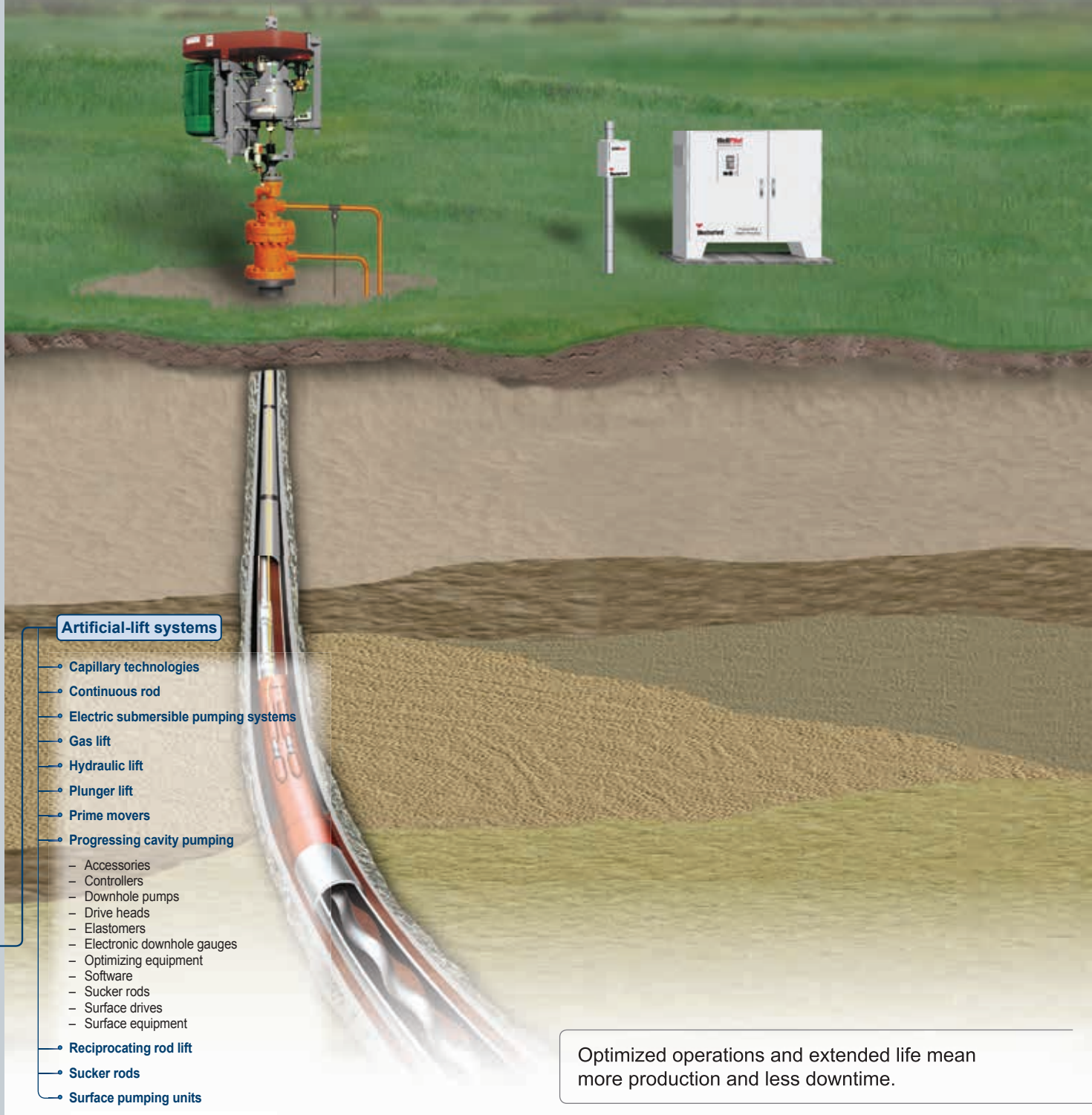




Weatherford®

Comprehensive PCP Solutions



Artificial-lift systems

- Capillary technologies
- Continuous rod
- Electric submersible pumping systems
- Gas lift
- Hydraulic lift
- Plunger lift
- Prime movers
- Progressing cavity pumping
 - Accessories
 - Controllers
 - Downhole pumps
 - Drive heads
 - Elastomers
 - Electronic downhole gauges
 - Optimizing equipment
 - Software
 - Sucker rods
 - Surface drives
 - Surface equipment
- Reciprocating rod lift
- Sucker rods
- Surface pumping units



Drilling



Evaluation



Completion



Production



Intervention

Optimized operations and extended life mean more production and less downtime.

Progressing cavity pumping systems

Drive heads

- Electric
- Hydraulic

Pumps

- Conventional
- Extreme conditions
- Insertable

Rods

- COROD® continuous rod
- High-torque rods
- API normalized sucker rods
- Ultrahigh-strength rods
- High-strength sucker rods
- Quenched and tempered rods
- Rod couplings
- Connectors

Power generation

- Gensets
- Hydraulic skids
- Engines
- Oilfield buildings

Accessories

- Stuffing boxes
- Gas separators
- Paddle rotors
- Tagbars
- Torque anchors

Services

- Elastomer selection with agitating autoclave
- LiftAdvisorSM well monitoring and analysis

Controllers

- WellPilot® variable speed drive (VSD)
- Downhole gauges

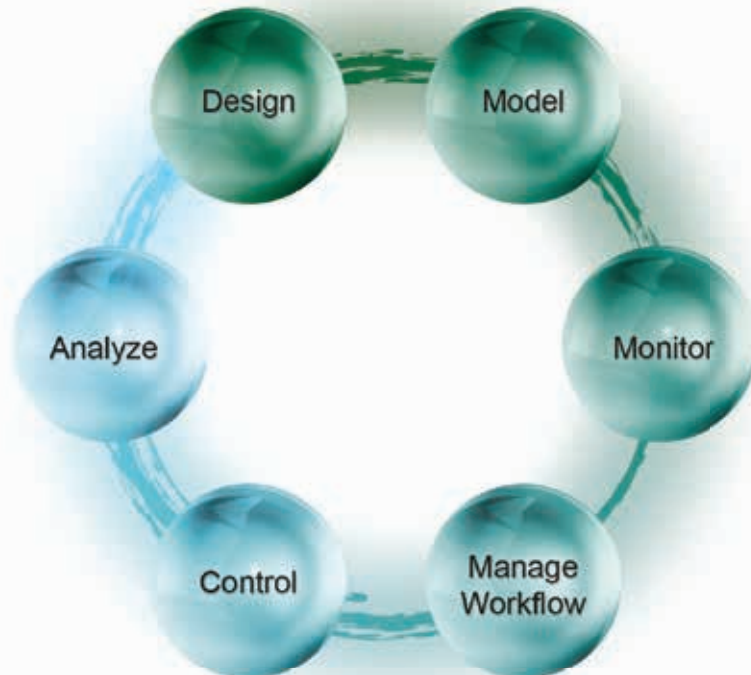
Software

- LOWIS™ software
 - Monitoring
 - Analysis
 - Trending
 - Workflow management
- WellFlo® software
 - Design
 - Nodal analysis

Weatherford's progressing cavity pumping (PCP) systems provide the broadest selection of pump-drive components, accessories and system configurations for a wide range of applications. Our fully integrated solutions include surface drive heads, power-generation systems, downhole pumps, rods, accessories, automation, optimization software and consulting services. These products and services address lifting applications, well conditions and challenging production scenarios.

We specialize in helping you evaluate your PCP system efficiency, diagnose problems and perform predictive analysis. Ultimately, our optimized lift systems empower you to realize the fullest potential of your wells.

Optimization Cycle



We provide solutions that correspond to each phase of the optimization cycle.

Why Weatherford?

As the industry leader in artificial lift, we have experience in all types of PCP applications, including heavy oil, light oil and coalbed methane (CBM). Our unrivaled applications expertise and global network of application experts provide you with the best system configurations and components to suit specific well characteristics and conditions.



Design Phase

The well optimization process begins with choosing the correct system design and proper components, including pumps, elastomers, drive heads, rods and accessories. We offer the widest variety of individual components for designing a PCP system. As the only worldwide source of products and services across all artificial-lift methods, we can evaluate your well reservoir and provide vital recommendations for the optimal lift form.

Selecting the right pump is critical, and we offer an unparalleled selection of geometries and configurations from which to choose. With such an extensive selection of rotors and stator shapes and sizes, you can find the ideal combination that suits your specific well characteristics and operating conditions.

Arrowhead® and Cloverleaf insertable pumps. We can help you reduce pump-change costs by making insertable PCPs (I-PCPs) more practical, while increasing the ability to flush sand and debris from the pump and pump intake without pulling the tubing. Our unique Flexisert™ I-PCP anchor allows you to install I-PCPs at any convenient place in the tubing string without installing a pump seating nipple (PSN).

Fat Boy™ PCP models. These models enable superior production by improving the movement of heavy oil and sand while enhancing the ability to pump large particles, such as pyrite or debris. The paddle rotor, combined with the slotted tagbar, generates a mixing action at the pump intake that helps maintain solids in suspension, enabling the rotor to handle large sand cuts without interrupting production.

Elastomer technology. One of our core competencies, elastomer technology features a comprehensive offering of standard and special-purpose product types. Special elastomers are available for heavy and sandy oils, high water cuts and explosive decompression resistance in gassy wells.

Agitating autoclave. Selecting the right material for each application is as important as offering a wide selection of products. Our agitating autoclave plays a key role in producing fluid-compatibility results quickly for optimal PCP elastomer selection and rotor sizing. Our international network of agitating autoclaves eliminates delays associated with shipping fluid samples to lab facilities abroad.

G-series direct-drive heads. Our G-series drive heads serve as a reliable, economic solution for a number of PCP applications including heavy to light oil, CBM and water-source wells. With an operational range of 5 to 300 HP, our G-series drive heads are built with a unique centrifugal wet-brake system that enables superior safety and protection, along with a quick and complete fluid dump, enabling you to resume production faster.

Applications

Our rugged PCP systems are well suited for a broad range of applications:

- Sand-laden heavy crude oil and bitumen
- High water cuts
- Various oil gravities with limits on hydrogen sulfide (H₂S), carbon dioxide (CO₂) and aromatics
- Dewatering gas wells, such as CBM projects
- Mature waterfloods



Our Arrowhead® insertable pumps increase the ability to flush sand and debris from the pump intake without having to pull the tubing.



Weatherford's agitating autoclave eliminates turnaround periods and logistical challenges associated with shipping volatile fluids.

Design Phase (continued)

Weatherford carries a broad selection of stuffing boxes, wellhead connections, electric and hydraulic motors, power generators and internal combustion engines.

DuraSeal™ series of rotating stuffing boxes. Improving the longevity of PCP drive heads, our *DuraSeal 300* stuffing box enhances and extends the performance of drive heads during highly abrasive applications, while the *DuraSeal 500* stuffing box bolsters the longevity of drive heads in wells with high water cuts. All *DuraSeal* stuffing boxes are compatible with hydraulic- and electrical-based systems.

We offer standard, high-strength and ultrahigh-strength rods to meet all your application requirements.

COROD® continuous rod. Our patented continuous rod strings feature a uniform body design, large annular space, and a lightweight string design enabling a reduction in maintenance and operational costs, while improving the overall efficiency of the artificial-lift system.

EL® sucker rods. Our uniquely engineered *EL* sucker rods greatly reduce the chances of developing fatigue cracks due to pre-stress compression applied at the surface.

Axelson® sucker rods. Manufactured with a quenched and tempered process, *Axelson* sucker rods offer greater fatigue resistance because of enhanced toughness, fine grain structure and high yield-to-tensile ratio.

Axelson is a registered trademark of Halliburton Energy Services, Inc. and is licensed to Weatherford.



Model Phase

WellFlo® software. Our field-proven engineering software helps engineers analyze, optimize and troubleshoot the performance of PCP systems. *WellFlo* software also aids engineers when designing the lift system and in performing well and system analyses. The program uses nodal analysis techniques to model reservoir inflow and well outflow performance for PCPs and to define the operating range based on the equipment configured.

WellFlo software uses pump-performance curves in its analysis to determine the operating parameters, including a special feature that enables calibration of the performance curve (flow and torque) based on actual measured data.



WellFlo software's nodal analysis technology enable downhole equipment and well performance to be analyzed and optimized more efficiently.

Monitor Phase

LiftAdvisor™ service. This service puts your wells on the Internet via our secure network and places the expertise of our field analysts at your keyboard. The service supplies you with Web-based well status, detailed reports and an experienced analyst's evaluation with recommendations for well-operation improvements. With *LiftAdvisor* service, you get concise daily and monthly well reporting in addition to field-proven analyses.

Downhole sensors. Manufactured according to the highest quality standards to ensure stability and longevity, Weatherford sensors provide reliable pressure and temperature readings in harsh downhole environments. The sensors are built with compact designs to fit most applications, including slim holes, and they are used with controllers and variable speed drives (VSDs) to provide more accurate control of the well, based on changing downhole conditions. We offer a range of sensors for multipoint and vibration sensing.



LOWIS™ software collects real-time pressure information from permanent downhole sensors, enabling you to remotely identify the difference between a hole in the tubing or a worn pump and, with a few calculations, identify the location of the tubing hole. Changes can be compared over time to identify trends, providing a method to predict potential problems and take proactive action to avoid expensive repairs.



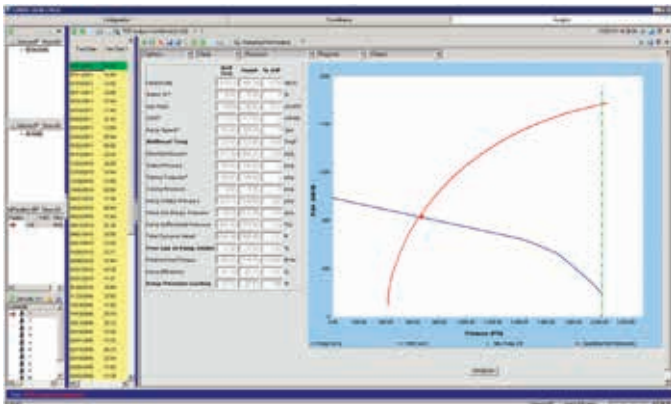
Weatherford's WellPilot® VSD flow control system offers a cost-effective method of protecting the pump from burning out while maximizing production.

Manage-Workflow Phase

LOWIS™ software. Our award-winning software provides you with the ability to optimize PCP systems by accurately monitoring specific parameters for analyzing artificially lifted wells. The software standardizes workflows by communally tracking tasks with a common interface, and the platform can be used across multiple asset types. With seamless tool integration and legacy supervisory-control-and-data-acquisition (SCADA) systems, prior investments can easily be incorporated into the new systems. *LOWIS* software is part of our comprehensive Field Office™ suite of production software.

Control Phase

Flow-sensor technology. Flow-sensor technology optimizes production by operating a well at the proper speed to ensure enough fluid is available to justify extraction and to protect against flow loss at the pump. This technology is available in a surface-mount standalone unit or as an integrated component in the *WellPilot* VSD controller, which constantly monitors the rod-string torque and automatically adjusts power output to ensure that the system does not exceed user-set limits. The technology automates decisions to safely handle accumulations of solids in the produced fluids, sudden water slugs and other short-term conditions where the operator does not want the well to shut down. This technology limits startup current as well as stress on mechanical parts and reschedules chemical treatments to reduce operating costs.



AWB operating point.

Analyze Phase

Analysis Workbench™ (AWB) for PCP. Take analysis and desktop intelligence to the next level with AWB. This application couples real-time monitoring and alarming capabilities coupled with integrated analytical and reporting tools to achieve optimal well and equipment performance. AWB software enables engineers to optimize wells using real-time data integrated with an engineered model for rapid identification of potential problems and preemptive action.

The data logger stores short-term data and the remote software provides analytical displays, so you are continuously aware of temporary system changes. Comparing trends over time helps predict potential problems, reducing risks.



Special Applications

Heavy oil

We offer a full lineup of pumps, materials and accessories for enhancing performance in heavy oil. Our Fat Boy™ PCPs require less head pressure to fill the pump-intake cavity and are far more effective than conventional geometries for wells with low bottom pressure. When combined with our soft elastomers, the wear performance improves significantly in heavy-oil, sand-laden applications.

Charge/recirculating pumps keep wellbore fluids consistent in problematic wells that slug sand, water or gas by mixing fluid before it enters the production pump. Our insertable Arrowhead® pumps offer all of the advantages of conventional systems, but, with the complete pump run on the rod string, you have the ability to clean sand and debris from the pump and replace the pump assembly without having to pull the tubing.

Overcoming aggressive light-oil characteristics

We provide a comprehensive offering of medium and high nitriles and saturated nitriles (HNBR), which all work to address demanding fluid-compatibility challenges. Also, our Hi-Per™ elastomer is designed to enhance the performance of PCPs in wells with high levels of aromatic fluids and gases (CO₂ and others). In lab and field tests, the *Hi-Per* elastomer has proven highly resistant to aromatics and gases, displaying considerably less swelling than medium nitriles and conventional high nitriles. It also dramatically reduces blistering during explosive-decompression conditions in high-gas environments.

Coalbed methane dewatering

PCP systems require careful selection of rotor/stator interference, specialized elastomers and bonding systems to address the harsh conditions inherent in these aggressive environments. CBM solutions such as our low-swell elastomers are well suited for handling the requirements of aggressive CBM wells. This method overcomes problems such as the stick-slip condition produced by the poor lubricating properties of water. The WellPilot® VSD flow-control system offers a cost-effective method of protecting the pump from burnout while maximizing production.





Comprehensive PCP Solutions

Optimized operations and extended life mean more production and less downtime.

For more information on Weatherford's comprehensive progressing cavity pumping solutions, visit us online at weatherford.com/pcp or e-mail our technical experts at als.pcp@weatherford.com.



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