

PLUG & ABANDONMENT OF HPHT WELLS CASE STUDY

Geodynamics - Geothermal Wells

Cooper Basin, Australia

AWT DISCIPLINES

Engineering Design

Well Abandonment

Operational Supervision



PROJECT BACKGROUND

While conventional geothermal power generation uses volcanic geology, Geodynamics examined the newer technology Enhanced Geothermal Systems (EGS).

This technology does not rely on volcanic systems but uses hot basement granite rocks to generate electricity. Hot granite rocks in South Australia's Cooper Basin reach temperatures in excess of 280 °C.

This geothermal energy resource is accessed by drilling wells 4-5 km deep into the granite rock and pumping water at high pressure into the rock to open up its naturally occurring fracture systems. Water is then circulated down injection wells into the hot rocks, through the granite and back up the production wells.

The energy in the hot geothermal brine produced at the surface was used to drive a steam turbine and produced electricity. This project was the first demonstration of EGS geothermal electricity generation in Australia. The 1 MWe Habanero pilot plant operated for 160 days in 2013 and prior to closure of the trial, the plant was operating at 19kg/s and 215 °C production well head temperature.

At the completion of the trial project, 7 wells were plugged and abandoned as part of the decommissioning and site rehabilitation works.

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AWT WORKSCOPE

AWT provided well site supervision and field engineering support throughout the three well abandonment campaigns for Celsius 1, Jolokia 1, Savina 1, Habanero 1 and Habanero 2, Habanero 3 and Habanero 4. Throughout each activity, regular Pre-Job Safety Meetings and Health Safety and Environment briefings were conducted. Supervision activities included rig up/downs, wireline intervention, fishing, tubular retrieval and cementing activities. Engineering services included well abandonment program review, risk assessment and mitigation, engineering calculations (cementing, mud compressibility and thermal fluid expansion), well control readiness and end of well reports.

THE CHALLENGES

The operational challenges included the use of heavy weighted (18.1 ppg) drill mud with elevated wellbore temperatures (flow-line temperature ~92°C), and barite sag. As a result of high surface temperatures and pressures, frequent rig equipment failures further compounded the challenge. Due to the weighted drill mud and high temperatures, specially formulated cement plugs and tuned spacers were used in order to form an adequate and effective well barrier.

AWT ADDED VALUE

In each well, excess tubing and casing was removed and replaced with approved cement plug barriers that satisfied the South Australian - Department of State Development authorities.

The well abandonment program was completed with no incident or accidents; run to schedule and close to the original budget.

