MEGADRIL

The one-drum solution to elevated gel strengths in invert systems

MI SWACO

Customer-focused, solutions-driven

DRILLING SOLUTIONS

The MEGADRIL solution eliminates the costly drawbacks of elevated gels in invert-emulsion drilling

APPLICATIONS

All wells that utilize diesel or mineral oil as the base fluid in invert-emulsion drilling-fluid systems.

PROBLEMS

With multiple reuses of standard invert-emulsion systems, low-gravity-solids buildup can cause progressive gel strengths. Because of ever-increasing costs of base oil, dilution results in higher overall cost per barrel of non-aqueous fluids.

SOLUTIONS

With its one-drum emulsifier and wetting-agent components, the MEGADRIL* drilling-fluid system delivers gel strengths that are non-progressive and consistently near the 6-RPM dial reading. The system is thermally stable to 400° F (204° C).

ECONOMICS

The MEGADRIL system tolerates an increase in the Oil-to-Water Ratio (OWR) without requiring additions of base oil, reducing the overall fluid cost. The one-drum MEGAMUL* emulsifier lowers inventory storage requirements where space is at a premium.

ENVIRONMENTAL

By reducing the need for excessive dilution with base oil, the MEGADRIL system also reduces disposal volumes.

Most oil-base systems are reliably and thermally stable, but many typically exhibit elevated, and sometimes severe, progressive gel strengths as drilling progresses. Recognizing the elevated gel-strength trend as problematic in some oil-base-fluid applications, M-I SWACO* Research and Development has developed the MEGADRIL system. This new drilling-fluid system delivers the durable and temperature-stable invert-emulsion fluid operators want, without the associated elevated gel strengths. In addition, this fluid withstands high solids loading, lower HTHP fluid-loss values and delivers a high tolerance to seawater and cement contamination.

To simplify mixing and reduce inventory on location, the MEGADRIL system utilizes a single-drum formula that contains the emulsifier, wetting agents and coating agents.

How it works

Through its unique combination of chemistries, the MEGADRIL system produces an improved relationship among the 6-RPM reading, gel strength and yield point. The result is a system that controls filtration without increasing overall viscosity and that has a higher tolerance for drill solids which can cause progressive gel strengths. This allows for reduced pump pressures and increased hole-cleaning capabilities while retaining manageable ECD values.

An entire system engineered to minimize product additions and reduce overall fluid costs

The MEGADRIL system's minimal product requirements simplify life on the rig through greatly reduced product requirements, while still maintaining desired fluid properties. The primary components of the MEGADRIL system include:

- **MEGAMUL.** A one-drum product that serves as an emulsifier and wetting agent for the MEGADRIL invert-emulsion system. The product is effective over a wide

Features

- Single-drum emulsifier/ wetting agent
- Reduced rheological properties result in lower pump pressure and ECD values
- Excellent drill-solids, temperature and contamination tolerance
- Lower HTHP fluid loss
- Capable of withstanding higher water content, especially in the lower mud densities

Benefits

- Simplified logistics
- Reduced disposal costs
- Decreased ECD for better hole cleaning
- Optimized drilling efficiency
- Lower pump pressures
- Increased hole cleaning

Typical Formulations

Density	9 lb/gal	11 lb/gal	13 lb/gal	16 lb/gal
Base-fluid:water ratio	70:30	80:20	80:20	85:15
Diesel, bbl	0.637	0.666	0.605	0.550
VG-PLUS*, lb/bbl	5	4	4	3
Lime, lb/bbl	4	5	6	6
MEGAMUL*, lb/bbl	6	7	8	9
25% $CaCl_2$ brine, bbl	0.296	0.181	0.164	0.110
Barite, lb/bbl	49.4	174.0	280.8	448.6

range of temperatures, contaminants and OWRs. Initial system formulation requires 4 to 12 lb/bbl (11.4 to 34.2 kg/m³), depending on density, OWR and required temperature stability.

- Supplemental fluid-loss control is obtained through additions of M-I SWACO VERSATROL* products. When HTHP fluid-loss values of less than 2 mL are required, additions of EMI-1036* filtration-control additive, designed to be used in diesel-oil-base invert-emulsion systems, are recommended. The EMI-1036 polymeric additive is specially designed to complement the emulsifiers of the invert-mud systems to provide HTHP fluid-loss control at low product concentrations. It is also effective in 100% diesel-oil-base applications and at temperatures up to 300° F (149° C).

Field results that deliver the promise

In the field, the MEGADRIL system has shown superior performance characteristics above conventional invert-emulsion systems.

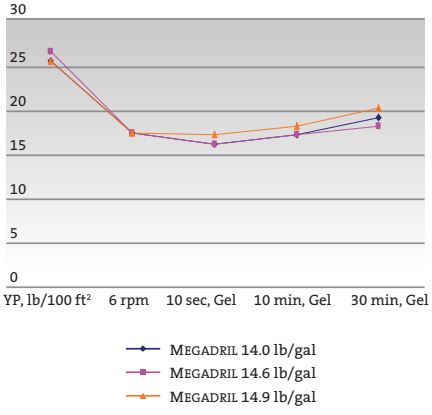
- Reduced mud losses, less dilution and improved drilling performance
- Lower rheologies compared to traditional invert-emulsion systems
- Improved relationship among the gel strength, yield point and 6-RPM reading delivers higher penetration rates, improved cuttings transport and reduction in downhole losses
- Lower consumption of supplemental fluid-loss additives
- Reduced pump pressures and increased hole-cleaning capabilities while retaining manageable ECD values

The MEGADRIL system in action

The system's relationship among the yield point, 6-RPM dial reading and the gel structure allows for superior cuttings transport, dramatically improving hole cleaning. The system's constant rheological relationship ensures efficient cuttings transport and fewer packoffs.

These properties are based on actual field data where the fluid design is optimized for an 8.5-in. horizontal well and where the OWR remains constant at 87:13 with 5.3% low-gravity solids in the system.

MEGADRIL Rheology vs Gel Strength

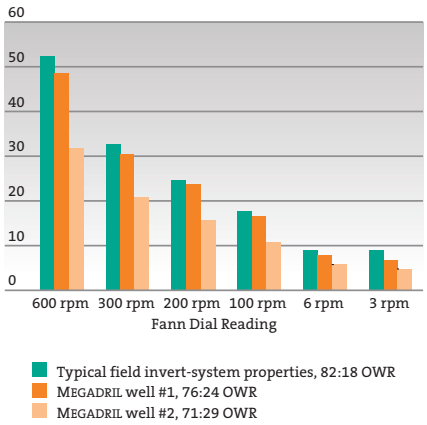


Problem A: High gels

In the mid-continent, operators required elevated yield points and 3- and 6-RPM dial readings for sufficient hole cleaning, when drilling horizontally but wish to maintain a close relationship with the gels.

The MEGADRIL solution: With its tight rheological profile, this new invert-emulsion system maintained a close relationship between the 6-RPM readings and the 10-sec through 30-min gel strengths.

Conventional Invert System vs MEGADRIL System, 10 lb/gal



Problem B: Base-oil costs

Base-oil costs were driving up the total AFE costs of wells drilled in the Bakken shale area of North Dakota.

The MEGADRIL solution: Because the MEGADRIL system lowered the overall diesel content by 10%, the operator not only saved an average of $20,000 per well but also benefitted from a generally lower overall rheological profile for the drilling-fluid system.

Learn more about the MEGADRIL solution

Your M-I SWACO representative can give you the whole story about this one-drum system that enhances the economics of drilling with an invert-emulsion system.

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