APPLICATION REPORT Oil & Gas

Flow measurement of slop reflux at a refinery

- Reprocessing the residue of heavy crudes in the production of naphthenic specialty oils
- Mass flow metering of slop oil to improve distillation operations
- High Temperature (HT) application with up to 400 °C / 752 °F

1. Background

The Nynas refinery in Nynäshamn, Sweden, produces specialty oils. Naphthenic specialty oils and bitumen are the core business products of the company. Unlike other refineries that process lighter crudes for the production of conventional fuels, Nynas processes heavy crudes to distill their special products. In order to increase distillation efficiency, Nynas also reprocesses the slop residue of crude oil, which is the lighter part of crude oil obtained during distillation.

2. Measurement requirements

In order to better handle the variability of the slop oil before reprocessing it, the slop reflux has to be controlled. Slop oil is a challenging medium. It is a thick and viscous fluid by nature and is recirculated at temperatures up to 400 °C / 752 °F. Depending on the heaviness of crude oil, the slop reflux can also be corrosive.

Medium	Slop oil
Flow rate	270...16,000 kg/h / 10...588 lb/min
Temperature	320...400 °C / 608...752 °F
Pressure	3.5 barg / 51 psig
Density	758 kg/m³ / 47.3 ft/m³
Viscosity	5 cSt (at operating temperature)

Nynas had already tried to master this application using mass flowmeters from competition. However, as these instruments were certified to only 350°C / 662°F, they were often failing in the application. Nynas was therefore searching for a reliable and accurate mass flowmeter to be used at one of their distillation units.

3. KROHNE solution

KROHNE supplied an OPTIMASS 6400 F in stainless steel (DN 50 / 2"). The Coriolis mass flowmeter turned out to be the flowmeter of choice in this HT application as it provided the necessary accuracy even at high temperatures of up to 400 °C / 752 °F. The flowmeter with twin V-tube design was vertically installed in the insulated slop reflux line.

To ensure the consistently high temperature of the medium, the device has been equipped with an insulation jacket and was connected to a heat tracing system. The OPTIMASS 6400 was provided as a remote version, allowing the converter to be separately installed up to 20 m / 65.6 ft from the flow sensor.

The meter allowed for a smooth set up and configuration. It enabled a seamless integration into the existing DCS (distributed control system) and asset management system of the customer.

OPTIMASS 6400 F with insulation jacket and connected to heat tracing system

4. Customer benefits

Nynas has been very satisfied with the OPTIMASS 6400. The meter has provided excellent accuracy and repeatability at high temperatures and handled the specific process conditions exceedingly well. It has been very robust and very reliable for the customer's operations. This way, Nynas has been able to model and optimize the distillation unit very effectively, also helping the company to troubleshoot and solve problems in the distillation column successfully.

5. Product used

OPTIMASS 6400 F

- Standard Coriolis mass flowmeter for the process industry
- Entrained Gas Management (EGM™): Continuous measurement even at gas concentrations of up to 100% and sudden void rate changes
- For cryogenic and high temperature applications (-200°C...+400°C / -328...+752)
- Optional insulation / heating jacket
- Communication: HART®, FOUNDATION fieldbus™, PROFIBUS™ Custody transfer applications: OIML R 117-1/MID MI-005 (liquids), OIML R 137 /MID MI-002 (gases)
- ATEX, IECEx, FM, Gost etc.

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
application@krohne.com

Please visit our website for a current list of all KROHNE contacts and addresses.

www.krohne.com