

OILFIELD TECHNOLOGY

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The logo for FMC Technologies, featuring the letters 'FMC' in a bold, red, sans-serif font, followed by the word 'Technologies' in a smaller, black, sans-serif font. The logo is set against a white rectangular background.

FMC Technologies

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Monitor. Maintain. Maximise. New technologies. New analytics. New vessel-based intervention capabilities. FMC Technologies brings them all together in an integrated package called Life-of-Field Services. Now, for the first time, it is possible to monitor 100% of the data produced by subsea systems, schedule repairs before equipment fails and reduce intervention costs by 40-50%. That means better information and better control to maximise a field's production.



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CHOOSING THE RIGHT CHEMICALS FOR UNCONVENTIONALS

The first US commercial oil well was drilled in 1859 in Titusville, Pennsylvania. The practice of drilling a vertical well with the intention of capitalising on fossil fuels as an energy source spread throughout the country as geologic areas were discovered. These areas, over time were developed to their potential, which necessitated a need to seek new fields in harder-to-reach locations and at deeper, more challenging depths, which encountered higher temperatures and extensive amounts of contaminants that the drilling fluid industry had to overcome.

Combine these changes with the introduction of the horizontal drilling technique in the late 1920s - early 1930s and these 'conventional' practices of drilling for oil and gas eventually were surpassed by more unconventional methods. These unconventional wells require 'fit to purpose' drilling fluid systems and methods of delivering them.

Drilling challenges in the oil bearing regions of the North Barnett Shale required advanced technology in regards to formation stabilisation and polyol applications formally reserved for offshore drilling were successfully applied. In addition, highly deviated wells in the Barnett Shale required the use of AES invert systems containing enhanced rheological modifiers for efficient cuttings removal.

The experience gained from these endeavours was used effectively in the Marcellus Shale where environmental guidelines mandated a diesel free invert. AES's ABS 40 System, a diesel free invert has been successfully utilised on hundreds of wells in Colorado, New Mexico, Ohio, Pennsylvania, Texas, West Virginia and Wyoming.

The company's existing infrastructure in South Texas required simultaneous expansion of additional drilling fluid facilities to service the Eagle Ford Shale locations. These facilities provide diesel based inverts, similar to the ones that provide service to the Bakken, DJ Basin and the Powder Basin in the Rocky Mountain areas.

Unconventional focus

The company has recently focused on the non-conventional shale drilling in Oklahoma, Kansas, Permian Basin, New Mexico and the Texas Panhandle. These are areas where extended reach horizontal and geometrically advanced projects are requiring advanced drilling fluid technologies. Previously these areas were accustomed to drilling vertical well bores with basic drilling fluid products. These technologically advanced drilling programmes have required not only an expansion in

facilities, but ongoing training of personnel in proper product applications, reclamation systems and environmental compliance.

Conventional long-term drilling fluid plants have been replaced with mobile plant technology as areas of client interest continue to change. Previous major focus areas such as the Haynesville and Barnett Shale have lost their lustre with the overabundance of natural gas and a depressed market price. This required the company to modify plant building processes, resulting in liquid mud facilities that are extremely mobile. These assets can quickly be transferred to areas with higher demand. This new approach to mud plant implementation has allowed client demands to be met in a matter of weeks, rather than months.

New formulations

By reformulating invert emulsifiers and by coupling synthesised emulsifiers and wetting agents, the reformulated inverts are more resilient to contamination. This has allowed for single package emulsifiers that simplify application and limit inventories on locations with limited space. Advancements in organophilic clay technology have been made to address the balance of efficient cuttings removal in high angle well bores while minimising ECD values to reduce downhole seepage losses associated with invert utilisation.

These advancements have led to the specific development of specialised polymeric and modified amine treated clays for the enhancement of 3 and 6 RPM readings. These specialised polymers provide the desired shear thinning nature of the fluid when pumps are applied. The advancement of invert technology has been continued with the introduction of EnerReach to the drilling industry. EnerReach was developed as a minimal clay invert fluid system, which offers enhanced rheological properties and inhibition control with improved flow characteristics providing lubricity and shear thinning while maintaining minimal ECD for seepage control in extended small bore horizontals. It has the versatility of being compatible with all industry base components, while meeting environmental compliance as deemed by area land management associations.

Loss circulation materials have also been modified to meet the challenge of formation sealing while remaining compatible with the restrictions of downhole tools such as mud motors and MWD tools. The development of the PERMASEAL, MICROSEAL and SILVERSEAL product lines, base their success on being single package products with specific

Richard Lanthier, AES Drilling Fluids, USA, details some of the latest drilling fluid developments that are helping operators drill unconventional wells.





Figure 1. Bulk barite storage tanks in Pleasanton, Texas.



Figure 2. Invert oil base mixing plant in Benwood, West Virginia.



Figure 3. Bulk barite delivery truck in Pleasanton, Texas.

particle size distribution used for the sealing sandstone or fractures in shale drilling.

Lubricity in water based fluids has been addressed with the development of ENERLUBE, a new liquid lubricant technology that is currently outperforming the industry standard offerings, when combined with the AES GXM product line, which bases its success on the use of a specially formulated, type and grind of graphite materials. Pairing this family of lubricants with water base systems that are chemically engineered for specific geographic areas has allowed for the successful drilling of extended reach horizontals in environmentally sensitive areas where invert drilling fluids would have normally been utilised.

The company is also engaged in servicing the offshore shelf prospects, utilising a combination of existing technology with new developments. Combining newly developed polymer technology with existing low lime fluids has resulted in the successful drilling of highly reactive offshore clays. This helps avoid the use of invert fluids that would require either the use of costly fully compliant synthetics or the expense of capturing and transporting diesel based invert cuttings to disposal sites.

Filling the skills gap

The management of AES has long since recognised the gap in experience level that exists due to the demise of the drilling industry in the 1980s. Combined with an ongoing expansion of service capabilities, the company

embarked on an ongoing personnel training programme. After carefully selecting candidates with a combination of formal education and rig experience, the company internally trains salaried drilling fluid engineers in practical field applications and the actualities of the challenges they will face. Coupling a stringent classroom environment with daily laboratory training, the onsite drilling fluid engineers understand not only drilling fluid components, but are provided with a clear understanding of client economic demands in terms of expedient completion of projects. Once personnel have completed their initial training, they are routinely exposed to advanced drilling fluid courses to insure they have a clear understanding of new technologies and systems being introduced to the industry.

The company also provides drilling fluid training schools for operator personnel in the Houston, Texas training centre where drilling personnel are invited to participate in four day drilling fluid seminars where the application of drilling fluid components are discussed. Customers will determine that the bulk of drilling fluid products are available to all suppliers, yet it is the proper applications of the products in a pre-planned and timely basis that will inevitably affect the outcome of a drilling project. In addition to comprehensive and frank discussions on drilling fluid products and processes, the client personnel engage in actual laboratory formulation and testing of water base and invert systems. They also have the benefit of navigating an actual drilling fluid report to help recognise pending problems based on drilling fluid trends.

Project management

AES Drilling Fluids maintains a corporate management presence as well as technical support in Houston. Additional technical support teams are located throughout Colorado, Louisiana, Oklahoma, Pennsylvania and Texas. The company believes in empowering individual account managers to provide customers with not only technical support, but also an immediate answer to pertinent questions and concerns.

An account manager maintains full responsibility for an operator's project from the planning stage to the completion of the project, providing the client with an immediate source of information, whether the issue is technical, pricing or operational. Initial discussion begins with prevalent concerns based on past experiences or offset well information in the area which is utilised for the account manager to prepare and present a case specific drilling fluid plan.

Drilling fluid engineer selection is made based on area expertise and experience level with the recommended drilling fluid system. Daily supervision of the project is maintained by the account manager, who is constantly engaged with all facets of the company's departments, to insure that no detail is overlooked. Drilling fluid properties are reviewed each morning by the account manager and the operator personnel. The customer is provided with an executive brief of the fluid properties as they compare to programmed values and are given a written overview of any changes that are needed with an anticipated system treatment for the next 24 hours. This process of well site fluid supervision often provides answers to the client prior to any questions arising and also provides a basis for any subsequent verbal discussion. Upon completion of the project, the account manager is engaged in approving final billing and the preparation of the drilling fluid recap for future reference and ongoing improvement.

Conclusion

Oil and gas exploration today moves at a much faster pace as new technology has afforded companies the opportunity to finish vertical and horizontal well projects in record time as compared to just a few years ago. Oilfield service providers, such as the drilling fluid industry, must continue to improve and create new products and methods in order to keep up with their customers' faster pace. A more efficient, economical and safer industry is the common goal for not only the oil and gas exploration companies, but for their support services as well. ■