



## Application note

# Moisture content in hydrogen annealing ovens

## Application

Annealing is the heating of steel to a very high temperature so that bonds, previously compromised in the rolling process, can be reformed in the metal. This strengthens the overall structure of the steel. Hydrogen, a high thermal conductivity gas, is used in the oven to better retain this high temperature environment surrounding the steel. Moisture is measured during this process to assure quality product.

## Background

High moisture content in hydrogen-rich gas, used in annealing furnaces, causes oxidation of the metal to occur. This results in an undesirable surface finish on the product.

In the past, electrolytic-type cells proved to be unreliable due to the recombination effect in a hydrogen atmosphere. This recombination affects the water, hydrogen and oxygen reaction (the principle on which such cells are based) causing ambiguous results.

## Installation

Typically, an aluminum oxide sensor is mounted in a properly designed sample system and continuously monitors the moisture content of the furnace hot-zone or effluent gas. The hot furnace gas cools to less than 50°C (120°F) before it enters the sample cell. This occurs naturally as the gas travels through the stainless steel sample lines. The feed gas to the furnace is also monitored in some installations.

## Equipment

Panametrics has decades-long experience implementing any of its aluminum oxide moisture analyzers with an appropriately-designed sample system for the removal of sub-micron particulate fines will excel in these applications. For highest speed of response and for maintenance-free operation, the Aurora RM using tunable diode laser spectroscopy is the ideal choice.

## Specifications

- Dew point range: -85° to -50°C (-121° to -58°F)
- Operating temperature: 538° to 1371°C (1000° to 2500°F)
- Operating pressure: 45 psig (412 kPa)

