APPLICATION NOTE

SYNGAS HYDROGEN MEASUREMENT

Application

Hydrogen is measured within syngas to ensure that plant/process operation is optimized. Hydrogen measurement is important as it indicates the quality of the syngas produced. Real time hydrogen indication allows the end user to adjust the process as required to ensure maximum efficiency. A typical adjustment could be, adding water to increase the hydrogen %, or removing water to increase the carbon monoxide %. Without the hydrogen measurement, the end user is making an assumption in regards to the end product ratio and cannot be sure that correct modifications are being made to the process.

Syngas Plant

Background

Syngas (synthesis gas) refers to a gas mixture that contains varying amounts of carbon monoxide, hydrogen and very often CO2. Production methods include steam reforming of natural gas or liquid hydrocarbons to produce hydrogen, partial oxidation, the gasification of coal, biomass, and in some types of waste-to-energy gasification facilities. The name comes from their use as intermediates in creating synthetic natural gas and for producing ammonia or methanol. Syngas is used for production of synthetic petroleum, as a fuel or lubricant via the Fischer–Tropsch process, as a fuel of internal combustion engines or as an intermediate for the production of other chemicals. However, it's most common use, is for production of hydrogen. Hydrogen is then sold as a separate product, while the residual gases are recycled, to be used as fuel for the SMR (steam methane reformer). There are two main measurement points for hydrogen, before the gases are separated through the PSA and after the PSA for measurement of the end product.

Measurement Technique

H2scan analyzers employ a solid state hydrogen specific technology based on palladium nickel alloy that requires no sample gas, reference cell or everyday calibration. The sensing material is inherently specific to hydrogen and has the capability to operate in a variety of multi-component and varying-component gas compositions. Also included on the sensor die are proprietary coatings to enable tolerance to % levels of hydrogen sulfide and carbon monoxide. Custom conditioning and calibration in contaminant gas streams along with very precise on-board temperature control loop provides high accuracy and long-term stable performance. H2scan's analyzers also are adaptable to conventional or NeSSI type sample systems and provides direct hydrogen measurements.

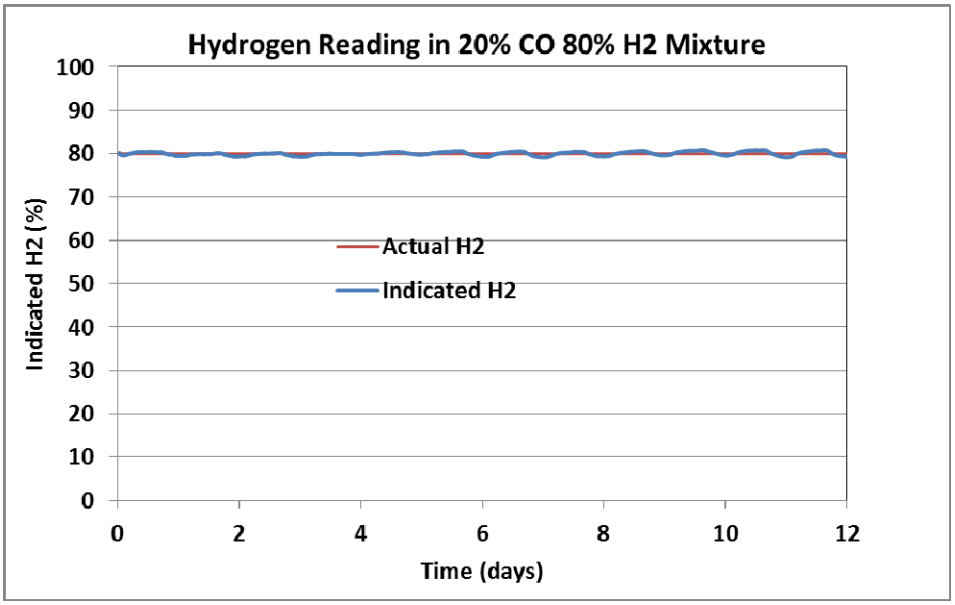
Reference Users
Air Liquide, Plasma Power, LLC

Advantages

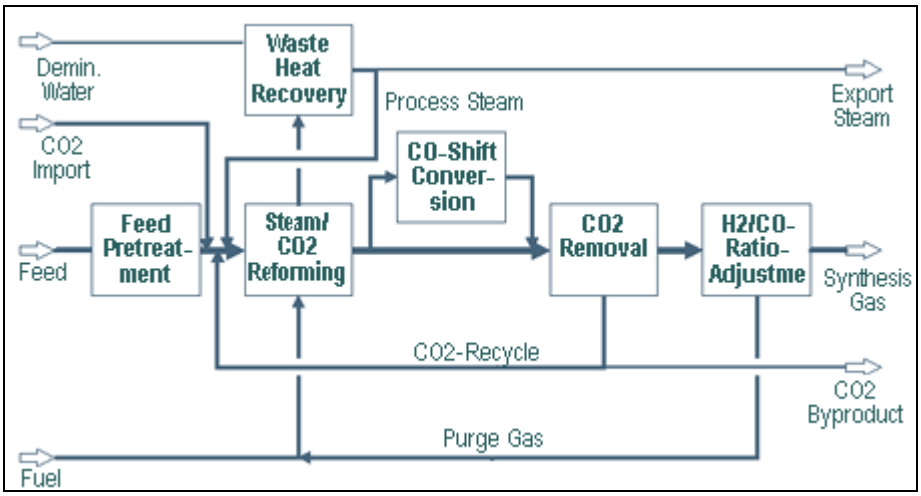
Hydrogen measurement within syngas has typically been done by measuring the most probable contaminants and assuming everything else was hydrogen. This assumption can lead to inefficiencies in the process when the reaction is not taking place correctly. The H2scan analyzer is useful because it is hydrogen specific and not cross sensitive to the other gases in the process. It allows the end user to measure what in the past has been a calculated number based on an assumption, adding new efficiency to an established process. The small, simple form factor allows implementation into current sample systems. If complete sample systems are required, H2scan can provide this as well.

HY-OPTIMA™ Series 1700

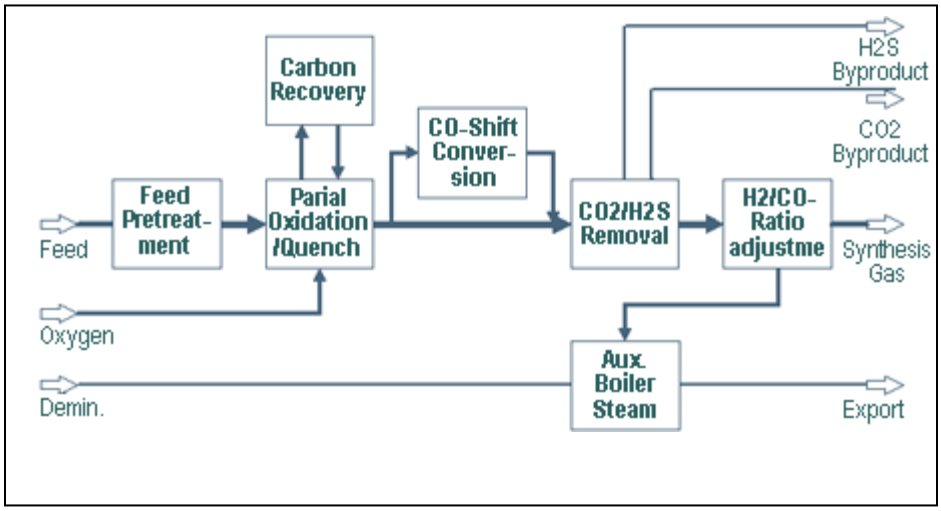
HY-OPTIMA™ Series 2700



Data showing analyzer performance in 20% CO



Synthesis Gas Production with Steam Reforming



Synthesis Gas Production with Partial Oxidation