The precipitation of n-paraffins (C18+) as wax crystals from crude oil can cause significant issues during production, transportation, and storage. The precipitation of paraffin wax can occur for a variety of reasons and while the paraffin content and composition of the crude is important; typically temperature or pressure changes are the main culprits. There are several methods for addressing wax crystal formation on equipment and pipeline surfaces once it occurs such as mechanical remediation (pigging), applying heat, and/or the use of hot solvent flush; however, the prevention of wax precipitation is preferred. Chemical treatments have the ability to modify wax crystalline structures to prevent agglomeration and deposition on surfaces to ensure hydrocarbon flow.
The concept of paraffin wax inhibition centers around the disruption of the crystalline formation of the n-paraffins and keeping them dispersed in the hydrocarbon; however, producing below the PP or WAT creates various wax challenges. Climate, environmental concerns, handling and storage capabilities all play a role in product selection, as ensuring hydrocarbon flow and reducing downtime for blockage removal is critical.

On the way up, more and more paraffin, wax and asphaltene particles adhere to the metal walls and reduce the diameter of the pipe which results in reduced production flow.

Paraffin and waxes are homogeneously distributed in the crude oil at typical reservoir temperature and pressure conditions.
BYK’s Capabilities/Technology/Chemistry

BYK is an expert in a wide array of chemical processes, such as wax emulsification, and possesses technological expertise to be the leading solutions provider to our global customer base. BYK is focusing on specialty chemicals and is functionalizing molecules for a specific purpose. The chemistry base covers fatty acid chemistry, polyacrylates produced in a classical radical polymerization and also by using controlled polymerization technology on an industrial scale. Hyperbranched polyamines and polymers based on styrene and maleic acid are also an integral part of our portfolio.

This expertise has been leveraged into the development of paraffin treatment products for the oil and gas market, using waxes or polymeric materials to provide our customers paraffin solutions in diverse crude oils from around the world.

Laboratory Testing Capabilities
- Pour point (modified ASTM method)
- Cold-finger testing (wax inhibition)
- Differential scanning calorimetry (DSC)
- Rheology (viscosity vs. temperature effect)

At seabed conditions the crude oil cools down significantly. This leads to changes in the solubility of the paraffin and wax. The solid paraffin particles start to adhere to the cool metal tubing.
Product Offerings – Pour Point Depressants

Out of an extensive BYK product portfolio we have tested and identified certain product groups which show an excellent performance as wax inhibitors and pour point depressants for crude oil.

**Polymer/Wax Compositions in Naphtha Solvent**
This product group utilizes specific polymers – often EVA based – in combination with different wax bases. All of these products are solved in industry typical Naphtha solvent. There is a range of products existing which are ready for sampling and testing.

**Wax Emulsions in Water**
BYK utilizes a specific emulsification process to produce wax emulsions in water. The products are very low viscous and storage stable. The wax base can cover natural occurring waxes but also semi-synthetic and synthetic waxes are available. For example, AQUACER 527 is a modified EVA copolymer wax with a solid content of 35% in water. There are further wax emulsions in water which show a significant impact on reducing the pour point of crude oil even to below 32 °F.

**Wetting and Dispersing Products**
These products also show a reduction in crude pour point, in spite of the fact, they were developed for a different industry. The most efficient products are within the hyperbranched polyamines, such as DISPERBYK-2150 and DISERPBYK-140, while the fatty acid based chemistry, such as the ANTI-TERRA-U 100, also provides a significant impact as a PPD for crude. These chemistries offer a high degree of flexibility to tailor made product offerings for specific crude oil properties.

Additives for Drilling Fluids and Production Chemicals

BYK Additives & Instruments is one of the world’s leading suppliers in the field of additives and measuring instruments. We offer a wide range of additive solutions for the manufacture of drilling fluids, cementing, completion, stimulation and production chemicals. Furthermore we provide several additive lines that can be used to solve production related problems including asphaltene deposition, paraffin wax deposition, scale formation and corrosion.

Additives are chemical substances which, when used in small quantities, improve product properties enormously. Manufacturing processes are also optimized by the addition of additives.

As a globally operating specialty chemicals company, BYK has production sites in Wallingford, Chester, Gonzales, Louisville and Rochester Hills (USA), Widnes (UK), Wesel, Kempen, Moosburg, Schkopau and Geretsried (Germany), Denteren, Denekamp and Nijverdal (Netherlands), as well as in Tongling (China). Today the company employs more than 2,000 people worldwide and invests 8% of sales in R&D. So why not using our innovative power to your advantage? We cordially invite you to join in a dialog with our additive specialists, who will gladly advise and support you with your very individual ideas, goals and projects. BYK is your competent technology partner when it comes to improving your drilling and upstream solutions.

Upstream-Solutions.BYK@altana.com

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