



HYDRATE DISSOLUTION



Our special application fluids are made from high-density, solids-free cesium formate brine.

Gas hydrates (or clathrate hydrates) are ice-like crystalline solids formed from mixtures of water and natural gas, usually methane. They form where pressure, temperature, gas saturation and local chemical conditions combine to provide a stable environment. Hydrate formation is highly undesirable; the clathrate crystals can agglomerate and plug the wellbore resulting in problems ranging from flow reduction and stuck pipe to equipment damage and possible well abandonment.

How to dissolve hydrates

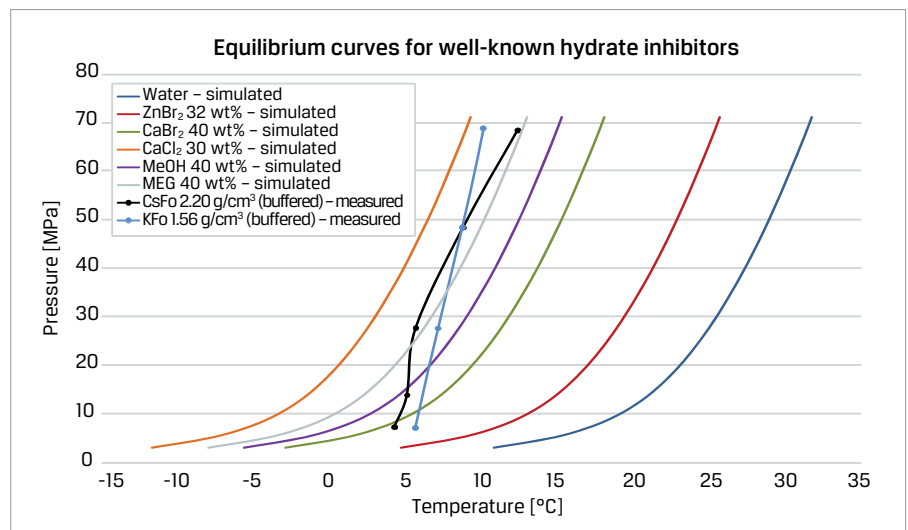
Our special application fluids are multiple-application cesium formate-based fluids, which are laboratory and field proven to effectively dissolve developed hydrate crystal plugs. Concentrated formate brines are very good inhibitors for gas hydrate formation. They are so-called inert inhibitors, which also make them highly effective for rapid hydrate dissolution.

As water activity of concentrated cesium formate brine blends is as low as 0.3, it has numerous benefits including lowering freezing points to aid hydrate dissolution. Due to their low density, many hydrate inhibitors/dissolvers are ineffective as they fail to contact the hydrate area, which is especially true in high-pressure zones or where high mud weights are required. As our special application fluids are solids free in densities from 1.80 g/cm³/15.0 lb/gal to 2.30 g/cm³/19.2 lb/gal, they can easily penetrate and maintain contact with the problem area and rapidly 'melt' crystalline solid blockages.

Laboratory verified

Special application fluid with density of 2.20 g/cm³/18.3 lb/gal was evaluated for hydrate equilibrium temperatures (HETs) in a high-pressure stirring autoclave system at constant pressure conditions of 10,000, 7,000, 4,000 and 1,000 psig using a Green Canyon gas mixture.

To compare performance of our special application fluids with well-known and respected hydrate inhibitors, hydrate equilibrium curves were simulated using hydrate-prediction modelling software (WHyP) for water, 30 wt% CaCl₂, 32 wt% ZnBr₂, 40 wt% CaBr₂, 40 wt% MeOH and 40 wt% MEG. The measured hydrate equilibrium curve for cesium formate brine is shown in the graph along with simulated curves for well-known hydrate inhibitors. Results indicate high-density special application fluids perform comparably or better than 40 wt% MeOH and 40 wt% MEG inhibited water systems, which are both known to be excellent hydrate inhibitors in low-density applications.





Field proven

Area	North Sea	Well class	Injection	Depth TVD	1000 m
		Date	Late 2013	Depth MD	1100 m

A North Sea operator suffered stuck wireline through hydrate blockage while investigating tubing leakage in a vertical injector well. Unsuccessful attempts were made to remove the blockage using conventional hydrate dissolvers and high overpull.

After two days, the operator switched to 2.00 g/cm³/16.7 lb/gal cesium formate brine, which forms the basis of special application fluids. A total of 450 liters were injected into the well via the clean-up manifold. The wireline was cycled while waiting for the formate to take effect and a degree of overpull was placed on the string. Within two hours of applying cesium formate brine, the wireline was worked free and displaced hydrates were seen at the rig floor and on various tools. During inspection the wireline showed severe hydrate damage, which indicates potential for wire separation and a time-consuming fishing operation to retrieve lost equipment.

The actual amount of time saved is difficult to determine, although it is believed to be several days, especially when a difficult fishing operation is allowed for. Seeing the effectiveness of cesium formate brine and its potential for averting costly non-productive time, the operator's representative recommended that it should be kept on the rig for standby purposes.

Why use our special application fluids?

- ◆ Highly effective
- ◆ Fast acting
- ◆ Safe to handle
- ◆ Saves time
- ◆ Environmentally non-damaging
- ◆ Available in solids-free densities up to 2.30 g/cm³/19.2 lb/gal
- ◆ Stable at high temperatures
- ◆ Multiple applications
- ◆ Easily obtainable

Physical and chemical properties

Appearance: Clear liquid, colorless

Odor: None

Specific gravity at 15.6°C/60.1°F: 1.80 g/cm³/15.0 lb/gal to 2.30 g/cm³/19.2 lb/gal

pH: 9 – 10.5

Viscosity at 20°C/68°F: 2 – 10 cP

Readily available

Special application fluids are readily available to rent in all volumes from stock for specific project requirements or to retain offshore for standby use. The fluids are delivered ready to pump with no additives required.

Why weight?

Special application fluids are fast-acting, effective and versatile high-density fluids for stuck-pipe release, debris-barrier formation, breaking filter cake, dissolving hydrates and suspension operations. With no weighting agents required, they are quickly spotted downhole to save time and reduce risk of costly alternative operations, such as sidetracking.



cabotcorp.com/saf

Cabot Specialty Fluids Ltd.

Cabot House, Hareness Circle
Altens Industrial Estate
Aberdeen AB12 3LY
Scotland

T (44) 1224 897 229

F (44) 1224 870 089

cesium.formate@cabotcorp.com

Cabot Specialty Fluids Ltd.

Bygg K12, PO Box 4
N0-5347 Kystbasen
Ågotnes, Bergen
Norway

T (47) 55 70 70 52

F (47) 55 70 70 53

CSF.NorthSea@cabotcorp.com

Cabot Specialty Fluids (S) Pte Ltd.

Level 08-09
The Metropolis Tower 2
11 North Buona Vista Drive
Singapore 138589

T (65) 6808 7870

F (65) 6808 7777

CSF.Asia.Pacific@cabotcorp.com

Cabot Specialty Fluids Inc.

4582 Kingwood Drive
Suite E145
Kingwood
Texas 77345

USA

T (1) 281 361 2330

CSF.Americas@cabotcorp.com