Drilling Services

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AP, Thailand, HeatWave℠

New HeatWave℠ Extreme Service Makes World Debut

Weatherford and Chevron team up to break temperature barriers in the Gulf of Thailand

Weatherford team members involved in the development and execution of the HeatWave Extreme joint project with Chevron Thailand

The latest innovation in Weatherford high temperature logging-while-drilling (LWD) services made its debut last January in Thailand with the newly-developed HeatWave Extreme (HEX)—an ultra-high temperature tool string operating up to 392˚F (200˚C) for up to 200 hours and survivability up to 410˚F (210˚C) for a maximum of four hours.

Component development and field testing for the new service began in May 2014 as a 10-month, joint venture with Chevron Thailand for an ongoing drilling operation beginning with four offshore gas wells in the Gulf of Thailand. The 4 ¾-in. modified tool string—including a gamma ray (HEX GAM), neutron porosity (HEX NEU), bore and annular pressure (HEX BAP), and directional services (HEX IDS)—recently drilled the third well of the project in a single run, reaching a measured depth (MD) of 15,878 ft (4,840 m) at 365˚F (185˚C).

HeatWave Extreme is expected to reduce drill times in the field by as many as 24 hours from the current average of just over five days by allowing drillers to maneuver the wellbore when temperatures exceed 347˚F (175˚C), rather than pulling out of the hole, re-entering, and drilling blind to MD said Jeff Percival, global strategic projects manager for Weatherford.

“It will increase our market share in Thailand, as well as bring us into other oil and gas plays throughout the world where there are extreme temperature challenges,” Percival said. “Once these tools are fully proven, we’ll be able to market them globally as the only solution for high temperature environments up to 392˚F (200˚C).”

The HeatWave Extreme sensors were tested to higher environmental standards than any existing LWD system to date. High-temperature ovens, vibration tables, flow loop, pressure vessels, test fixtures with air hammers, and a horizontal drilling machine were some of the equipment used during the qualification process to ensure that the specifications were met.

The largest obstacle was redesigning 11 printed circuit boards to withstand the extreme heat and vibration profile. The boards were subjected to aggressive air hammer testing to expose any workmanship errors, uncover any subtle flaws in the layout, and to optimize the application of staking materials that fasten the components to the boards. Following their thermal qualification testing, the boards were attached to their respective sensors at the insert- or sonde-based assembly level for vibration testing for four hours in each of three axes at 20g.

In addition to being the first Weatherford project of its kind with a client like Chevron, the HeatWave Extreme breakthrough was a result of the collaboration of several Weatherford departments. The Research and Development team redesigned, built, and tested the new tools throughout the process and were pivotal to making the new system model a reality. Global Business Unit team members coordinated the project in the US and Thailand providing logistics, training for field personnel, and technical support to ensure software compatibility with the new tools. The Thailand Operations team trained in Houston and took the lead on assembling the new components overseas for rig deployment.

In addition to many others who contributed to the project, special thanks go to:

Research and Development

Medhat Mickael, Vice President for R&D and Engineering
Chris Yarbrough, Electrical Engineering Manager and his team
Lance Pate, Mechanical Engineering Manager and his team

Global Business Unit

Jeff Percival, Global Project Manager
Blubin Idukkala, Global Product Maintenance Manager and his team

Thailand Operations

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John Smith, R&M Manager Thailand and his team
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MENA, Saudi Arabia, Revolution®, SpectralWave®, CrossWave®

Weatherford Revolution® RSS along with Penta-Combo LWD including SpectralWave® and CrossWave® save client $100,000's in rig operating costs by eliminating TLC wireline run and improve well delivery time by 7 days.

Weatherford Drilling Services was called on to drill the 5 7/8" section of TINT-45 mainly in an effort to avoid TLC logging operations by delivery Spectral Gamma Ray in LWD. The use of Weatherford Penta-Combo LWD with CrossWave® Sonic and SpectralWave® LWD eliminated the need to run multiple TLC logging operations in order to evaluate the reservoir. Not only did Weatherford Drilling Services eliminate the need for TLC logging operation with multiple reaming runs but we also drilled the 5 7/8" horizontal section with faster ROP than offset wells in the field drilled by competitors which utilized RSS with only MWD/GR.

The combination of faster ROP to drill the horizontal section and eliminating the TLC logging operation resulted in over 7 days of rig time being saved which drastically improved well delivery time and saved the client over $350,000 in associated rig operating costs.