Nouryon

The essential ingredient for strength

Levasil® OF – colloidal silica dispersions for optimized cementing in oilfield drilling

LevaSil®

Our sustainability approach

On a daily basis we strive to do more with less, reducing carbon emissions through a combination of improved energy efficiency, increased use of renewable energy, and higher use of bio-based raw materials in production. Downstream, we focus on expanding our portfolio of eco-premium products, which have a significant sustainability benefit over common alternatives.

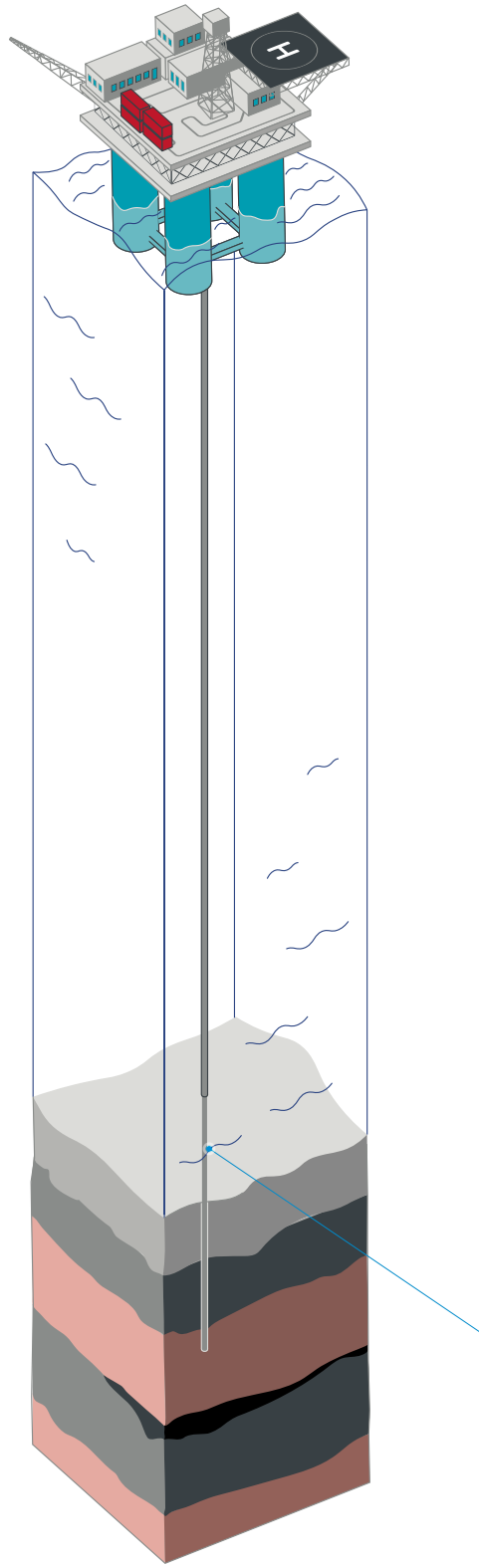
Natural solutions for extreme conditions

It is vital that well cementing is both safe and predictable in oil drilling operations on land and offshore. Our Levasil® OF products are optimized for low and high temperatures, as well as deep and ultra-deep waters.

Levasil® colloidal silica is a water-based cohesive binder that helps create more durable cement. A perfect component when cementing to secure steel casings in oilfield boreholes – both on land and offshore. Colloidal silica is registered on the OSPAR PLONOR list.

LevaSil®

In cement-based applications, Levasil® colloidal silica works exceptionally well as a stabilizer, a durability enhancer, an accelerator and a strength developer, resulting in extremely stable, bleed-free cement slurries without free water.



Improved workability

Levasil® OF particles interact with the free lime (calcium hydroxide) created during cement hydration to create calcium silicate hydrate (CSH) gel. This generates a cohesive gel structure that enhances plastic viscosity and improves stability. This results in a grout that remains pumpable for a long period of time and still has low fluid loss and improved gas control. Combining colloidal silica with latex gives a synergetic effect, improving fluid loss control even further.

Shorter setting time

Levasil® OF provides a substantial enhancement of early compressive strength, shortening the setting time of the cement slurry so drilling can resume faster – saving time and money. Additionally, the low specific gravity of colloidal silica produces lightweight slurries that can be injected more controllably.

More durable concrete

Our Levasil® colloidal silica technology helps the formulator to create a more durable concrete. Our Levasil® OF products contribute to increased final strength by reacting with the free lime, converting it to calcium silicate hydrates. This results in a densified concrete with better carbonation/acid-resistance.

Recommended products

Levasil® OF products are stable during storage and are perfect for use in a liquid additive system, resulting in virtually no waste during operations. The extremely high specific surface area makes our Levasil® OF products very cost-effective per weight unit. This effectiveness per volume and weight unit gives lower transportation, handling and storage costs.

Additional benefits are:

- Designed particle technology
- Discrete particles
- Wide range of specifically manufactured products
- Non-toxic, inorganic, water-based and registered on the OSPAR PLONOR list
- Long shelf life

Parameter	Unit	Levasil® OF30	Levasil® OF36	Levasil® OF50	Levasil® OF75	Levasil® OF8
Density	g/cm³	1.2	1.2	1.1	1.1	1.4
SiO_2	wt%	30	30	15	15	50
pH	–	10.5	10.1	10.0	10.5	9.5
Viscosity	mPas	<10	<10	<10	<15	<10

Conditions	Product selection	Design guideline	Temperature	Benefits
Shallow gas Low temperature Fragile formation	**Levasil® OF30** **Levasil® OF36** **Levasil® OF50**	kg Class G cement 100 Fresh water 85 Dispersant 0.5–1 Retarder 0–2 Fluid loss additive 1–3 Levasil® OF50 or Levasil® OF36 7–10 Specific gravity: 1.56 kg/l (13 ppg) Temperature: 10–60°C (50–140°F)	10°C 50°F	Lightweight grouts Acceleration, early strength Gas migration control Zero free water
Wash out/fluid loss	**Levasil® OF75**	kg Class G cement 100 Fresh water 44 Fluid loss additive 1–3 Dispersant 0–3 Levasil® OF75 3–6	75°C 170°F	Cohesive and high yield viscosity
Acidic environment High temperature	**Levasil® OF8**	kg Class G cement 100 Fresh water 41 Dispersant 1–2 Retarder 2 Silica flour 15–35 Levasil® OF8 2–5	120°C 250°F	Improved strength retrogression control Enhanced acid resistance Addition of silica flour is indispensable at temperature above 120 °C (250 °F)

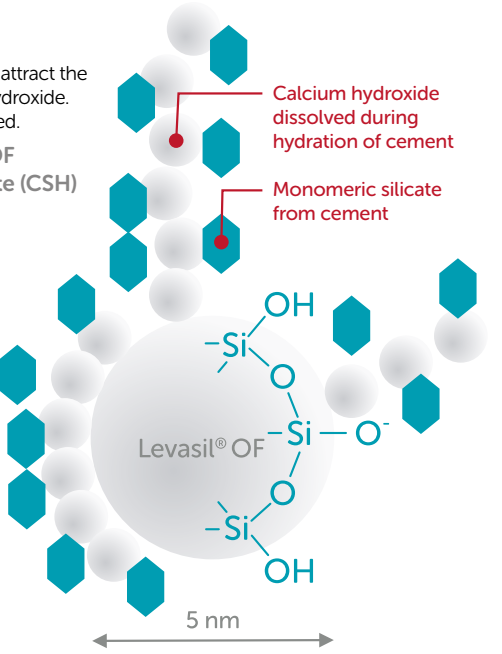
How it works

Hydration of cement
During hydration of cement, both silica and calcium hydroxide are dissolved and become available for further reaction.

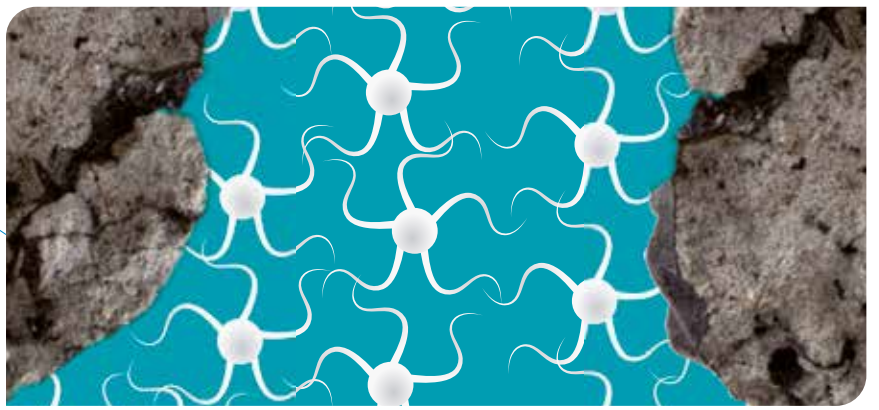
$C_3S + 2\ H_2O$ -> CSH + 2 $Ca(OH)_2$

CSH gel creation
The Levasil® OF silica particles attract the dissolved silica and calcium hydroxide. Additional CSH binder is created.

$Ca(OH)_2$ + SiO_2/Levasil® OF
=> calcium silicate hydrate (CSH)



Densification of cement
The new CSH binder enhances the cement paste density, reinforcing the structure between cement grains.



Björnström, J., Martinelli, A., Matic, A., Börjesson, L. and Panas, I. "Accelerating effects of colloidal nano-silica for beneficial calcium-silicate-hydrate formation in cement", Chem. Phys. Lett., Vol 392, No. 1–3, pp. 242–8.

Contact us

For more detailed product information, samples, technical service and further information, please visit our website at **nouryon.com/levasil**, send an e-mail to **colloidal.silica@nouryon.com** or contact your regional sales office.

Levasil® is a registered trademark of Nouryon in several countries worldwide.

Nouryon

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of more than 7,900 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands. Visit our website and follow us @Nouryon and on LinkedIn.

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