

PRODUCTION

RapidFlo™ Plunger-Lift System

Optimize gas well production
with a high-velocity plunger



The RapidFlo™ Plunger-Lift System Unloads Gas Wells Faster to Boost Production

Deliquification is a time-tested method for increasing production in gas wells, and plunger-lift systems are reliable deliquification solutions. But traditional plunger-lift systems typically interrupt production as the plunger falls—and the longer the plunger fall takes, the longer production is postponed.

Engineered as a high-performance alternative to traditional plunger-lift systems, the Weatherford RapidFlo plunger-lift system minimizes production interruption.

Unlike the plungers in traditional systems, our plunger falls through the production tubing at increased speeds to shorten the overall cycle time. This means quicker unloading and shorter wait times for increased production from your wells. The plunger can even fall while the well is flowing. This free cycle capability means continuous enhanced flow rates through the entire plunger cycle.

Aerodynamic, durable design enhances performance

The RapidFlo plunger excels in wells that are producing at near-critical flow rates. Computational fluid dynamic (CFD) analysis incorporated during RapidFlo plunger development provides streamlined flow of the plunger for rapid speed on the descent and maximum lift on the ascent. The plunger maintains efficient sealing during upward travel, and streamlined design enables falls against high flow rates to eliminate downtime during cycles. Coupled with uniquely designed bumper springs from Weatherford, the plunger can withstand high impacts at the surface and downhole.

The plunger consists of a solid spiral mandrel, tapered mandrel nose, and premium high-alloy dart. The dart is the only moving plunger part and is capable of withstanding high impacts from high-speed wells. The outer-body diameter of the plunger is cut just under production-tubing drift to provide the maximum seal while the plunger moves freely. When the tool is in the open position during descent, a large flow area is exposed and maximizes flow through the tool to decrease cycle time and increase well production.





RapidFlo plunger dimensions and flow areas

Tubing size	2.375 in.	2.875 in.
Outside diameter	1.900 ±0/-0.005 in. (48.260 ±0/-0.127 mm)	2.346 ±0/-0.005 in. (59.589 ±0/-0.127 mm)
Flow areas	1.094 in. ² (705.54 mm ²)	1.474 in. ² (951.04 mm ²)
Fishing neck size	1.375 in. (34.925 mm)	1.375 in. (34.925 mm)
Fishing tool	2 in. GS	2 in. GS

Applications

The RapidFlo plunger is especially beneficial for wells under these conditions:

- High volumes
- Initial liquid loading
- High-flow applications
- Harsh environments
- Gas-lift assisted plunger applications



The RapidFlo plunger design maintains an efficient seal on the ascent and enables rapid falls even against high flow rates.

Shorter plunger cycles and increased uptime

Comparison of conventional and RapidFlo plungers in a 10,000-ft (3,048-m) well



Conventional pad-to-pad plunger

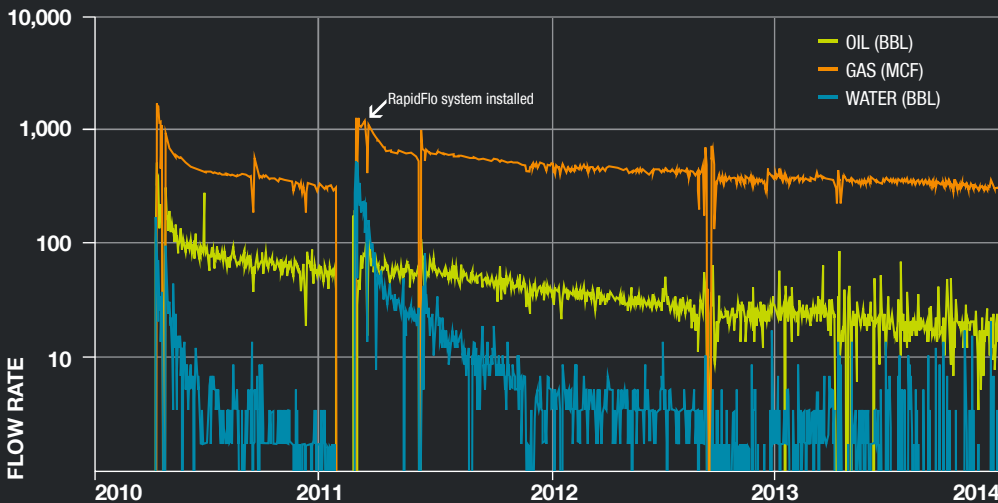
- Averaged eight cycles per day (8 hours of off time)
- Required a minimum of 1 hour to get plunger to bottom of well

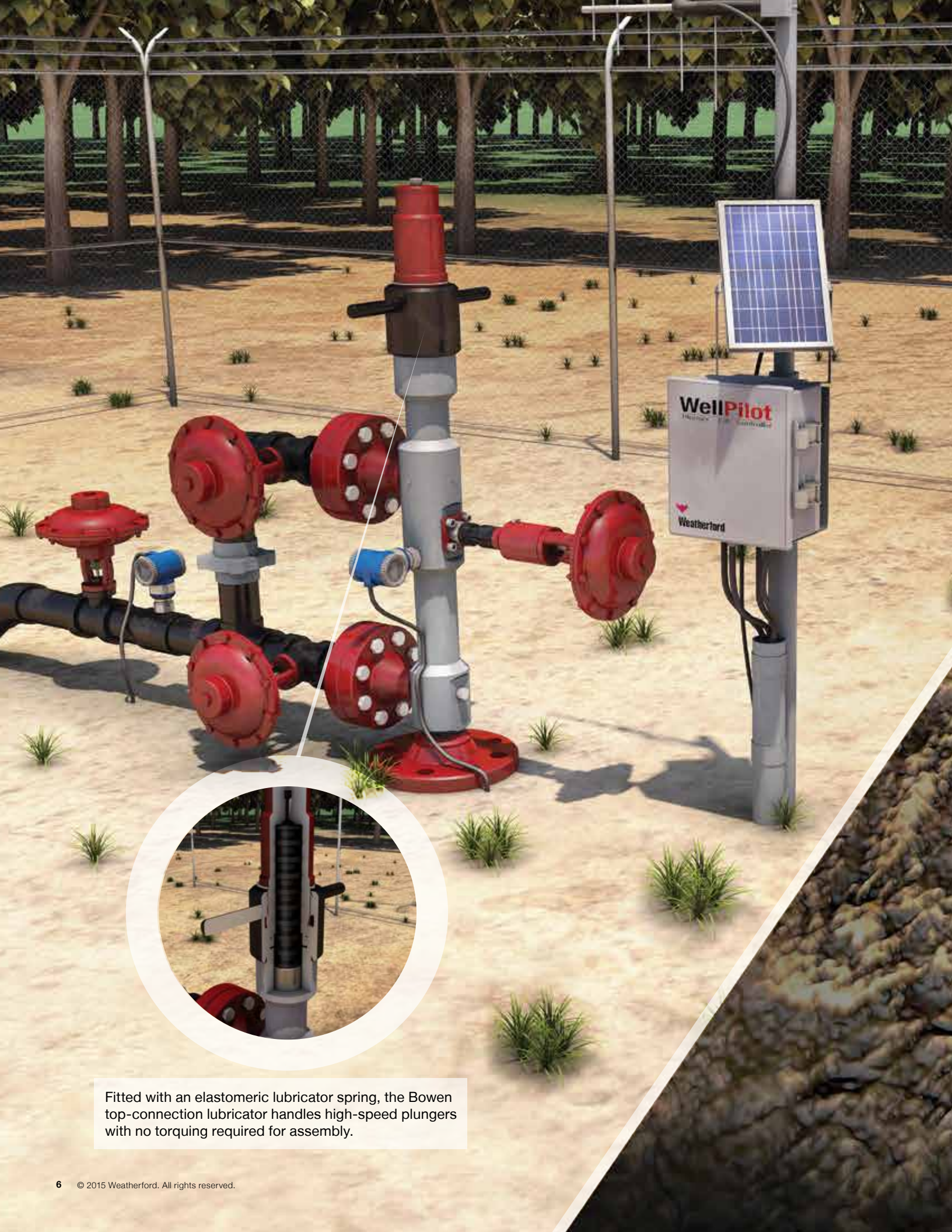
RapidFlo plunger replacement

- Eliminated all off time
- Cycled 15 to 20 times per day based on flow rate
- Increased production an average of 120 Mcf/D (3,398 m³/d)

Conventional plunger system vs. RapidFlo plunger system

Replacing a conventional plunger system with a RapidFlo system increased gas production over the 3-year period.





Fitted with an elastomeric lubricator spring, the Bowen top-connection lubricator handles high-speed plungers with no torquing required for assembly.



The simple design of the RapidFlo plunger provides a durable valve mechanism and a tight tolerance between the plunger and the tubing.

The check valve in the double bumper spring prevents backpressure on the formation and creates a liquid brake to slow the speeding plunger before the metal-to-metal contact with the spring in stagnant flow conditions.



Optimize the performance of your plunger-lift well with our suite of complementary products

As operators maximize production with high-rate plunger-lift systems, they find that high-velocity plungers place an additional demand on components of the plunger-lift system. However, Weatherford designed and builds the RapidFlo system with components specifically engineered to meet the demands associated with the high impacts of high-velocity plungers. With our broad selection of technology and extensive lift experience, we can provide optimal solutions for your wells.

Safe, fast makeups with higher yield strength

Handles fast-moving plunger impacts with a hand-tight connection

Especially well suited for high-performance wells, our Bowen top-connection lubricator endures high impacts of high-velocity plungers. It enhances safety, reduces potential connection failure, and minimizes environmental exposure during plunger trips. Unlike standard lubricators with EUE (external upset ends) 8rd connections that require full-torque makeup, the Bowen connection provides substantially higher yield strength with hand-tight makeup, which reduces connector makeup times for wireline servicing operations.

The Bowen top lubricator is a common addition to wells in which the plunger velocity exceeds the preferred window of arrival times. This lubricator creates a stronger connection that protects the critical lubricator-spring housing against failures caused by high plunger velocities. By comparison, the impact load rating of industry-standard lubricators with EUE top connections between the flow-tee body and the top spring housing is significantly lower.

EUE/Bowen lubricator connection strengths

Connection	2.375-in. EUE	Bowen B01
Recommended makeup torque	1,300 ft-lbf (1,763 N·m)	Hand tight
Yield point	104,340 lbf (464,104 N)	265,000 lbf (1,134,297 N)



Bowen lubricator

Elastomeric lubricator spring

Resists high-impact and chemical damage

Highly recommended in high-impact applications with the RapidFlo plunger, the Weatherford elastomeric lubricator spring reduces potential damage from plunger velocities that exceed normal operating parameters. Conventional lubricators have internal metal springs and a typical static load of 900 to 1,200 lb (408 to 544 kg) before full collapse

and subsequent metal-to-metal impact. Our elastomeric spring is designed to withstand a static load up to 2,200 lb (998 kg), thereby eliminating full collapse, metal-to-metal contact, and failure. In addition to the full benefits of impact resistance, the elastomeric spring is highly resistant to CO₂, H₂S, and other aromatics that can damage conventional steel springs.

Double bumper spring with standing valve

Extends protection with superior shock absorption

Designed and built for high-impact applications, the Weatherford double bumper spring delivers the required performance in long-term RapidFlo plunger installations. Unlike conventional downhole single bumper springs, the double bumper spring can withstand the impact from high-velocity plunger falls, thus preventing damage to the plunger or spring. The three-cup hold-down assembly provides a secure structure for

the springs; and seals are available in several materials, depending on the application.

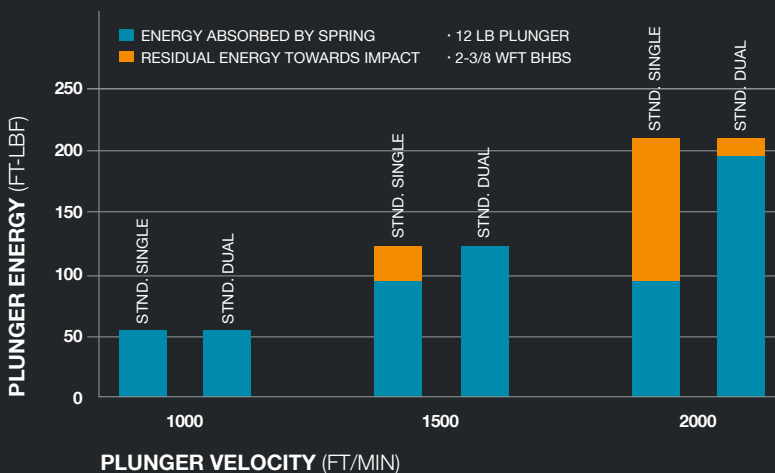
As an additional benefit, the double bumper spring features a standing-valve ball and seat to hold fluid above the bumper spring. This eliminates backpressure on the formation and also decelerates the plunger before it makes metal-to-metal contact with the dart on the head of the spring. The standing valve has a streamlined design to minimize pressure drop and maximize flow.

Weatherford offers multiple designs for lubricator and bottomhole springs.



Comparison of energy dispersion of bottomhole bumper springs

RapidFlo plungers travel faster than conventional plungers, which travel at an average of 1,400 ft/min (426.7 m/min). The dual spring bottomhole spring absorbs the majority of the plunger energy at high-speed operation.



Differential flow control with autocatcher assembly

More than a timer for plunger cycles

The differential flow-control method is effective with the RapidFlo plunger. This proven method prevents the plunger from making unnecessary trips or dry runs and damaging the downhole bumper spring. For this application, we help you choose the best option for your well from the WellPilot® F-22 differential flow controller, the K-500 flow controller, or the WellPilot DLQ controller.

Using this method, flow times are determined by the flow rate after the RapidFlo plunger arrives at the surface. Flow continues until it drops to the predetermined flow rate at which liquid loading starts to impede flow. The controller acts to release the plunger, which falls to the bumper spring, closes, and returns with any accumulated fluid from within the production tubing.

This method uses real-time well information to optimize the lift cycle and adjusts automatically to changing surface and downhole conditions to minimize fluid buildup and maximize gas production. It also regulates well operation to minimize downhole equipment wear from high-impact dry-hole or near dry-hole plunger trips.

The autocatcher assembly ensures that plunger trips are triggered only by indications from the controller. When the plunger arrives at surface during each cycle, the autocatcher assembly catches it, thereby reducing plunger wear and dry-trip potential. The assembly is operated with either its own instrumentation gas or the fuel gas used in opening and closing the main control valve.



WellPilot controllers automate plunger drops and catches while capturing and sending operating data to the field office.

Weatherford brings global expertise, comprehensive solutions, and an unparalleled depth of products for you to optimize your wells. For more information on the RapidFlo plunger system or any of our production optimizing solutions, contact us at **PO-Info@weatherford.com**.



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