



RHE-USE

**The only truly engineered solution for extracting
low-gravity solids from oil-base drilling fluid**



RHE-USE: Field-proven answer to the enormous costs associated with LGS in an oil-base mud

Simply said, the RHE-USE[†] process treats oil-base drilling fluid, allowing the reuse of premium mud that previously was destined for disposal. In some cases, the RHE-USE technology has even reduced LGS below 1% while drilling, which previously had been seen as unattainable.

The patent-pending RHE-USE technology means operators can now re-use invert emulsion drilling fluid over multiple wells without having to continually rely on reclamation through high rates of dilution.

New-generation solution for a long-standing problem

Features

- Chemically enhanced process to extract low-gravity solids
- Treats oil-base drilling fluid of all density ranges
- Recovers high volumes of re-usable oil-base drilling fluid
- Reduces friction and downhole mud temperature
- Produces cleaner drilling fluid
- Minimizes dilution appreciably
- Patent pending
- Generates larger and firmer cuttings, which improves solids control and screen efficiencies

Benefits

- Haul-off and waste disposal costs are substantially reduced
- Higher penetration rates
- Reduced days on well enabling more wells drilled per rig
- Fewer trucks hauling drilling waste
- Minimized environmental liability exposure
- Reduced diesel consumption

Conventional mechanical separation methodologies are unable to extract ultra-fine low-gravity solids from an oil-base drilling fluid. Until now, coping with finely ground drill solids of five microns or less meant operators had no choice but to dump and dilute – an extremely expensive proposition – all the while adding anywhere from 500 to 800 bbl of diesel and chemicals per well to build rheology to compensate for lost hole volume during drilling. At the end of the day, the tremendous expense of hauling off cuttings and solids-contaminated fluids increased overall well costs appreciably.

The uniquely engineered RHE-USE process from M-I SWACO, a Schlumberger company, is the industry's most economically and environmentally viable solution to remove LGS from an oil-base drilling fluid. The unprecedented chemically enhanced process has been field-proven to deliver tremendous savings in mud-related costs, including the transporting of solids-laden fluids for disposal. By delivering clean fluid, RHE-USE technology also dramatically improves drilling performance.

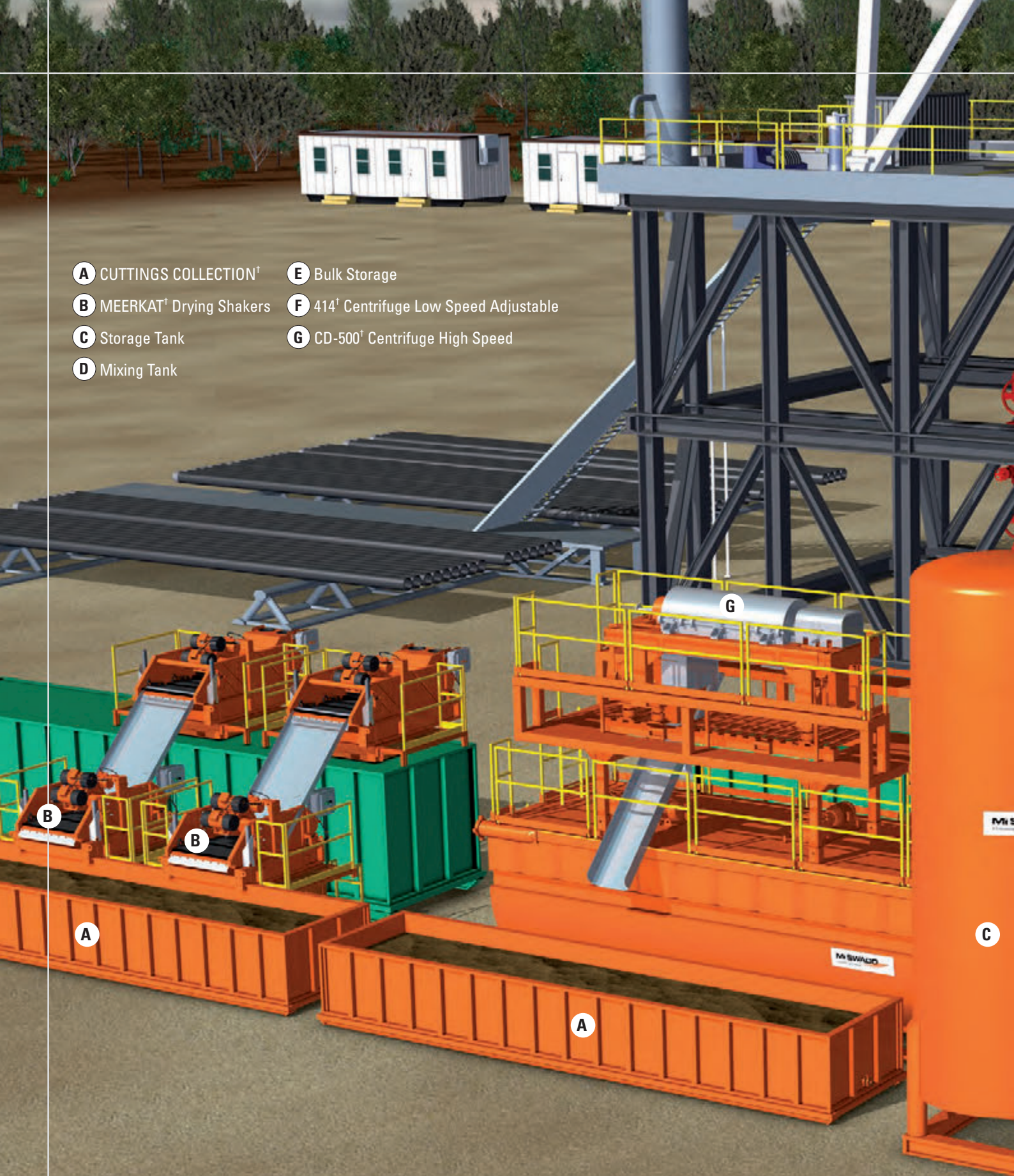
Indicative of the effectiveness of the RHE-USE process is instances where drilling fluid has remained static downhole for up to a month, brought to surface and successfully treated for reuse. Using the RHE-USE technology, cement-contaminated oil-base drilling fluid left in the wellbore during the completion has been fully restored to its original rheological properties, making it suitable for reuse

First used in conjunction with the M-I SWACO MEGADRIL¹ oil-base drilling fluid in unconventional shale plays, the RHE-USE process provides the industry its first-ever engineered solution capable of controlling low-gravity solids while reducing dilution as well.

The RHE-USE technology is offered as a package where the drilling fluid specialist and the solids control specialist on location work hand-in-hand to ensure the M-I SWACO oil-base drilling fluid system and the RHE-USE process jointly deliver the exceptional drilling and waste management results operators have come to expect.



- A** CUTTINGS COLLECTION†
- B** MEERKAT† Drying Shakers
- C** Storage Tank
- D** Mixing Tank
- E** Bulk Storage
- F** 414† Centrifuge Low Speed Adjustable
- G** CD-500† Centrifuge High Speed



The RHE-USE process combines the newest generation solids control and proprietary chemical technologies in a package that is easily configured for any location. The compact but fully integrated mechanical and chemical process provides superb

management of ultra-fine low-gravity solids to reduce waste and recover valuable oil-base drilling fluid and barite for reuse.

With the RHE-USE methodology staged centrifugation is used in tandem with chemically enhanced flocculation to keep

both LGS and drill solids manageable. A typical RHE-USE configuration employs dual MEERKAT Shakers throughout the well construction operation to assist in drying the drill cuttings to reduce waste volumes and recover valuable base fluid.



LGS don't stand a chance with the patent-pending RHE-USE process

F

D

E

The M-I SWACO 414 low-speed adjustable Centrifuge is run at low rpm to recover nearly all the barite for reuse in the active system. The decanting centrifuge also rejects the most ultra-fine LGS. The companion CD-500 high-speed Centrifuge

is run to process the RHE-USE effluent and control the LGS percentage.

Complementing the advanced solids control technologies a RHE-USE set-up also comprises a mixing system as well as fluid and bulk storage tanks.

The RHE-USE process raises the bar in drilling efficiency

The resulting economic savings and the reduced environmental footprint have elevated the RHE-USE technology to the operators' number one choice for managing LGS in invert emulsion drilling fluids. In addition, with supplies of barite and some liquid additives depleting rapidly and costs skyrocketing, the capacity of the RHE-USE process to conserve these valuable resources further reinforce its distinction as the industry's only economic and environmental option for dealing with LGS.

No wonder why more and more operators are looking at the RHE-USE technology to solve their LGS problems and optimize the overall value of their asset.

Before the introduction of the RHE-USE technology, combating the build-up of ultra-fine LGS required the use of dual centrifuges and dilution. With the RHE-USE process, staged centrifugation accompanied by chemically enhanced treatment renders both LGS and drill solids manageable. Adjusting the system to produce relatively 'dry' cuttings also reduces drilling wastes.

In test wells prior to the RHE-USE treatment, roughly 1,800 bbl of spent oil-base mud, rig waste, rain water and

as much as 220 bbl of cuttings had to be hauled off for disposal at approved and suitable sites. That process required from 25 to 30 truckloads of waste per well in addition to the fluid that had to be shipped to over-stocked liquid mud plants every third well for dilution.

Complicating the disposal picture, ever-increasing activity in the shale plays has resulted in fewer and therefore more expensive waste disposal sites that are often located far from the drilling location. For operators, this means considerable increases in waste management costs.

With the RHE-USE technology those profit-draining problems are relegated to the past.

Aside from the savings in treating and disposing of contaminated oil-base mud, the tremendous reduction in LGS concentrations through application of the RHE-USE process also appreciably enhances drilling performance.

Over time, the enduring presence of LGS creates havoc with drilling fluid properties, restricting the optimum performance of premium oil-base mud. High concentrations of LGS eventually thicken the fluid, increasing both the plastic

viscosity and progressive gel strengths.

By reducing LGS to manageable levels, the RHE-USE technology allows operators to increasingly beat drilling curves with rates of penetration (ROP) that in some instances nearly double those of offset wells. In fact, compared to earlier wells, in some intervals the RHE-USE process has been shown to reduce drilling days by more than half.

As an added bonus, the RHE-USE technology considerably decreases friction, reducing bottom hole mud temperatures, meaning that operators no longer have to rent expensive high temperature-rated tools to drill a deeper. Reduced friction likewise minimizes abrasion to motors, bits, tubulars and other downhole tools, which if not remediated can restrict the number of wells a rig is capable of drilling each year. Reducing abrasion likewise allows bits to drill longer, resulting in fewer trips.

Questions? We'll be glad to answer them.

To learn more about how the RHE-USE process can slash your costs and improve drilling efficiency, please contact the M-I SWACO representative nearest you.





Success story

Haynesville Shale: The RHE-USE process plays substantial role in record well

The situation

The operator was preparing to drill a well in an area where low-gravity solids typically presented a host of problems and were extremely difficult to remove with mechanical separation. This situation not only severely impacted drilling performance, but also required spent mud and cuttings be shipped more than 200 miles for disposal, which together increased well construction costs considerably.

The solution

M-I SWACO recommended the operator employ its new generation RHE-USE process to reduce low-gravity solids to enhance drilling efficiency and reduce disposal costs. The process would be used in a 5,659-ft (1,725 m) interval from 10,782 to 16,441 ft (3,286-5,011 m). The patent-pending, chemically-enhanced technology had been field-proven to optimize drilling while dramatically reducing waste disposal costs.

The results

By using the RHE-USE process, the operator set a field record, drilling the well five days faster than the best available offset with two fewer trips required. Penetration rates averaged 150 to 160 ft/hr (46-49 m/hr) with the operator suggesting 200 ft/hr (61 m/hr) was very possible. The final LGS was below 5% with larger and firmer cuttings coming across the shakers. From faster drilling to reduced disposal costs the use of RHE-USE is credited with saving the operator an estimated \$393,590 in this application.



ONLINE RESOURCES

RHE-USE

www.miswaco.com/rheuse

Drilling Waste Management

www.miswaco.com/dwm

Shale Gas & Liquids

www.slb.com/shale

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