



PETRONAS

MG3DF™

Drilling base oil

Shallow HPHT ERD Deep Water Drilling

Versatile base oil that breaks drilling barriers

PETRONAS Lubricants International

Winning formula for superior drilling

MG3DF™ is a drilling base fluid derived from Low Sulphur Waxy Residue (LSWR) feedstock. It delivers competitive advantages in the ever-challenging drilling environment and is safe to be used with minimal health, safety and environmental impact.

MG3DF™ Specifications

| Properties | Test Method ASTM | Typical Specs |
|------------------------|---------------------------|----------------|
| Appearance | Visual | Bright & Clear |
| KV@40°C, cSt | D445 | 2.3 |
| Flash Point, °C | D93 | 92 |
| Aniline Point, °C | D611 | 80 |
| Pour Point, °C | D97 | <-42 |
| Distillation Range, °C | D86 | 201 – 305 |
| Aromatic Content, wt% | IP391 & In-house Standard | < 0.1 |
| Density@15°C | D4052 | 0.82 |

MG3DF™ Performs under pressure

The Catalytic Process



MG3DF™

MG3DF™ is a highly versatile drilling base fluid, capable of adapting to the world's most demanding drilling environments.

Features

- Fulfills the Group III, highest classification and requirements by International Oil and Gas Producers Association (OGP)
- Low BTEX and Polycyclic Aromatic Hydrocarbon (PAH) content
- High flash point
- Low pour point
- Narrow boiling range
- Globally available
- Efficient supply chain management.

Benefits

- ✓ **Reduce your operational costs** – use a single base oil for multiple onshore and offshore applications
- ✓ **Lower the risk of downhole loss circulation** – MG3DF™ maintains optimum viscosity for penetration and ECD control
- ✓ **Superior performance** – engineered for drilling shallow, deepwater, HPHT, CTD and ERD wells
- ✓ **Excellent thermal stability and low pour point** – the product's hybrid properties make it safe for end users and suitable for both HPHT and extreme cold applications.

Manufactured from Melaka Group III base oil plant in PETRONAS Melaka Refinery with production capacity rate of 450,000 barrels per year.

Melaka Group III base oils are engineered with Mercedes-AMG PETRONAS F1 Team advanced lubricants technology to deliver superior performance.

MG3DF™ is also accredited and compliant with US EPA and CEFAS requirements as well as REACH Europe & Halal Certifications.



Upstream International Operators and Drilling Fluid Contractors have utilised **MG3DF™** base oil in their drilling fluid formulations

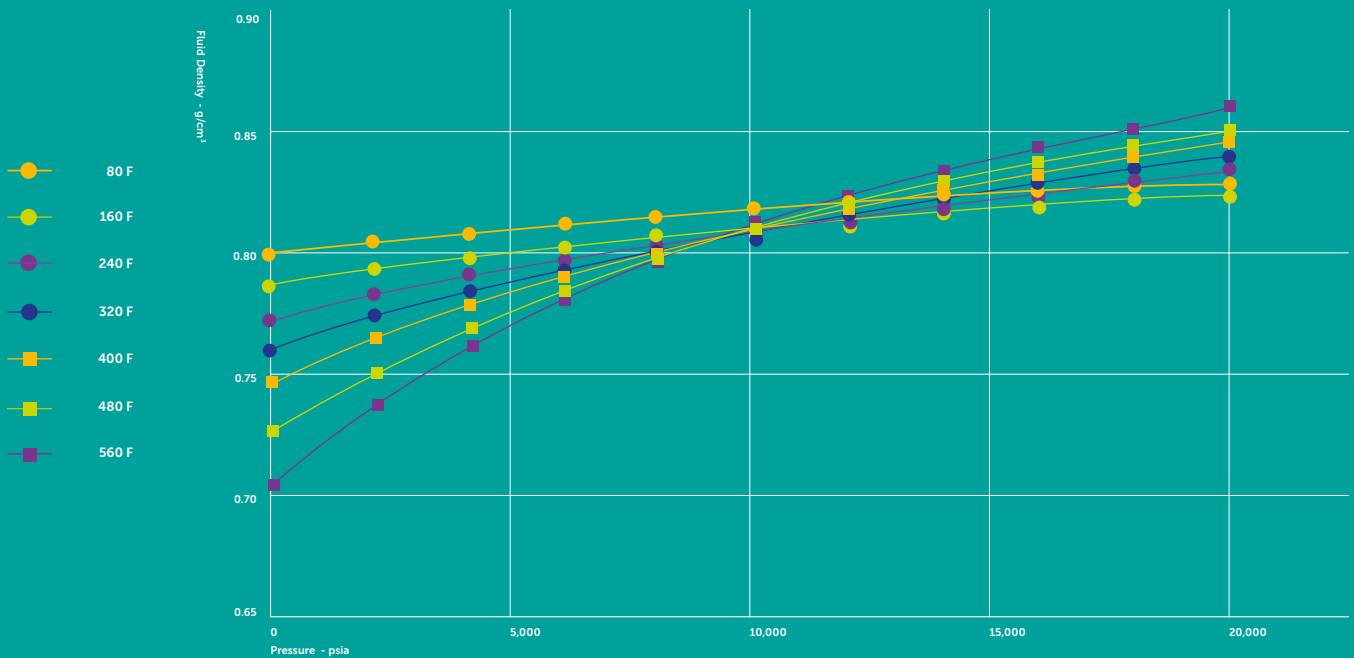
Over 300 various types of HPHT, ERD, Deepwater, CTD and Shallow Wells were drilled with **MG3DF™** base oil in SBM formulations for Peninsular Malaysia, Sabah & Sarawak drilling activities with international operations focused in Mexico, Gabon, Myanmar, Indonesia and Brunei.

MG3DF™ Field Performance

- The deviated deepwater L-3 well at inclination of 45° in water depth of 1005m was drilled successfully to final TD with **MG3DF™**
- ECD variance values for **MG3DF™** are lower for 12.25" hole section and similar for 8.5" hole section than base oil 'X'
- Stable rheological profile is observed with less fluctuations in the ECD while drilling with **MG3DF™** base oil
- **MG3DF™** performed better than base oil 'X' as higher mud weight of more than 1.5PPG was used in L-3.

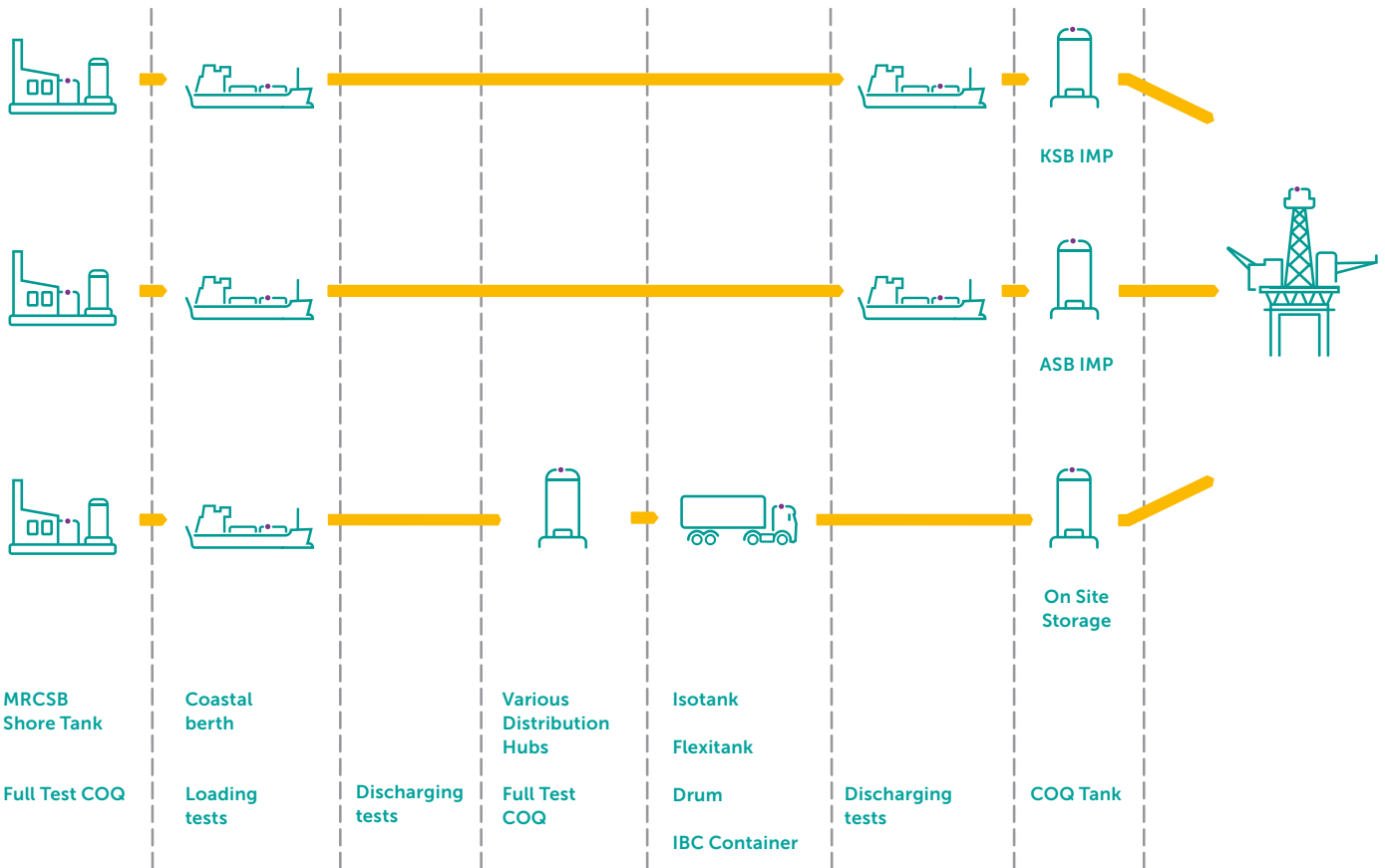


PVT Profile of MG3DF™ @0-20,000 psi & 80-560 °F Houston Independent Lab

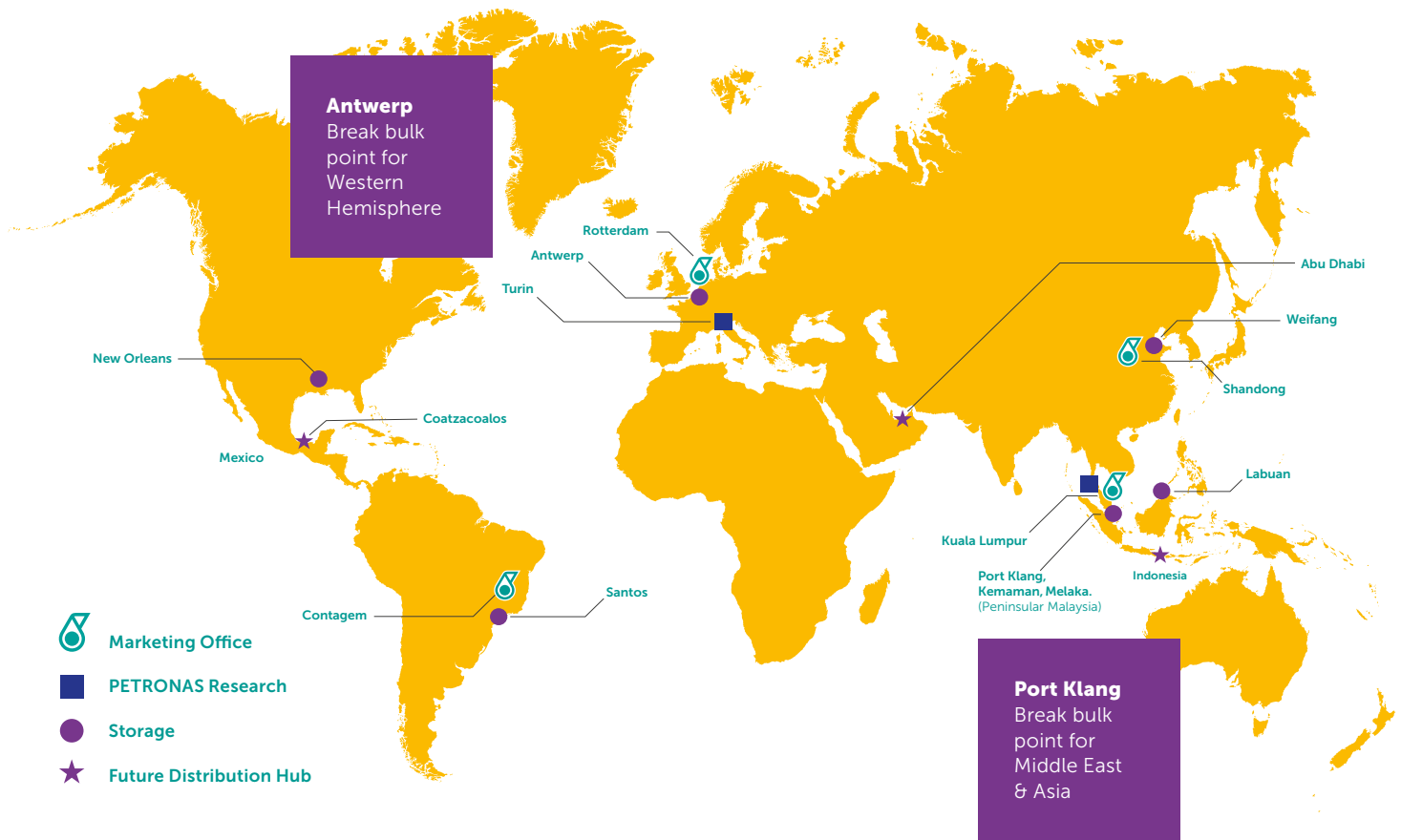


- At constant temperature, **MG3DF™** was less compressible as the pressure was increased
- At constant pressure, **MG3DF™** was more compressible, as temperature increased
- **MG3DF™** shows minimal change in density before and after the cycle.
This indicates a stable fluid, and shows that over the range of temperatures and pressure, the sample minimally degrades.

Transfer of product throughout the MG3DF™ supply chain



Through the Marketing Offices and 8 Distribution Hubs, PLI has established base oil sales in over 50 countries



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MG3DF™

Drilling base oil



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