



NOVEL PARAFFIN INHIBITION APPLICATIONS AND SOLUTIONS

CERIFLOW™ Phenolic Resin Inhibitors Enhance Performance in Difficult Crudes

A significant challenge in the oil and gas industry today relates to wax-control, or controlling the deposition of high molecular weight wax during crude oil production. SI Group is solving this technical issue with its CERIFLOW™ products, a complete line of flow assurance components, some specifically designed for paraffin inhibition applications.

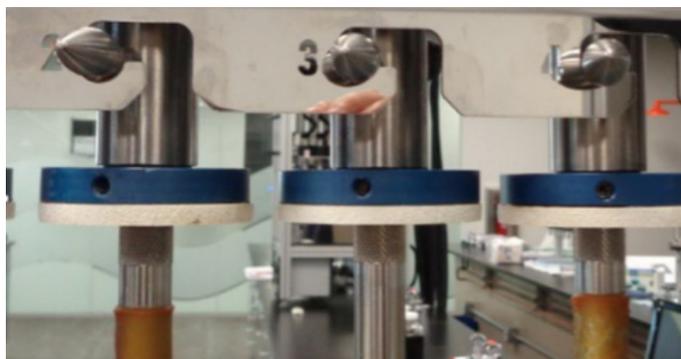
The goal of paraffin inhibition is to prevent or reduce the deposition of wax on surfaces. In the past, phenolic resins have shown limited inhibition application and have not been considered as a viable wax control chemistry; these products were impractical for widespread use. However, SI Group has recently unlocked the performance of this chemistry by designing resins with novel properties.

SI Group manufactures a wide-range of monomers and uses them in a variety of phenolic resins. Continuous design and testing of these resins has led to new innovations—the ability to control chemical and physical properties—offering unique products and solutions. This has resulted in the formulation of CERIFLOW paraffin inhibitors that offer a low pour point and elevated active content.

Performance Testing

Paraffin inhibition testing was conducted using the Cold Finger method in both SI Group's application laboratory as well as in third-party flow assurance testing laboratory. CERIFLOW products were tested on four different crude oils, including several US land and GOM crudes.

Figure 1. SI Group Testing Capabilities

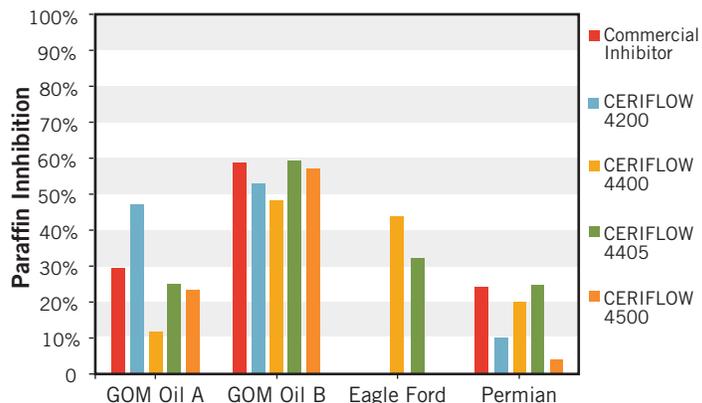


Paraffin inhibition testing conducted using the Cold Finger method.

Paraffinic Field Crude

CERIFLOW products were evaluated at 15% activity in a variety of field crudes, including two GOM, a Permian and an Eagle Ford crude. Performance was compared against a conventional, fully formulated inhibitor product and the results are shown in Figure 2. For this test, the Cold Finger was set at 20°C below the WAT, allowing for the crystallization of a wider range of paraffin molecular weights.

Figure 2. Cold Finger Testing: 20°C Below WAT

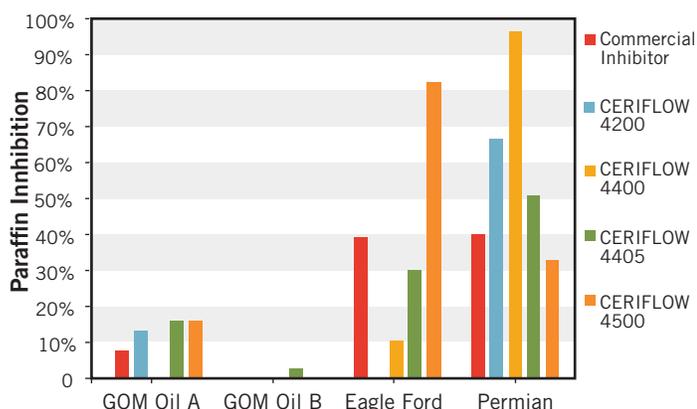


As shown in Figure 2, CERIFLOW 4200 significantly outperforms the commercial inhibitor in GOM crude Oil A. There is potential for this product to perform significantly well in sub-sea, umbilical chemical delivery applications with its low pour point at high activity.

In addition, CERIFLOW 4400, 4405 and 4500 exhibit great performance in a Permian crude. All three CERIFLOW products provide robust deposition control under different wax crystallization conditions. Further, these CERIFLOW inhibitors also show performance in the challenging, unconventional production of the Eagle Ford crude.

For the next series of testing, the Cold Finger was set at 10° C below the WAT. This adjustment narrowed the crystallization range of paraffin molecular weights, particularly the high molecular weight waxes, which can be problematic in the field. The results, as seen in Figure 3, showcase the exceptional performance in the Permian crude of several CERIFLOW products relative to the commercial inhibitor.

Figure 3. Cold Finger Testing: 10° C Below WAT



CERIFLOW 4500 is superior in the Eagle Ford crude at this reduced temperature delta—the product more than doubles the performance of the commercial inhibitor product. Similarly, CERIFLOW 4400 exhibits great performance, suggesting the high potential of the phenolic resin inhibitor.

Great Performance and Low Pour Points

The current CERIFLOW paraffin inhibition product line offers the optimal combination—great wax control performance in multiple crude oils with low product pour points. The following four CERIFLOW inhibitors, shown in Figure 4, are available at 50% activity and perform under different deposition conditions. Further design work continues on phenolic resins, especially in applications with significant technical challenges.

Figure 4. CERIFLOW Paraffin Inhibition Products

Product	As Supplied Pour Point (°C)	30% Dilution Pour Point (°C)
CERIFLOW 4200	<-50	<-50
CERIFLOW 4400	23	<-50
CERIFLOW 4405	25	-20
CERIFLOW 4500	40	6

What This Means for You

CERIFLOW paraffin inhibitors show exciting performance in several difficult crudes. These exclusive phenolic resin components have unique physical characteristics such as very low pour points, which offer increased flexibility in product design and regional use. To learn more or test our products in the field, please contact your local sales representative or our Oilfield team at oilfield@siigroup.com.



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