Vortex Technology Optimizes Alkylyte Production at Refineries

RESULTS

- Eliminated unscheduled shutdowns
- Increased measurement reliability
- Reduced number of potential leak points
- Reduced maintenance costs

Eliminated plugged impulse lines, unscheduled shutdowns, and increased safety.

APPLICATION

Sulfuric acid to hydrocarbon feed ratio control to produce high-quality gasoline components (alkylates)

APPLICATION CHARACTERISTIC

Fluid: Isobutane/Olefin feed, Flow: 1,000–14,000 BPD, Temperature: 40 °F (4.4 °C), Pressure: 90 psig (6.2 bar)

CUSTOMER

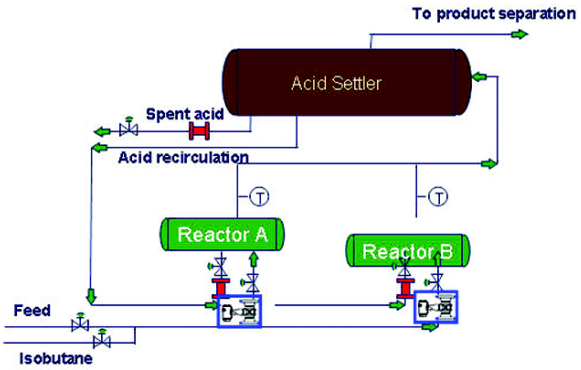
A North American Refinery

CHALLENGE

This refinery had been experiencing plugging/clogging of their DP orifice plates during the Alkylation process. They wanted to ensure safety by avoiding a potential explosion due to high temperatures in the alkylation process, and decrease downtime due to maintenance.

The alkylation process mixes an isobutane stream and olefin feed with a stream of sulfuric acid. Alkylation units in refineries produce alkylates, which are blended with straight-chain alkanos to adjust the octane rating of gasoline. The mixture is chilled to 40 °F (4.4 °C) and fed to two parallel reactors. The chemical reaction is highly exothermic, and runaway high temperatures may cause an explosion. To control temperature in the reactors, the system manipulates the flow rate ratio of the hydrocarbon and sulfuric acid feeds.

High reliability and low downtime are key equipment requirements in a refinery process like sulfuric acid alkylation. To optimize the process, measurements must be available at all times. Maintenance due to plugging/clogging of impulse lines or ports is unacceptable. In addition, minimizing the exposure of personnel to hazardous acids is critical to increasing safety.



Typical diagram of the alkylation process

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Rangeability is especially pertinent to alkylation units because there is a significant seasonal change in flow rates to produce summer-grade and winter-grade gasoline.

Because of the physical nature of the feed, plugging of DP/orifice plate impulse lines by crystalline precipitates often occurs. The plugging caused loss of measurement, high maintenance costs, and was responsible for process downtime. Vibration and fluid pulsation also make the measurement difficult and often require expensive pipe braces.

The non-clog design resulted in reduced maintenance costs and increased process uptime as the flow signal is now more reliable.

SOLUTION

The Rosemount 8800 Vortex Flowmeter crevice and port-free design make it immune to clogging from precipitates. The customer reported maintenance-free operation since installation in 1994 and made contingency plans to brace the pipes feeding the reactors. They had experienced problems with vibration and fluid pulsation on the sensor with previously installed meters.

The 8800 start-up went smoothly. The mass-balanced design and Adaptive Digital Signal Processing (ADSP) filtered out noise signals, and no braces were needed. The meters were installed with the factory-default configuration for filters, which resulted in trouble-free operation.

Due to the installation of the 8800 Vortex Flowmeter, the customer has eliminated downtime, increased measurement reliability, reduced the number of potential leak points, and reduced maintenance costs.

RESOURCES

Emerson Process Management Petroleum Refining Industry

http://www2.emersonprocess.com/en-US/industries/refining/Pages/index.aspx

Rosemount Vortex Flowmeters

http://www2.emersonprocess.com/en-US/brands/rosemount/Flow/Vortex-Flowmeters/Pages/index.aspx

Emerson Process Management
Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA
www.rosemount.com
Tel (USA) +1 800 522 6277
Tel (International) +1 (303) 527 5200
Fax +1 (303) 530 8459

Emerson Process Management
Blegistrasse 23
P.O. Box 1046
CH 6341 Baar
Switzerland
Tel +41 (0) 41 768 6111
Fax +41 (0) 41 768 6300

Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone
Dubai UAE
Tel +971 4 811 8100
Fax +971 4 886 5465

Emerson Process Management Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
T (65) 6777 8211
F (65) 6777 0947
Enquiries@AP.EmersonProcess.com

Emerson Process Management Latin America
Multipark Office Center
Multipark Office Center
Turrubares Building, 3rd & 4th floor
Guachipelin de Escazu, Costa Rica
T+(506) 2505-6962
international.mmicam@emersonprocess.com

ROSEMOUNT®

For more information:
www.rosemount.com

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