

Case study: Canada

CENTigrade ESP system designed for SAGD infill wells delivered record run time, saved \$750,000 USD

A major steam-assisted gravity drainage (SAGD) customer in Canada wanted to use electrical submersible pump (ESP) systems in infill wells with 7-in. casing and bottomhole temperatures up to 428°F (220°C).

Infill wells are drilled in SAGD fields between existing well pairs in order to maximize recovery from the reservoir.

Even though their temperatures are not as high as SAGD wells, infill wells are still hot enough to challenge ESP systems with conventional temperature ratings.

In the past, conventional ESP systems had operated for only a few months before failing. The operator had targeted run times over one year for these applications to justify these type wells.

The standard 500 series **CENTigrade™ elevated temperature production system** is too large to fit into 7-in. wells and the conventional 400 series ESP systems were not robust enough to handle the high-temperature environments.

Baker Hughes artificial lift experts developed an ESP system to handle temperatures up to 446°F (230°C). Its features include:

- The **CENTigrade 450XPV high-temperature motor** powering Baker Hughes compression pumps with high-temperature carbides
- High-temperature 400XPV seals with three metal bellows
- XPV motor lead extensions

High temperatures, along with steam, gas, abrasives, and low sub cool push the ESP systems to the limit.

Separating gas using gas separators is not very effective in highly deviated wells and another solution was needed. Baker Hughes used the keyhole gas avoider to avoid the gas at the top of the casing and allow access to the wellbore fluid at the bottom into the pump.

The 400 series CENTigrade ESP systems proved to be a success with a total of 44 installs. The longest run achieved to date is 1,189 days and 56% of the systems exceed the one-year run time target.

Challenges

- Increase ESP system run lives in wells with bottomhole temperatures reaching 428°F (220°C)
- Determine different solution because the 7-in. casing with instrumentation in wellbore would not accommodate the typical 500 series CENTigrade ESP system

Results

- Developed a 400 series motor and ESP system rated to bottomhole temperatures up to 446°F (230°C)
- Successfully installed 44 units, exceeding the customer's run time target
- Reduced costs due to less frequent pulls and installs, and increased production uptime, saving the customer approximately \$750,000 USD to date