Refinery Decreases Usage of Chemical Additives with Reliable Desalter Interface Measurement

RESULTS

- Decreased usage of chemical additives
- Reduced operations and maintenance costs
- Reduced risk of unscheduled shutdowns

APPLICATION

Oil Refinery Desalter

Desalter vessels use water, chemical additives, and a high voltage electrified grid to remove potentially corrosive salts from crude before the refining process. Three liquid phases form in the vessel: salt water, crude, and an emulsion layer between the two.

APPLICATION CHARACTERISTICS

Crude oil is viscous and contaminated with solids, dissolved salts, and water content; Heavy emulsion layer; Temp: 250 – 300 °F (120 - 150 °C), Press: 165- 190 psi (11- 13 Bar); Highly variable amount of salt and water in different crude feedstock.

CUSTOMER

Major Refinery in Northeastern United States

CHALLENGE

An Instrument Reliability Engineer at a Major Refinery sought to improve reliability of their current method for emulsion upper (Crude/Emulsion) and lower (Emulsion/Salt Water) interface level measurements in four desalter vessels. Consistent and efficient desalter operation requires reliable and accurate measurement of the top and bottom of the emulsion layer. Salt laden water settles and is removed from the bottom of the vessel for treating. Desalted crude is drawn off the top of the vessel and sent to refining units. The top of the emulsion layer must stay below the desalter internal electrical grids to prevent the grids from shorting out. The bottom of the emulsion layer must be maintained above the salt water discharge to prevent crude-containing emulsion from being sent to water treatment.

This customer previously used capacitance probes to measure and control the Salt Water Level at the bottom of these vessels. This technology was susceptible to errors due to coating, and proved unreliable resulting in control in the “Manual Mode”. Additionally, capacitance technology is unable to read the Oil/Emulsion interface. Manual spit valves were used to locate/verify the emulsion upper/lower boundaries, but provide poor resolution.

Figure 1: Desalter vessels that required improved measurement reliability.

Figure 2: Rosemount 5302 Guided Wave Radar reliably measures emulsion layer on desalter vessel.

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Process Management

Unreliable or inaccurate salt water level measurement can lead to the risk of sending oil to the water treatment plant, fouling the equipment. Inaccurate or infrequently sampled emulsion thickness measurements can cause the risk of an electrically shorted grid and unit trip. As a result, the Desalter is run extremely conservatively, using excessive demulsifying additive, and consuming about 120 man hours of instrument maintenance per capacitance probe.

SOLUTION

To address this problem, this customer directly replaced four capacitance probes with four Rosemount 5302 Guided Wave Radar multivariable transmitters (GWR) using rigid single lead probes. The replacement not only provided a reliable measurement of the water interface, but also a measurement of the top of the emulsion layer. With this capability, the emulsion thickness and water level can both be identified using a single process connection. The Rosemount 5300 has unique Direct Switch Technology which provides a stronger signal and enhances the radars performance in low dielectric fluid. This additional signal strength allowed for the use of a single lead probe which eliminates risk of probe coating. GWR requires no calibration and is immune to density changes, so the measurement is easy to commission and reliable in the desalter's changing process conditions.

By maintaining a reliable emulsion measurement, this customer was able to keep water out of the electrical grids and keep oil out of the waste stream. As a result, the control loop is now run in automatic mode and operation is more efficient and reliable. They were able to save over $100,000 annually per desalter in chemical emulsion costs and $14,400 annually in reduced maintenance costs.

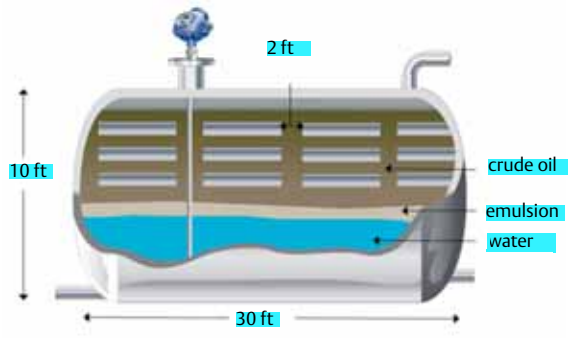

Figure 3: Drawing of installation in desalter tank showing emulsion layer and electrical grids.

RESOURCES

Emerson Process Management Refining Industry

http://www.emersonprocess.com/solutions/refining/

Rosemount 5300 Series - Superior Performance Guided Wave Radar

http://www2.emersonprocess.com/en-US/brands/rosemount/Level/Guided-Wave-Radar/5300-Series/Pages/index.aspx

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