



# Weatherford®

## REAL RESULTS

### Reciprocating-Rod Lift System Selected in a Coal Bed Methane Project for Dewatering Process Increases Average Time to Failure

#### Objectives

- Provide an alternative solution to producing coal bed methane (CBM) in a Colombian field plagued with excessive solids, high gas-to-liquid ratios (GLR), low production rates (less than 600 BFPD, 96 m<sup>3</sup>/d), and energy blackouts.
- Previous attempts using electrical submersible pumping (ESP) systems proved unsuccessful. The pumps were frequently stuck and had a run life of lower than 30 days due to the adverse conditions in the field.
- In an effort to combat the excessive solids in the fields, new wells were completed using progressing cavity pumping (PCP) systems. Once again, adverse conditions in the field created an unfavorable condition for elastomers used, producing swelling and explosive decompression of elastomers from gas action inside the pump. This condition affected the run life of the PCP, in most cases making run life fairly low.

#### Results

- Weatherford completed a detailed analysis of the field and designed a reciprocating-rod lift (RRL) system as an alternative solution, based on the field conditions.
- The RRL system's surface equipment started with a Variable Speed Hydraulic Unit (VSH2), selected for its ability to adapt in continuously changing well conditions such as low liquid level, high GLR, and production changes, allowing the equipment to maintain high system efficiencies. Continuous monitoring of well conditions was achieved through the addition of Weatherford's WellPilot® rod pump controller (RPC). In some wells, rod rotators were included to handle high rod wear that was observed and caused by poor lubrication between rods and tubing.
- The subsurface equipment for the RRL systems included Weatherford's EL® high-strength rods, selected to meet the relationship between production and depth based on the maximum tubing size allowable to run in the wells.

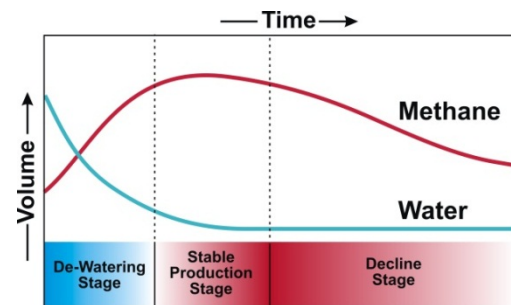


Chart illustrating the dewatering life cycle.

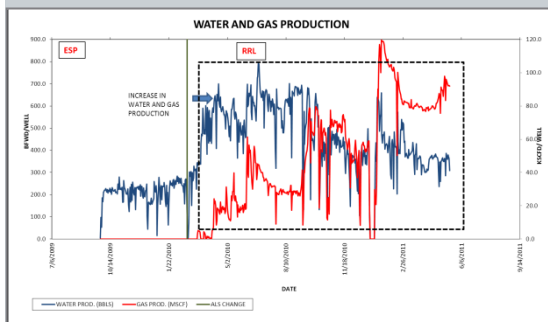


Chart indicating an increase in gas and water production after installing the RRL system.

**Location**  
Colombia

**Well Type**  
Onshore coal bed methane

**Casing Size**  
5 1/2-in.

**Tubing Size**  
2 7/8-in., external upset ends (EUE)

#### Products/Services

- Hydra-pneumatic VSH2 units
- WellPilot RPC
- EL high-strength rods



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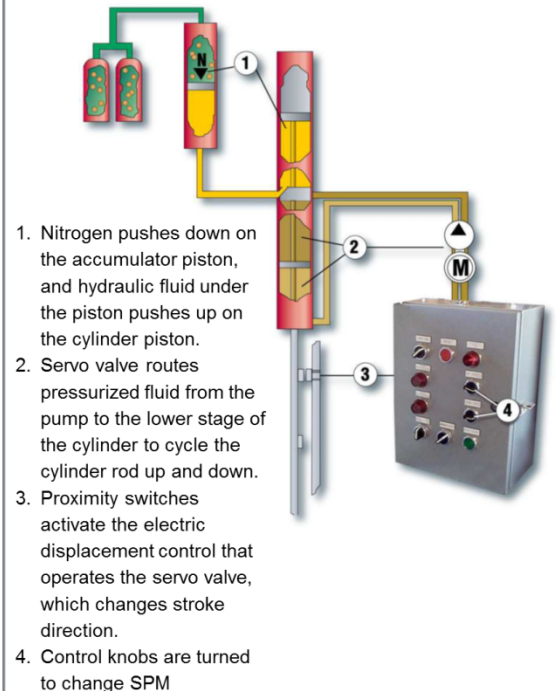
### Results (continued)

- When designing the pump, Weatherford considered solids and low production volumes as important values to improve the system life. An oversize pump design was selected to ensure high fluid velocity to improve the flow characteristics of the system for extracting solids. Wear by solids was handled with a pressure-actuated plunger using Zytel® 20% fiberglass rings, providing good performance against abrasive wear and poor lubrication inside the pump. A two-stage pump design was included to improve the system's capability to handle unexpected shutdowns.
- The project started in February 2010. Currently, 11 RRL systems have been installed, and almost all the systems are currently running without failures. The last measurements confirmed 221 days of average time to failure.

### Value to Client

- The installation of Weatherford's RRL systems eliminated almost all failures of artificial-lift equipment and increased the average time to failure almost tenfold.
- The RRL system allowed the client to obtain a real evaluation of gas reserves, which was used to obtain continuous and stabilized production from the wells to reach the complete gas irruption.
- The high efficiency associated with the RRL systems translated into lower energy cost, especially when energy consumption was auto-generated.
- Based on the systems' success, the client was able to continue the project and has planned to develop all their CBM fields to use the RRL systems.

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Operational sequence of the VSH2 system.

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