Tackifier Products

Industrial Lubricant Tackifiers. ..............................................3
Food Grade Tackifiers ..........................................................4
Biobased Tackifiers. ...............................................................4
Emulsion Based Grease Tackifiers. ..........................................5
High Temperature Tackifiers. ..................................................5
Tackifier and Thickener for Aqueous Systems. .........................6
Testing, Handling and Blending Information. ...........................7
Tackifier Products

Tackifiers are additives that confer tack, or stringiness, to a substance and are typically used to provide adherence in fluid lubricants and stringiness in grease. Thickeners give additional body to greases and fluid lubricants. Both tackifiers and thickeners also provide drip resistance and serve to inhibit stray mist in pneumatic system lubricants.

FUNCTIONAL PRODUCTS INC. offers an extensive line of tackifiers for various systems and applications. This catalog presents information regarding our mineral oil, vegetable oil, and latex based products. The catalog also lists the appropriate application for each tackifier.

FUNCTIONAL PRODUCTS INC. offers a wide range of tackifiers to fit your requirements. Custom products are our specialty. If you require something not in our standard catalog, please let us know. We will be happy to create a tackifier that meets your need.

Definitions
NSF — The NSF, a non-governmental non-profit corporation, assumed responsibility from the FDA. Registry numbers are assigned to approved products, lubricants and lubricant additives.

OCP — Olefin copolymer
PAO — Polyalphaolefin
PIB — Polyisobutylene

String Length — A measure of tackifier performance as determined by the Ductless Siphon Test (see page 7).

Noteworthy

FUNCTIONAL PRODUCTS was given the “Best Paper Award” at the ELGI Annual Meeting in Paris for their paper on polymer compatibility in mineral and vegetable oils.

FUNCTIONAL PRODUCTS provides instruction on polymers in the Advanced Grease Course at the NLGI conferences.

FUNCTIONAL PRODUCTS received an award for its paper at the National Lubricating Grease Symposium in Wuyishan, China.

Health and Safety:
The product descriptions here, in Technical Data Sheets (TDSs) and on product labels are not intended to take the place of a Safety Data Sheet (SDS).

A SDS is provided with each order or sample shipment of an order or a sample and can be downloaded from our website:

www.functionalproducts.com
Phone: 1-330-963-3060
# Industrial Lubricant Tackifiers

**Applications and Treat Levels**

- **Way Lubricants:** 0.5-1.0%
- **Chain Oils:** 0.3-1.5%
- **Greases:** 0.5-1.5%
- **Aerosol Resistance:** 0.5-2.0%

*Treat levels are typical ranges. Since there are no standardized tests for these properties, the actual treat level is best determined by the formulator.

## Typical Properties

<table>
<thead>
<tr>
<th>Product</th>
<th>Diluent Oil</th>
<th>Polymer</th>
<th>Viscosity (cSt at 100°C)</th>
<th>Color (ASTM D1500)</th>
<th>Shear Stability</th>
<th>String Length (0.5 wt% in ISO 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-172</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>4000</td>
<td>&lt;4</td>
<td>Very Good</td>
<td>48</td>
</tr>
<tr>
<td>V-172E</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>2800</td>
<td>&lt;2</td>
<td>Very Good</td>
<td>34</td>
</tr>
<tr>
<td>V-174</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>800</td>
<td>&lt;3</td>
<td>Good</td>
<td>50</td>
</tr>
<tr>
<td>V-176</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>2900</td>
<td>&lt;4</td>
<td>Good</td>
<td>47</td>
</tr>
<tr>
<td>V-177</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>10500</td>
<td>&lt;4</td>
<td>Good</td>
<td>98</td>
</tr>
<tr>
<td>V-177L</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>6800</td>
<td>&lt;4</td>
<td>Good</td>
<td>76</td>
</tr>
<tr>
<td>V-178</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>4000</td>
<td>&lt;4</td>
<td>Good</td>
<td>90</td>
</tr>
<tr>
<td>V-178E</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>2100</td>
<td>&lt;4</td>
<td>Good</td>
<td>67</td>
</tr>
<tr>
<td>V-179</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>300</td>
<td>&lt;4</td>
<td>Good</td>
<td>63</td>
</tr>
<tr>
<td>V-184</td>
<td>Naphthenic</td>
<td>PIB/OPC</td>
<td>4000</td>
<td>&lt;4</td>
<td>Very Good</td>
<td>49</td>
</tr>
<tr>
<td>V-188</td>
<td>Paraffinic</td>
<td>OCP</td>
<td>4000</td>
<td>&lt;4</td>
<td>Excellent</td>
<td>28*</td>
</tr>
<tr>
<td>V-189A</td>
<td>Paraffinic</td>
<td>OCP</td>
<td>13000 at 40°C</td>
<td>&lt;4</td>
<td>Excellent</td>
<td>20*</td>
</tr>
<tr>
<td>V-198A</td>
<td>Paraffinic</td>
<td>PIB</td>
<td>5000</td>
<td>&lt;4</td>
<td>Poor</td>
<td>52</td>
</tr>
<tr>
<td>V-298</td>
<td>Technical White</td>
<td>PIB</td>
<td>4000</td>
<td>&lt;1</td>
<td>Poor</td>
<td>53</td>
</tr>
<tr>
<td>V-298F</td>
<td>Technical White</td>
<td>PIB</td>
<td>6250</td>
<td>&lt;1</td>
<td>Poor</td>
<td>78</td>
</tr>
<tr>
<td>V-298L</td>
<td>Technical White</td>
<td>PIB</td>
<td>2000</td>
<td>&lt;1</td>
<td>Poor</td>
<td>36</td>
</tr>
<tr>
<td>V-378</td>
<td>Group III</td>
<td>PIB</td>
<td>5000</td>
<td>&lt;3</td>
<td>Good</td>
<td>75</td>
</tr>
<tr>
<td>V-388</td>
<td>Group III</td>
<td>OCP</td>
<td>4000</td>
<td>&lt;3</td>
<td>Excellent</td>
<td>22*</td>
</tr>
</tbody>
</table>

* OCP tackifiers confer lower string lengths than those of PIB tackifiers. However, the shear stability of OCP tackifiers is much higher, resulting in smaller decreases in string length in applications where shear is present.
Food Grade Tackifiers
For Incidental Food Contact

Applications
- Greases
- Chain Oils
- Anti-mist
- Way Oils

Typical Properties

<table>
<thead>
<tr>
<th>Product</th>
<th>Diluent</th>
<th>Polymer</th>
<th>Viscosity (cSt at 100°C)</th>
<th>Color (ASTM D1500)</th>
<th>Shear Stability</th>
<th>String Length (0.5 wt% in ISO 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-422</td>
<td>White Mineral Oil</td>
<td>PIB</td>
<td>3000</td>
<td>&lt;1</td>
<td>Good</td>
<td>53</td>
</tr>
<tr>
<td>V-425</td>
<td>White Mineral Oil</td>
<td>OCP</td>
<td>3000</td>
<td>&lt;2</td>
<td>Excellent</td>
<td>15*</td>
</tr>
<tr>
<td>V-498</td>
<td>White Mineral Oil</td>
<td>PIB</td>
<td>4000</td>
<td>&lt;1</td>
<td>Good</td>
<td>53</td>
</tr>
<tr>
<td>V-584</td>
<td>Vegetable Oil</td>
<td>Proprietary</td>
<td>2500</td>
<td>&lt;4</td>
<td>Fair</td>
<td>10**</td>
</tr>
</tbody>
</table>

* OCP tackifiers confer lower string lengths than those of PIB tackifiers. However, the shear stability of OCP tackifiers is much higher, resulting in smaller decreases in string length in applications where shear is present.

** 0.5% by weight in Canola oil

For more information please refer to our Additives for Food Grade Lubricants catalog.

Biobased Tackifiers

Biobased tackifiers are primarily used to provide adherence in saw-chain and saw-guide oils in environmentally sensitive locations.

Typical treatment level for a chain lube is 3-10%. This level will bring a vegetable oil to ISO 46 or ISO 68 grade. Low temperature properties can be improved with the addition of FUNCTIONAL PD-551 at 0.2-1.0%.

Typical Properties

<table>
<thead>
<tr>
<th>Product</th>
<th>Diluent</th>
<th>Viscosity (cSt at 100°C)</th>
<th>Color (ASTM D1500)</th>
<th>Shear Stability</th>
<th>String Length (0.5 wt% in Canola)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-515</td>
<td>Vegetable Oil</td>
<td>8000</td>
<td>&lt;4</td>
<td>Good</td>
<td>5</td>
</tr>
<tr>
<td>V-584</td>
<td>Vegetable Oil</td>
<td>2500</td>
<td>&lt;4</td>
<td>Fair</td>
<td>10</td>
</tr>
</tbody>
</table>

The polymers themselves are not readily biodegradable, but allow the formulation of tacky lubricants in biobased oil systems.

For more information please refer to our Additives for Biobased Products catalog.
Emulsion Based Grease Tackifiers

As an emulsion, the high active polymer level results in modest viscosity compared to oil based tackifiers. These additives are for use in greases that are either made with water, or where water is formed as a by product of soap formation. **FUNCTIONAL V-191M** is more resistant to ‘clotting’ during blending. The typical treat level is 0.5-2.0%.

**HANDLING:**
These products are subject to freezing at temperatures below 32°F. Freezing must be prevented to avoid irreversibly breaking the emulsion. Recommended storage temperature is 40-100°F.

<table>
<thead>
<tr>
<th>Product</th>
<th>Diluent</th>
<th>Polymer</th>
<th>Appearance</th>
<th>pH</th>
<th>Odor</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-191</td>
<td>Water</td>
<td>Hydrocarbon</td>
<td>White Liquid</td>
<td>10</td>
<td>Slight ammonia</td>
</tr>
<tr>
<td>V-191M</td>
<td>Water</td>
<td>Hydrocarbon</td>
<td>White Liquid</td>
<td>10</td>
<td>Slight ammonia</td>
</tr>
</tbody>
</table>

High Temperature Tackifiers

**FUNCTIONAL V-378** and **V-388** are additives that provide stringiness and water resistance to thermally stable lubricants and greases based on PAO and Group III base oils. Lubricants using Group III oils or PAOs with these tackifiers are more thermally and oxidatively stable than other products made with the same base oils and conventional tackifiers.

**HANDLING:**
Due to their viscosity, elevated temperatures can facilitate handling. Safe handling precautions are the same as those to be taken with the base oil; see the current SDS.

<table>
<thead>
<tr>
<th>Product</th>
<th>Diluent</th>
<th>Polymer</th>
<th>Flash Point</th>
<th>Viscosity (cSt at 100°C)</th>
<th>Color (ASTM D1500)</th>
<th>String Length (0.5 wt% in ISO 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-378</td>
<td>Group III Oil</td>
<td>PIB</td>
<td>410°F (210°C)</td>
<td>5000</td>
<td>&lt;2</td>
<td>75</td>
</tr>
<tr>
<td>V-388</td>
<td>Group III Oil</td>
<td>OCP</td>
<td>410°F (210°C)</td>
<td>4000</td>
<td>&lt;2</td>
<td>22*</td>
</tr>
</tbody>
</table>

* OCP tackifiers confer lower string lengths than those of PIB tackifiers. However, the shear stability of OCP tackifiers is much higher, resulting in smaller decreases in string length in applications where shear is present.
**Tackifier and Thickener for Aqueous Systems**

**FUNCTIONAL V-801** is an environmentally friendly, non-hazardous liquid additive that thickens and confers tack/stringiness to fluids made from water or emulsions of water and soluble oils. It may be blended to increase adherence and drip resistance to liquids or colloidal suspensions used in aqueous bar and chain oils or wire rope lubricants. **V-801** can also be used in flocculating agents, home care/cleaning, and ceramic applications, including as a binder for powders and an anti-sag agent in paints.

The active ingredient in **FUNCTIONAL V-801** is a high molecular weight proprietary polymer that provides tackiness and thickening. The polymer is not considered biodegradable.

### Typical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Tacky, viscous liquid</td>
</tr>
<tr>
<td>Color</td>
<td>White, opaque</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.01</td>
</tr>
<tr>
<td>Lbs per Gallon</td>
<td>8.42</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>40,000 @ 40°C</td>
</tr>
</tbody>
</table>

The typical treatment level is 0.3 - 5%, depending on the application. At temperatures greater than 200°C, the product degrades into a film that does not build up. At temperatures below 5°C, **V-801** may be combined with a cold flow improver such as ethylene or propylene glycol. Due to the range of applications, treatment level is best determined by the end-user.

**HANDLING:**

**FUNCTIONAL V-801** flows readily at ambient temperature and may be pumped into transfer systems. The product should be stored at temperatures above 5°C and below 45°C. Replace container lid tightly after use to maintain product consistency and quality. Exposure to air for more than a few hours may cause the formation of surface film. The film may be easily removed prior to use.

**FUNCTIONAL V-801** has a shelf life of 6 months. Avoid mechanical shearing during handling and blending to minimize possible loss of tackiness.

Safe handling precautions are the same as those to be taken with other tackifiers. See the current Safety Data Sheet.
Testing, Handling and Blending Information

**String Length Testing using the Ductless Siphon Method:**
A vacuum pump draws fluid through a capillary with one end initially placed under the surface of the liquid. As liquid is removed through the capillary, the level drops so that the capillary is above the surface. The suction pulls the tacky liquid up even through airspace. Tackier solutions will draw a longer filament than less tacky solutions; non-tacky solutions are not drawn across the airspace at all. A graduated cylinder is used as the container; the siphon draws the level down until the filament breaks. The maximum height of the filament supported by the vacuum is recorded as the string length.

A comprehensive discussion of this test method is available. The ductless siphon test is based upon a paper, *Evaluating Tackiness of Polymer Containing Lubricants by the Open Siphon Method: Experiments, Theory, and Observation*, which was authored by scientists from **FUNCTIONAL PRODUCTS INC.** and the University of Akron Department of Polymer Engineering.

**Incompatibilities:**
Like other polymers, tackifier polymers can drop out of solution if the polarity of the diluent is changed. Usually, this problem arises when a polymer is blended with another (more-polar) additive such as a motor oil detergent package, way oil package or a sulfonate emulsifier. In such cases the polymer may drop out of solution. Incompatibility can be avoided by attention to the blending sequence; when blending a polymeric additive and a polar additive, always completely dissolve one additive in the diluent oil before starting the addition of the other.

**Blending:**
Viscous additives like tackifiers can be difficult to mix into low-viscosity diluents. Poor mixing may cause incompatibility when other additives are added (as stated above). If the agitation is not sufficient for good blending, the easiest solution is to heat the tackifier before blending.

**Thermal Breakdown:**
Except for **FUNCTIONAL V-378**, polyisobutylene-based tackifiers start to break down above 100°C (212°F). Fortunately, most tackifier applications are at modest temperatures. Some greases, however, are made at higher temperatures and breakdown can occur.

Be especially wary of the long cooling time of grease that is drummed hot.

**Shear Breakdown:**
The high molecular weight of polymers provides tack in solution. While some tackifiers are more shear-stable than others, shear will eventually break down any tackifier. The shear that occurs in agitating with air or with ordinary open propellers is typically not a serious problem. Shear in pumping, however, frequently leads to loss of tackiness. Best practice is to use a diaphragm pump or centrifugal pump, without pump recirculation during blending. The number of transfer operations should be minimized. Be especially careful about devices that re-circulate through a bypass to limit pressure. One solution is to replace the pump with an air-driven diaphragm pump, which will stop pumping when the discharge pressure reaches the limit.
Purchasing Information

Functional Products, Inc.
8282 Bavaria Road
Macedonia, OH 44056
Phone: 330-963-3060
Fax: 330-963-3322
sales@functionalproducts.com
sds@functionalproducts.com
www.functionalproducts.com

North America

United States
East Coast
CT, DE, Eastern PA, Eastern NY, NH, NJ, MA, MD, ME, RI, VT
Ivanhoe Industries, Inc.
318 William Leigh Drive
Tullahoma, TN 37388
Phone: 251-547-1200
Fax: 251-946-7411
w.tuszynski@ivanhoeindustries.com

Southeast
VA, NC, SC, GA, AL, MS, LA, FL
Lintech International
PO Box 10225
Macon, GA 31297
Phone: 877-546-8324
Fax: 478-784-1745
www.2lintech.com

Midwest
MO, KS, OH, AR, NM, NE, IA, IL, CO, TX
Hall Technologies
6300 Barmen Industrial Drive
St. Louis, MO 63130
Phone: 314-725-2600
Fax: 314-662-7377
www.halltechnics.com

West Coast
WA, AZ, CA, ID, HI, MT, NV, OR, UT, WA, WY
Tri-iso, Inc.
2187 Newlands Ave. #101
Cardiff by the Sea, CA 92007
Phone: 760-322-6000
Fax: 760-621-9119
www.tlonline.com

Canada
Tempo Canada ULC
1175 North Service Road West, Suite 200
Oakville, ON Canada
Phone: 905-339-3399
Fax: 905-339-3383
www.tempoca.com

Mexico
Presidio
Pte. de la Independencia #707
Col. Alamos
CP 03400 Mexico City, DF, Mexico
Phone: 52-55-55-606-5551
Fax: 52-55-55-606-5420
www.presidio.com

Europe

France, Germany
Lumar France
& Avenue Eiffel
78240 Carrières-sur-Seine
Phone: 33-1-39-159-899
Fax: 33-139-159-313
commercial.france@lumarquimica.com
www.lumarquimica.com

Italy
Lumar Italy
Str. Comp. le Per Campagna
20078 San Colombano al Lambro
Milano
Phone: 39-03-71-20-04-63
Fax: 39-03-71-20-04-45
nella@lumarquimica.com
lumarquimica.com

Spain, Turkey
Lumar Quimica, S.L.U.
Milanseal 23-27, 41.1a
08017 Barcelona
Phone: 34-935-947-500
Fax: 34-935-947-501
lumar@lumarquimica.com
www.lumarquimica.com

Switzerland
Intermell AG
Untermülli 11
CH-6300 Zug
Phone: 41-41-725-3510
Fax: 41-41-725-3619

United Kingdom
Terry Dickson
Unit 13, Sandwell Business Development Centre
Oldbury Road, Smethwick, B66 1NN
Phone: 44-121-544-3638
terrydicken@hotmail.com

Asia

China
Smart Oil & Chemical Limited
Flat F, 23/F, Block 10, Lok Shan Path
Royal Ascot, Shatin
New Territories, Hong Kong
Phone: 852-2887-5466
Fax: 852-2636-6566
brianay@smart-oil.com
Sunflower Chemical
No. 55, Lane 805, Jiangnan Road
Shanghai
Phone: 86-186-2158-0862
Fax: 86-21-5078-0763
xz.tian@sunflowerchemical.com
www.sunflowerchemical.com

India, Bangladesh
Environ Chem
A-805 Kemp Plaza
Chemical Bunder Road
Malad (West)
Mumbai 400064
Phone: 91-22-2408-9238/9330/31/32
Fax: 91-22-2403-9240
sales@environchem.com
www.environchem.com

© 2014 Functional Products, Inc. All rights reserved