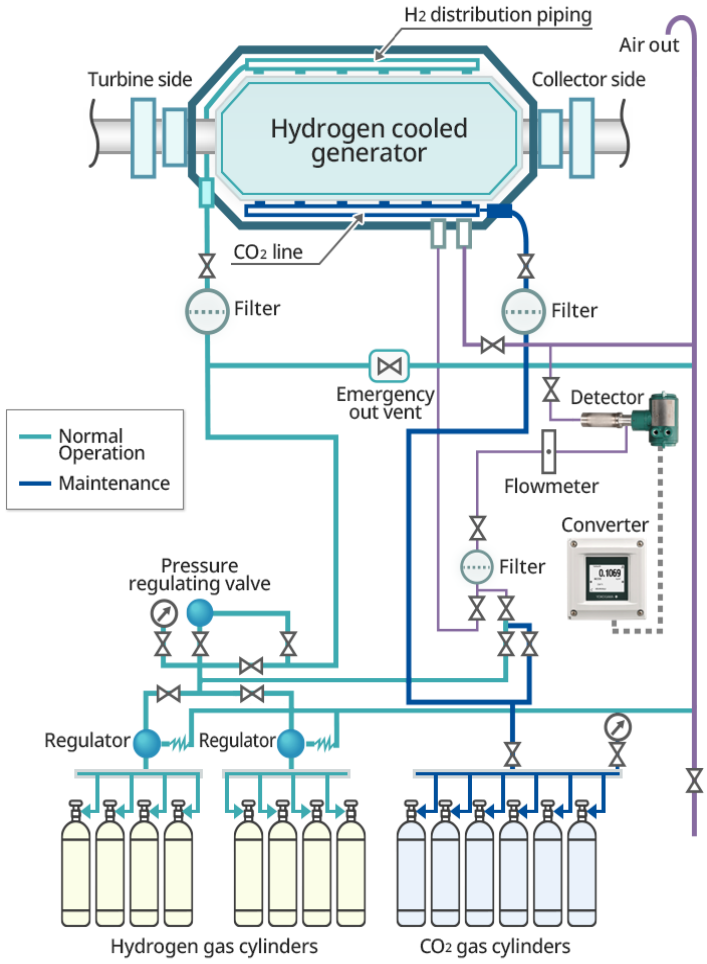
OpreX™ Analyzers | Application Note

Gas Concentration Monitoring for Turbine Generators

Hydrogen purity and gas replacement monitoring with gas density meter

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Large-scale turbine generators in power plants use hydrogen cooling to remove heat. Yokogawa's gas density meter offers field-proven and effective gas monitoring for safe operation.



Flow diagram of H_2 and replacement gas in a generator

For hydrogen-cooled turbine generators, gas monitoring is required during both normal operation and maintenance.

Hydrogen purity for normal operation

Hydrogen gas is sealed within the generator and maintained at a pressure of 0.2 to 0.6 MPa and a concentration of approximately 98%. If the hydrogen concentration drops, hydrogen gas is supplied from a pressurized gas cylinder to prevent the formation of an explosive mixture with air.

Gas replacement for maintenance

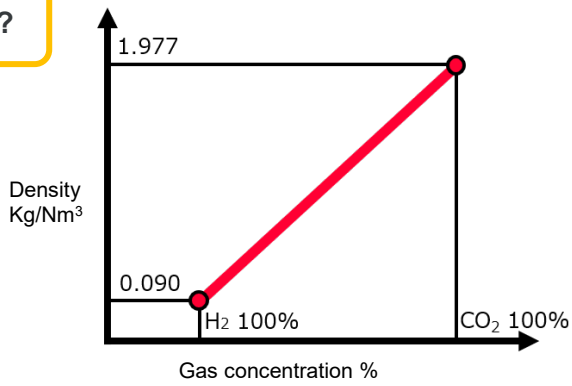
During shutdown, the generator is purged with an inert gas such as carbon dioxide supplied from a cylinder to release the hydrogen gas. The carbon dioxide is then replaced with air. The opposite order is used after maintenance for startup.
It is necessary to monitor the gas replacement process inside the generator to ensure safe maintenance operation.

Comprehensive monitoring and reduced maintenance costs with a single gas density meter

Conventional gas condition monitoring required multiple thermal conductivity analyzers for both normal operation and maintenance. Yokogawa's gas density meter enables the monitoring of both hydrogen purity and gas replacement status with a single instrument. Our reliable technology helps users reduce maintenance costs.

How can a density meter measure gas concentration?

Since each gas has a unique density, the gas concentration can be determined by measuring the density of a gas mixture. This concentration conversion is applicable only to binary gas mixtures consisting of two components.
The graph shows an example of the correlation between gas density and concentration in a binary gas mixture.



Yokogawa's gas density meter GD series can be used as a concentration analyzer for various binary gas mixtures. For turbine generators, a single instrument measures gas concentrations both during normal operation and maintenance by switching among the following three binary gas measurements.

H_2 - Air | **H_2 - CO_2** | **Air - CO_2**

◆Product Details



GD802G
Gas Density Meter Converter



GD80
Gas Density Meter Detector

Sample Gas Conditions	Sample Gas: All gases except for corrosive gases (Contact Yokogawa for details.) Temperature: -10 to 60℃ (No condensation) Flow Rate: 0.1 to 1 L/min Pressure: 50 kPa to 600 kPa abs.
Principle	Multi-mode oscillation technology
Performance Specification	Hydrogen Purity Meter (H2 in Air) and Replacement Meter (H_2 in CO_2, Air in CO_2) Range: Concentration: 0 to 100 vol% (H_2 in Air is default 85 to 100 vol%) 90% Response Time: Approx. 5 s (Time required for the reading to reach 90% of its final value after the indicated value begins to change (at a gas flow rate of 0.6 L/min). When switching from the zero point CO_2 to the span point H_2.). Linearity: ± 1% Repeatability: ± 0.5% Zero / Span Drift: ± 0.5%/ month (Provided that the detector, converter, and pressure transmitter are not affected by ambient temperature.)

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

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