$50,000 in installation costs & over $100,000/yr in hydrogen gas usage saved via 2-wire Coriolis

RESULTS

- Improved accuracy on the usage saved over $100,000/year
- Improved turndown
- $50,000 savings in installation through the use of 2-wire Coriolis
- No accuracy degradation with 2-wire vs. 4-wire Coriolis
- Verified the hydrogen bill

APPLICATION

Hydrogen is an important process stream in refining, and the usage has gone up substantially with the trend toward cleaner fuels. There are two main uses of hydrogen in a refinery: hydrocracking and hydrotreating. Hydrocracking is the process that converts gas oils into higher margin lighter, cleaner fuels through the use of hydrogen. Hydrogen costs can be 4 times the combined utilities and catalyst costs for a typical hydrocracker. Hydrocrackers are typically the largest hydrogen consumer in the refinery.[1] As the quality of crude oil globally declines (decreased API gravity and increased sulfur content), hydrogen consumption increases. Hydrotreating utilizes hydrogen to remove sulfur and other impurities from the process stream. Hydrotreating specifically for sulfur removal is called hydrodesulfurization, or HDS. Hydrogen has a low molecular weight, which is difficult to measure, particularly with variable flow rates.

A major refinery in the Western USA uses high pressure hydrogen gas and wanted to get better measurement of their usage of hydrogen within the refinery. They not only wanted to reduce their overall usage, but also be able to check their hydrogen bill to ensure they were getting what they paid for.

Installed Micro Motion® ELITE® Series flowmeter

CHALLENGE

The refinery had been measuring their hydrogen usage with orifice plates. However, they were not getting sufficient accuracy and turndown for adequate process control in the HDS and hydrocracking units.

In another part of the refinery, they were already using Micro Motion Coriolis meters for hydrogen measurement. In that part of the

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refinery, they had suspected they were being overbilled for hydrogen and had been able to use the Coriolis meters to uncover a billing error of $500,000. Although their primary concern for this installation was around process control, they also wanted to be able to use their process control meters to verify their hydrogen bill.

SOLUTION

Two Micro Motion® ELITE® Series flowmeters were selected for the application. These 2-inch high nickel alloy meters were chosen for their superior gas flow accuracy (+/-0.35%), their high turndown capabilities, and proven successful installations of Micro Motion meters for hydrogen gas measurement. The high nickel alloy wetted material has a higher pressure rating than stainless steel and was selected to withstand the 2000 psig hydrogen pressure.

The meters were to be used on the hydrogen feed supplying both the hydrocracker and HDS unit. This installation site did not have sufficient power to use a traditional 4-wire Coriolis meter, but the customer did not want to sacrifice accuracy and turndown for the application. The Micro Motion 2-wire transmitter was selected to eliminate the need for additional wiring and unlimited power supply system installation. This saved at least $50,000 for the project.

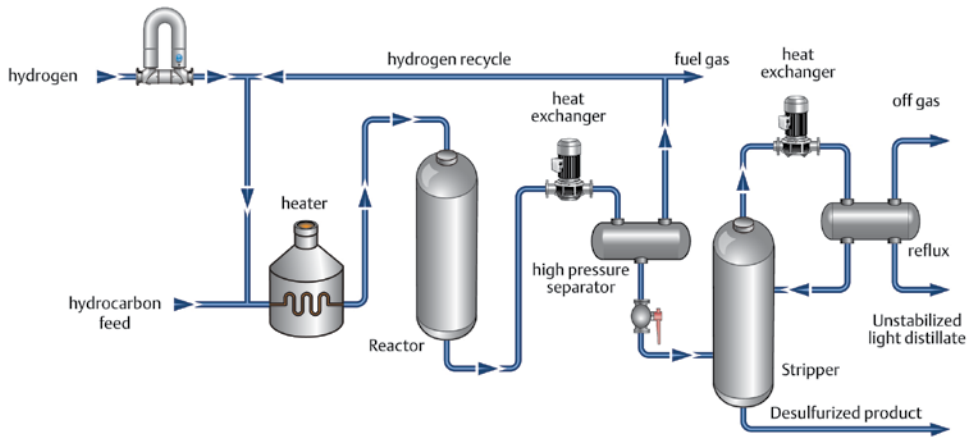
By improving the accuracy from greater than 1% using the orifice plates to 0.35% using the Coriolis meter, the customer was able to save as much as $117,000/year in hydrogen. There were also maintenance savings through eliminating orifice plate wear and maintenance of the impulse lines.

The customer had no choice but to install the sensor in a location where the factory-imprinted flow direction was in the reverse direction to what they were flowing. The meter works in both directions, so this wasn't an issue (a simple configuration change in the transmitter completely remedied the situation), but in order to reduce confusion to the operators, they chose to make a new flow direction arrow and install it on the sensor (see photo on page 1).

The refinery can now verify the accuracy of the hydrogen supplier's custody transfer meters to check for billing inconsistencies as well as monitor and control their hydrogen plant usage with confidence.

References:

[1] Long, R., Picioccio, K., & Zagoria, A. (Q3 2011) . Optimising hydrogen production and use. Petroleum Technology Quarterly.



Simplified Hydrodesulfurization (HDS) Unit

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