Soybean Oil Refiner Improves Carbon-to-Steam Ratio Using Multivariable Flow Transmitters

RESULTS

- Natural gas and steam flow accuracy improved to 1%, enabling automatic control
- Reduction in steam waste
- Installation costs reduced by 30%
- Reduced leak points by 30%

APPLICATION

Natural gas and steam measurement in hydrogen reformers

Application Characteristics: Soybean oil processing. The reformer produces hydrogen, which is used to hydrogenate soybean oil.

CUSTOMER

Large Midwest Soybean Oil Refiner

CHALLENGE

In soybean oil processing, hydrogen is used to hydrogenate oil and is manufactured by combining steam and natural gas in a hydrogen reformer. The ratio of steam-to-carbon from the entering gas mixture is critical to prevent carbon formation on the catalyst and to maintain the efficiency of the hydrogen reformer. A ratio above the defined set point will waste steam, while a ratio below the set point will wear out the catalyst. Reliable natural gas and steam readings are needed to stabilize steam-to-carbon ratios. Fluctuating flow rates force hydrogen reformers to operate in manual mode, causing the plant to run the steam-to-carbon ratio above the set point to preserve the catalyst, which uses excess steam.

Providing accurate and reliable steam and natural gas flow readings was the challenge. A traditional flow installation configured to compensate for density variations required three separate transmitters - one for differential pressure, one for static pressure and one for temperature. The signals from all three transmitters are sent to the control system where the mass flow calculations were performed. This practice adds additional costs and provides suboptimal performance. Just as significant as the pressure and temperature (density) related effects are the effects of changing orifice flow coefficients, which affect bias error and efficiency. These effects, if not corrected, can lead to errors between 2 and 5% of flow rate.
**SOLUTION**

Steam and natural gas flows are each measured with one Rosemount 3095 MultiVariable™ Transmitter with a Rosemount 68 RTD sensor. The 3095 transmitter provides full dynamic compensation, eliminating bias errors and giving a mass flow rate accuracy of 1%. The improved installed performance from the 3095 increased flow stability and accuracy, enabling tight control of the carbon-to-steam ratio. The result allowed the operation to move from manual mode to automatic control, which reduced steam waste and freed up the operators to work on other tasks.

In addition to improved performance, the 3095 Multivariable Flow transmitter combines the differential pressure, static pressure and temperature measurements into a single device on one twisted pair of wires, reducing total installed cost by 30% and potential leak points by 30%.

**RESOURCES**

Emerson Process Management Food and Beverage Industry
http://www.emersonprocess.com/foodandbeverage/

Rosemount 3095 MultiVariable™ Mass Flow Transmitter
http://www.emersonprocess.com/rosemount/products/flow/m3095mv.html