

Water Management

**AquaBond™
Formation Water Reduction Technology**



The U.S. oil and gas industry will spend an estimated \$34.7 billion on water management in 2018.¹ Much of this cost is due to the hauling and disposal of formation water. Over the life of a well, water disposal costs can account for up to \$6 million, representing up to half a well's operating expense.² These costs are predicted to increase. An overloaded water transportation network along with limitations and restrictions on wastewater disposal wells adds to this challenge.

Hexion's AquaBond™ formation water reduction technology has proven to reduce formation water by as much as 50%, while improving oil and gas production compared to offset wells. Since the technology is chemically bonded to proppant, the water reducing property stays effective for the life of the well.

Technical Advantages and Benefits

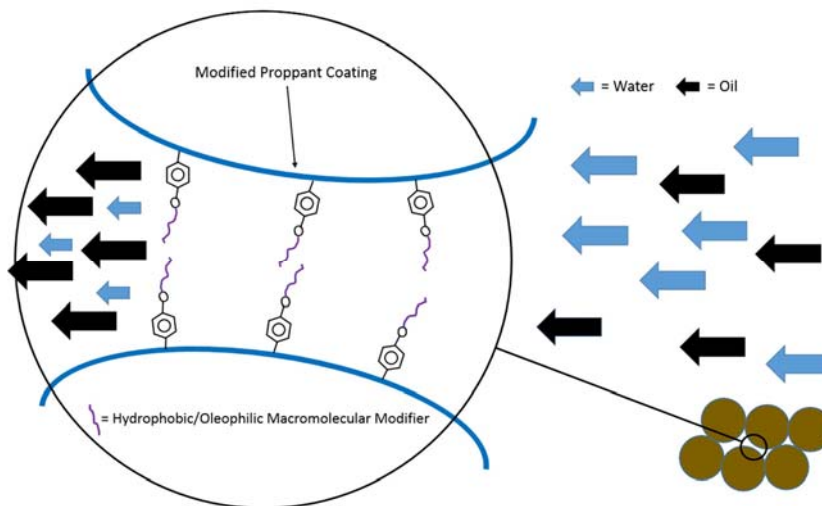
- Reduces the production of formation water while improving oil and gas production
- Increases well profitability by reducing wastewater management costs
- Patented chemistry is bonded to proppant and remains in place and effective for the life of the well

AquaBond Technology Formation Water Reduction Plan

1. Pump AquaBond technology downhole using the same method as traditional proppants
2. Frac water returns to the surface per typical flowback procedure
3. Hydrocarbons and formation water contact the chemically altered proppant pack
4. The AquaBond technology preferentially flows hydrocarbons over water
5. More oil and gas (and less water) is produced to the surface

How it Works

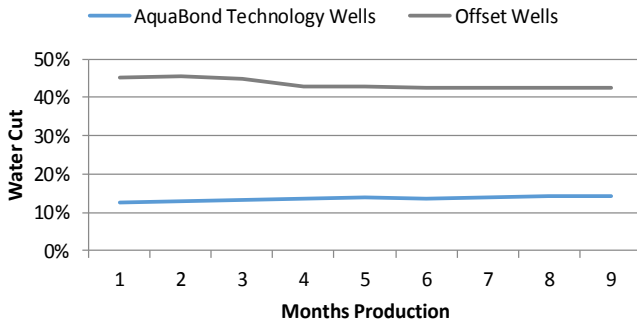
The patented AquaBond technology alters the relative permeability of the proppant pack to admit hydrocarbons and limit the admission of water. The pack acts as a semi-permeable membrane to selectively allow hydrocarbons to penetrate.



Granite Wash Case Study

Wells utilizing AquaBond technology in the Granite Wash realized a reduction of formation water by more than 43% compared to offset wells. Additionally, the average cumulative BOE was more than 40% higher. The water cut for the wells that used AquaBond technology was significantly lower.

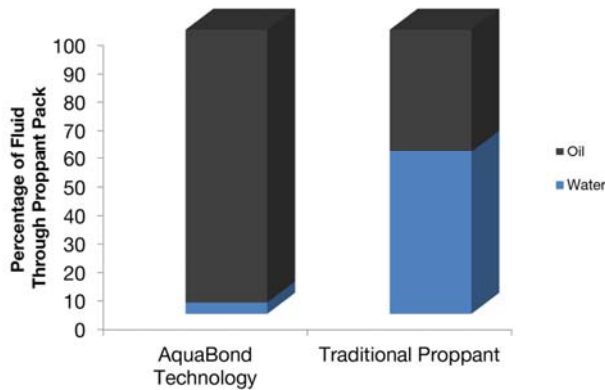
Average Water Cut



Reduced Water Through the Proppant Pack

In laboratory testing, a consolidated proppant core was placed in a vessel containing 2:1 ratio of water to oil. The fluid was then pumped through the core.

Ratio of Water and Oil Admitted Through the Proppant Pack



The AquaBond proppant core admitted less than 5% water without hindering the flow of the oil. The traditional proppant core admitted nearly 60% water and less overall oil.

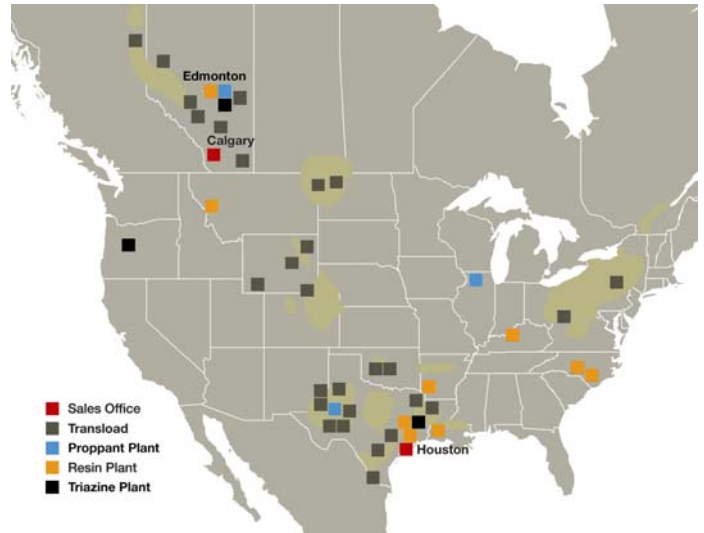
To see a video highlighting the testing results, please send an e-mail to oilfield@hexion.com.



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North America Manufacturing and Distribution Network



Hexion continues to strategically locate transloads near the major shale plays in North America to meet the industry's increasing need for resin coated proppants.

References

- Source: IHS WaterIQ 2018.
- Calculations made assuming 800 MBOE over life of the well, 3 MMBBL water, and total water management cost of \$2.00 per barrel.

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