Integrated Subsurface Water Management
Extend well and field life while reducing operations costs and downtime
Integrated water shutoff and conformance solutions from Baker Hughes help you produce what you want, not what you don’t want.

Now, you have powerful new tools to help you solve an old problem: increased operating and lifting costs associated with excess water production. Our water management experience and comprehensive range of chemical and mechanical services mean you get the integrated solution best suited for your operations. Our cost-effective technologies help you to

- Enhance hydrocarbon production while minimizing excess subsurface water
- Decrease operations costs and downtime
- Extend well and field life by integrating proven solutions
- Optimize facility capacity

Baker Hughes reservoir water conformance technology reaches deep into naturally fractured and hydraulically fractured reservoirs to decrease water production. Other field-proven products and services extend our capabilities into standard reservoir conformance and near well-bore shutoff.

Another powerful part of the Baker Hughes water management toolbox is our ability to accurately analyze and diagnose your problem with advanced tools and techniques. Our reservoir modeling capabilities offer critical insight into the development of the most effective solution.

Managing the integration and deployment of these technologies to best solve your subsurface water management problems are local Baker Hughes water management specialists and application engineers. These skilled water management specialists are backed by unsurpassed reservoir expertise and the global research, development, and testing resources of Baker Hughes.
Polymer systems for effective water management

We have a comprehensive line of gel and chemical systems for improving reservoir fluid conformance in naturally fractured reservoirs and matrix-driven producing formations, and for treating hydraulically fractured wells in shale plays to shut off water.

Baker Hughes systems withstand significant pressure differentials, address challenges in high- and low-temperature reservoirs, and shut off water by reducing permeability. Our technology enables us to customize treatments for near-wellbore and reservoir excess water production issues. Baker Hughes treatment designs and processes help ensure better performance and reliable, longer-term results.

MARCIT-CT

Hydrocarbon reservoirs typically contain mixtures of reservoir attributes, some of which are more conducive to flow. These more conductive features are often naturally-occurring fractures or other secondary porosity features. The MARCIT-CT™ treatment preferentially blocks these high-flow pathways to improve production from unswept portions of the reservoir.

Benefits

- Customizes treatments for better performance
- Reduces water and CO₂ production for lower operating costs
- Modifies flow in the reservoir
- Increases oil production
- Eliminates typical isolation requirements
- Minimizes equipment needs

CAPIT gel system

The CAPIT™ gel system is a higher temperature, higher strength version of the MARCIT-CT gel system and is often used in conjunction with a MARCIT-CT treatment as the final cap to a large reservoir conformance treatment. The properties of the CAPIT gels are very similar to a standard MARCIT-CT treatment, but the gel is much stronger and has higher temperature stability. CAPIT provides the same benefits to your operations as MARCIT-CT.

UNOGEL chemical water conformance

The UNOGEL™ high-strength gel system uses an organic cross linker, which extends capabilities in reservoirs with temperatures in excess of 220°F (104°C) with the same benefits of MARCIT-CT. The UNOGEL system reduces the flow in fractures without penetrating the matrix. Its low leak-off properties are ideal for conformance improvement in dual porosity reservoirs. In those situations where gas production is undesirable, the UNOGEL technology can be injected into matrix permeability to completely block the offending zone. The system was developed to provide stable gels with sufficient working time to allow their placement in more demanding environments.

1 - Listed as a registered trademark of Marathon
2 - Listed as a registered trademark of Unocal
**FracBlock gel system**
The FracBlock™ gel system was developed specifically for the treatment of hydraulically fractured wells in unconventional reservoirs such as shale plays.

**Benefits**
- Customizes treatments for better performance
- Operates in higher temperature reservoirs (250°F [121°C])
- Treats propped fractures
- Penetrates deeper into the microfracture system
- Withstands significant pressure differential
- Reduces water production, resulting in lower operating costs
- Increases oil or gas production
- Minimizes the equipment needed

**MARA-SEAL gel**
The MARA-SEAL™ gel uses a low molecular weight, cross-linked polymer that is injected directly into the target zone. Because of the low pregel viscosity of this system, injection into small diameter pore throats within matrix rock can be achieved, resulting in permeability reduction for total fluid shutoff.

**Benefits**
- Customized treatment
- Reservoir penetration
- Permeability reduction shutoff
- Easy cleanout
- Minimal equipment requirements

**SILJEL treatment fluids**
SILJEL™ water-shutoff solutions are solids-free treatment fluids that are pumped into permeable formations to form permanent plugs, which seal reservoir porosity and permeability. Ideal for shutting off unwanted water production, the fluids are nonselective, making placement a key consideration with these treatments.

**Benefits**
- Low initial viscosity during pumping
- Good plugging efficiency
- Internally activated system
- Simple operation

**Gel Systems Cut Water Production by Nearly 35%**

**Benefits**
- Average oil production of 56 wells increased 225%, from 100 to 325 BOPD
- Reduced WOR from 55 to 12.5
- Reduced water production by almost 35%, from 6,100 BWPD to 3,950 BWPD
- Seven months payout time for gel treatment

**Background and challenges**
- Excessive water production in marginally profitable formation
- Cement squeezes usually used for water shut-off were uneconomical
- Low permeability, low porosity, naturally fractured system

**Baker Hughes solution and results**
- Baker Hughes gel systems achieved penetration into the formation
- Timing, temperature, and pressure of the injections were customized for the application
- Initial treatments were completed in 24 hours
- Three years later, production is virtually the same in 34 wells
Relative permeability modifiers and cement systems

In addition to our industry-leading gel systems, Baker Hughes offers other chemical-based technologies such as relative permeability modifiers (RPM) and Magne-Block™ cement systems for reducing or eliminating water production in challenging conditions.

**AquaFix relative permeability modifier (RPM)**

The AquaFix™ RPM reduces unwanted water production from oil and gas wells and for near-wellbore profile modifications in waterflood injection wells. In production wells, these products are best used in reservoirs producing excessive water through matrix flow from a wet zone that is isolated from overlying or underlying hydrocarbon zones. They can also be used for temporary mitigation of water production through a coning mechanism.

**Benefits**

- Selectively reduces formation permeability to water to improve oil/water and gas/water ratios
- Opportunities to increase hydrocarbon production
- Lithology independent
- Good shear tolerance
- Compatible with most common stimulation fluids, scale inhibitors, and heavy brines

**Magne-Block cement systems**

Magne-Block systems are acid-soluble, hard-setting, magnesium-based cement systems used for isolation behind pipe in carbonate and sandstone formations, including gravel-pack completions. A principal application of Magne-Block systems is water shutoff in vertical and horizontal completions. Because Magne-Block treatment is acid soluble, it can be either a permanent or temporary solution.

**Part of the industry’s most comprehensive suite of water management solutions**

Baker Hughes subsurface water management technology goes beyond just chemical-based tools. For example, our Equalizer™ inflow control technology is the industry’s most effective mechanical solution for early water breakthrough.

Contact Baker Hughes today to learn more about how we can integrate powerful, proven technologies to create the most effective solution for your specific water management challenge.