Additives for Food Grade Lubricants

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Functional Products Inc. was founded in 1985. We received our ISO 9001:2008 certification in 2011, and we are REACH compliant.

Functional Products formulates and blends over 200 active products and also provides custom formulary capability for short and long-run needs.

Headquarters, general offices and manufacturing plant are located in Macedonia, Ohio. Sales offices and stocking points are located throughout the United States and Canada, as well as Latin America, Europe, Australia, India and Asia.

Mission Statement:
Functional Products Inc. is committed to providing our customers with quality products and services that meet or exceed their expectations through the use of continuous improvement.

Additives for Food Grade Lubricants

Functional Products Inc. offers an extensive line of additives for various types of food grade lubricants. This catalog presents information about our coupling agents for white oils, anti-wear and corrosion inhibitors for mineral oil based lubricants, and tackifiers and thickeners for white oil and vegetable oil based lubricants.

Functional Products Inc. offers a variety of active ingredients in a variety of diluents, thus providing a wide range of additives to fit your need, whatever it might be. Custom products are our specialty; if you require something not in our standard catalog, please let us know. We will be happy to create an additive that meets your needs.

Definitions:

FDA – The U.S. Food and Drug Administration approves generic chemical substances for the food-processing industry. The FDA does not approve either branded products or mixtures.

USDA – The U.S. Department of Agriculture approved branded substances and mixtures, specifically for meat and poultry processing plants but the lists became the default lists for other food processors. By presidential order in 1998, the USDA abandoned this role.

NSF – The National Sanitation Foundation, a non-governmental non-profit corporation, assumed the role formerly filled by the USDA. In addition, they created registry numbers for approved products and they separated the listings of lubricants from the listings of lubricant components.

H-1 – The USDA classification H-1 was applied to lubricants with incidental food contact and ingredients used to make these lubricants. Under NSF, H-1 applies to lubricants and a new category, HX-1 applies to ingredients for H-1 lubricants.

HX-1 – The NSF classification HX-1 applies to ingredients for H-1 lubricants.

H-2 – The USDA classification H-2 was applied to lubricants in food-processing plants with no food contact and ingredients used to make these lubricants. Under NSF, H-2 applies to lubricants and a new category, HX-2 applies to ingredients for H-2 lubricants.

HX-2 – The NSF classification HX-2 applies to ingredients for H-2 lubricants.

21 CFR 178.3570 – This section of the Code of Federal Regulations deals with Lubricants with Incidental Food Contact.

Health and Safety:
The product descriptions here, the Technical Data Sheets (TDS) and the product labels are not intended to take the place of a Material Safety Data Sheet (MSDS).

An MSDS is provided with each shipment of an order or a sample, or can be downloaded from our website:

www.functionalproducts.com
Phone: 1-330-963-3060
Coupling Agents

APPLICATION:
White mineral oil, widely used in food grade lubricants, is generally a poor solvent for polar lubricant additives such as antioxidants and anti-wear additives. These coupling agents are additives used to increase the polarity of the food grade lubricant to enable advantageous use of other additives. They can also be used to impart rubber-swelling properties to food grade lubricants to minimize seal shrinkage and leakage. Considering the wide variety of possible applications for coupling agents, it is recommended that samples of each product be evaluated by the formulator to determine the most appropriate for a particular use.

COMPOSITION:
The active ingredients in each of these coupling agents are a different, unique blend of esters in a food grade diluent oil suitable for use as lubricant components where incidental contact with food could occur, as described in 21 CFR 178.3570. Our coupling agents have been registered with the NSF and may be cited as a component when you submit your lubricant composition to NSF.

TREATMENT LEVEL:
The typical treatment level is typically two parts coupling agent to one part additive to be dissolved, however exact levels need to be determined by the formulator. Rubber swell is imparted at levels over 4%. USDA requires that all additives be used at the minimum level that achieves the desired effect.

HANDLING:
These coupling agents are easily handled liquids and any convenient technique may be used for blending. Safe handling precautions are the same as those to be taken with the base oil. Please see the current Material Safety Data Sheet for detailed information.

<table>
<thead>
<tr>
<th>Property</th>
<th>CA-441</th>
<th>CA-447</th>
<th>CA-450</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF Registration Number</td>
<td>120908</td>
<td>120909</td>
<td>140748</td>
</tr>
<tr>
<td>Category Code</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
</tr>
<tr>
<td>Appearance</td>
<td>Clear Colorless Liquid</td>
<td>Clear Colorless Liquid</td>
<td>Light Amber Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Mild or None</td>
<td>Mild or None</td>
<td>Mild or None</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.92</td>
<td>0.913</td>
<td>0.99</td>
</tr>
<tr>
<td>Lbs. Per Gallon</td>
<td>7.7</td>
<td>7.5</td>
<td>8.26</td>
</tr>
<tr>
<td>Flash Point</td>
<td>135°C (275°F)</td>
<td>135°C (275°F)</td>
<td>&gt;185°C (365°F)</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>12 cSt at 40°C</td>
<td>12 cSt at 40°C</td>
<td>12 cSt at 40°C</td>
</tr>
</tbody>
</table>
Anti-wear Additive / Corrosion Inhibitor

APPLICATION:
FUNCTIONAL CI-426 and CI-426-EP are oil-soluble anti-wear additives and corrosion inhibitors that may be used in lubricants and hydraulic fluids with incidental food contact. FUNCTIONAL CI-426-EP is an extreme pressure version. Both are completely soluble in white oils, polyalphaolefins and other suitable base oils.

COMPOSITION:
FUNCTIONAL CI-426 is composed of amine salts of an alkyl phosphate. FUNCTIONAL CI-426-EP is composed of phosphate compounds. Both additives meet the NSF certification requirements for an ingredient in lubricants with incidental food contact under paragraph 21CFR 178.3570.

TREATMENT LEVEL:
FUNCTIONAL CI-426 is permitted in food grade lubricants up to 0.5%, while FUNCTIONAL CI-426-EP can be used up to 2.0%. If only rust protection is needed, then 0.3-0.5% is usually sufficient. They may be used with antioxidants, viscosity improvers or other additives customarily used in these applications.

HANDLING:
In concentrated form, these additives are skin and eye irritants and should be handled with suitable personal protection. The concentrated form should not be heated unnecessarily, as heating could release fumes of the amine and be an inhalation irritant. See the current Material Safety Data Sheet. The oils made with these additives are not hazardous and may be handled with the usual precautions for similar oils.

<table>
<thead>
<tr>
<th>Property</th>
<th>CI-426</th>
<th>CI-426-EP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF Registration Number</td>
<td>120910</td>
<td>138503</td>
</tr>
<tr>
<td>Category Code</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
</tr>
<tr>
<td>Appearance</td>
<td>Yellow Liquid</td>
<td>Yellow Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Mild amine</td>
<td>Mild amine</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>Lbs. Per Gallon</td>
<td>7.7</td>
<td>7.7</td>
</tr>
<tr>
<td>Flash Point</td>
<td>105°C (220°F)</td>
<td>105°C (220°F)</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>800 cSt at 40°C, 45 cSt @ 100°C</td>
<td>450 cSt @ 40°C</td>
</tr>
<tr>
<td>pH (in 99% isopropanol, 1% water)</td>
<td>8.5 - 9.5</td>
<td>7.0 - 8.0</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>6.5%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0</td>
<td>2.0%</td>
</tr>
<tr>
<td>Solubility in Oil / Water</td>
<td>Soluble / Insoluble</td>
<td>Soluble / Insoluble</td>
</tr>
<tr>
<td>Corrosion Inhibition (CCH, % rust free-44 hours)</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>Rust Test ASTM D665B</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td>4 Ball Test ASTM D783 (1.0% IN 100 SEN)</td>
<td>Initial Seizure 80 kg</td>
<td>Initial Seizure 160 kg</td>
</tr>
<tr>
<td></td>
<td>Scar Diameter 2.9 mm</td>
<td>Scar Diameter 3.6 mm</td>
</tr>
<tr>
<td></td>
<td>Weld Load 126 kg</td>
<td>Weld Load 250 kg</td>
</tr>
</tbody>
</table>
**Water-soluble Corrosion Inhibitor**

**APPLICATION:**
FUNCTIONAL CI-498 is a water soluble corrosion inhibitor that may be used in lubricants and hydraulic fluids that might have incidental food contact. It is completely soluble in water-based fluids.

**COMPOSITION:**
FUNCTIONAL CI-498 is an aqueous solution of a phosphate salt, registered with NSF as a component which meets the specifications of Classifications HX-1 & HX-2 (21 CFR 178.3570) for lubricants with incidental food contact.

**TREATMENT LEVEL:**
FUNCTIONAL CI-498 is permitted in food-grade lubricants at levels up to the level needed to accomplish its purposes of corrosion inhibition. The treatment level will depend on the rest of the formulation, but may be in the range of 0.3-0.5%. It may be used with antioxidants, thickeners or additives customarily used in these applications.

**HANDLING:**
In its concentrated form, FUNCTIONAL CI-498 is a skin and eye irritant and should be handled with suitable personal protection. FUNCTIONAL CI-498 should be protected from freezing. See the Material Safety Data Sheet.

<table>
<thead>
<tr>
<th>Property</th>
<th>CI-498</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF Registration Number</td>
<td>120912</td>
</tr>
<tr>
<td>Category Code</td>
<td>HX-1, HX-2</td>
</tr>
<tr>
<td>Appearance</td>
<td>Clear, slightly yellowish liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>none</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.02</td>
</tr>
<tr>
<td>Lbs. Per Gallon</td>
<td>8.5</td>
</tr>
<tr>
<td>Flash Point</td>
<td>none</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>100%</td>
</tr>
</tbody>
</table>
Tackifiers and Thickeners for Lubricants

APPLICATION:
Tackifiers are additives that confer a tack or stringiness to a substance, and are typically used to provide adherence in fluid lubricants and stringiness in greases. Thickeners give additional body to greases and fluid lubricants. Tackifiers and thickeners provide drip resistance and inhibit stray mist in pneumatic system lubricants. We offer tackifiers and thickeners with properties optimized for special uses.

- **FUNCTIONAL V-422** is a general-purpose tackifier that is widely used in food grade greases and fluid lubricants. It also provides mist control. It is water-white in color.
- **FUNCTIONAL V-425** is a thickener and tackifier used in greases and fluid lubricants intended for use in food-processing equipment. It also controls misting of these lubricants. This additive is more stable than those derived from polyisobutylene and degrades less at high temperatures. It is also water-white in color.
- **FUNCTIONAL V-460** is a viscosity index improver (VII) with excellent shear stability that may be used in preparing industrial fluids and lubricants. It may also be used without dilution as a supplemental crankcase additive for the automotive aftermarket. A 10% treat rate in ISO32 oil thickens to 10.1 cSt @ 100° C.
- **FUNCTIONAL V-498** is also extremely light in color which makes it especially useful in spindle lubricants for textile machinery. It may also be used to provide adherence in way oils and chain lubricants, stringiness in greases and aerosol resistance in mist and pneumatic system lubricants.
- **FUNCTIONAL V-508F** is a thickener for vegetable or animal-based fatty oils, used to blend lubricants of ISO46 or ISO68 viscosity grade. **V-508F** has excellent high-temperature properties, is shear stable, and has a PSSI of 28%. With approximately 85% biodegradable content, **V-508F** is biodegradable under all widely used standards.
- **FUNCTIONAL V-584** confers a tack or stringiness to lubricants made from vegetable or animal based fatty oils. It is principally used to provide adherence in chain oils in environmentally sensitive or food-processing locations. It will also inhibit stray mists and provide drip resistance.

COMPOSITION:
Our Food Grade tackifiers and thickeners are approved as components in NSF Classification HX-1, lubricants with incidental food contact. Their specific compositions are identified in the table on the next page.

TREATMENT LEVEL:
Since tackiness and stringiness are subjective properties that lack standardized test methods, the required treatment level is best determined by experimentation. Values in the table below are typical levels for the lubricant types.

<table>
<thead>
<tr>
<th>Product</th>
<th>Lubricant Type</th>
<th>Treatment Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-422, V-425, V-498</td>
<td>Fluid (mineral oil)</td>
<td>0.5-1.5 %</td>
</tr>
<tr>
<td>V-460</td>
<td>Industrial lubricant &amp; grease</td>
<td>5-15%</td>
</tr>
<tr>
<td>V-422, V-425, V-498</td>
<td>Grease</td>
<td>0.5-0.25 %</td>
</tr>
<tr>
<td>V-425, V-498</td>
<td>Anti Mist</td>
<td>0.3-0.6 %</td>
</tr>
<tr>
<td>V-498</td>
<td>Spindle Oils</td>
<td>0.1-0.5 %</td>
</tr>
<tr>
<td>V-508F</td>
<td>Vegetable oils and esters</td>
<td>4.0-8.5%</td>
</tr>
<tr>
<td>V-584</td>
<td>Fluid (vegetable oil)</td>
<td>1.0-2.0 %</td>
</tr>
</tbody>
</table>
Additives for Food Grade Lubricants

HANDLING:

Due to the viscosity of these products, elevated temperatures (approximately 150°F / 65°C) can facilitate handling. Temperatures over 200°F may lead to degradation of tackiness and viscosity. Safe handling precautions are the same as those to be taken with the base oil; see the current Material Safety Data Sheet for more information. The tackiness of products made from any tackifier may be somewhat lessened by shear, so mechanical shearing during blending and handling should be minimized. FUNCTIONAL V-498 is especially sensitive to shear, so special care should be taken with it and lubricants made from it.

Warming FUNCTIONAL V-584 and V-508 to about 120°F (50°C) may facilitate pumping and handling, however extended storage of this or any other vegetable oil-derived product at elevated temperatures is not recommended. For best tackiness retention, do not warm above about 150°F (65°C). Safe handling precautions are the same as those to be taken with vegetable oils; see the current Material Safety Data Sheet for more detailed information.

<table>
<thead>
<tr>
<th>Property</th>
<th>V-422</th>
<th>V-425</th>
<th>V-460</th>
<th>V-498</th>
<th>V-508F</th>
<th>V-584</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF Reg. No.</td>
<td>120906</td>
<td>120905</td>
<td>142396</td>
<td>133062</td>
<td>146676</td>
<td>120913</td>
</tr>
<tr>
<td>Category Code</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
<td>HX-1, HX-2</td>
</tr>
<tr>
<td>Application</td>
<td>Tackifier</td>
<td>Thickener</td>
<td>Tackifier</td>
<td>Viscosity Index Improver</td>
<td>Tackifier</td>
<td>Tackifier for Fatty Oil Based Lubricants</td>
</tr>
<tr>
<td>Active Ingredient</td>
<td>polyisobutylene</td>
<td>olefin copolymer</td>
<td>ethylene and propylene copolymer</td>
<td>polyisobutylene</td>
<td>proprietary polymer</td>
<td>proprietary</td>
</tr>
<tr>
<td>Diluent</td>
<td>white oil</td>
<td>white oil</td>
<td>white oil</td>
<td>white oil</td>
<td>vegetable oil</td>
<td>vegetable oil</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.845</td>
<td>0.845</td>
<td>0.86</td>
<td>0.86</td>
<td>0.93</td>
<td>0.93</td>
</tr>
<tr>
<td>Lbs. Per Gallon</td>
<td>7.00 – 7.10</td>
<td>7.00 – 7.10</td>
<td>7.16</td>
<td>7.10 – 7.25</td>
<td>7.75</td>
<td>7.75</td>
</tr>
<tr>
<td>Flash Point (COC)</td>
<td>150°C (300°F)</td>
<td>150°C (300°F)</td>
<td>150°C (300°F)</td>
<td>135°C (275°F)</td>
<td>150°C (300°F)</td>
<td>150°C (300°F)</td>
</tr>
<tr>
<td>Kinematic Viscosity (cSt @ 100°C)</td>
<td>3,100</td>
<td>3,000</td>
<td>3,000</td>
<td>4,000</td>
<td>1,100-1,400</td>
<td>2,500</td>
</tr>
<tr>
<td>Color</td>
<td>water-white</td>
<td>water-white</td>
<td>water-white</td>
<td>water white</td>
<td>Yellow (&lt;4 ASTM)</td>
<td>Hazy yellow or orange</td>
</tr>
</tbody>
</table>
Purchasing Information

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