

Accurate Flow and Density Measurement in Power Generation Plants

ROTAMASSTI Coriolis Flowmeter

Reconciliation achieved between fuel consumed and power generated Utility-Scale plants demand precise, durable instrumentation. This note outlines solutions to support stable combustion, safety, and efficiency.

Application

The most common fuels used to generate electric power for businesses and consumers varies by world region. In regions such as the Middle East, where petroleum is less expensive, there are more oil-fired power plants. However, other parts of the world where petroleum is high-priced, there are emissions restrictions, or efficiencies are lower, use fuel such as natural gas, are used to drive the turbine.



Coriolis Flowmeter in use

The United States leads the world in natural gas power generation, with 987 plants and nearly 530 gigawatts of installed capacity. Natural gas is the nation's largest source of electricity, outpacing coal and other fossil fuels. These power plants come in two main types: simple-cycle units, which are faster but less efficient, and combined-cycle units, which offer greater efficiency but take longer to ramp up. A key advantage of natural gas plants is their flexibility—they can quickly adjust output to match changing electricity demand and play a crucial role in supporting variable renewable energy sources like wind and solar.

In this application, the customer's facility was using Natural gas power generation and required a reliable and accurate flow measurement technology to measure the fuel flow required to run the turbines. The fuel flow to the turbine was to be measured and compared to the power generated by the turbine in megawatts, which would be the direct indication of the power generation efficiency, which are part of the plant settlement system application.

Challenges

Accurate flow measurement of fuel gas to the gas turbines is essential for effective combustion control and heat rate optimization. However, the existing flowmeters were unable to deliver consistent and reliable readings due to fluctuations in gas composition, temperature variations, and changing load conditions. These inconsistencies made it difficult for the customer to precisely reconcile fuel consumption with power

generation. Additionally, high vibration levels in the piping introduced noise into the flow signals, further degrading measurement accuracy.



Aerial view Gas turbine electrical power plant

Solution

Yokogawa's ROTAMASS TI (Total Insight) Coriolis flowmeter offers precise measurement of mass flow, temperature, and density—ensuring accuracy regardless of gas composition changes, temperature fluctuations, or varying load conditions. This advanced capability enabled more accurate control of fuel flow to the turbines, allowing the customer to assess power generation efficiency with greater confidence and reliability.



Pipelines showcasing industrial energy production

Regarding the vibration noise from the pipeline, the “box-in-box” design of the ROTAMASS TI isolates the flow tubes from the process connection. By absorbing the mechanical noise or any external forces from misalignment from the pipeline, it delivers an excellent zero stability and final flat accuracy. The ROTAMASS TI performance made it possible for the customer to make process improvements, which resulted in higher efficiency between the fuel consumed and the power generated. It was a major improvement over the prior metering system.

Key Benefits

- A single device with mass, temperature and density measurements simplifies maintenance and reduces costs.
- “Box-in-box” design eliminates pipe vibration effects.
- Multi-phase measurement and totalization ensure accurate readings with the precision necessary for reconciliation.



ROTAMASS TI
Coriolis Flowmeter

OpreX™ Through the comprehensive OpreX portfolio of products, services, and solutions, Yokogawa enables operational excellence across the enterprise.

Trademarks Co-innovating tomorrow, OpreX and all product names of Yokogawa Electric Corporation in this bulletin are either trademarks or registered trademarks of Yokogawa Electric Corporation. All other company brand or product names in this bulletin are trademarks or registered trademarks of their respective holders.

YOKOGAWA ELECTRIC CORPORATION
World Headquarters

9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180-8750, JAPAN

<http://www.yokogawa.com>

YOKOGAWA CORPORATION OF AMERICA
YOKOGAWA EUROPE B.V.
YOKOGAWA ENGINEERING ASIA PTE. LTD.
YOKOGAWA CHINA CO., LTD.
YOKOGAWA MIDDLE EAST & AFRICA B.S.C.(c)

<http://www.yokogawa.com/us/>
<http://www.yokogawa.com/eu/>
<http://www.yokogawa.com/sg/>
<http://www.yokogawa.com/cn/>
<http://www.yokogawa.com/bh/>