Outstanding Environmental Properties

Shell GTL Saraline 18.5V is classified as a synthetic base fluid (SBF, Group III: low to negligible aromatic content) for Non-Aqueous Drilling Fluid (NADF) mud formulations under the definitions provided by the International Association of Oil and Gas Producers (OGP).

- Approved for Offshore Discharge
  Shell GTL Saraline 18.5V has an extremely favourable environmental profile which makes it an excellent candidate as an environmentally-friendly drilling base fluid. This is evident from the offshore discharge approval of drill cuttings received in Malaysia, Australia, New Zealand, Thailand, Indonesia, Brunei, India, Nigeria, Dubai and most recently, in China. This reduces complexity, costs and safety risks in managing drill cuttings.

- Minimal Health and Safety Risk
  Shell GTL Saraline 18.5V is odourless, has a clear appearance, low volatility, and high flashpoint, and contains virtually no sulphur and aromatics, all of which provide safe working conditions for operators. It does not contain known carcinogens (e.g. poly-aromatic hydrocarbons) nor BTEX (benzene, toluene, ethylbenzene and xylenes).

- Low Ecotoxicity
  Shell GTL Saraline 18.5V is readily biodegradable in both marine water (OECD 306) and freshwater (OECD 301F). It does not bioaccumulate and is non-toxic. Its superior environmental performance is confirmed with an OCNS (Offshore Chemical Notification Scheme for the North Sea) ranking of group E (lowest environmental hazard).

- Bioremediation
  Shell GTL Saraline 18.5V consists of a specific range and class of hydrocarbons (linear and branched paraffins) which shows excellent potential for bioremediation through land farming methods producing successful plant growth media, as proven in onshore studies in Bangladesh, China and New Zealand. This reduces complexity, costs and safety risks in transportation of drill cuttings.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Protocol</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodegradation</td>
<td>OECD 306</td>
<td>73% after 28d, (readily biodegradable)</td>
</tr>
<tr>
<td>Aerobic (freshwater)</td>
<td>OECD 306</td>
<td>62% after 28d, (readily biodegradable)</td>
</tr>
<tr>
<td>Aerobic (marine water)</td>
<td>OECD 307</td>
<td>Half-Life (DT50) = 21 days (based on 1000 mg/kg initial dose)</td>
</tr>
<tr>
<td>Aerobic (soil)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Water Column Toxicity      |                                |                                              |
| Acartia tonsa              | PARCOM, ISO 14569              | 48h EL50: >1,000 mg/L (non-toxic)            |
| Skeletonema costatum      | USEPA 2001 40 CFR 435          | 72h EL50: >1,000 mg/L (non-toxic)            |
| Myxodopsis baltica        | USEPA 2003                     | 96h LC50: >1,000,000 ppm of 10% SPP (non-toxic) |
| Paphis auratus             | OECD 202                       | 7d LC50: >100,000 mg/L (non-toxic)           |
| Daphnia magna              | OECD 203                       | 48h EL50: >1,000 mg/L (non-toxic)            |
| Brachydanio rerio         | OECD 117                       | 96h LC50: >1,000 mg/L (non-toxic)            |

| Sediment Organism Toxicity |                                |                                              |
| Corophium volutator       | PARCOM Protocol 1995 [A]       | 10d LC50 >20,000 mg/kg (wet basis)          |

| Bioaccumulation Potential  | OECD 117                       | log Kow >6.5 (not bioaccumulative due to poor bioavailability) |
Shell
GTL SARALINE 185V
Synthetic Base Fluid for High Performance Drilling
**SHELL GTL SARALINE 185V**

The drilling base fluid of choice for leading operators

Shell GTL Saraline 185V is an innovative, non-toxic, multi-application synthetic drilling base fluid derived from natural gas. It is at the forefront in meeting drilling demands and challenges of the future in the most environmentally-friendly and safe manner – from scorching desert to subarctic temperatures, from deep water to high-temperature wells.

Its distinctive properties result in excellent drilling performance in a wide range of conditions, in addition to outstanding environmental attributes.

Used in over 20 countries, it has a proven track record of excellence with supply security through a world-class distribution network, supported by two unique Gas-to-Liquids (GTL) plants and over a dozen supply hubs across the globe.

**The Process**

Shell pioneered the Fischer-Tropsch GTL technology in the world’s first full-scale GTL plant of its kind in Bintulu, Malaysia, achieving commercial GTL production in 1993.

It is the culmination of 20 years of research into the utilisation of natural gas for the production of synthetic fuels and specialty chemicals, according to the GTL process diagram below.

---

**Excellent Drilling Performance**

Shell GTL Saraline 185V has a low viscosity, a low pour point and relatively high flash point, making it ideal for use in drilling in a range of well conditions and in different environments.

- Its low viscosity results in a better equivalent circulating density (ECD), faster drilling rate and increased hole cleaning efficiency.

- Its rheological profile is relatively flat over a wide working temperature, therefore enabling better mud control while drilling with less time spent on mud conditioning, and ultimately reducing non-performing time (NPT).

- It is suitable for deep water environments with mud line temperatures of 40°F or 4.4°C.

- It is also suitable for high-temperature high-pressure (HTHP) environments with exceptional thermal stability in borehole temperatures up to 400°F or 205°C.
Proven Track Record

Sold to more than 40 customers in over 20 countries worldwide

Shell GTL Saraline 185V has upheld the excellent standards of Shell products over the past decade. It is a well-established (since 1997), highly regarded synthetic drilling base fluid in Asia Pacific/Oceania, Oman and more recently in Nigeria, Chile and China.

Shell GTL Saraline 185V is used by operators worldwide:

- Australia
- Bangladesh
- Brunei
- Chile
- China
- Indonesia
- India
- Kenya
- Malaysia
- Mozambique
- Myanmar
- New Zealand
- Nigeria
- Oman
- Philippines
- Qatar
- Russia
- Saudi Arabia
- Tanzania
- Thailand
- United Arab Emirates
- United States of America

Shell GTL Saraline 185V is also ideal as a base fluid in Hydraulic Fracturing

- The preferred health, safety and environmentally-friendly fluid for hydraulic fracturing
- No BTEX and extremely low aromatics, thus reducing harm to health and the environment
- Conducive to groundwater protection due to limited water solubility, lack of aquatic toxicity and limited soil transport
- An established proppant carrier in leading worldwide fracking operations
At Shell, we are committed to high quality as reflected in our policy of strict quality assurance through constant control and monitoring of our manufacturing processes – from incoming feedstock to the finished products.

Shell GTL Saraline 185V is globally available, with supply security through a world-class distribution network in partnership with distributors.

We continue to build on our excellent customer service track record through our strong sales, marketing and technical teams.
**Customer Satisfaction**

**Malaysia**

“When using Shell GTL Saraline 185V based mud in our SBM (synthetic based mud) wells, the drilling speed was two times faster than that of a high performance WBM (water based mud) well, and the SBM did not cause any stoppage.”

Oil and gas MNC

**China**

“Shell GTL Saraline 185V performed very well in China’s Bohai Bay and Indonesian fields. In Bohai Bay, the average drilling speed improved by 30% and was even higher in Indonesia.”

Major oil and gas player with interests in China and Indonesia

“Shell GTL Saraline 185V provided good hole stability especially in the shale gas projects, holding the geometry of the hole well enough to support good logging. Shell GTL Saraline 185V helped in our underbalance drilling, as gas entered the wellbore into solution and came out mostly at the surface fluid processing plant. It also allowed for constant hole pressure and ensured the hole remained in good state.”

Shale gas projects operator

**India**

“Significant improvement in drilling speeds is seen in deeper wells with Shell GTL Saraline 185V.”

Oil and gas MNC

Shell has partnered strategic distributors with strong storage and logistics expertise as well as widespread regional hubs in the world. We continue to explore potential supply hubs in other key locations to improve our supply chain efficiency.

**Key**

- Supply Hub
- Shell GTL Plant
TECHNICAL SPECIFICATIONS

High Flash Point and Low Viscosity

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>Unit</th>
<th>Test Method</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density @ 15°C</td>
<td>kg/m³</td>
<td>ASTM D4052</td>
<td>779</td>
</tr>
<tr>
<td>Flash point</td>
<td>°C</td>
<td>ASTM D93</td>
<td>85</td>
</tr>
<tr>
<td>Kinematic viscosity @ 40°C</td>
<td>mm²/s</td>
<td>ASTM D445</td>
<td>2.8</td>
</tr>
<tr>
<td>Pour point</td>
<td>°C</td>
<td>ASTM D97</td>
<td>2.1</td>
</tr>
<tr>
<td>Aniline point</td>
<td>°C</td>
<td>ASTM D611</td>
<td>94</td>
</tr>
</tbody>
</table>

Least Toxic OCNS Rating vs Others

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Shell GTL Saraline 185V</th>
<th>Diesel</th>
<th>LTMO1</th>
<th>LTMO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total BTEX, ppm</td>
<td>ND</td>
<td>3840</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Total Aromatics, %m</td>
<td>-0.02</td>
<td>34</td>
<td>-0.02</td>
<td>-0.03</td>
</tr>
<tr>
<td>Sulphur, ppm</td>
<td>-1</td>
<td>10-5000</td>
<td>10 max</td>
<td>-1</td>
</tr>
<tr>
<td>OCNS Designation*</td>
<td>E</td>
<td>A</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

* Details of OCNS Rating

The OCNS (i.e. Offshore Chemical Notification Scheme) list is produced by CEFAS on behalf of the United Kingdom Department for Energy and Climate Change and the Netherlands State Supervision of Mines. Group “A” is the most toxic while Group “E” is the least toxic.

<table>
<thead>
<tr>
<th>OCNS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result for aquatic-toxicity data, ppm</td>
<td>&lt;1</td>
<td>&gt;1-10</td>
<td>&gt;10-100</td>
<td>&gt;100-1,000</td>
<td>&gt;1,000</td>
</tr>
<tr>
<td>Result for sediment-toxicity data, ppm</td>
<td>&lt;10</td>
<td>&gt;10-100</td>
<td>&gt;100-1,000</td>
<td>&gt;1,000-10,000</td>
<td>&gt;10,000</td>
</tr>
</tbody>
</table>

Stable Properties over a Wide Range of Temperatures

Density vs Pressure Profile at different temperatures

Viscosity vs Temperature Profile

LTMO = Low Toxicity Mineral Oil
ND = Not Detected by GC/MS