Impact
FLUID SOLUTIONS

STAR SHIELD®

Wellbore Shielding® & Stabilization for North America & Onshore Basins

Proven Solutions for Complex Challenges

Impact Fluid Solutions is a premier provider of specialty additives for oil and gas drilling and cementing. We combine advanced chemistry with extensive oilfield expertise to identify critical wellbore challenges and develop purpose-built solutions. Our best-in-class additives deliver advantages unavailable from conventional fluids and are:

- Proven in thousands of wells throughout the U.S. and Canada
- Trusted by leading operators, fluid companies and oilfield service providers
- Backed by technical support conventional chemical suppliers cannot provide

In particular, Impact is a recognized leader in the science of Wellbore Shielding® and stabilization. Our STAR SHIELD® Wellbore Shielding products for unconventional oil and gas plays have enabled trouble-free drilling in some of the most unstable, mechanically weak formations in North America.

Major North American Oil & Gas Basins

PROVEN SUCCESS ACROSS NORTH AMERICA

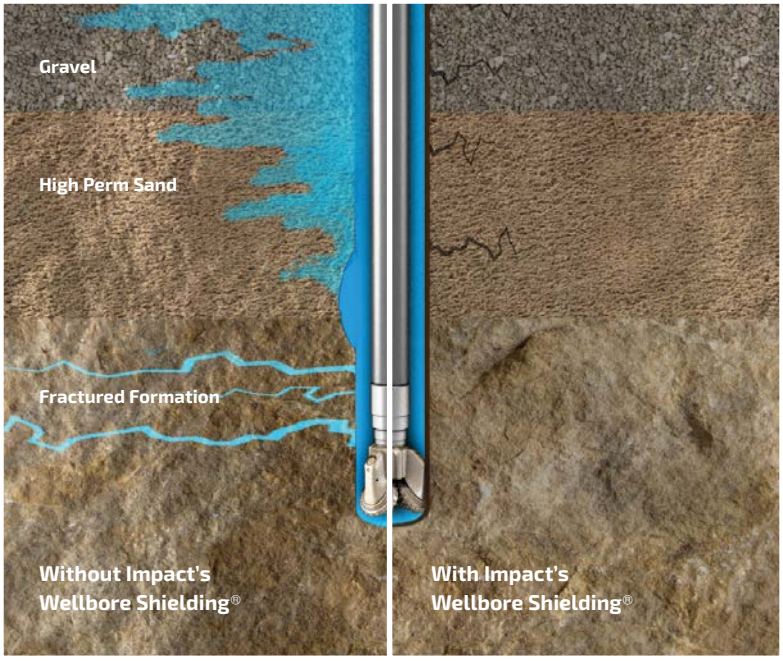
- Eagle Ford Shale
- Woodford Shale – Anadarko & Arkoma Basins
- Permian Basin
- Bakken Shale
- Canada

Preventing Wellbore Stability Problems in North American Basins

Overcoming Difficult Conditions in Unconventional Wells

From mechanically weak formations to depleted zones with high overbalance pressures, wellbore instability is a growing concern in North American resource plays. The low fracture gradients and narrow mud weight windows commonly found in these environments can exacerbate stability issues. Conventional approaches to wellbore instability generally involve remediation after problems occur. However, these reactive solutions ultimately translate to additional rig time and costs.

Impact's Wellbore Shielding® additives represent a smarter strategy: prevention. Our flagship STAR SHIELD® products—formulated specifically for North American shale plays—are proven to engineer ultra-low invasion drilling fluids. These innovative additives preserve wellbore stability to enable operators to reduce NPT, improve ROI and increase ultimate recoveries.



Typical Loss Zones - With and Without Wellbore Shielding® Additives in the Drilling Fluid

STAR SHIELD SOLUTIONS STABILIZE WELLBORES IN CHALLENGING DRILLING CONDITIONS INCLUDING:

- Unconventional shale plays
- Microfractures
- Depleted formations
- Poorly consolidated sands
- Heavy oil (SAGD)
- Coal seams
- High overbalance (>5,000 psi)

Shield Against Fluid & Pressure Invasion

The STAR SHIELD® name comes from the advanced science behind our solutions. Impact's proprietary chemistry forms a flexible "shield" in the fluid system, producing an extremely low-permeability barrier on the face of the wellbore. This shielding barrier quickly seals and isolates a targeted range of pores and microfractures at high differential pressure, protecting troublesome formations. In contrast with conventional wellbore strengthening techniques, the seal remains stable under high-shear and high-temperature conditions.

HOW WELLBORE SHIELDING® WORKS

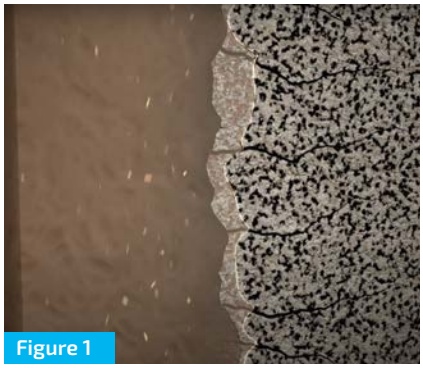


Figure 1

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

Figure 2

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

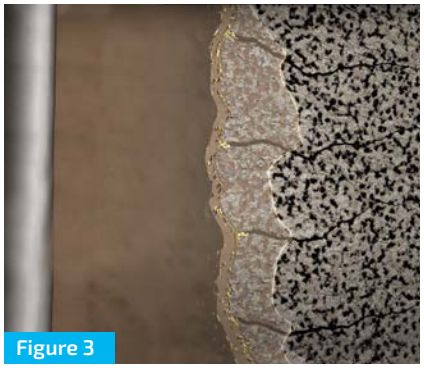


Figure 3

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

Advanced Science. Measurable Advantages.

STAR SHIELD® additives form a tough, impermeable barrier at the fluid-rock interface that effectively blocks solids invasion, enabling operators to:

- **Strengthen & Stabilize the Wellbore** – Shield mechanically weak and interbedded shales and prevent fractures from propagating, minimizing formation breakdown and preserving wellbore integrity.
- **Avoid Stuck Pipe Incidents** – Reduce the potential for differential sticking in depleted and high-porosity formations, and high overbalance conditions.
- **Minimize Non-Productive Time** – Inhibit sloughing, washouts, hole closure and other significant contributors to NPT.
- **Eliminate Intermediate Casing** – Achieve significant savings on well construction costs by running two casing strings instead of three.
- **Prevent Fluid Loss & Formation Damage** – Protect against fluid penetration into pores, fractures and bedding planes, and transmission of wellbore pressure to the geology.
- **Expand the Mud Weight Window** – Drill with mud densities greater than the fracture gradient without incurring losses, stuck pipe incidents, or logging or casing issues.
- **Reduce Total Well Costs** – Add STAR SHIELD products directly to the circulating system at comparatively low concentrations, providing savings on dilution, transportation and storage while reducing waste.

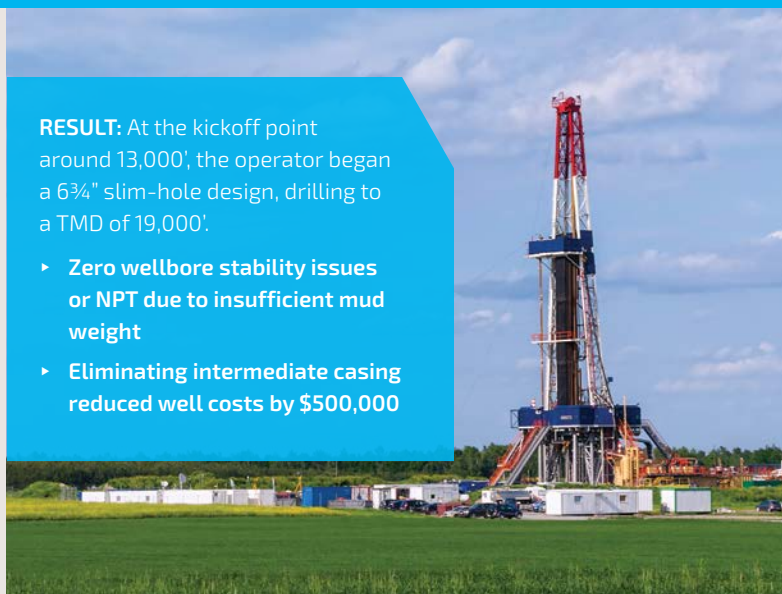
+ *ADDITIVE PERFORMANCE* *Eagle Ford Shale*

Expanding the Mud Weight Window While Saving $500,000

In the Eagle Ford Shale, an operator drilling a well designed with three casing strings encountered significant gas influx in the lateral. The operator increased the mud weight to 13.5 ppg in the troublesome Wilcox interval.

Problem: Lost circulation occurred while placing a mud cap, breaking down the Wilcox. The operator experienced substantial NPT and lost large volumes of oil-based mud to the formation.

Solution: Using STAR SHIELD® in the active system, the operator drilled the Wilcox with a mud weight of 13.5 ppg. Below the Wilcox, the mud weight was increased to 14.5 ppg with full returns.



RESULT: At the kickoff point around 13,000', the operator began a 6¾" slim-hole design, drilling to a TMD of 19,000'.

- **Zero wellbore stability issues or NPT due to insufficient mud weight**
- **Eliminating intermediate casing reduced well costs by $500,000**

STAR SHIELD® Products

Solving a Range of Wellbore Stability Challenges

Impact recognizes that every drilling program is different, so we developed the STAR SHIELD product line to seal several targeted ranges of fracture sizes. All of these advanced additives are equally effective in water-, oil- and synthetic-based fluid systems. Our scientists and technical team will work with you to determine the ideal STAR SHIELD product to solve your wellbore stability challenges while optimizing mud weight and solids in the fluid system.

STAR SHIELD® 100	STAR SHIELD®	STAR SHIELD® 500	STAR SHIELD® 3000
Seals induced and pre-existing fractures ranging up to 100 µm	Seals induced and pre-existing fractures ranging up to 250 µm	Seals induced and pre-existing fractures up to 500 µm with only slight modifications to solids control systems	Seals fractures up to 3,000 µm with relatively low concentrations compared to conventional LPMs and LCMs

+ *ADDITIVE PERFORMANCE* *Woodford Shale*

Eliminating Mud Losses, NPT & Intermediate Casing

An operator was planning a multi-well program in the Woodford Shale, where expensive instability issues and severe mud losses are common when drilling the depleted Red Fork formation.

Problem: Keeping mud weights below the fracture gradient in the Red Fork sands can pose challenges for operators later in the Springer/Woodford lateral section, where higher mud weights are required to prevent sloughing shale.

Solution: The operator pre-treated the drilling fluid system with STAR SHIELD® before switching to oil-based mud, and then maintained that formulation to TD.

RESULT:

- **Successfully drilled 20,619' of open hole to TD and lateral to 22,164' with no mud losses or NPT related to wellbore instability**
- **Significant cost reduction by avoiding the need for intermediate casing**

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.

impact-fluids.com
+1 713 913 4316

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Impact Fluid Solutions, LP
2800 Post Oak Blvd., Suite 2000
Houston, TX 77056
Phone: +1 713 913 4316