Application Note

H20 in Hydrogen Recycle Stream of Refinery Reformer

Key Features

- *Avoids damage to the sensor from other components in the stream*
- *Virtually maintenance free operation with no routine service needed*
- *Responds quickly to process changes: no wet-up or dry-down times*
- *See product datasheet for more details*

The Catalytic Reformer Unit of a modern refinery is an important process unit for converting lower octane naphtha streams into higher octane aromatic compounds.

These chemical conversions are done in catalytic reactors that transform straight-chain C_6 – C_8 compounds found in the naphtha into light aromatics such as Benzene, Toluene and Xylenes (BTX). This high octane reformate can then be used in gasoline blending or sold to chemical plants.

Catalytic Reforming Unit

As shown in Figure 1, the feed stream to the Reformer Unit first enters a DePentanizer tower to remove the pentane and lighter compounds from the naphtha. The naphtha is then mixed with hydrogen and enters a series of heaters and reactors where the conversion to aromatics takes place.

Following the last reactor, a Hydrogen Separator strips out the hydrogen and other light gases from the stream. After the removal of the hydrogen, the stream enters a Stabilizer Tower (also called a DeButanizer) that removes the butanes and lighter with the Reformate leaving out the Bottoms for gasoline blending or sent to a chemical plant.

Critical Control of Moisture

The catalyst in the reactors is very expensive and sensitive to poisoning if exposed to certain compounds; most notably H2O. During normal operation of the Reformer, the moisture content tends to accumulate in the Hydrogen Recycle stream — building up to undesirable levels. If left unchecked, the moisture damages the catalyst, thus shortening its life and resulting in costly replacement fees. Proper operation of the Reformer needs reliable monitoring of the moisture levels in the Hydrogen Recycle.

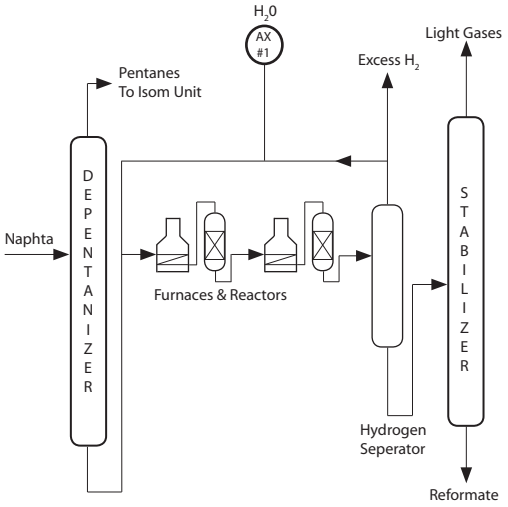

Figure 1: Flow diagram of Refinery Reformer

Traditional Measurement Solutions

Electrochemical moisture analyzers have been the traditional method for monitoring the levels of H_2O in the Hydrogen Recycle stream. Unfortunately the trace hydrocarbons and HCl present in the stream contaminate the electrochemical probes, resulting in high maintenance costs due to the need to be constantly replaced. It's not uncommon for moisture probes to be replaced multiple times a year, for an annual maintenance cost easily exceeding $100,000 per year.

SpectraSensors' Solution

The SpectraSensors SS2100 is the ideal solution for this challenging application. Its non-contact sensor is impervious to damage from contaminants. The use of Tunable Diode Laser technology means that measurement interferences from other infrared absorbing compounds are avoided. And being laser-based, there are no wet-up or dry-down delays resulting in significant savings in time and labor.

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