

Thermal Flow Meters for Hydrogen Gas Monitoring

TYPICAL APPLICATIONS INCLUDE:

- Gas Turbines
- Turbine Generator Cooling
- Electrolyzers and the Electrolysis Process
- Primary or Back-up Power Systems
- Fuel Cells
- Hydrogen Storage and Transmission
- Combustion Equipment
- Heat-Treating Systems
- Steam/Methane Reforming
- Refineries
- Ammonia/Methanol Production
- Steel Production

HYDROGEN AND HYDROGEN BLEND USE ARE ON THE RISE IN INDUSTRIAL AND POWER MARKETS FOR REDUCED EMISSIONS.

Environmental, social, and political challenges have put pressure on producers to come up with cleaner solutions for our global energy needs and to reach net-zero goals. One solution gaining more traction is the conversion to hydrogen from fossil fuels or the addition of hydrogen used as a blend with traditional fossil fuels, like natural gas or methane, to fuel equipment and for power generation.

There are two emerging methods for hydrogen production: “blue” and “green”. Blue hydrogen is produced from natural gas and paired with carbon capture. Green hydrogen is produced through electrolysis using renewable energy sources. Forecasted production using green and blue hydrogen sources are projected to grow faster than other sources.

The US hydrogen market shows that, of the 11.4m metric tons of hydrogen consumed annually, the largest consumers are refining (57%) and ammonia/methanol production (38%), with steel-making (2%) and other industries (4%) in the minority of consumption. Many other industries are expected to begin or increase use of hydrogen in their industrial processes. Accurate flow measurement solutions, like thermal mass flow meters, are key to efficient process control for hydrogen, air, natural gas, oxygen, and other gas flow used in hydrogen applications.

OXYGEN AND HYDROGEN FLOW METERS FOR ELECTROLYZERS

Electrolyzers can be optimized with flow measurement devices to monitor both oxygen and hydrogen outputs during the production process. The hydrogen gas can then be stored as either a compressed gas or liquefied. The oxygen created can either be released back to the air or captured and stored to supply other industrial processes.



Green hydrogen utilizes renewable sources in the production process.



Hydrogen production application with steam/methane reformer at a gas separation plant.

STEAM/METHANE REFORMING

95% of hydrogen in the United States is produced from natural gas using steam/methane reforming, a “grey” source process. In this endothermic process, high temperature steam and pressure cause a reaction to produce hydrogen, carbon monoxide, and carbon dioxide. These gases are then isolated in a water-gas shift reaction. The methane or natural gas along with the resulting gases from this process can all be monitored for efficiency or emissions reporting with thermal mass flow meters.

HYDROGEN FOR POWER GENERATION

Power plants fueled by hydrogen and natural gas-hydrogen blends have already started popping up in the United States. Combustion gas turbines operating on hydrogen or hydrogen blends offer a cleaner solution to our energy needs than traditional coal-fired power plants.

Turbines used in pilot programs are being designed to handle both hydrogen blends and pure hydrogen. As green hydrogen becomes more plentiful and costs go down, the ratio of hydrogen to natural gas will go up until the systems are run on 100% green hydrogen.

TURBINE GENERATOR COOLING

Hydrogen-cooled turbo generators use gaseous hydrogen as a coolant because of the low density and high thermal conductivity properties of the gas. Hydrogen-cooled generators are preferred in some applications over air-cooled generators due to the lower cost and size. Thermal mass flow meters are a trusted measurement solution for the use of pure hydrogen to cool turbine generators.

FLOW METERS FOR HYDROGEN MONITORING

One of the most effective techniques for improving efficiency is a precise control strategy. The accurate, repeatable measurement of gases with thermal mass flow meters can help you achieve your performance goals. In addition to the primary benefits of direct measurement of mass flow rate, low-flow sensitivity, and fast response, the meter’s no-moving parts design also helps reduce maintenance costs.



399 Reservation Road | Marina, CA 93933

Office: 831.384.4300

foxthermal.com



Model FT4X Thermal Mass Flow Meter from Fox Thermal available in inline and insertion styles.