APPLICATION NOTE: Positive Displacement Flow Meters Aid in Crude Oil Refining Efficiency

Crude oil is the term used for unprocessed oil and the starting point for many different substances that vary greatly in use, appearance, phase, and viscosity. There are a few major classes of hydrocarbons in crude oils: paraffins, aromatics, and napthenes. Refining crude oil allows for the separation of these classes and production of many commonly used products like liquefied petroleum gas (LPG), gasoline, naptha, diesel fuel, fuel oils, lubricating oils, paraffin wax, and other residual materials.

Crude Oil Processing

The operation to refine crude oil combines a multitude of processes that fall into three main categories: separation, conversion, and blending. Throughout these processes the product is pumped, heated, cooled, and blended to refine and balance the final products, and remove contaminants and impurities. In order to increase efficiency, control corrosion in auxiliary equipment, and aid in the refining and demulsification processes, chemical treatment programs are employed.

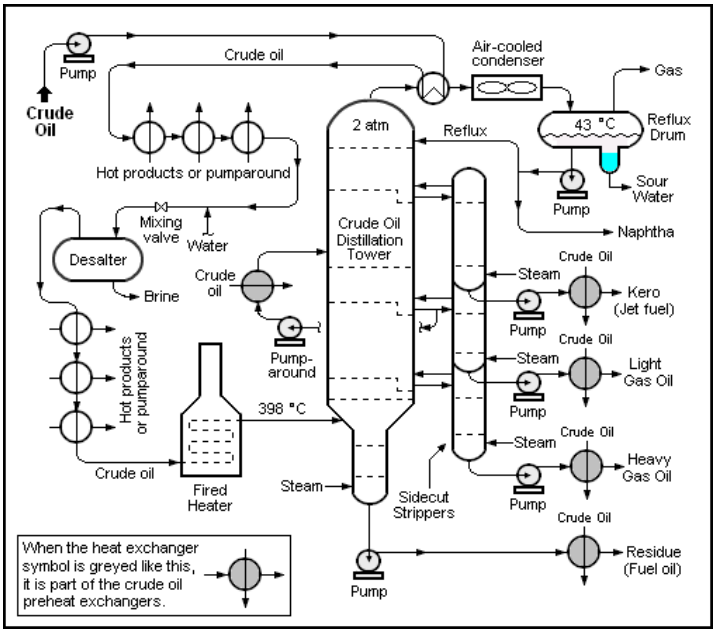

Diagram showing typical steps in crude oil processing

The chemicals used are often expensive and need to be controlled for proper ratio into feedstocks. Overdosing can be costly and wasteful while underdosing can have adverse effects on product throughput and efficiency, and cause premature equipment failures due to higher corrosion rates. The chemicals used are typically high viscosity, low flow, and dosed using pulsating pumps which can make accurate flow measurement and control difficult.

HIGHLIGHTS

Industry: Oil refining
Service: Flow Rate/Total
Fluid: Treatment chemicals

Application

Chemical injection at different points within the refinery process

Problem

- Dosing chemicals at different points in the process to assist with production, increase efficiency and improve equipment life
- High viscosity chemicals in pulsating flow require accurate and robust flow measurement
- Plant engineers need to monitor dose rates and daily totals of chemical usage

Solution

- DC-I Series Positive Displacement Flow Meters
- TrickleMeter Positive Displacement Flow Meters
- BR3000 Rate/Totalizer Display

Customer Application and Solution

The customer needed a flow measurement solution for demulsifiers and wetting agents that are dosed into the desalter. These high viscosity liquids are dosed using pulsating diaphragm pumps at low volumes. The customer also needed to measure the addition of corrosion inhibitor into the crude oil distillation tower. While not a high viscosity liquid the inhibitor is dosed in low volumes. This liquid helps to increase capacity, reduce maintenance and provide higher separation efficiency of the tower. The customer wanted a simple, robust, highly repeatable, and reliable solution for liquids varying in viscosity, flow rate, and material compatibility.

Many flow meter technologies have trouble measuring high viscosity fluids. Pulsating flow can also prove challenging for many types of flow meters due to the demand for high durability and speed of response. Flow Technology recommended the DC-I Series positive displacement flow meter for the higher viscosity demulsifiers and wetting agents, and the Tricklemeter positive displacement flow meter for the low flow corrosion inhibitor. Both flow meters are compatible with the liquids, can handle the pulsating flow and measure the low flow rate. With only two moving parts, the flow meters also provide a very robust, highly repeatable flow measurement solution, and a wide turn-down range with easy installation and maintenance. The BR3000 Rate/Totalizer Display was selected to provide a local display of rate and total for use by technicians. A 4-20mA analog output allows for remote monitoring of the flow rate to track usage and record data for later review.

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