Saving Money and Energy with Optimized Crude Operations

Critical Data. Real Time.

Measuring Crude Viscosity

Viscosity is the most important transportation property for heavy crudes. Viscosity determines how difficult and energy-intensive it is to transport a fluid; many heavy crudes cannot be pumped without blending in lighter crudes or other diluent. These lighter crudes are often much more expensive than the base crude – balancing blending requirements and pump energy usage is critical for efficient operation.

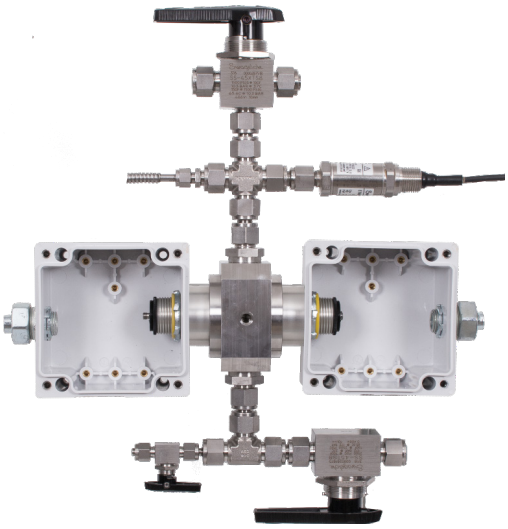
Verax NIR Spectrometer

Current Measurements are Insufficient

By its nature, heavy crude presents challenges to property measurement. Temperature is by far the most significant factor influencing the viscosity of a fluid. Often times, the lab reference temperature does not represent operating conditions and lab results from spot samples are too slow to enable effective process control. The most common on-line instrument for measuring crude viscosity is a resonant tuning fork inserted into the pipeline. The resonant modes of the vibrating fork are correlated to viscosity. However, the tuning fork does not provide real—time diagnostic information to ensure accurate measurement. Particulate matter and waxes can build up on the resonant element resulting in a silent failure, with no indication that anything is wrong.

NIR Spectroscopy for Crude Analysis

The JP3 Verax™ system uses an NIR spectrometer to determine the composition of a sample. The chemical composition of a fluid such as crude oil determines its viscosity at a given temperature. Therefore, with an accurate compositional measurement, NIR spectrometer results can be correlated with ASTM Reference values at a predetermined reference temperature. Each measurement produces diagnostic values that can be used to ensure the system is functioning properly. In addition, the NIR measurements can provide other valuable information such as vapor pressure, distillation curves, crude quality monitoring, diluent analysis, and detection of feedstock changes.



VeraSight Flow Cell

Optimizing Crude Operations with JP3 Verax

Many heavy crudes cannot be pumped without dilution; the light crude and other diluents used for blending add cost. Diluent blending must be balanced against pump energy usage and wear-and-tear to ensure efficient operation. With multiple input locations along a pipeline, the composition and properties of crude in a pipeline can change significantly.

The JP3 Verax system provides an opportunity to improve blending operations by monitoring crude viscosity. Additionally, composition and other physical properties can be used by downstream customers to optimize their operations. Examples include refinery feedstock blending and distillation tower efficiency.

Benefits in Energy Usage and Reducing Carbon Footprint

Reliable, responsive measurement of viscosity in crudes is necessary for ensuring efficient blending and minimizing energy usage in pumping operations. JP3 Verax measurement allows for real-time blend monitoring, allowing precise control of the parameters necessary for efficient pumping. This reduces energy usage and minimizes waste. By monitoring crude properties as a 'spectral fingerprint', off-spec crude can be dramatically reduced.

Designed for Speed and Reliability

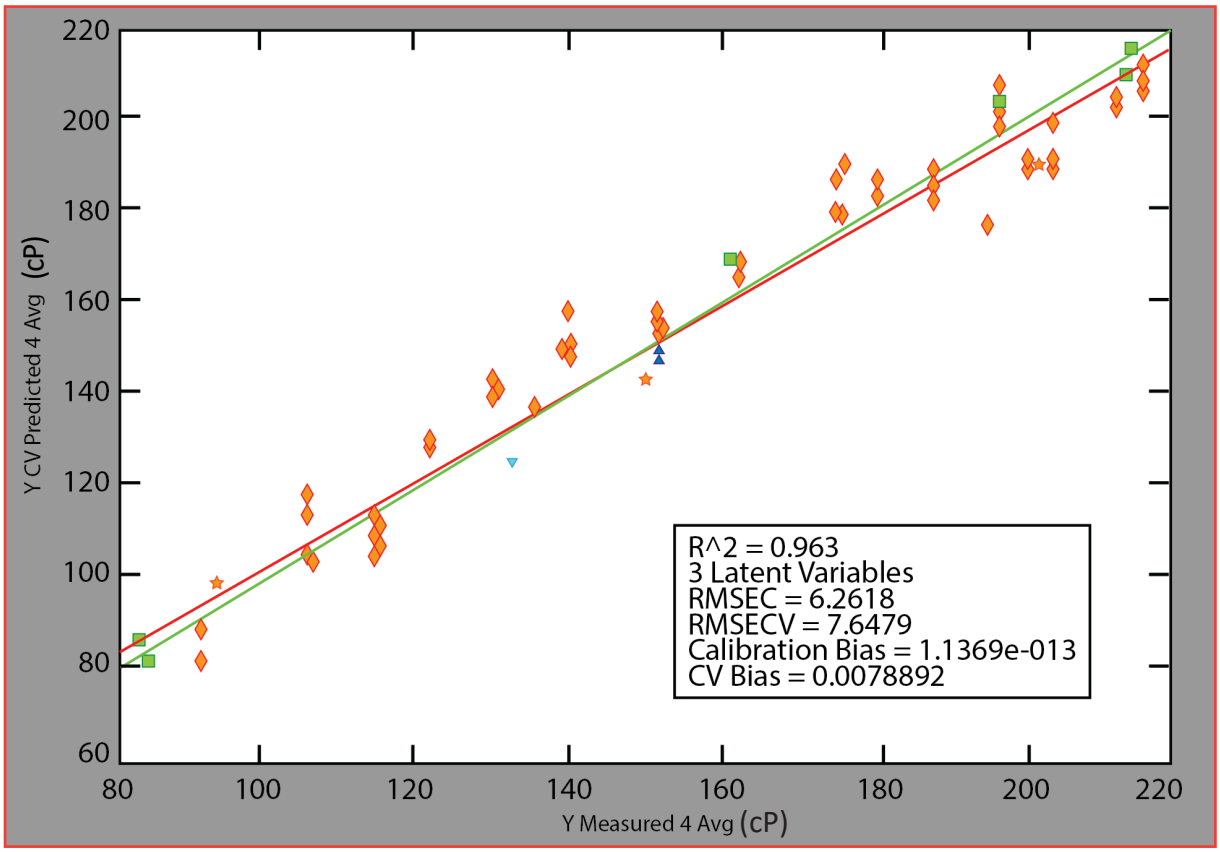
The highly reliable Verax analyzer provides analysis for up to four crude streams in less than fifteen seconds per stream. Utilizing a highly stable laser optical source, and packaged to operate in harsh environments with no shelter, the Verax operates in-line at process pressure and temperature.

The VeraSight™ flow cells are mounted at the process points of measurement with fiber optic cable connections back to the control unit. All material is returned to the pipe, resulting in emissions-free operation. This means no sample conditioning or transport systems are required, thus improving response time and safety.

Comparison of Methods

Method	Response Time	Fault Tolerance	Additional Measurements
Laboratory Sampling	>1-4 Hours	N/A	Dependent On Tests Performed
Resonant Tuning Fork	10 Seconds	"Silent" Failure When Contaminated	No
JP3 Verax	15 Seconds	On-board Computer Diagnostics	Vapor Pressure (RVP, VPCRx), Distillation Curves, Crude Quality Monitoring, Diluent Analysis

JP3 Verax Viscosity (cP) in Crude Prediction vs. Laboratory Values



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