

Gulf of Thailand drilling/completion both high tech and high volume, with HSE as core value

By Mike Killalea, Editor & Publisher

DRILLING IN THE Gulf of Thailand (GOT) is not only high-volume work, but presents considerable technical drilling-and-completion challenges. **Chevron**, the major operator in the GOT, drills some 40% of its global footage there – that's right, 40%. In 2007, that constituted 3.7 million ft and 310 wells, and the previous year, 4.4 million ft. Chevron's preeminence in the region more than doubled following the 2005 merger with **Unocal**.

Chevron's drilling program will extend through the next decade and beyond, explained **Mike Haas**, drilling & completions manager for the Asia South Business Unit, **Chevron Thailand Exploration and Production Ltd.**

"It's good for us because it allows us to contract long term," he said, "and it gives us the opportunity to work with long-term drilling contractors and service providers to ensure we're all on the same page."

The safety of the workforce is our most important consideration each and every day.

—Mike Haas, drilling & completions manager, Asia South Business Unit, Chevron Thailand E&P

SAFETY FIRST

Safety is a central concern for Chevron. "The safety of the workforce is our most important consideration each and every day," Mr Haas said. He observed that safety has improved this year compared with 2007.

In 2007, the operator actually experienced more issues in completions than in drilling. One barge-supported hydraulic workover unit, for instance, had a number of safety problems last year. "It was many little things," Mr Haas said. "It wasn't a single event. It was a pinched



Chevron's activity in the Gulf of Thailand will extend through the next decade. The northern sector comprises oil plays, while the south is primarily gas. In 2008, Chevron's operations will require 8-9 rigs. One such is Transocean's GSF Key Gibraltar (above).

finger here, a scraped knee there. But they all get the same rigorous attention as if they were a major incident. Small incidents have the potential to be major so we must learn from them all."

Chevron focused on the teamwork on that barge, which has since operated almost one year without a recordable incident. In addition, all of the currently active drilling rigs operating for

Chevron in the GOT have worked without a lost-time incident (LTI) in 2008. **Halliburton's Sperry Drilling Services** also reports that it has operated in the GOT for 7 years without a lost-time incident. Similarly, **Atwood Oceanics'** Vicksburg rig recently celebrated seven years without an LTI.



The highly faulted GOT subsurface demands complex 3D directional wells, typically batch drilled, some as deep as 17,000 ft. Above is Transocean's GSF Compact Driller.



Chevron says it puts safety foremost in its Gulf of Thailand operations. Recently, Atwood Oceanic's Vicksburg (above) celebrated 7 years without a lost-time incident.

MANY SMALL STRAWS

The northern portion of the gulf comprises oil plays while in the south the fields produce gas. Throughout the GOT the subsurface can be characterized as highly faulted with stacked sands and small reservoirs.

"It takes a lot of straws – a lot of wells," Mr Haas said. "We drill for both gas and oil. Because the faults are small, the plays are small, and you have to get really efficient at drilling them."

This year, Mr Haas explained that Chevron's operations would employ 8-9 rigs from various contractors, including Atwood Oceanics, **Seadrill**, **Premium Drilling** and **Transocean**.

Chevron's complex 3D directional wells are typically drilled in batch fashion. A rig might drill surface hole on each of a set of 10 or more wells, run conductor pipe, and repeat that on the intermediate hole sections before drilling each well to TD. Wells are typically 11,000 ft-14,000 ft, although Chevron has recently drilled some below 17,000 ft. Anti-collision is a major concern for the directional drillers, particularly in the top-hole sections, as a result of the batch process and numerous infill projects, according to a spokesman from Halliburton, whose Sperry subsidiary is the directional drilling company used in the GOT.

Each well takes about 5-6 days to drill, log and run tubing. Because they are drilled as slimhole monobore completions with tubing cemented into place, the well volume is high. To date, more than 3,000 development wells have been drilled from more than 150 offshore platforms.

"The way you work on these wells is with small wireline tools," Mr Haas said. "We manage all of that within the sizable completions group, including a large slickline organization. That's why this group is a little bit different than the typical D&C organization."

The slimhole strategy helps manage costs. "Reserves per well are small," he pointed out. "We can't afford to drill expensive wells here. The way you get efficient is to drill smaller wellbores and use a lot of innovation to draw the cost down."

Typically, wells are spudded at 12 ¼ in., followed by 8 ½ in., then 6-in. hole to TD. PDC bits and synthetic drilling fluids are required. Technology has enabled wells that 20 years ago were drilled in 30 days-plus to now be finished in less than 6 days. This has been achieved by using industry-available technology and developing some techniques locally.

“We can afford to spend some effort and money to develop techniques to save a few hours per well when you drill more than 300 per year,” Mr Haas said. For example, wells are cemented and now logged off the critical path out of the way under the rig floor. But other technologies have been tried but not adopted.

In addition to the complex directionality, the reservoirs are very hot – 350°F-400°F. As a result, Chevron has had little success with rotary steerable systems and instead use conventional downhole motors and rotary assemblies with adjustable gauge stabilizers for directional control. Sperry employs its Solar Suite of Measurement and Logging While Drilling sensors, along with its AGS Adjustable Gauge Stabilizer for direction work. Sperry says the AGS allows directional control at temperatures to nearly 400°F, the temperature of these very hot reservoirs. The Solar suite allows the flexibility to obtain only directional measurements up to a complete replacement for triple-combo wireline.

“We tried (rotary steerable systems) a number of times, with limited success,” Mr Haas said. “We had some success

and some failures, but even in our trials we were cherry-picking the wells – nothing too hot, nothing too deep.

“You drill as many wells in 2 years here as you drill in 10 years somewhere else.”

—Mike Haas, Chevron
Thailand

He added that the technology is not advanced enough to handle the combination of small holes and high temperature. Further, the high temperatures reduce cycles to failure on downhole equipment. Sperry says it has implemented specific processes to help manage these temperature effects to minimize NPT. In addition to the high temperatures, the typical GOT horizontal well is characterized by extreme geometry, creating high torque and drag, according to Sperry.

Chevron has achieved a number of drilling milestones in Thailand, and drilling challenges become increasingly complex.

“A lot of the easier wells, as you’d expect, have been drilled,” Mr Haas remarked. “As time goes on, the wells are getting more complex. Average well depths have increased year on year to reach deeper and further from platforms, which has challenged slimhole monobore drilling techniques. As the wells get deeper and hotter, it challenges all of our service providers to provide reliable tools and services to handle the extremes.”

PEOPLE

“We have a very diverse organization with engineers from many different countries supporting us,” Mr Haas said. “This is a big group, but we’re trying to bring on the right people, see they get the right training, and see that they are motivated and challenged.”

Chevron’s Thailand D&C division includes about 180 employees, in addition to contractors.

He said that the GOT is an excellent training ground. “You drill as many wells in 2 years here as you drill in 10 years somewhere else.”

High volume, high challenge – and all with a Thai smile! ☠