

Increasing Drilling Efficiencies in the North Sea

Cubility's MudCube is the industry's first enclosed solids control system that eliminates the traditional process of shaking fluid and solids (photos: Cubility)

It's no secret that the quality of drilling fluids, drilling waste volumes and HSE represent major cost and efficiency issues in today's North Sea drilling environment and are particularly important with the current low oil prices.

BY TORE GRELLAND

Many North Sea operators, for example, are using the downturn to tackle historic issues the region has faced, including high operating and drilling costs, with industry analysts Wood Mackenzie, predicting that drilling costs will come down by a third by 2016.

While much of this decline will be seen in a reduction in rig and vessel rates due to oversupply, one other area that is being addressed is that of solids control and increasing the efficiencies of drilling fluids.

The Importance of Solid Control

Despite the vital role drilling fluids play in drilling operations today – cooling and lubricating drill bits, carrying drill cuttings to the surface, controlling pressure at the bottom of the well, and ensuring formation retention to name but a few – the solids control technologies that guarantee their effectiveness have too often lay rooted in the past.

For many years, the first line of defence in the maintaining of drilling fluids and the separation of rock particles in drilling operations was that of shale shakers. Through vibration and high G-forces, solids were filtered out for overboard discharge or for treatment on the rig or onshore and the cleaned mud was then incorporated back into the active fluid system and reused to drill the well.

Yet, such shale shakers come with significant limitations...

Firstly, the high G-forces often break down the drilled solids into finer particles, reducing the ability to remove them and increasing the solids content (fines) in the drilling fluids. The result is a reduced amount of solids being removed, an increase in the solids content in the drilling fluid, and a decline in drilling fluid efficiency with a negative impact on penetration rates and Equivalent Circulating Density (ECD).

Secondly, vibrating type shale shakers often result in high volumes of mud being lost with large amounts of drilling waste generated and less mud able to be reused within the system.

This has both an environmental and cost downside. With the cost of an average oil-based mud used on the Norwegian Continental Shelf USD 1,300 per m³ and the treatment and disposal of drilling waste conservatively estimated to cost USD 1,580 to 1,750 per tonne, it's clear that as much mud needs to be saved and re-used as possible.

Finally, shale shakers are often synonymous with a poor working environment with personnel exposed to high noise levels and vibrations as well as the emission of oil and other vapours.

An Alternative Approach

It's clear that an alternative approach to shale shakers is required – one that leads to the efficient separation of drilled rock

particles from the fluids to optimise drilling fluid and drilling performance, maintain drilling fluid parameters, reduce the volume of mud lost, minimise the total tonnage of drilling waste generated, and improve HSE. Leading the way is Cubility.

Cubility AS is a Sandnes-based, Norwegian company that is looking to irreversibly change drilling operations and the waste and solids control issues that accompany them.

This is being achieved through the MudCube. The MudCube is the industry's first enclosed solids control system that eliminates the traditional process of shaking fluid and solids. It is an enclosed, vacuum-based filtration system that effectively removes solids from drilling fluids and has to date been adopted on a number of offshore rigs in the North Sea, Middle East, Far East and North and South America.

Rather than relying on high G-forces to separate mud and the drilled solids as is the case with shale shakers, with the MudCube drilling fluids are vacuumed through a rotating filter belt using high airflow to separate the cuttings from the fluid more effectively. The solids removal efficiency of the new system is often higher than 90%.

The cleaned drilling fluids are then returned to the active mud system and the drilled solids – carried forward on the filter belt – are discharged either directly overboard (if they meet environmental discharge regulations) or to a cuttings handling system.

The improved separation capabilities of the MudCube leads to better quality mud, fewer chemicals required to maintain its properties (one operator and mud company recently reported the reduced use of premix chemicals as bringing savings of as much as USD 270,000), more mud recycled back to the mud tanks to be reused for drilling, and less waste. The MudCube leads to substantially drier cuttings with mud on cuttings being reduced to less than 30% of drilled solids and oil on cuttings as low as 5 wt%.

The MudCube also results in improved drilling efficiencies with

stable mud properties and a decrease in Non Productive Time (NPT). Effective solid control also results in higher rates of penetration (ROP), reduced stuck pipe incidents, and wellbore stability.

Another benefit comes from the size of the MudCube – less heavy than traditional shakers and with just a single filter belt – thereby freeing up much-needed rig space and weight and improving the drilling rig's variable deck loads (VDL). It is estimated that a typical MudCube-system can save up to 25 tonnes on existing facilities and much more on new-builds.

With many North Sea platforms close to maximum space in terms of infrastructure and instrumentation, this is a significant benefit.

Finally, the remote, automated operations of the MudCube and its enclosed system with reduced vibration and noise levels and the elimination of oil vapour also brings considerable workplace benefits. At a time when HSE regulations are becoming increasingly stringent in the North Sea, this is of significant benefit to operators.

The Case of Maersk

To date, Cubility has secured contracts for the MudCube in the North Sea, Middle East, Far East and South America drilling sites

with customers including Maersk Drilling, Dong Energy, Statoil (where the MudCube was designated a proven technology in 2012), Saipem, Saudi Aramco and Talisman Energy. The company also recently opened offices in Houston and Kuala Lumpur to expand its global footprint.

In one such installation on the Maersk Giant rig – a jack-up drilling rig based in the North Sea – three MudCubes replaced four traditional shale shakers. Since the installation, the Maersk Giant has embarked on an ambitious drilling program in the North Sea with the MudCubes used in the drilling of thirteen wells to date.

Benefits to the operators – Talisman Energy Norge AS and DONG E&P Norge AS – include improved working conditions and no costly HVAC upgrades to the shaker room; improved drilling efficiencies with less drilling fluid being lost and more returned to the mud tanks for reuse; and the cuttings having a low mud content for easier and cheaper disposal. In one selected well, where only 27 tonnes (17 m³) of drilling fluid waste was generated, the estimated oil on cuttings was just 1 to 5% by weight.

The operator also confirmed a significant reduction in the oil mist/vapour and chemical exposure to personnel, the elimination of vibrations, and noise that was reduced to 74 dBA, well below the Norwegian petroleum industry's NORSOK standards of 83 dBA.

Bringing Drilling Efficiencies to Johan Sverdrup

Cubility has also recently signed a multimillion dollar deal on the Johan Sverdrup field, one of the most important industrial projects in Norway over the next 50 years.

Located 155 kilometres west of Stavanger, Johan Sverdrup is one of the five biggest oil fields on the

Norwegian Continental Shelf with expected resources of between 1.7 to 3 billion barrels of oil equivalent. Production start-up is scheduled for the end of end 2019 and will consist of four platforms on which the MudCubes will be based.

In this case, the MudCube will provide the operator Statoil with improved drilling efficiencies, lower mud consumption, reduced waste volumes and improved HSE and is testament to the long-term partnership and collaboration Cubility has enjoyed with Statoil.

Bringing Solids Control into the 21st Century

With the need to monitor the bottom line in North Sea operations and increase drilling efficiencies (not to mention the stringent environmental and HSE requirements), solids control and waste management technologies are a critical element of optimising performance.

Finally, operators have a modern-day solution they can turn to. ■



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