

Global Oilfield Solutions

Basoflux® – Paraffin Control
for the Oil Industry

 **BASF**
We create chemistry

Basoflux® products are highly effective and an economic solution for the mitigation of paraffin issues

BASF has designed a wide range of high-performance products, Basoflux® grades, which help you to mitigate paraffin deposits and can significantly lower the pour point of your paraffinic crude.

Introduction

Generally, wax control agents should have a wide performance range, but due to the various origins and compositions of crude oils this target is difficult to achieve. Therefore it is common practice for the most effective additives to be developed individually for each crude oil or residue. Many different polymer systems have been synthesized over recent decades, but only a few of them were found to be effective wax control agents. BASF has developed two of these classes as part of their Basoflux® grades.

Function guide

For polymers to be effective wax control agents, their molecular structure must contain “paraffinic chains” to allow them to interact with paraffins. They can be characterized by their function in solving wax related issues. It should also be noted that several additives may display multiple functions depending on the nature of the crude oil.

Pour point depressants: Additives which reduce the pour point of crude oils are known as pour point depressants (PPDs) or flow improvers. Upon cooling, wax separates out as plate-like crystals or needles. These crystals interact to form a three-dimensional network in which the crude oil is trapped, resulting in increased viscosity or even solidification of the bulk oil phase. PPDs affect the crystallization process and prevent the formation of such three-dimensional networks, thereby reducing the pour point.

Wax inhibitors: Chemicals that affect the amount of wax which is deposited in e.g. cold-finger tests or in a coaxial-shear cell test are usually referred to as wax inhibitors. In some cases, the wax appearance temperature (WAT) or the cloud point is also affected. Wax inhibitors generally influence the crystal morphology, creating weaker deposits which are more easily removed by shear forces within the flowing crude.

Dispersants: Wax dispersants can reduce the amount of wax deposits in flowlines by different mechanisms depending on their chemical nature. Some will adsorb to pipeline surfaces thereby changing the wettability to water-wet. Others will adsorb to growing wax crystal surfaces reducing the tendency of the crystals to agglomerate. Most of the dispersants are typical surfactant structures but some polymeric wax control additives also display dispersing activity. A paraffin dispersant test kit based on surfactants is available through your local sales representative.



Initial recommendation

In order to study the efficiency of wax control agents in crude oils, the following parameters should be tested: Wax appearance temperature (WAT), pour point, viscosity, rheology, paraffin deposition and prevention, restartability of a model pipeline.

It is highly recommended to dose all additives above the WAT to get reproducible and comparable results during pour point testing. If this is not possible, dosage at the temperature at the planned injection point would be preferred.

Innovation

Innovation based on more sustainable, high-performing products to make our customers more successful, is at the heart of BASF's strategy. The Basoflux® product line is designed to support the Oilfield Service Industry to meet their customer's expectation on reliable flow assurance. BASF continuously invests in improving this offering and now we are able to introduce a range of 2 new products to compliment our Paraffin Control portfolio.

Basoflux® RD 5119 and RD 5120

- Both products do not contain toluene and the solvent is naphthalene-depleted, this assures:
 - Access to markets where toluene is regulated and cannot be imported, e.g. China, Kazakhstan
 - Reduced toxicity: not carcinogenic, repro-toxic or toxic to organs
- Both products have a higher flash point than toluene or xylene, this provides:
 - Easier handling, re-packing, blending and handling in general will be less hazardous

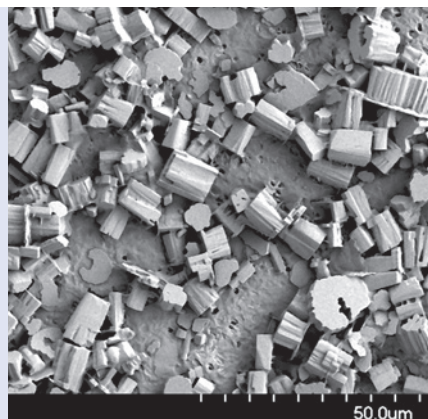
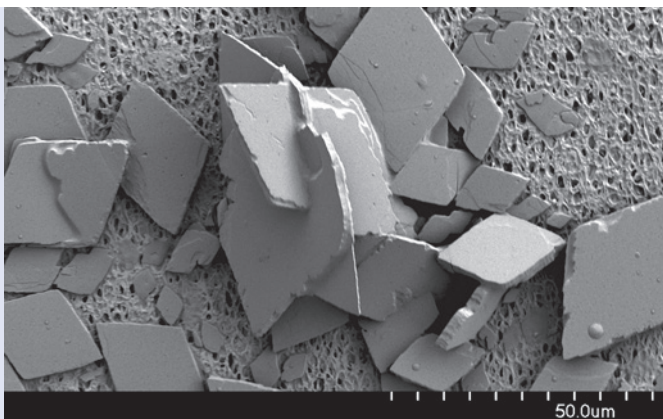


Figure 1. (a) Sample of paraffin crystals without inhibition

(b) With BASF products present

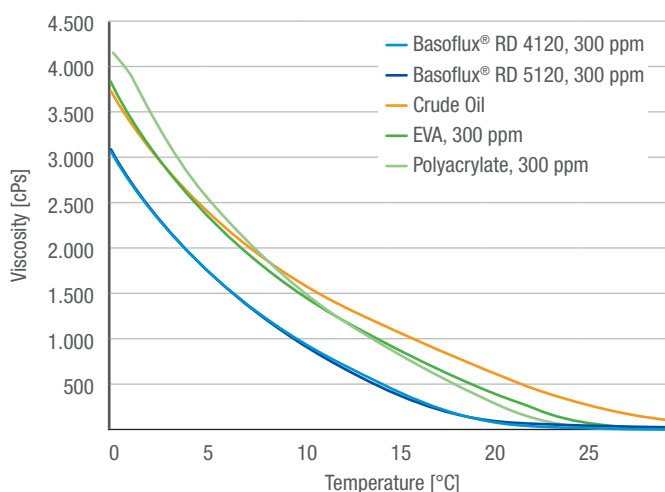
Handling

Generally, BASF's polymers which are effective as wax crystal modifiers contain paraffinic chains in their molecular structure and thus will have a similar melting point. Our recommendation for handling the Basoflux® PI 40, 41, 42 and 43 is to utilize one of the following in order to remove the product from a drum.

(1) Water bath at 70 °C for minimum 4 hours, (2) Hot room (40–50 °C) for minimum of 12 hours or (3) Heating jacket (70 °C for minimum 4 hours). Our recommendation for handling the Basoflux® RD types is to only heat the product for +20 °C over the reported melting point Basoflux® RD 4119 (32 °C), Basoflux® RD 4120 (45 °C) and Basoflux® RD 5119 (37 °C) for a maximum of 6 hours. Exposure of Basoflux® RD types to prolonged heat can cause product deterioration.

Viscosity versus temperature

Evaluation of the rheology performance of the Basoflux® RD types in crude oil



Product name	Product form	Product description	Active content [%]	Melting point Approx. [°C]	Flash point [°C]
Basoflux® PI 40	Waxy solid	Modified polycarboxylate	80	50	>61
Basoflux® PI 41	Waxy solid	Modified polycarboxylate	80	50	>61
Basoflux® PI 42	Waxy solid	Modified polycarboxylate	70	45	>61
Basoflux® PI 43	Waxy solid	Modified polycarboxylate	70	45	>61
Basoflux® RD 4119	Liquid to Waxy	Polyacrylate, EVA	50	12	-3
Basoflux® RD 4120	Waxy solid	Polyacrylate, EVA	50	26	-3
Basoflux® RD 5119	Liquid to Waxy	Polyacrylate, EVA	50	25–30	59
Basoflux® RD 5120	Waxy solid	Polyacrylate, EVA	50	31–36	54



Organic solvent	Labelling	Relative mw	Relative chain length	Paraffin application		
				Dispersant	Inhibitor	Pour point depressant
Solvesso 150		Medium	C ₂₀ ⁺		■	■
Solvesso 150		Medium	C ₂₂ ⁺		■	■
Solvesso 150		Low	C ₂₀ ⁺	■	■	■
Solvesso 150		Low	C ₂₂ ⁺	■	■	■
Toluene		High	C ₁₆ -C ₁₈		■	■
Toluene		High	C ₁₈ -C ₂₂		■	■
Solvesso 150 ND		High	C ₁₆ -C ₁₈		■	■
Solvesso 150 ND		High	C ₁₈ -C ₂₂		■	■

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