**Challenge**
In completion operations, a major concern is formation damage and decreased production rates caused by thick and uneven filter cake. In addition, costs can increase due to increased rig time and fluid chemicals. Conventional filter cake breakers use corrosive acids that pose significant HSE risks and require specialized trucks, tanks, and equipment; provide an uncontrolled and localized reaction; and increase the risks for wormholing.

**Overview**
Baroid’s N-FLOW™ Filter Cake Breakers offer the advantage of delayed breaker action for all types of completion operations. The action of N FLOW breaker systems can be retarded for several hours, depending on downhole temperatures and breaker formulations. This delayed reaction helps ensure that the breaker solution is uniformly distributed throughout the completion interval before it begins to work. Therefore, there are no “hot spots” like those commonly produced when conventional breakers make initial contact with the filter cake, and completion tools can be retrieved in a timely manner, minimizing the risk of corrosion damage.

The N FLOW breaker systems generate organic acid slowly downhole, not at the surface, dissolving calcium carbonate throughout the interval. In addition, N FLOW breaker systems are neutral when mixed with carrier brine, and therefore help eliminate the potential for injury and damage associated with handling hazardous acids at the surface.

Each breaker can be formulated to match specific well conditions, based on dynamic temperature and pressure testing and return permeability analysis. The N FLOW system can be formulated for a safe, controlled reaction in a wide variety of well and formation types, and is an excellent breaker fluid for use in formations that may destabilize on contact with strong mineral acid. The N FLOW breaker system dissolves calcium carbonate and polymers/starches.

**Features**
- Neutral pH at surface
- Fully-controlled, in-situ reaction
- Uniform distribution for even removal
- No downhole “hot spots”
- Removes wormholing potential
- Minimal corrosion risk
- Does not require special trucks, tanks, or equipment
- All components are environmentally acceptable
- Can be mixed in the surface rig pit and pumped downhole

*Open-hole completions*
Benefits
N-FLOW filter cake breakers use novel acid-generation technology to effectively remove the filter cake, wherever the fluid is placed. N FLOW breakers can be used to remove oil- and water-based filter cakes, and can be used in formations with a wide range of temperatures and pressures.
- Safer than conventional acid breakers, excluding harsh chemicals
- Cost-efficient
- Mixed at the surface rig pit and pumped downhole, eliminating the need for special equipment
- Helps increase production efficiently by evenly removing the filter cake

Applications
N-FLOW filter cake breakers are highly effective in:
- Horizontal wells
- Open-hole completions
- Gravel-packed wells
- Expandable screens for filter cake removal
- Injector wells for filter cake removal
- Sandstone, dolomite, and limestone formations
- Deepwater applications
- Mature well stimulation
- Workover and completion

Conclusion
The N-FLOW breaker system can provide effective, uniform filter cake removal in various applications, and can be formulated to match your specific well conditions. The advantage of the delayed breaker action can provide a safe and effective filter cake removal, leading to reduced formation damage, reduced costs, and higher production rates, ultimately helping you to satisfy your operational requirements. Baroid will create a customized solution to help ensure your job is done efficiently, effectively, and safely, every time.

Return Permeability Study
Berea sandstone core material exposed to 10.8 parts per gallon (ppg) NaCl/NaBr/BARADRIL-N™ fluid. Filter cake was exposed to N-FLOW breaker

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