

Monitoring Hydrogen and Purge Gas in Power Stations



Application

All large generators/alternators (above 200MW) in power stations are filled with hydrogen at approximately 7-10 BarG. This is to improve the efficiency of the generation as the Hydrogen reduces the drag and friction of the rotor inside the generator reducing losses. Additionally, hydrogen has an extremely good thermal conductivity that assists in the cooling of the alternator.

When an alternator is brought on-line after shutdown or from new, it has to be filled with hydrogen which is of course dangerous if the hydrogen was to mix with air. In order to avoid this mixture, a purge gas, normally carbon dioxide, is used to fill the unit before the hydrogen is introduced. During normal operation, the hydrogen has to be continually topped up from skid mounted hydrogen bottles or hydrogen generators to replace the hydrogen lost due to fugitive emissions. These emissions are normally small however, as with any rotating machine, the seals on the shaft are a weak point. Also, the cooling hydrogen is passed through a heat exchanger and this has various connections and flanges that could fail.

The problem

Until recently, many power stations have considered the generator room to be a safe area as the generator cannot be certified. There are however several possible leak sources for the hydrogen, namely the rotating shaft seals, the joints and flanges around the heat exchanger, plus other seals. The hydrogen bottles should be stored externally but this is not always possible and therefore could also be a potential hazard.



The problem - cont'd

With recent changes, European legislation has required the power stations to rethink to this approach. As a result, all power stations should be looking to reclassify their generator halls as Zone 2 areas. This means that they are required by regulation to follow best practice to eliminate risks of explosions.

A mixture of the following measures normally achieves this: -

- Confinement or early detection of any leaks
- □ Ventilation
- □ Reducing possible ignition sources

The solution

A fixed gas detection system is one of the most powerful tools in enabling risks to be reduced. A system can give early warning of any leaks from the alternator and enable the gas supply to be shutdown or other executive actions to be taken. The system can also provide outputs to control ventilation or shut down non-essential electrical equipment thereby reducing ignition sources.

GMI have a comprehensive range of products for this application and the Active-8 system is ideally suited with five or six points normally being required per generator. These are normally placed at each of the significant potential leak sources. These points must always take into consideration that hydrogen is far lighter than air, so areas that could trap hydrogen should be considered in any solution as well as assuring that the top of the building is suitably assessed as to the likelihood of a gas build up.

The purge gas is also a risk as carbon dioxide (CO2) leaks can be considered as hazardous. Although CO2 is non-toxic, it can cause asphyxiation by removing the oxygen in the area. This will probably only occur where the leak source is enclosed, however, it is often a good idea to monitor for CO2 so that any leak is picked up quickly thus reducing the cost of lost gas and the risk of not having gas available when needed to bring a generator on/off line.

GMI has over 60 years experience of gas detection needs and are uniquely qualified to assist Power Generating companies to assess their needs and provide a turnkey solution for site surveys, equipment supply, installation and commissioning any system supplied.

GMI HEAD OFFICE Inchinnan Business Park, Renfrew, PA4 9RG Scotland, U.K. Tel: +44 (0) 141-812 3211 Fax: +44 (0) 141-812 7820





GMI SERVICE / REPAIR CENTRE 25 Cochran Close, Crownhill, Milton Keynes, MK8 OAJ England, U.K. Tel: +44 (0) 1908 568867 Fax: +44 (0) 1908 261056



As an ISO 9001 approved company, GMI Ltd's quality assurance programmes demand the continuous assessment and improvement of all GMI products. Information in this leaflet could thus change without notification and does not constitute a product specification. Please contact GMI or their representative if you require more details.