

CAMBRIDGE VISCOSITY/DBR CASE STUDY

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When Oil Is Struck, Cambridge Viscosity Helps Schlumberger-DBR Technology Analyze It

DBR Technology Center, a division of Schlumberger Canada Limited, provides quality phase behavior and other forms of analysis on petroleum hydrocarbon fluids. One of the key attributes that the company's engineers need to measure under high-pressure and controlled temperature conditions is viscosity. The company had developed its own measurement system, a huge machine that consumed half the floor space of a typical conference room, and had traditionally used it to conduct the measurements.

Some 15 years ago, DBR recognized that Cambridge Viscosity's technology had characteristics of significant value in analyzing live oil, including requiring very small sample volumes to produce highly accurate measurements without using mercury, and began mounting high-pressure versions of Cambridge Viscosity series 300 sensors in its oil analysis system. Cambridge Viscosity sensors are distinctive in their design: two electromagnetic coils act upon a single moving part – a piston – at a constant force, while proprietary circuitry analyzes the piston's movements to measure absolute viscosity. Over the course of a few years, Cambridge Viscosity worked closely with DBR to modify and upgrade the viscometer design to meet DBR's evolving requirements.

This work ultimately led to the development of the Cambridge Viscosity 440 sensor, which offers a tenfold improvement in accuracy over other high-pressure sensors, requires a very small sample size (<2ml), and is self-cleaning, thereby offering both high reliability and low maintenance.

"Through the course of our relationship with Cambridge Viscosity, we have asked them to innovate on our behalf and they have done so many times," says Jatinder Kalra, manufacturing manager at DBR. "The 440 was the first major advance, and it continues to be an integral part of our fluid behavior laboratory package."

From DBR DIY to CV PVT

In 2005, DBR came to Cambridge Viscosity with a significant request: to create a full

PVT (Pressure Volume Temperature) system to meet DBR's needs and specifications. Cambridge Viscosity's expert engineers developed the VISCOLab PVT Airbath. A fraction of the size of DBR's home-grown solution, the Airbath uses a simple three-valve plumbing configuration to control sample flow. Pressure is monitored with a digital pressure gauge, and temperature is controlled with an isothermal oven. This Airbath system was designed to require only 10-15 ml of fluid (including cleaning) and heat up to the desired temperature in 4-6 hours. It is now successfully being used by a variety of industry labs.

DBR then realized that the Cambridge VISCOLab PVT system could be further improved with additional capabilities. These included operating at lower temperatures along with high temperatures, further reducing the amount of sample required and shortening the system stabilizing time. Cambridge Viscosity engineers went back to their workshop and produced the VISCOLab PVT Recirculating Bath system.

"Cambridge Viscosity has always been responsive to our needs," says Kalra. "It's truly a very collaborative relationship and we're grateful for their excellent service and work."

A complete yet compact isothermal unit with pressure transducer, the Recirculating Bath system offered a number of important improvements over DBR's home-grown solution and the Airbath system. The Recirculating Bath stabilizes temperature in about 30 minutes, and performs accurate viscosity measurement with as little as 3-4 ml of sample (6 ml is average).

These performance capabilities are especially critical given the nature of the application. When DRB tests an oil sample, its analysis is a key data point in a billion-dollar decision made by an oil company. Samples have to be forced from rock as much as 20,000 feet below ground. These samples are very expensive to acquire and typically are in limited volumes. The smaller the sample required and the faster that the analysis can be performed, the more cost-effective and efficient it is to test potential drilling sites. Additionally, the accuracy and reliability of the viscosity measurement system helps to build the confidence needed to make such weighty decisions.

Benefits Cement the Relationship

Another valuable attribute of the VISCOLab PVT Recirculating Bath system is its portability. Often, testing labs are small, mobile units that can be based near the typically remote locations chosen to drill for samples. The Recirculating Bath system is easy to transport and has a fairly small footprint, making it a very practical solution. In addition, because it can fit in any lab, the system assures consistency of readings between labs.

Aside from the hardware aspect of the solution, the VISCOLab PVT Recirculating Bath comes with software that is powerful yet easy to use. The intuitive graphical user interface enables operators to easily set temperatures and other parameters, providing the real-time monitoring and control capabilities they need. The software also includes critical temperature- and pressure-correction equations to ensure more accurate data. The sensor and piston can distort with changes in temperature and pressure, so being able to automatically apply temperature-compensated viscosity (TCV) and pressure-compensated viscosity (PCV) is an important innovation.

Over the course of the 15-year relationship, DRB has undergone many changes; but its focus has stayed the same and its reliance on and loyalty towards Cambridge Viscosity have remained consistent throughout. Today, approximately 25 Cambridge Viscosity systems are used by DBR and other Schlumberger divisions.

“Our customers like the units because they’re compact enough to be taken out to the field easily,” says Kalra. “But mostly they like them because they’re efficient and accurate. Anything less would mean a loss of money and our reputation, so we have a lot invested in the Cambridge Viscosity systems.”

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