

## Polymer Additives for Grease

**FUNCTIONAL PRODUCTS INC.** offers a variety of polymer additives that improve grease properties including tack, shear stability, water resistance and, by thickening the grease, significantly increase yield. These additives are available in liquid or powder form and have been tested in aluminum complex, simple lithium, lithium complex, calcium sulfonate and polyurea greases. For information on Functional's additives in calcium sulfonate and polyurea greases, please contact Functional Products as the choice of base oil and soap affect which additive may be best suited for the application.

### Selection Guide

- **Are liquid or solid additives preferred?**
- **Is the process batch or continuous?** Liquid additives are best for continuous processes.
- **When are the additives incorporated into the batch: at the initial reaction stage or with the cooling oil?** Reactive chemistries such as V-4040P must be added with during the initial reaction while temperatures are high while other polymers may be added during the initial reaction or with the cooling oil, depending on reaction temperature. If the reaction temperature is greater than 200°C, non-reactive polymers are best added with the cooling oil.

### Added Tack

Tack can be described as adhesive or cohesive. **FUNCTIONAL PRODUCTS INC.** provides additives which can improve both types of tack as measured using pull-off force as determined by a modified probe tack method (ASTM D2979). For details, request a copy of Functional's NLGI Paper #1417, "The Adhesiveness of Grease".

- **Adhesive Tack:** 1% V-201 (pellet), 1% V-207 (powder), 4% V-4004A (liquid) or 1.5% V-4033 (liquid)
- **Cohesive Tack:** 1% V-4060 (pellet) or 1% V-191 (liquid)

### Shear Stability

	Form	Treat Level (%)	Worked Penetration* Change ( <sup>1</sup> / <sub>10</sub> mm)	Roll Stability** (% Change)
Li Complex Base Grease		0	-24	11.0
Base + <b>Functional V-176</b>	Liquid	2	6	-1.4
Base + <b>Functional V-178</b>	Liquid	2	-3	1.4
Base + <b>Functional V-188</b>	Liquid	2	-3	4.1
Base + <b>Functional V-207</b>	Powder	1	-5	4.4
Base + <b>Functional V-4004A</b>	Liquid	3	1	1.4
Base + <b>Functional V-4040P</b>	Powder	0.25	3	3.0

\*Roll Stability: ASTM D1831

\*\*60 and 10,000 Strokes Cone Penetration: ASTM D217

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# FUNCTIONAL PRODUCTS INC.

Innovative Chemistry for Lubricants

## Water Resistance

	Form	Treat Level (%)	WS/O* (%)
Li Complex Base Grease		0	73
Base + <b>Functional V-207</b>	Powder	1	14
Base + <b>Functional V-4004A</b>	Liquid	3	33
Base + <b>Functional V-4033</b>	Liquid	1.5	32
Base + <b>Functional V-4040P</b>	Powder	0.25	23
Base + <b>Functional V-4060</b>	Pellet	1	18

\*Water Spray-off: ASTM D4049

## Water Resistance in Biobased Grease

	Form	Treat Level (%)	WS/O* (%)
Canola Simple Li Base Grease		0	100
Base + <b>Functional V-508M</b>	Liquid	10	33
Base + <b>Functional V-584</b>	Liquid	2.5	85

\*Water Spray-off: ASTM D4049

**FUNCTIONAL PRODUCTS INC.** polymer additives increase the yield of the grease. Change in penetration of the grease with and without polymer additives shows the economic advantage of using our products.

## Yield Increase

	Treat Level (%)	Cone Penetration*	NLGI Grade Change	Oil Adjustment Required (%)
Li Complex Base Grease	0	296	--	--
Base + <b>Functional V-207</b>	1	265	1 grade	15 - 20
Base + <b>Functional V-4004A</b>	3	268	1 grade	15 - 20
Base + <b>Functional V-4004A</b>	1.5	272	1 grade	15 - 20
Base + <b>Functional V-4040P</b>	0.25	264	1 grade	15 - 20
Base + <b>Functional V-4060</b>	1	270	1 grade	15 - 20

\*Cone Penetration: ASTM D217

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