



SPE 115375

Continual Advancement of Casing-While-Drilling Technology

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This paper was prepared for presentation at the 2008 SPE Annual Technical Conference and Exhibition held in Denver, Colorado, USA, 21–24 September 2008.

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Abstract

A world record was created when drilling the longest and deepest 13 3/8-in. casing with drill shoe on one of Talisman Malaysia's offshore wells during March 2007. Meticulous planning and job execution for this casing-while-drilling operation were also essential in achieving this significant milestone.

The goals when using casing drilling technology include the reduction of "flat" time (such as nonproductive time [NPT] and time for reaming and wiper trips) and the resolution of potential problems to achieve overall savings in well construction costs. Drilling with casing (*DwC*[™]) technology uses the casing string as the drill string, drilling down the hole with a drillable bit. The bit is left in the hole after reaching the targeted depth. The cementing process can take place without tripping out the assembly. Eliminating the casing installation process helps reduce flat time and saves significant rig costs, especially important for operators when they consider the high daily costs associated with offshore rigs.

DS 2 drill shoe is the cement-in-place casing drilling bit which is drillable by all other bit types. It is specially designed for drilling a soft formation with confined compressive strength lower than 7,000 psi. The success of Talisman Malaysia's record-breaking offshore project opened up a new frontier for the DS 2 drill shoe's capabilities when combined with *DwC* technology.

This paper will briefly examine and visually display the planning and implementation process, as well as the results of the longest and deepest 13 3/8-in. casing drilling well in the world to date.

Introduction

Although drilling-while-casing has a century old history, this technology was not widely used because of various limitations. However, significant developments in the technology have increased operators' interest in recent years. Apart from hazard mitigations, one of the key factors that attract operators to drilling with casing (*DwC*) is its capability to eliminate the casing running process in conventional drilling operations. *DwC* allows the cementing process to begin immediately after the DS 2 drill shoe reaches targeted depth. The single operation removes nonproductive time (NPT) from the drilling curve, increasing drilling efficiency. Reducing time for drilling operations also can bring significant cost savings, especially for offshore rigs.

Talisman's PM-314 block is located offshore West Malaysia. (See **Fig. 1**) Talisman planned to drill an exploration well, Naga Besar-1, in this field. The operator was examining new technologies in order to reduce drilling cost per foot. Since *DwC* has been successfully implemented in the adjacent block PM-323, the technology attracted serious consideration during the planning phase of Naga Besar-1.

DwC technology utilizes a non-retrievable drill bit, DS 2 drill shoe. This assembly is attached to the bottom of the casing string and remains downhole after reaching targeted depth. The drilling, running casing, and cementing are completed in a single operation. The distinct advantage of the DS 2 drill shoe is that it is drillable by any roller cone and all PDC bits. The drillable core structure of the DS 2 drill shoe is constructed with drillable material that features aluminum blades set with thermally stable polycrystalline (TSP) diamond disks in the leading face that serve as the primary cutting structure. To prevent severe damage to drillout bits, the drillable core of the DS 2 drill shoe cannot be constructed with a more durable material; inherently limiting its capability when drilling medium-to-hard formations. Hence, the DS 2 drill shoe is typically limited to drilling a soft formation with confined compressive strength up to 7,000 psi.

For Naga Besar 1, the 13-3/8-in. casing was planned to set at 908 m target depth. The well distance of 720 m to be drilled by Talisman for the Naga Besar-1 was thought to exceed the DS 2 drill shoe's capability; therefore, a detailed analysis on the formation lithology, as well as meticulous planning needed to be carried out in order to ensure that the DS 2 drill shoe had sufficient bit life to succeed during the project.