



Weatherford®

Capillary-Injection Technology

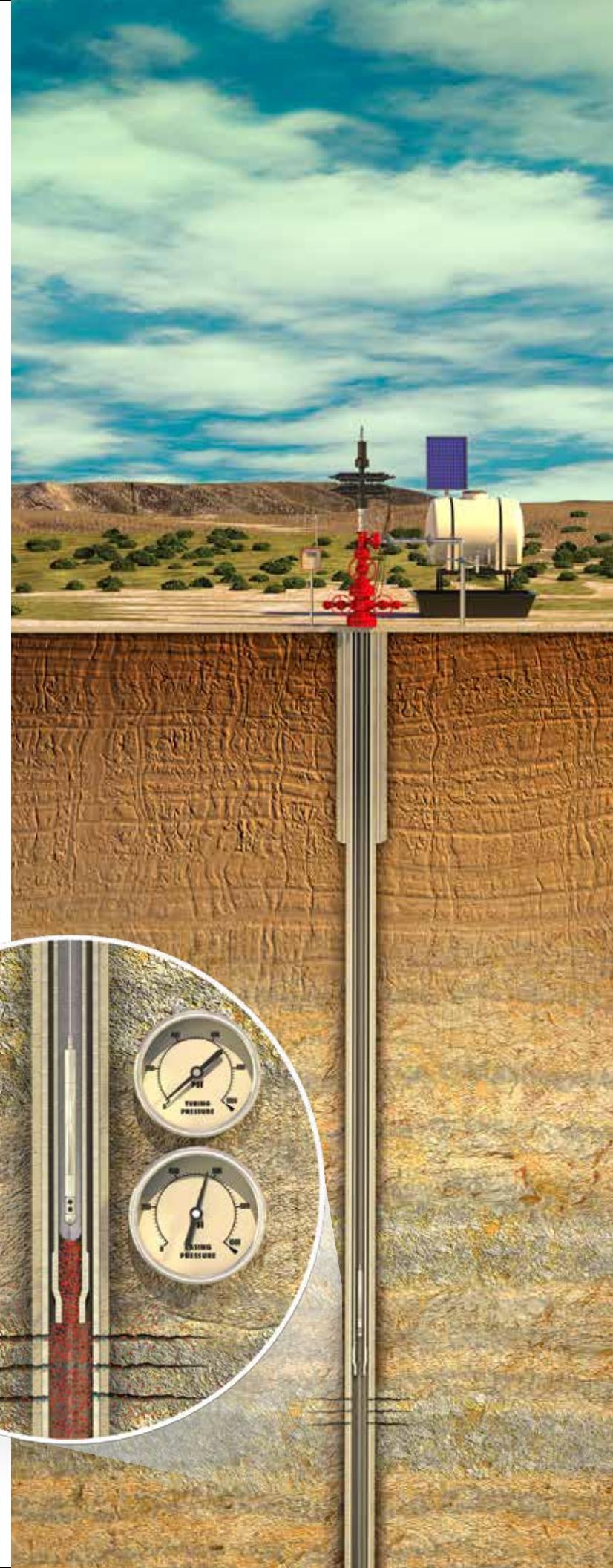
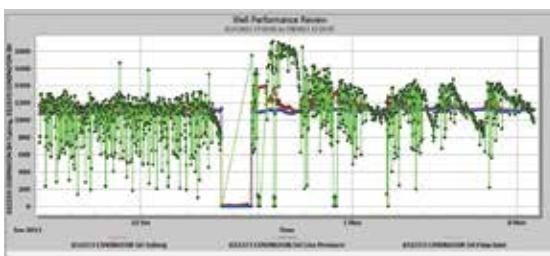
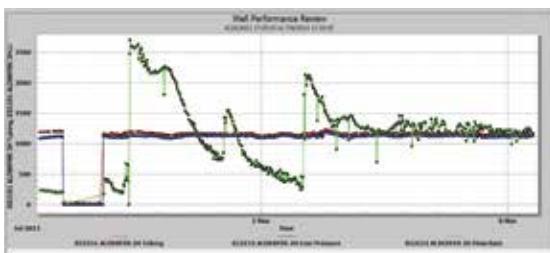


Advanced Chemical-Delivery Systems to
Boost Oil and Gas Production

Confidently delivering chemical treatments

Weatherford's capillary-injection tubing system enables you to maximize production and reduce lifting costs by precisely and safely placing chemicals at the production intake or elsewhere within the wellbore.

Pumping the right chemical down your well, in the exact spot and quantity needed, can eliminate conditions that lead to workovers and lost production. For you, this means reduced extraction costs, lower operating expenses and stable, producing wells. Perhaps most important, you can be confident that you are working with a company that has an unwavering commitment to safety and extensive experience in a wide range of circumstances. As an industry leader with units located in the United States, Argentina, Mexico, Indonesia and the Middle East, Weatherford has performed more than 12,000 capillary installations.





The right technology and experience to safely service your wells

Weatherford offers a complete range of capillary-injection systems to meet your precise needs. We install strings internally, without requiring a workover, for virtually all sizes of production tubing and casing. External installations, via stainless-steel clamps, enable the integration of artificial-lift methods—such as rod pumps and plungers—without hindering master-valve operation.

After determining the optimal installation method, we position the Weatherford CC-1 chemical-injection valve at the production-tubing intake to prevent backflow. Because turbulence from the well's natural flow creates foam, we precisely calculate the critical velocity, to make sure the well will lift properly.

This whole installation process takes just three to four hours in live gas wells, enabling a return to steady production at or above the decline curve.

Well Problem	Capillary-Injection Solution
Well loading	Pinpoint delivery of foaming agents and surfactants
Corrosion and scale	Injection of precisely engineered corrosion inhibitors
Salt buildup	Targeted, customized production chemical solutions
Paraffin buildup	Chemicals precisely delivered just beneath the area where paraffin forms
H ₂ S and CO ₂	Specially formulated chemicals and alloys



Experience makes the difference

A global provider of oilfield production technology and services, Weatherford offers expertise and products to cover every kind of gas well, including those with ultrahigh pressures and temperatures.



Our track record includes more than 12,000 capillary installations and 225 combined years of experience, with an outstanding safety record that goes far beyond standard requirements. Weatherford runs blowout preventers on all capillary installations and provides climate-controlled cabins for every land installation, to ensure optimum performance in all weather conditions.

Weatherford teams draw on some of the industry's most advanced technology to enhance the success of your well. Our exclusive WellFlo® analysis software uses a guided, step-by-step well-configuration interface to accurately evaluate the well's flowability. We then enter the appropriate parameters into a system that provides exact inflow and outflow performance curves. Our comprehensive production-optimization portfolio also includes critical velocity-reducing systems (CVR and iCVR+), the Xtra-Lift™ Renaissance™ system, the cap-catch fishing tool and hanger packoffs.

120,000
Capillary Installations

225 Combined
Years
Experience



Limitations of batch treatments and soap sticks

Batch treatments, used to pump down inhibitors and enhance production, have serious limitations. Wells must be temporarily shut in for pumping from the surface. As a result, more chemicals are required than with capillary treatments—because some of those chemicals will disperse before arriving at the end of the production tubing. This lack of precision can cause inconsistencies, leading to lost production and recurring shut-ins for follow-up batch treatments.

Soap sticks are a common alternative for applying foaming agents to liquid-loaded gas wells. Dropped from the surface, soap sticks must travel down the tubing before reaching producing liquid levels. Results tend to be impermanent, because sticks have a limited lifespan before they completely dissolve and the process must be repeated. This can lead to inconsistent flow and additional labor costs for repeat treatments. Soap sticks may also require shut-in time to allow chemicals to reach the water and activate.

Capillary-injection technology advantages

- Reduces well interventions caused by scale, paraffin, corrosion and salting
- Requires no batch treatment or shut-in time
- Lowers chemical costs through precise placement and metering of production chemicals
- Saves on downtime with continuous chemical delivery at perforations
- Installs easily, requiring just three to four hours in live wells
- Provides adjustable chemical volumes for changing production rates
- Enables custom blending of multiphase chemical treatments to meet specific needs



Capillary injection increases production 26 percent and eliminates recurring treatment costs

In Rusk County, Texas, an operator who used soap sticks to combat declining production was experiencing periodically high operating costs resulting from frequent repeat treatments. To reduce operating and lifting costs, Weatherford installed a capillary-injection system at a depth of 10,150 ft (3,094 m).

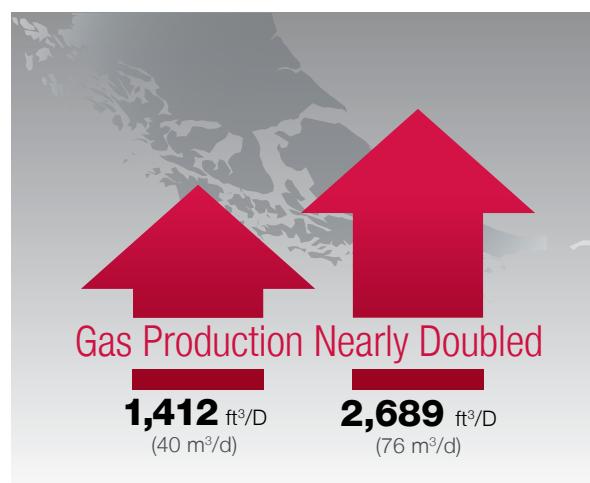
Following installation, production increased by 26 percent—from 206,000 to 260,000 ft³/D (5,833 to 7,362 m³/d)—completely eliminating the high operating costs and downtime associated with soaping.



Foamer applied through capillary tubing almost doubles production

In the Strait of Magellan, south of Chile, an operator faced production declines due to liquid loading and low bottomhole pressures. Weatherford recommended lightening the liquid column in each well by applying foamer through 1/4-in. capillary tubing, installed inside the production tubing.

As a result, gas production nearly doubled—increasing from 1,412 to 2,689 ft³/D (40 to 76 m³/d)—with no downtime during treatment.





Capillary injection increases production by eliminating liquid loading

In Wyoming, a gas well was experiencing liquid loading, requiring the operator to periodically vent the well to help sustain production. To remedy the situation, Weatherford recommended installing a capillary string inside the tubing and injecting an Engineered Chemistry® foamer at a precisely calculated rate and depth.

After treatment, production was increased by 45,000 ft³/D (1,274 m³/d)—while reducing atmospheric emissions and eliminating the need for future venting and the resulting loss of production.

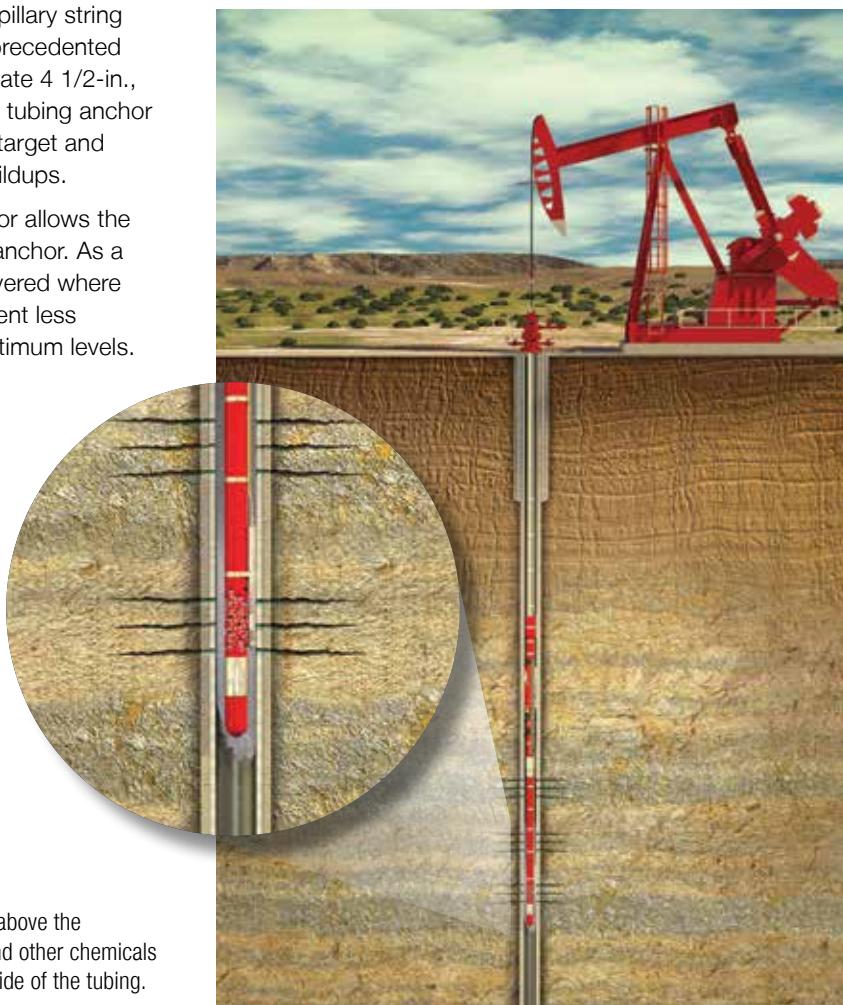
Capillary-injection tubing anchor enables injection below the rod pump tubing anchor

Weatherford's unique capillary-injection tubing anchor lets you inject foamers, inhibitors and other chemicals with exceptional precision below the rod-pump anchor.

The anchor works in conjunction with the capillary string to provide a chemical-delivery system of unprecedented effectiveness. Designed to easily accommodate 4 1/2-in., 5 1/2- and 7-in. casings, this combination of tubing anchor and capillary string enables you to precisely target and quickly treat paraffin, corrosion and scale buildups.

Weatherford's capillary-injection tubing anchor allows the capillary tubing to pass directly through the anchor. As a result, 100 percent of the chemicals are delivered where they are needed, so you need 30 to 40 percent less chemicals to keep your well producing at optimum levels.

Weatherford's unique capillary-injection tubing anchor is part of our ongoing commitment to exceptional technology and service, enabling you to treat rod-pump wells with unprecedented precision.



Weatherford's capillary tubing anchor is set above the rod pump and delivers foamers, inhibitors and other chemicals through a capillary string banded to the outside of the tubing.



Capillary-Injection Technology

For more information on how Weatherford's capillary-injection technology can reduce lifting costs and help maximize gas production in your wells, please contact us at gaswell.deliquification@weatherford.com, or visit us online at weatherford.com.



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