

Hydrogen Annealing Ovens

Models 3050-OLV, 2850

Application

Moisture is measured in hydrogen annealing ovens.

Problem

Hydrogen gas is used in annealing furnaces manufacturing stainless steel and other metal parts. High-moisture concentrations in the hydrogen will oxidize the metal, resulting in an unusable product with a surface finish that is too dark.

Equipment

Any quartz-crystal based analyzer can be used although in some applications, a limit of detection below 0.1 ppmv may be desired.

A small, stainless steel filter is recommended for use at the sample tap to catch any particulate that may be present in the furnace atmosphere.

If the desired moisture content is below 1 ppmv, the use of electro-polished stainless steel tubing to connect the analyzer to the process is strongly recommended.

Procedure

The moisture content of the furnace effluent hydrogen gas is continuously monitored by the moisture analyzer. The sample line should be long enough to allow the hot furnace gas to cool to less than 60°C before it enters the analyzer.

How Previously Handled

Often, aluminum oxide cells have been used in the attempt to measure moisture in the hydrogen. They have proven to be unreliable due to the reducing effect the hydrogen atmosphere has on metal oxides. The hydrogen reduces the aluminum oxide back to base aluminum thereby changing its electrical characteristics and thereby its sensitivity to water. Since the stability of the sensor's calibration depends upon a stable oxide layer, the readings are unreliable as the sensors fail to zero.

Electrolytic-type cells have long since proven unreliable in this application due to the oxygen-hydrogen recombination effect inherent in this technology.

Results

Continuously monitoring moisture, a 3050-OLV or 2850 moisture analyzer will respond quickly and accurately to the moisture content of the hydrogen. This enables a furnace operator to quickly know when he can begin annealing product and, as importantly, when he should stop because of a moisture problem.

Knowing the moisture content of the hydrogen gas ensures a consistent bright annealing of metals.

Typical Operating Specifications

Range of interest:

0.1 to 16 ppmv

Operating Pressure:

3.1 barg (45 psig)

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