



FLC[®] WELLBORE SHIELDING[®]

Ultra-Low Invasion Additives & Wellbore Stabilizers





Innovative Additives. Proven Performance.

Impact Fluid Solutions develops next-generation additives purpose-built to solve complex drilling and cementing challenges. We are recognized leaders in the science of wellbore stabilization, driving innovation in the industry to offer advantages unavailable from conventional fluids. By combining advanced chemistry with extensive oilfield expertise, we identify critical wellbore challenges and deliver solutions that enhance the performance of drilling fluids and cement slurries. Our products are proven in basins around the world and trusted by leading operators, fluid companies and oilfield service providers.

Impact's best-in-class solutions are backed by a level of R&D and technical support that conventional chemical suppliers cannot provide. At our ISO-accredited Technology Center, we not only innovate new products but provide services for our customers including shale characterization and inhibition studies, cement spacer design, formation damage testing and drilling fluid formulation. In the field, Impact technicians align lab diagnostics with real-world conditions to optimize the performance of our additives.

10,000+ Wells
50+ Countries

+ ADDITIVE PERFORMANCE

\$30 Million+ Reduction in Well Costs

A deepwater Gulf of Mexico operator embarking on an extensive drilling program experienced significant wellbore stability issues including cavings, pack-offs, tight hole and lost circulation.

Problem: Offset well lost 28,000 bbl of OBM and casing set above the high-pressure zone

Solution: Adding FLC 2000® extended the frac gradient window, allowing higher mud weights

RESULT:

- Rig time and fluid losses reduced
- Over \$1 million reduction in cost per well across more than 30 wells



Preventative Wellbore Stability Solutions

Enabling Trouble-Free Drilling in Challenging Basins

Wellbore instability is a growing concern for operators faced with the challenges of drilling critical wells such as those in deepwater, mechanically weak formations, and high overbalance and depleted zones. Common to all environments with weak formations are low fracture gradients and narrow mud weight windows, where drilling operations can exacerbate wellbore instability. In these challenging conditions, operators can wait for problems and remediate—or take a preventative approach with Impact's Wellbore Shielding® and stabilization solutions.

Impact's FLC® product line is the premier Wellbore Shielding® solution, proven to engineer ultra-low invasion drilling and workover fluids. Conventional approaches to wellbore instability issues are generally reactive, and ultimately translate to additional rig time and costs. FLC products preserve wellbore stability throughout the drilling process—helping operators reduce NPT, improve ROI and increase production.

Figure 1

Typical loss zones without FLC® Wellbore Shielding® in the drilling fluid

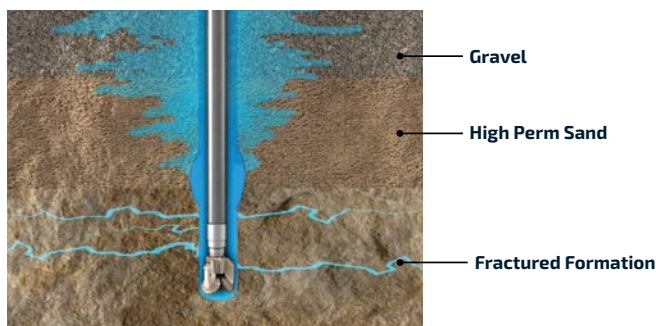


Figure 2

Typical loss zones using FLC® Wellbore Shielding® in the drilling fluid



FLC SOLUTIONS OPTIMIZE WELLBORE STABILITY IN DIFFICULT DRILLING CONDITIONS INCLUDING:

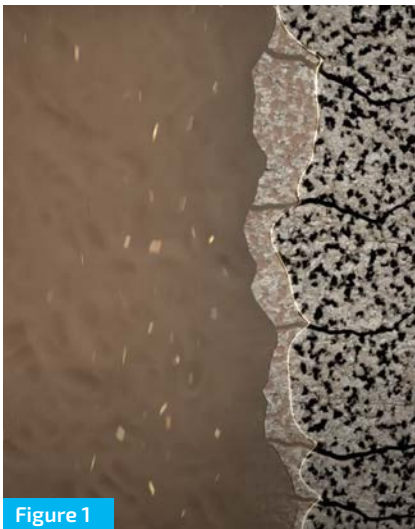
- ▶ Deepwater applications
- ▶ Depleted formations
- ▶ High overbalance (>5,000 psi)
- ▶ Poorly consolidated sands
- ▶ Microfractured and tectonically stressed shales
- ▶ Microfractured chalk
- ▶ Coal seams

Shield Against Invasion & Instability

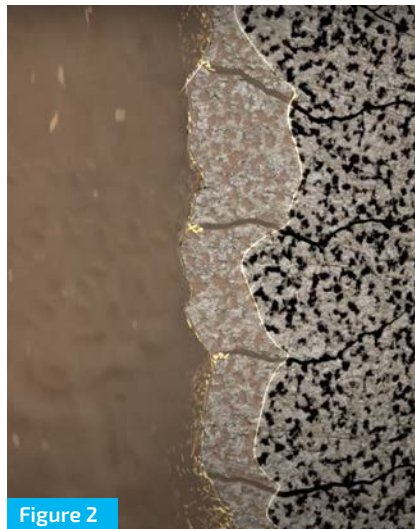
FLC® additives are built on proprietary chemistry designed to form flexible “shields” in the fluid system. These shields produce an extremely low-permeability barrier at the fluid-rock interface, minimizing invasion across a broad range of pores and microfractures. Unlike conventional wellbore strengthening techniques, the shielding barrier is stable under high shear and high temperature conditions, protecting troublesome formations.

FLC products quickly and effectively seal microfractures from 1-3,000 μm on the face of the wellbore at high differential pressure, providing a number of key advantages.

HOW WELLBORE SHIELDING® WORKS



Initially, the FLC® Wellbore Shielding® particles are free-floating in the drilling fluid.



As differential pressure increases, the shielding particles work with mud solids to form a protective layer on the face of the formation.



The result is a nearly impenetrable barrier against fluid and pressure invasion, which lifts off easily once differential pressure is released.



Minimize Formation Damage & Downhole Losses

FLC® additives mitigate fluid penetration into pores, fractures and bedding planes—stabilizing the wellbore and maintaining formation integrity. The low-permeability seal that FLC deposits limits the transmission of the wellbore pressure to the geology. This “pressure barrier” effect minimizes formation breakdown and prevents fractures from propagating.

Allowing operators to drill with mud densities greater than the fracture initiation pressure provides numerous benefits. In high-permeability formations prone to fractures, FLC has enabled wells to be drilled with mud densities greater than 6,000 psi of overbalance—without incurring losses, stuck pipe incidents, or logging or casing issues.

Eliminate Remedial Treatments

FLC additives deposit a very thin filter cake that exhibits not only high return permeability, but lower flow initiation pressures. The FLC filter cake simply lifts off with the inflow of the well, eliminating the need for acidizing and other matrix stimulation treatments—reducing time to first production.

Reduce NPT & Total Well Costs

By shielding mechanically weak and interbedded shales, FLC additives protect against major causes of NPT including sloughing, washouts and hole closure. This can eliminate the need for an intermediate casing string, lowering well construction costs considerably. FLC also reduces the potential for differential sticking in high-porosity formations.

FLC additives are equally effective in water-, oil- and synthetic-based systems, and can be added directly to the circulating system at comparatively low concentrations. Compared to conventional products, operators will require significantly less material to achieve superior results. That translates to savings on dilution, transportation and storage, not to mention reduced waste volumes.

Maximize Production Potential

In reservoir applications, drilling fluids formulated with FLC help optimize production potential. Reservoir pores can become saturated with mud filtrate or plugged by drilled solids or bridging materials, causing damage and limiting productivity. FLC Wellbore Shielding® chemistry prevents wellbore fluids and materials from damaging the reservoir. Field data supports the results of lower fluid invasion and higher production rates compared to conventional products.

+ ADDITIVE PERFORMANCE

Stabilizing the Wellbore While Saving \$200,000

An offshore operator in Qatar was concerned about the potential for high fluid losses and differential sticking while drilling a fractured and faulted carbonate formation, where formation pressures varied from 4 ppg to 9.1 ppg equivalent mud weight.

Problem: High torque often encountered, requiring 2–3% lubricant by volume in 8½" lateral

Solution: FLC 2000® added to drilling program

RESULT:

- ▶ 14,000' lateral drilled
- ▶ Elimination of 2–3% lubricant, saving \$200,000
- ▶ Minimal losses
- ▶ No wellbore stability issues
- ▶ No differential sticking
- ▶ Improved hole cleaning
- ▶ Reduced torque





FLC® Products

A Range of Solutions to Meet Specific Challenges

Impact recognizes that every drilling program is different, so we offer a range of FLC Wellbore Shielding® and stabilization solutions to meet a variety of requirements. We first developed the industry-leading FLC 2000® additive, then extended the product line to meet specific customer needs. Our scientists and field technicians will work with you to determine the ideal FLC product—solving your wellbore stability challenge and optimizing mud weight and solids in the fluid system.

FLC® FINE

up to 150 µm

Seals fractures up to 150 µm while the smaller particle size improves solids control management, reducing maintenance costs without compromising performance.

FLC 2000®

up to 250 µm

Seals 250 µm fractures; our original Wellbore Shielding® solution.

FLC® SUPREME

up to 500 µm

Seals 500 µm fractures with a broad sealing range that does not require bypassing the shale shaker systems.

FLC® EXTREME

up to 3,000 µm

Seals 500–3,000 µm fractures at high differential pressures, offering a comprehensive range of sealing capabilities while still allowing the continuous use of shale shaker systems.

+ ADDITIVE PERFORMANCE

Drilling to TD With No Losses for the First Time

An operator undertaking a multi-well drilling program in the North Sea (Norway) regularly encountered wellbore stability issues while drilling 12¼" sections through interbedded sands and shales.

Problem: Persistent seepage losses, often leading to total losses

Solution: FLC 2000® added for drilling the 12¼" section, along with Impact's LCP 2000® lost circulation solution as needed

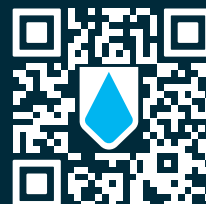
RESULT:

- ▶ Drilled to TD with no losses – a first in this field
- ▶ Nine subsequent wells drilled to design TD using FLC 2000
- ▶ FLC 2000 used in the 8½" reservoir sections on select wells



Whether we're working with operators, fluid companies or oilfield service providers, we take the time to fully understand each customer's individual technical requirements before making a recommendation. To discuss how Impact can help solve your wellbore challenges, contact your regional sales representative.

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