the gas composition used at ENGIE Combigoilfe.

The turbine can now be optimally controlled using the data for the natural gas mass flow transmitted by the FLUXUS® G721 ultrasonic systems to the process control system. Thierry Fougedoire from the ENGIE Combigoilfe maintenance team sums up the positive experience with Flexim as follows: "Our main concern was to achieve a reliable measurement of the natural gas flow that feeds the turbine of the Combigoilfe power plant. Maintenance of the wetted flowmeters required a production stop every time, incurring costs and delays. Despite a regular maintenance plan, there were frequent failures in the measurements.

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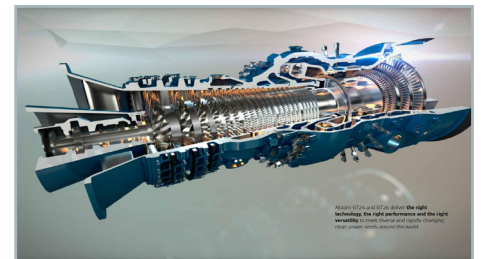
The Combigoilfe power plant in Fos-sur-Mer



The working principle of a gas and steam power plant: It combines a gas turbine and a conventional thermal power plant to generate electricity. The gas initially drives a combustion turbine. It then generates steam that drives another turbine. The combustion turbine and steam turbine then work as a duo to drive one or more generators.

These then generate electricity.

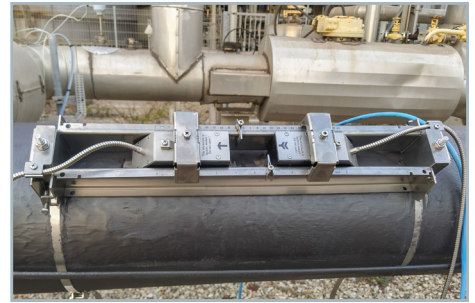
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Alstom's GT26 turbine with sequential combustion technology

© ALSTOM

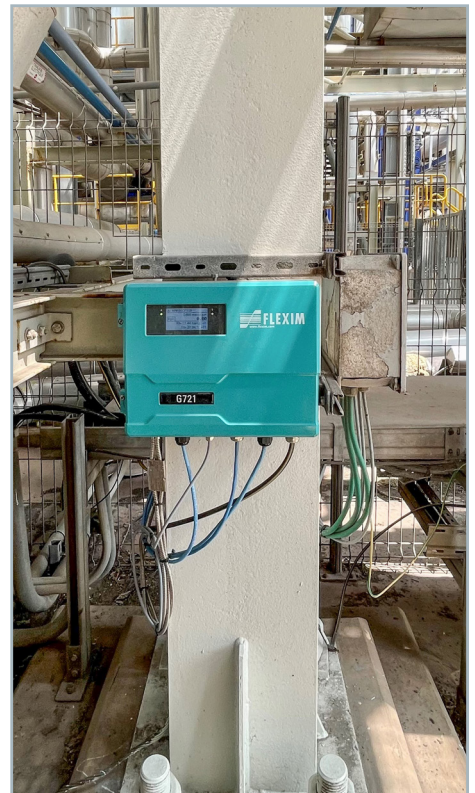
us in every way, from selecting the product to commissioning and checking the measurement. The installation in record time and the accuracy of the measurement will allow us to carry out the performance test in our power plant in optimal conditions."



There is no need to open the pipeline and therefore no interruption of operation when installing the clamp-on ultrasonic transducers.



In the Variofix C transducer attachment devices, the ultrasonic transducers are permanently optimally protected.



The stationary FLUXUS® G721 is used as the measuring transmitter.



Advantages

- Reliable measurement of the mass flow from the outside of the pipe
- No production disruption whatsoever, neither for commissioning nor for regular checks
- No time-consuming maintenance
- Large measuring range that covers all operating conditions, from the lowest to the highest flow velocities
- High level of accuracy despite insufficient, undisturbed inlet and outlet sections thanks to automatic flow profile correction
- Permanent solution: The measuring system does not require any predictive maintenance

Measuring Points and Instrumentation

Pipelines	6", stainless steel
Medium	natural gas – own data set for the individual gas composition
Temperature	~ 300 °F
Pressure	~ 700 psi
Devices used	2 stationary FLUXUS® G721 ultrasonic measuring systems for gases
	2 pairs of clamp-on GRK1552 ultrasonic transducers (Lamb wave, cover a wide range of flow rates)
	2 pairs of Variofix C transducer mounting fixtures
	2 clamp-on Pt100 temperature sensors, Atex

Customer

ENGIE Thermique France, Combigolfe Power Plant, Fos-sur-Mer, France

ENGIE is a European and global leader in renewable energy generation, centralized and decentralised energy infrastructure and related services, low-carbon power generation, and gas and electricity supply. With its 96,000 employees, the group generated sales of EUR 93.9 billion in 2022.

ENGIE Thermique France operates four combined cycle gas and steam power plants. The Combigolfe power plant was commissioned in 2010 and has an output of 424 MW. With an annual electricity production of almost 2.6 TWh, corresponding to the annual electricity consumption of 520,000 households, Combigolfe makes an important contribution to the security of supply in the Provence-Alpes-Côte-D'Azur region.



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