

Reliable Hydrogen Dew Point Measurement For Electricity Generator Protection

Hydrogen gas is used for cooling rotor windings in turbine generators for several reasons. Its extremely low density offers minimal resistance to rotor rotation reducing the energy requirement for same. Furthermore, its excellent thermal conductivity makes it a very efficient carrier of heat away from the generator, where it is cooled and continuously recirculated in a closed loop.



It is not commonly known that the quality of the hydrogen used for cooling turbine generators has a significant impact on the bottom line of a power generation utility. Pressure and purity are important factors but understanding the impact of moisture levels within the gas and accurately monitoring its dew point is critical. The presence of wet hydrogen gas is extremely detrimental to the longevity of the windings due to increased risk of corrosion and insulation failure. Therefore, it is vital that the dew point of the purge gas be maintained as low as possible. The industry standard is set at -20°C dew point (or lower) for control.

A desiccant-based dryer is usually included in the gas circulation loop. The presence of moisture is also indirect evidence for air leaking into the generator compartment. Another option is optimizing the hydrogen scavenging, so the dew point is kept within specified limits. The water is usually introduced into the generator atmosphere as an impurity in the turbine oil; another route is via leaks into the water cooling systems. The criticality of this parameter to the process brings into focus the requirement for fast, accurate dew point measurement and the explosive nature of the environment dictates the need for hazardous area approved instrumentation.

The Xentaur Portable Dew Point Meter (XPDM) is a battery operated, ATEX certified, hand held hygrometer, designed for applications where rapid and precise dew point measurement is essential. The XPDM's aluminium oxide sensor technology is manufactured to a proprietary method in which the oxide layer is made to be hyper-thin as well as extremely hygroscopic. This results in a very sensitive sensor with a fast response. Furthermore the Hyper Thin Film (HTFTM) sensors exhibit a capacitance change over their full range, several orders of magnitude larger than that of conventional aluminium oxide sensors with negligible temperature sensitivity. The advantages are increased sensitivity and enhanced repeatability with less susceptibility to noise and drift.

Aluminium oxide sensors absorb water molecules much faster than they desorb them. A key feature of the XPDM is that its sensor is maintained in a desiccant chamber for dry storage between measurements. Consequently, the sensor is typically dryer than the gas sample to be measured.

A major British energy company has standardised on the XPDM for hydrogen dew point measurement on their hydrogen cooled turbo generators across several power stations.

This portable 'spot check' instrument offers a cost-effective and flexible solution to premature windings insulation failure, which can be used across the site for periodic checking or as back-up to an online system.

The XPDM is available exclusively from ABL Instruments.



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