First Successful ALS Application in Borate Mining

Proves System Reliability, Boosts Production, and Enhances Efficiency within Highly Corrosive Well

Objectives

- Produce borate and boric acid from an adapted mining well using hydrochloric acid (HCl) injected through a nearby surface well.
- The modified lift system required a production rate from 400 to 1,000 bpd of solution. Additional needs included improved lift methods that could reliably withstand the corrosive conditions of boric acid as well as the bottomhole temperatures—all with better solids-handling over previous air-injection methods.

Our Approach

- Weatherford designed an artificial lift solution (ALS) that included a specially adapted, insertable progressing cavity pump (I-PCP) system—recommended for its solids handling, fluid viscosity, and high bottomhole-pressure capabilities. These were all critical factors in developing an optimal system.
- Existing ALS components were adapted and enhanced using advanced materials and engineering to ensure the I-PCP's durability and performance within such a highly corrosive, downhole environment.
- The custom system also included a permanent-magnet motor for PCP (PMM-PCP) with embedded rare-earth materials and high-torsion capability that produces a continuous 0.99 power factor and fewer CO_2 emissions.

Value to Customer

- The successful I-PCP installation (December 2023 with stable well operation beginning January 2024) achieved desired production without high-torque alarms and zero rod disconnections—proving the modified ALS technology for mining applications.
- Production efficiency was increased through the I-PCP abrasion-resistant-rotor/elastomer-stator combination.
- Operational costs and downtime were reduced by eliminating the need for frequent, labor-intensive tubing pulls.
- Viability of the project proved that adapting oil and gas ALS technology was safe and effective for borate-production enhancements and overall efficiency in solution mining.

Ready for borate production, the modified I-PCP with PMM is installed at the 5E Advanced Materials location in Newberry Springs, California.

CLIENT
5E Advanced Materials

LOCATION
Newberry Springs, California

WELL TYPE
Borate-solution production well

FORMATION
Colemanite Layer

CASING SIZE AND TYPE
7 x 3-1/2 in. (177.8 x 88.9 mm)
fiber-reinforced plastic (FRP) tubing

TEMPERATURE
Bottomhole temperature 122°F (50°C)

DEPTH
1,300 ft (400 m)

FLOW RATE
1,000 bpd (158 m^3/d)

PRODUCTS/SERVICES
- New Energy Solutions
- Artificial Lift Solutions
- Insertable Progressing Cavity Pump
- Permanent Magnet Motor for PCP

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