FUNCTIONAL PRODUCTS INC.
Innovative Chemistry for Lubricants

Viscosity Modifiers and Base Stocks

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Viscosity Modifier Selection

Viscosity is first step in proper lubricant selection. Formulators use polymer-based viscosity modifiers or "VM" in combination with base oils to tailor the temperature and shear response of lubricants. This brochure features industrial viscosity modifiers for petroleum based lubricants and greases. Specialty VMs for biobased or incidental food contact (NSF H1) are described in the **Biobased** and **Food Machinery** brochures.

Olefin Copolymers (OCP)

Olefin copolymers are a diverse group of polymers used in: engine or crankcase oil, tractor fluids, hydraulic fluids, pneumatic oils, greases, rust preventatives, and general purpose industrial lubricants. OCPs are a cost effective replacement for heavy petroleum oils and provide both improved low temperature fluidity and greater high temperature viscosity.

Olefin Copolymers in Liquid Form

High quality OCP polymer pre-dissolved in highly refined petroleum oil is the fastest and most convenient option to add viscosity to a lubricant or grease formulation. We supply drum, tote, and bulk quantities.

Product	Viscosity, at 100°C	PSSI, D6278	Chemistry	Base Oil	Thickening Efficiency, 10wt%
V-160	1000	22	OCP	Paraffinic	11.0 cSt
V-166	1200	35	OCP	Paraffinic	11.4 cSt
V-158	1200	45	OCP	Paraffinic	11.9 cSt
V-158F	1400	50	OCP	Paraffinic	12.1 cSt
V-186	4500	60	OCP	Paraffinic	12.3 cSt

Styrene Copolymers

Styrene copolymers offer higher thickening efficiency, lower PSSI, and higher viscosity index than conventional olefin copolymers of the same P-SSI rating. Their styrene functionality is key in mitigating the oxidative and abrasive effects of soot and varnish in heavy-duty applications. **FUNCTIONAL V-4300** Series is based on diblock styrene polymer architecture which disperses carbonized soot particles to prevent sludge formation and abrasive wear.

Product	Form	P-SSI, D6278	Base Oil	Chemistry	Thickening Efficiency
V-4318	Liquid	0 – 5	Paraffinic	Styrene OCP	8.9 cSt
V-4312	Liquid	5 – 10	Paraffinic	Styrene OCP	10.0 cSt
V-4314	Liquid	20 – 25	Paraffinic	Styrene OCP	12.3 cSt
V-4316	Liquid	60	Paraffinic	Styrene OCP	11.2 cSt

FUNCTIONAL V-4600 Series styrene viscosity modifiers are based on a multi-arm, star-like structure which is highly resistant to shear thinning under high flow rates in confined passageways like engines.

Product	Form	P-SSI, ASTM D6278	Base Oil	Chemistry	Thickening Efficiency, 10wt%
V-4630	Liquid	0 – 2	Group III	Styrene OCP	6.2 cSt

Polymethacrylates (PMA)

FUNCTIONAL M Series viscosity modifiers are polymethacrylate copolymers which offer greatly improved shear stability, viscosity index improvement, and low temperature fluidity versus olefin copolymer (OCP) viscosity modifiers. Olefin copolymers typically have PSSI from 20 – 60 by ASTM D6278 diesel injector shear; polymethacrylates can achieve PSSI as low as 0 by ASTM D6278 and require the more aggressive 20 Hour KRL (CEC L-45-A-99) test to exhibit shearing of viscosity. **FUNCTIONAL MH-2000**, **MH-4500**, and **MH-7000** are highly recommended starting points.

Product	Viscosity, at 100°C	P-SSI, D6278	SSI, 20 Hour KRL	Thickening Efficiency, 10wt%	Key Applications
MG-1000	1050	0	15	9.8 cSt	Gear oil and HF in (PAO)
MG-3000	550	0	20	11.0 cSt	Gear oil and HF in Group I-III
MH-2000	1050	1	35	9.7 cSt	Economy gear oil
MN-3500	900	9	60	12.0 cSt	Naphthenic oil for low temp.
MH-4500	1550	15	65	13.0 cSt	Hydraulic fluid
MH-7000	1550	36	N/A	14.6 cSt	High VI industrial, engine oil

For polymethacrylate pour point depressants, see the **Industrial Additives** brochure.

Dispersant Polymethacrylates (D-PMA)

FUNCTIONAL MD polymethacrylates include a small percentage (<1%) of nitrogen functionality to greatly reduce deposits formed from high temperature and oxidation. **FUNCTIONAL MD** products are often used in clutch or transmission fluids for tractor, automotive, and racing where high heat and wear is generated.

Product	Viscosity, at 100°C	P-SSI, D6278	SSI, 20 Hour KRL	Thickening Efficiency, 10wt%	Key Applications
MD-2200	1550	3	35	9.0 cSt	Dispersant gear and HF
MD-8004	950	40	N/A	16.9 cSt	Tractor hydraulic, ATF

High Viscosity Synthetic Base Stocks

Synthetic base stocks are defined here as shear stable polymers meeting or exceeding the 15% viscosity loss by DIN 51350-6 (also known as 20 Hour KRL or CEC L-45-A-99) for applications like HVLP high VI hydraulic fluid or OEM gear oils. These high viscosity options are able to effectively thicken low viscosity fluids with minimal shear loss in severe duty applications.

Product	Chemistry	Viscosity, at 40°C	Viscosity, at 100°C	Viscosity Index	SSI, 20 Hour KRL	Flash Pt., D92 COC	Density, lb/gal	Color, D1500
V-736	EPO	9000	600	235	5	280°C	7.1	0.5
V-731	EPO	19000	1100	270	10	280°C	7.1	0.5
V-732	EPO	40000	2000	290	15	290°C	7.1	0.5
MB-1010	PMA	44000	900	170	15	200°C	7.8	1.0
V-705	LT-PO	37000	6500	510	4	220°C	7.5	<0.5

FUNCTIONAL V-730 Series

Ethylene Propylene Oligomers (EPO)

FUNCTIONAL V-736, V-731, and **V-732** are low molecular weight copolymers (“oligomers”) of ethylene and propylene in liquid form. Ethylene propylene oligomer (or “EPO”) viscosity modifiers offer the best thermal, oxidative, and hydrolytic stability versus other synthetic base stock types. Various EPO grades have been registered on the NSF HX-1 white list or European Ecolabel LuSC list.

FUNCTIONAL MB-1010

Polymethacrylate Base Stock

FUNCTIONAL MB Series products are premium high viscosity synthetic base stocks which have been tailored for high VI improvement, additive compatibility, and mild dispersancy for degradation products as the lubricant ages under severe conditions. Specific products from this series vary in their handling viscosity, shear stability index (SSI) by CEC L-45-A-99 “20 hour KRL” testing, and .

FUNCTIONAL V-705

Proprietary ‘Low Temperature Polyolefin’ Technology

Proprietary “low temperature polyolefin” **FUNCTIONAL V-705** is ideally suited for low temperature, high VI hydraulic fluids in paraffinic oil. **FUNCTIONAL V-705** provides highly shear stable thickening without negligible effect on low temperature fluidity to achieve PAO-like fluidity with mineral oil formulations and economics. **FUNCTIONAL V-705** is not recommended for the extreme temperatures and oxidative stress of industrial and automotive gear oils, transmission oils, or clutch fluids.

Not finding exactly what you need?
We can help you navigate your options –
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