Water and Gas Shutoff:
Real Results

Qatar

Thru-Tubing Package Decreases Water Cut, Increases Oil Production

A Weatherford thru-tubing package decreased water production in the horizontal section of a well to enhance oil recovery. The XFLO setting tool was used to convey an inflatable retrievable bridge plug and an inflatable cement retainer on coiled tubing; cement was subsequently pumped in to fill the casing section between the bridge plug and the retainer. The successful operation resulted in an oil production increase of more than 12 percent and test results indicated a reduction in water cut of more than 30 percent.

Oman (Basma field)

GENISIS® Swellable Packers Eliminate Saltwater Intrusion, Saving Disposal Costs and Rig Time

Three *GENISIS* swellable packers were run on the same base pipe as the production casing, with the drilling fluid still in place and acting as the swelling medium. The operation effectively shut off the salt water from the well, increasing production and saving saltwater disposal costs. It also eliminated the need for crossovers and additional connections, cutting costs further and saving rig time.

Oman (Fahud field)

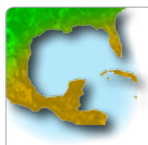
Innovative Straddle-Packer Assembly and Gel Help Control Unwanted Gas Flow, Lead to Sustained Oil Production Increases

A purpose-built Weatherford straddle-packer assembly was used to inject an operator's specialized gel into a predetermined zone to control unwanted gas production. The operation reduced the well's high gas-to-oil ratio, resulting in sustained oil production increases.

UK (North Sea)

Production Logging Tool, Bridge Plugs Contribute to Significant Decrease in Water Cut in Two Producing Wells

Weatherford's production memory-logging tool identified zones that had produced 97 percent water cut in two wells. Subsequent caliper surveys confirmed that a proposed remediation technique—inflatable retrievable bridge plugs—would work properly, despite the diametric irregularities of the wellbores. Set by electric wireline, the bridge plugs effectively isolated the water-producing zones, increasing hydrocarbon production substantially.



Gulf of Mexico

ACP™ Annulus Casing Packer Overcomes Challenging Environment to Eliminate Water Production

A Weatherford *ACP* tool effectively shut off water production in a hole intersecting a water zone adjacent to the production zone. The operation saved the operator the cost of another cement squeeze; at a total estimated cost of US$1 million, previous cement squeezes from the same platform had failed to effectively resolve the problem. Weatherford's approach also eliminated water disposal costs and provided a viable solution for future water-containment operations.

To learn more about effectively managing excess water and unwanted gas production with our water/gas shutoff services, contact an authorized Weatherford representative or visit **weatherford.com.**

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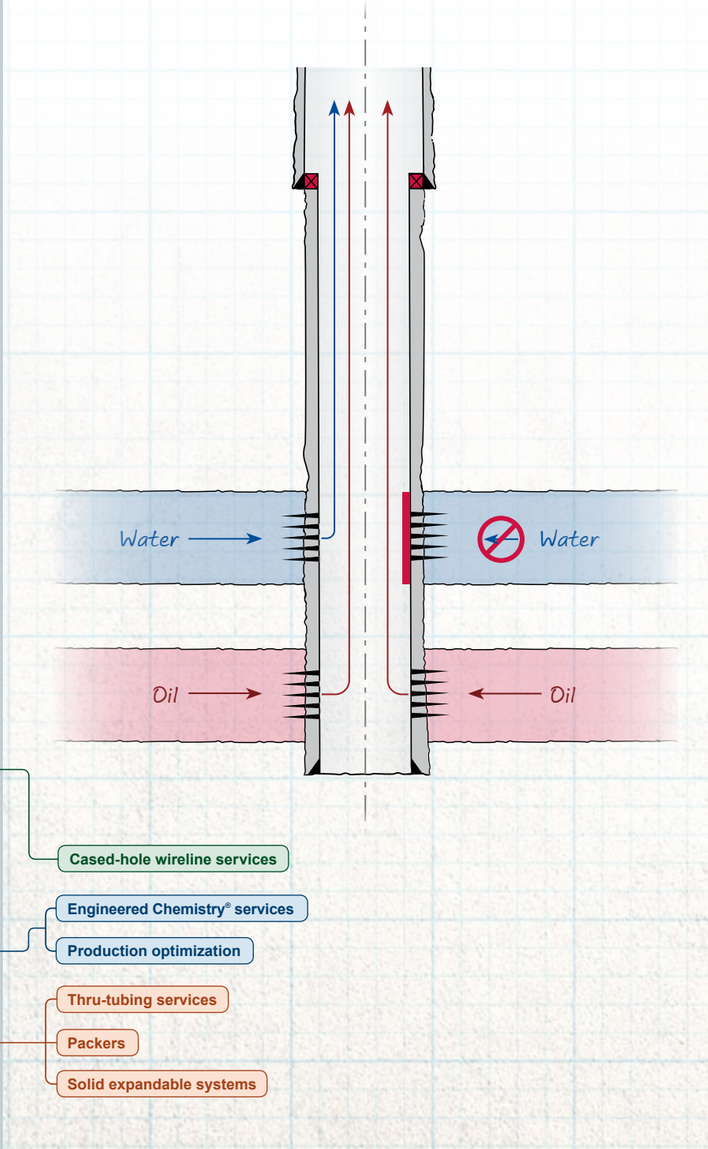
Water and Gas Shutoff Capabilities

Effectively managing excess water and unwanted gas ingress to optimize production and maximize reservoir recovery



Water and Gas Shutoff,
the Weatherford Way

We combine an array of products and services with application-specific expertise to effectively manage excess water and unwanted gas ingress. Excess water can lead to a number of undesired outcomes, such as lost oil and gas production, disposal costs and casing failure. Similarly, in the absence of ready access to a market, associated gas poses several potential problems, including diminishing oil production. While flaring is often a cost-effective remedy, it has environmental consequences; and alternatives, such as injection into a disposal well or liquid conversion, are not always viable. With a phased approach to water/gas shutoff, we help you navigate these challenges to optimize production and maximize recovery.

Our phased approach

Phase	Detail	Select Deliverables
ASSESS	We use a number of techniques, including production logging and tubing testing, to assess the general condition of your well; identify factors that could lead to high water/gas cut; and pinpoint the root causes of water/gas ingress when the situation becomes problematic.	- identification of structural defects - water/gas encroachment map - production logs - tubing testing results - risk analysis
SELECT	Once a problem has been identified (through a third-party assessment or ours), we work with you to select products and services that meet your operational objectives.	- proposed remediation strategy - product/service selection - cost/benefit analysis - budget
EXECUTE	Available for worldwide deployment, our wellsite support crews execute the predetermined remediation strategy, whether the situation calls for a cement squeeze, injection of specialized chemicals, or installation of a solid-expandable casing system.	- well plan - logistics support - HAZOP/HAZID
EVALUATE	Drawing on our monitoring tools, as during the assessment phase, we evaluate the effectiveness of our remediation efforts and make adjustments as necessary; we also conduct post-execution reviews to make certain we have met your objectives and to inform future water-/gas-ingress remediation operations in the same reservoir.	- before-and-after comparison - lessons learned - after-action review

Select Product and Service Portfolio

Evaluation

Cased-hole wireline services

Our cased-hole wireline services can help you identify structural defects in your well that could lead to excess water or unwanted gas production, and to pinpoint the location of existing problems. Specific offerings include casing inspection, cement evaluation and production logging.

- Cement evaluation
- Casing inspection
- Production logging

Production

Engineered Chemistry® services

We provide a number of chemicals for various stages in a well's life cycle. These include specialized solutions designed to treat excess water production, such as Brine Block® chromium carboxylate cross-linker, appropriate in fresh water and brines.

Production optimization

We offer a number of innovative technologies to monitor and enhance the performance of producing wells, such as our Red Eye® water-cut meters. Able to precisely measure water cut in flowing lines, these advanced systems can help you detect water onset and take measures accordingly to avert excess water production; alternatively, they can be used to assess the effectiveness of a water shutoff operation.

- Water-cut metering

Intervention

Thru-tubing services

We integrate an array of thru-tubing technologies and associated expertise—honed through simulation-based training—to optimize interventions inside or below production tubing. Cement squeezes, plugbacks and tubing-patch installations are among the specific services we offer to shut off unwanted gas or water production. We also provide tubing testing to identify structural defects that could lead to excess water or unwanted gas production, and to locate the root causes of water/gas ingress.

- Cement squeezes
- Plugbacks
- Tubing testing
- Tubing-patch installations

Packers

Used to isolate the wellbore, inflatable packers have a wide range of applications, including water and gas shutoff. Our extensive selection includes ACP™ annulus casing packers, rated for high-temperature environments, and IPP™ injection production packers, suitable for high-angle, horizontal wells. In addition, we offer high-performance, annulus swellable packers, also suited for gas/water shutoff operations.

- Inflatable
- Swellable

Solid expandable systems

Our solid expandable technologies include the MetalSkin™ cased-hole system, which effectively seals and isolates damaged casing; its multiple applications include gas and water shutoff. In some scenarios, it offers advantages over more conventional approaches, like cement squeezes and scab-liner installations. While a cement squeeze is often an effective short-term fix for excess water or unwanted gas production, the procedure typically must be repeated; in contrast, the *MetalSkin* system is a more permanent option. In addition, it has a larger ID than scab liners, thereby facilitating future drilling, completion, production, or injection operations.

- Cased hole

Select Cased-Hole Wireline Technologies

Direct pump setting tool (DPST): used to set bridge plugs, cement retainers, packers, straddles and whipstocks during completion or intervention operation, including water shutoffs; a non-explosive, electro-hydraulic tool, DPST offers a safe alternative to conventional explosive setting devices.

Extreme™ plugs: family of advanced tubing plugs and packers that can expand up to 165 percent beyond their run-in diameter; eliminate runs, standby time associated with more conventional "petal-basket" operations to minimize NPT.

PSP™ plugs: high-expansion, compression-set plug designed for plug-back operations; eliminate runs, standby time associated with more conventional "petal-basket" operations to minimize NPT.

Select Thru-tubing Technologies

Coiled-tubing packer system: used to conduct integrity tests on production tubing or casing; typically recommended when the packer system stays within the same tubing/casing ID throughout the operation.

FH one-trip cement retainer: used in cement squeezes; allows the cement retainer to be hydraulically set and squeezed through in one trip.

FracGuard® composite bridge plugs: recommended for plugback operations that require permanent plugs; can be conveyed on coiled tubing, electric line or slickline.

Inflatable retrievable bridge plugs: ideally suited for plugback operations in which the packer system runs through production tubing and sets in a large-diameter casing, liner or screen; run on coiled tubing or electric line.

Jet Set™ packer system: used in integrity testing; recommended when the packer system must traverse multiple tubing/liner sizes before reaching testing depth.

WidePak™ one-trip straddle packer: an ISO 14310 V0 rated straddle packer used for temporary or permanent isolation of tubing sections, perforations, or windows.

WRP bridge plugs: recommended for plugback operations that require temporary plugs; can be conveyed on coiled tubing, electric line or slickline.