Lubricants and Fuels
Designing for performance as the experts’ expert

Nouryon is proud to be a leading global supplier of surfactants and polymers to the lubricant and fuel formulation industry. How have we become leaders? By designing for performance as the experts’ experts and delivering essential solutions for shared success.

Partnering with our customers is the way we do business. Often designing exclusive new chemicals for our customers, we’ve helped the largest lubricant and fuel producers in the world develop and deliver successful new products and leading brands to the marketplace. Combining our unique knowhow in creating customized synthesis of amines and polymers with our customers’ expertise, we continue to enhance the industry’s ability to formulate lubricants and fuels that meet next-generation legislation and OEM requirements. Equally important, we continue to help formulators innovate and gain competitive advantage worldwide. Based on our global footprint, integrated supply chain and decades of experience, our customers rely on our proven ability to ensure local product availability and supply alternatives. As a worldwide chemical company, we provide notification and regulatory support for all regions.

Delivering essential solutions for shared success

With our long history of producing surfactants, we have proven we can meet our customers demands of consistent high quality technology.

We also have continuously improved production procedures, quality assurance and safety, leading to products with even more reliable performance and higher purity.

Our customer-driven employees take every precaution to deliver products within a unique specification every time. With our analytical laboratories integrated into our production facilities, we can deliver each batch with a Certificate of Analysis to meet the customers targets.

Synthesis and tech service lab capabilities

We have three dedicated synthesis labs based in North America and Europe for development of new or tailor-made products for our customers. These laboratories are equipped to fully simulate production and have the same capabilities to react amines into various surfactants. We also have a pilot production facility that can prepare smaller quantities for field trials.

Our technical centers can support surface analysis, application and physical characterization.

List of capabilities:
- MTM, HFRR, QCMD, interfacial tension, surface tension, contact angle.
- XPS (State-of-the-art machine acquired early 2013 for point analysis, imaging and depth profiling. Different sputter guns allow depth profiling of organic and inorganic materials.)
- SEM-EDX (high resolution SEM imaging, highly sensitive EDX detector)
- SIMS
- Raman microscopy (532 nm and 785 nm excitation)
- IR microscopy / IR imaging machine
- NMR (600 mHz, number of 2D correlation NMR tools for diffusion studies)
## Solutions for lubricants and fuels

<table>
<thead>
<tr>
<th>Product</th>
<th>Chemical description</th>
<th>Appearance</th>
<th>TBN</th>
<th>HLB</th>
<th>Engine oil</th>
<th>Drive line</th>
<th>Grease</th>
<th>Marine fuel</th>
<th>Diesel fuel</th>
<th>Ethanol fuel</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPHOLAK YJH-40</td>
<td>Amphoteric surfactant</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>AQUATREAT AR-40</td>
<td>Polyacrylic acid</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN 12D</td>
<td>Dodecyl amine</td>
<td>Solid</td>
<td>297-304</td>
<td>10.7</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN 18D</td>
<td>Dodecyl amine</td>
<td>Solid</td>
<td>204-211</td>
<td>7.9</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN 2C</td>
<td>Dicocodialamine</td>
<td>Solid</td>
<td>140-155</td>
<td>4.2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Intermediate</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN 2HF</td>
<td>Hydrogenated dicocodialamine</td>
<td>Solid</td>
<td>109-125</td>
<td>1.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Intermediate</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN 8D</td>
<td>Octyl amine</td>
<td>Liquid</td>
<td>555</td>
<td>12.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN CD</td>
<td>Cocoyl amine</td>
<td>Liquid</td>
<td>272-285</td>
<td>10.3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN DMD8D</td>
<td>Dodecyl dimethylamine</td>
<td>Liquid</td>
<td>180-191</td>
<td>7.1</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN MH18</td>
<td>2-Ethanesulphonyldialkyl methyl amine</td>
<td>Liquid</td>
<td>141</td>
<td>4.0</td>
<td>–</td>
<td>Neutalisation</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN GL</td>
<td>Oleoyl amine</td>
<td>Liquid</td>
<td>202-212</td>
<td>8.0</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN T</td>
<td>Tallow amine</td>
<td>Paste</td>
<td>203-217</td>
<td>8.2</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMEEN TM-97</td>
<td>Tallow amine</td>
<td>Solid</td>
<td>209-217</td>
<td>8.2</td>
<td>–</td>
<td>Thickener</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMOFUEL 120D</td>
<td>Octadecyl fatty diamine</td>
<td>Liquid</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMOLUBE 211</td>
<td>Fatty amine oleate</td>
<td>Solid</td>
<td>170-190</td>
<td>8.6</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARMOLUBE C</td>
<td>Estearin</td>
<td>Liquid</td>
<td>87</td>
<td>3.6</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARGUAD CCNTR251</td>
<td>Dicoctyldimethylammonium nitrate</td>
<td>Liquid</td>
<td>n/a</td>
<td>17.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ARGUAD CCNTR252</td>
<td>Dicoctyldimethylammonium chloride</td>
<td>Liquid</td>
<td>n/a</td>
<td>17.3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>BERAID 355SM</td>
<td>Polyethylene glycol dimer</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Ignition improver</td>
</tr>
<tr>
<td>BEROL 887</td>
<td>Non-ionic surfactant alcohol based</td>
<td>Liquid</td>
<td>n/a</td>
<td>11.5</td>
<td>–</td>
<td>Detergent</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>DUOMEEN C</td>
<td>Cocoamidcoplaceine</td>
<td>Paste</td>
<td>409-442</td>
<td>18.2</td>
<td>2</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>DUOMEEN O</td>
<td>Octylamidocaprolactam</td>
<td>Liquid/paste</td>
<td>320-350</td>
<td>16.2</td>
<td>15.6</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>DUOMEEN T</td>
<td>Tallow diamine</td>
<td>Liquid/paste</td>
<td>320-350</td>
<td>15.6</td>
<td>15.6</td>
<td>Friction modifier</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ETHHOMEEN T/12</td>
<td>Ethoxylated fatty amine</td>
<td>Liquid</td>
<td>156-165</td>
<td>10.4</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>Lubricity additive</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ETHHOMEEN T/15</td>
<td>Ethoxylated fatty amine</td>
<td>Liquid</td>
<td>156-165</td>
<td>10.4</td>
<td>–</td>
<td>Friction modifier</td>
<td>–</td>
<td>Lubricity additive</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ETHYLAN 1005</td>
<td>Non-ionic surfactant alcohol based</td>
<td>Liquid</td>
<td>116</td>
<td>11.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Detergent</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ETHYLAN 1545</td>
<td>Non-silicone alkoxylated polymer</td>
<td>Liquid/paste</td>
<td>20.5</td>
<td>13.7</td>
<td>–</td>
<td>Detergent</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ETHYLAN T101/1</td>
<td>Non-ionic ethoxylated alcohol</td>
<td>Liquid</td>
<td>n/a</td>
<td>13.7</td>
<td>–</td>
<td>Detergent</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>GAA</td>
<td>Oleylaminocaprolactam</td>
<td>Solid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>PHOSPHOLAN PE169</td>
<td>Phosphate ester</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Anticorrosion</td>
<td>–</td>
<td>–</td>
<td>Metal working antitrust, emulsifier</td>
</tr>
<tr>
<td>PHOSPHOLAN PE65</td>
<td>Phosphate ester</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Anticorrosion</td>
<td>–</td>
<td>–</td>
<td>Metal working antitrust, emulsifier</td>
</tr>
<tr>
<td>PHOSPHOLAN P1054</td>
<td>Phosphate ester</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Anticorrosion</td>
<td>–</td>
<td>–</td>
<td>Metal working antitrust, emulsifier</td>
</tr>
<tr>
<td>MRAMC DCE</td>
<td>Dodecyl dipropyleneamine</td>
<td>Liquid</td>
<td>341-365</td>
<td>26.7</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>NRIBRAK DRA-21</td>
<td>Oxyalkylated phenolic resin</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Demulsifier</td>
</tr>
<tr>
<td>NRIBRAK DTM-910</td>
<td>Noronic polyacrylate</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Demulsifier</td>
</tr>
<tr>
<td>NRIBRAK RTC-330</td>
<td>Polymeric aqueous solution</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Metalworking oil scavenger synthetic fluids</td>
</tr>
<tr>
<td>WITCAMIDE 511</td>
<td>Fatty alkanolamine</td>
<td>Liquid</td>
<td>n/a</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
Benefiting from fatty amine chemistries and insights from polymer technologies

In addition to our wide range of products, Nouryon Surface Chemistry can develop customized solutions.

We believe that partnering with our customers, combined with deep understanding of our chemistries are key to delivering superior value and tailor made solutions.

Our core technologies
Based on our world-class nitrile technology, we develop, produce and supply amines, polymers and quaternary amines. Ethoxylation and sulfonation are also among our core capabilities.

The chemical toolbox
Our broad spectrum of relevant technologies includes the following:

- **Amide amine and imidazoline** - From natural fatty acids
- **Amides** - Based on natural fatty acids and/or fatty amines
- **Epoxidation** - Epichlorohydrin addition
- **Glucosidation** - Natural-based raw material glucose
- **Oxidation** - Hydrogen peroxide reactions with amines to amine oxides
- **Amphoteric** - Derivatization of amines with SCA or Acrylic acid
- **Natural polymers** - Derivatives based on starch chemistry
- **Acrylic polymerization** - Specialty synthetic acrylic polymers
- **Phosphating** - Phosphate ester surfactants
- **Cyanoethylation** - Addition of acrylonitrile to reactive hydrogen
- **Carbon Disulfide** - To produce dithiocarbamate and thiocarbamate

Surface Chemistry, a business unit of Nouryon, is a major producer of specialty chemicals. Based in Chicago, USA, our business unit operates in 50 countries, with regional marketing centers, manufacturing and R&D centers world wide. We are a leading supplier of specialty surfactants, synthetic and bio-polymer additives.

**Manufacturing**
Chatanooga, USA
Houston, USA
Ft. Worth, USA
Itupeva, Brazil
Mons, Belgium
Morris, USA
Salisbury, USA
Singapore
Stenungsund, Sweden
Stockholm, Sweden
Ningbo, China

**R&D and TS&D Centers**
Chicago, USA
Stenungsund, Sweden
Shanghai, China

**Headquarters**
Chicago, USA

Manufacturing
- Chattanooga, USA
- Houston, USA
- Ft. Worth, USA
- Itupeva, Brazil
- Mons, Belgium
- Morris, USA
- Salisbury, USA
- Singapore
- Stenungsund, Sweden
- Stockholm, Sweden
- Ningbo, China

R&D and TS&D Centers
- Chicago, USA
- Stenungsund, Sweden
- Shanghai, China

In addition to our wide range of products, Nouryon Surface Chemistry can develop customized solutions.

We believe that partnering with our customers, combined with deep understanding of our chemistries are key to delivering superior value and tailor made solutions.

Our core technologies
Based on our world-class nitrile technology, we develop, produce and supply amines, polymers and quaternary amines. Ethoxylation and sulfonation are also among our core capabilities.

The chemical toolbox
Our broad spectrum of relevant technologies includes the following:

- **Amide amine and imidazoline** - From natural fatty acids
- **Amides** - Based on natural fatty acids and/or fatty amines
- **Epoxidation** - Epichlorohydrin addition
- **Glucosidation** - Natural-based raw material glucose
- **Oxidation** - Hydrogen peroxide reactions with amines to amine oxides
- **Amphoteric** - Derivatization of amines with SCA or Acrylic acid
- **Natural polymers** - Derivatives based on starch chemistry
- **Acrylic polymerization** - Specialty synthetic acrylic polymers
- **Phosphating** - Phosphate ester surfactants
- **Cyanoethylation** - Addition of acrylonitrile to reactive hydrogen
- **Carbon Disulfide** - To produce dithiocarbamate and thiocarbamate

Surface Chemistry, a business unit of Nouryon, is a major producer of specialty chemicals. Based in Chicago, USA, our business unit operates in 50 countries, with regional marketing centers, manufacturing and R&D centers world wide. We are a leading supplier of specialty surfactants, synthetic and bio-polymer additives.
We are a global specialty chemicals leader. Markets worldwide rely on our essential chemistry in the manufacture of everyday products such as fuels, plastics, coatings, asphalt, agrochemicals, personal care and lubricants items. Building on our nearly 400-year history, the dedication of our 10,000 employees, and our shared commitment to business growth, strong financial performance, safety, sustainability and innovation, we have established a world-class business and built strong partnerships with our customers. We operate in over 80 countries around the world and our portfolio industry-leading brands includes Armeen, Armolube, Armofuel, Beraid, Berol, Dissolvine, Duomeen, Ethomeen, Ethylan and Phospholan.

For more information visit: surfacechemistry.nouryon.com

Products mentioned are trademarks and registered in many countries.

The information presented herein is true and accurate to the best of our knowledge, but without any guarantee unless explicitly given. Since the conditions of use are beyond our control, we disclaim any liability, including patent infringement, incurred in connection with the use of these product data or suggestions.