

Global Oilfield Solutions

Fluid Loss Additives
for Oilwell Cementing

 **BASF**
We create chemistry

Maintain the cement slurry performance you designed with BASF's Fluid Loss Additives

Introduction

Minimization of water loss to the formation while pumping cement is of major importance to the oil industry. It serves to avoid impairment of the designed cement slurry performance. This allows maintenance of the required cement slurry volume, compressive strength development, and bonding between the formation and the casing. Moreover, fluid loss control is necessary to ensure the pumpability of the cement slurry and to prevent gas migration.

Water is lost by a filtration mechanism when the cement slurry is placed across a permeable formation. The aqueous phase of the slurry enters the formation leaving the cement particles behind which form a filter cake.

Two principle classes of fluid loss additives exist: particulate materials (e.g. latex) and water-soluble polymers. Both additive types decrease the filtration rate by reducing filter cake permeability. Water soluble fluid loss additives also increase the viscosity of the aqueous phase which mitigates settling of the cement particles. With the appropriate fluid loss additive in a well formulated slurry system, even at a high hydrostatic pressure, it is possible

to produce a low permeability filter cake which will prevent loss of filtrate from the cement. The following parameters are controlled by fluid loss additives during cementing by reducing water leak-off:

- Volume reduction
- Prevent loss of hydrostatic pressure and gas or water intrusion
- Early compressive strength
- Achieve desired mechanical properties
- Rheology and Thickening time
- Control cement slurry viscosity and pumping pressure requirements

Several factors influence the performance of fluid loss additives:

- Type of dispersant
- Cement composition
- Cement particle size distribution
- Temperature
- Pressure
- Amount of dissolved salts in water
- Type of dissolved salts in water





Applications

BASF offers both water-soluble fluid loss additives, Polytrol®, and latex-based products, Basoblock.

Polytrol® and Basoblock are industry-proven products which prevent fluid loss from the cement slurry under various conditions:

- Permeable zones
- Large differential pressures, for example across depleted or partially depleted zones
- Squeeze operations
- Narrow annular clearances
- Varying water quality and salinity

Polytrol® products are water soluble. They adsorb on the cement grain surfaces and can potentially become wedged in the filter cake pores. Due to the polymers' hydrodynamic volumes, the filter cake permeability is reduced significantly. Cement slurries containing water-soluble polymers must be well dispersed to obtain optimal fluid-loss control. This is why Liquiment® dispersants show synergistic effects by improving the packing of cement grains in the filter cake.

Basoblock latices physically plug small pores in the cement filter cake due to their small particle size and their film forming properties. Additionally, latex additives reduce the matrix permeability of cement systems during the critical liquid to solid transition time.

Initial recommendations

Typical dosage rates (bwoc) are as follows:

- Polytrol® FL 24 1–2.5%
- Polytrol® FL 29 0.5–1.5%
- Polytrol® FL 32 0.5–1.5%
- Polytrol® FL 34 0.3–1.5%
- Polytrol® FL 45 0.3–1.5%
- Polytrol® FL 56 1–2.5%
- Basoblock ND614 5–15%
- Basoblock D623 5–15%

Our cementing lab/staff is able to test cement slurry formulations based on your application requirements according to the API recommended practices with regard to filtration, HTHP thickening time, gel strength development and rheology.

To minimize fluid loss, dosage rate and the probability of gas migration we recommend to include Liquiment® dispersants as noted in summary table in the slurry design. Over-dispersion should be avoided since this would lead to artificially improved the API fluid loss results. The recommended dose rate for Liquiment® dispersants is ca. $\leq 0.6\%$ bwoc.

Product range

Group 1

Water-soluble fluid loss additives for standard conditions

For cement jobs up to 280 °F, BASF has developed a range of three products to accommodate for individual slurry design depending on the well conditions.

Polytrol® FL 24

is our only fluid loss additive provided as beads to decrease dusting and improve flowability and solubility. It is viscosifying and shows synergistic effects with Liquiment® 5581 which considerably reduces the required dosage rates. Additionally, it exhibits good compatibility with brines.

Polytrol® FL 29

is a formulated product. It was developed for primary or squeeze operations through a wide temperature range between 60 °F and 280 °F. It is specifically suited for shallow well cementing, due to the non-retarding behavior at low temperature. In addition, cement slurries with Polytrol® FL 29 exhibit thixotropic behavior. Its compatibility with all classes of cement and a wide variety of typical cement additives makes it a versatile performer. It can be used with fresh or seawater and to some extent also in highly concentrated brines.

Polytrol® FL 32

is a formulated product. It helps to reduce apparent viscosity and to improve the rheological properties of a cement slurry. It helps to handle slurries with reduced water/cement ration at temperatures up to 250 °F (121 °C).

Fluid Loss Additives for Oilwell Cementing

General information

Group	Product	Physical form	Application temperature
Water-soluble products for standard conditions	Polytrol® FL 24	Bead	60–250 °F (16–93 °C)
	Polytrol® FL 29	Powder	60–280 °F (16–138 °C)
	Polytrol® FL 32	Powder	60–250 °F (16–121 °C)
Water-soluble high performance products	Polytrol® FL 34	Powder	> 400 °F (> 204 °C)
	Polytrol® FL 45	Powder	> 400 °F (> 204 °C)
	Polytrol® FL 56	Powder	> 400 °F (> 204 °C)
Latex-based products	Basoblock ND 614	Dispersion	60–300 °F (16–149 °C)
	Basoblock D623	Dispersion	60–300 °F (16–149 °C)

* API fluid loss is the volume of fluid in a filtrate as determined according to the fluid-loss test given in API RP 10B

Group 2

Water-soluble high performance fluid loss additives

BASF's portfolio of high performance fluid loss additives comprises three products which have gained industry wide acceptance and are known to work in a wide variety of well conditions (up to at least 400 °F) and slurry compositions.

Polytrol® FL 34

is a fully synthetic viscosifying and non-retarding fluid loss additive. It offers a delayed gel strength development to provide right angle set characteristics to the slurry. Combining this product with Liquiment® 5581 dispersant furnishes dramatically reduced API water loss.* The non-retarding properties are ideal for light cement compositions which in many cases exhibit extended thickening times. This product shows excellent performance in sea water and salt concentrations up to 18%.

Polytrol® FL 45

is also fully synthetic viscosifying and non-retarding but it shows exceptional compatibility with a wide variety of dispersants and retarders. It enhances the right angle set characteristics of the cement slurry to prevent gas intrusion.

Polytrol® FL 56

is the ideal fluid loss additive for slurries mixed with strength-stabilizing agents such as silica flour or weighting agents like Fe₂O₃. In many cases there is no need for a dispersant due to its additional dispersing effect. A salt tolerance of up to saturation makes this the most robust additive for cementing across salt formations.

Group 3

Latex-based fluid loss additives

BASF offers two latex-based products which differ in their chemical composition. They show film forming properties over a threshold temperature, thus forming a gas impermeable barrier.

Basoblock ND614

is a liquid dispersion based on a styrene/butadiene copolymer. The polymer forms an elastic membrane throughout the matrix of the cured cement, reducing the formation of voids and hairline cracks therein. Moreover, the resulting cement mixture shows improved resistance to the penetration of gas, oil and formation brines. Flexural strength and abrasion resistance are also increased. It is less retarding than Basoblock D623.

Basoblock D623

is a liquid dispersion based on a styrene/butadiene copolymer. The polymer forms an elastic membrane throughout the matrix of the cured cement, reducing the formation of voids and hairline cracks therein. Moreover, the resulting cement mixture shows improved resistance to the penetration of gas, oil and formation brines. Flexural strength and abrasion resistance are also increased. D623 shows improved fluid loss control in salt containing environments and up to 300 °F (149 °C) if compared to Basoblock ND614.

The temperature- and salt stability for both additives can be increased up to 350 °F (177 °C) where necessary through the addition of a surfactant based stabilizer system available from BASF.

More information is available upon request.

Electrolyte tolerance

Availability

Fresh water	Sea water	NaCl	Retarding effect	Dispersing effect	Synergistic Liquiment® dispersant	Region			
						NA	SA	EU	AP
+	+	+	None	None	5581	■	■	■	■
+	+		Mild	None	K2F	■	■	■	■
+	+	++	Mild	Strong	K3F	■	■	■	■
+	+	++	None	None	5581	■	■	■	■
+	+	++	None	None	K3F	■	■	■	■
+	+	+++	Mild	Mild	K3F			■	■
+		n.a.	None	Mild	K3F	■	■	■	■
+	+	n.a.	Mild	Mild	K3F	■	■	■	■

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