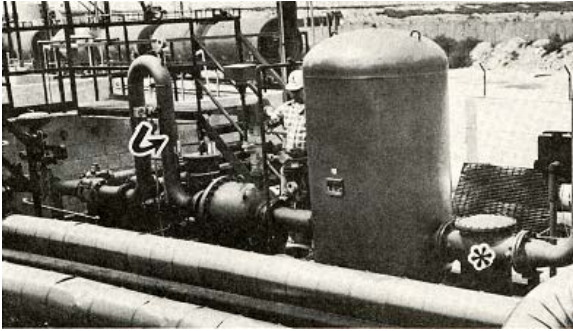


Pipeline sampling improved with in-line static mixer

KOMAX SYSTEMS INC
MIXING BY DESIGN

CASE STUDY 934



Problem: Crude oil contains varying amounts of bottom sediment and water (BS&W) which affect the value and the price paid for the crude. Delivery of crude oil by pipeline requires that a representative, proportional sample of the material withdrawn from the pipeline be analyzed to determine the basis for payment. Without an appropriate sampling system, crude oil delivery by pipeline is severely restricted, and often precluded, by the owner/operator of the pipeline.

Huntway Refining Co. in Wilmington, CA was subject to just such restrictions. Without an appropriate metering and sampling device, the refinery had to depend on costly truck shipments for much of its 500 bpd crude oil requirements.

Solution: In early 1982, Huntway Refining Co. installed an automatic custody transfer (ACT) system at the plant's crude oil intake from the pipeline. The ACT unit provides a strainer and an air knockout drum upstream of a positive displacement flow meter and an in-line static mixer upstream of the automatic, flow proportional sampling valve. The mixer consists of a fixed arrangement of mixing elements enclosed in a 20" section of flanged pipe. The mixing unit has no moving parts since normal pipeline feed provides all the energy needed for mixing.

The crude oil containing BS&W is mixed through two-by-two division, cross-current mixing, and back-mixing, which improves

turbulence and increases mixing efficiency. A special element in the mixer cancels all of the axial rotation of the flow as it leaves the mixer. This eliminates the centrifuging effect (or barber poling) when water and crude separate along the inside surface of the pipeline.

After the crude leaves the mixing unit, a sample is taken by a valve which periodically opens on a frequency proportional to the amount of oil flow measured by the positive displacement meter. The sampling continues throughout the course of each shipment, which can vary from 10,000 to 15,000 bbl per delivery. At the end of the shipment run, the collected sample is analyzed to determine the value of the crude oil delivered. By preventing BS&W segregation and presenting a homogenous mixture to the sample valve, the mixer helps assure an accurate determination of the crude oil composition and value.

Results: Since installation of the ACT unit with in-line static mixer, Huntway has reduced its costs for truck shipments of crude oil and increased its flexibility for receiving crude. A related benefit is an improvement in operation efficiency since the accurate analysis of the incoming crude provides better information on operating conditions required for processing the crude oil.