



Bismuth is a widely accepted tin and lead substitute for consumer and industrial applications such as polymerization catalysts, lead solder and lead shot.



Bismuth compounds are used in the pharmaceutical industry in the formulation of antacids

Bismuth compounds are used as plastics additives to provide radio-opacity for components implanted in the human body

Bismuth compounds are widely used in lipstick and other cosmetic applications to provide sheen

Bismuth in Lubricants

- Bismuth Carboxylate is accepted in the industry as a suitable replacement for Lead Naphthenate as an EP/AVW additive in lubricant formulations.
- Bismuth acts synergistically with active and inactive sulfur components to enhance the extreme pressure capability of lubricant formulations.
- Loading rate levels of 0.1% to 1% by weight of Bismuth effectively achieve the enhanced EP performance.
- Bismuth compounds are also suitable for use in the soap structures of greases.
- Through the addition of < 0.5% Bismuth by weight in the soap structure, water washout in greases is reduced.

Shepherd Chemical

- Shepherd Chemicals, a developer and manufacturer of Metal Carboxylates since 1916, is one of the world's leading manufacturers in this class of compounds.
- Shepherd manufactures a range of Bismuth-based additives for lubricants using acids such as Neodecanoic, Naphthenic and Ethyl-hexanoic - see the table below:

Bismuth			Molybdenum	Zinc
BiLUBE 8107	BiLUBE 8123	BiLUBE 8325	BiLUBE 4131	BiLUBE 3315
BiLUBE 8109	BiLUBE 8211	BiLUBE 8417	BiLUBE 4525	BiLUBE 3319
BiLUBE 8121	BiLUBE 8313		BiLUBE 4627	

- Shepherd manufactures products utilizing a range of natural and synthetic Carboxylic acids as well as Sulfonic acids.
- Shepherd develops and manufactures custom additives based on expertise in other metal technologies.
- As part of our development process, we customize our products to the applications through control of various properties:
 - Acidity
 - Metal Content
 - Oil Solubility
 - Additive Content
 - Viscosity
 - Color
 - Physical Form & Softening Point



PROPERTIES OF BiLUBE®

			BiLUBE 8109	BiLUBE 8123	BiLUBE 8211	BiLUBE 8325
	Test Method	Units				
Viscosity @ 40°C	ASTM D-445	CSt	609	14,386	410	2,644
Viscosity @ 100°C	ASTM D-445	CSt	18	133	19	49
Specific Gravity	Shepherd Method		1.18	1.3	1.3	1.22
Appearance			Brown liquid	Pale yellow liquid	Brown liquid	Brown viscous liquid
Copper Corrosion 24hr @ 100°C	ASTM D-130*		1A - shiny	1B - shiny	1B - shiny	1A - shiny
Flash Point	ASTM D-92	°C	132	204	142	164

*Copper corrosion test performed in neat additives

PERFORMANCE OF BiLUBE® IN LUBRICANTS WITH ACTIVE AND INACTIVE SULFUR

Product	Treat Rate	Active Sulfur (0.4%)			Inactive Sulfur (1%)		
		Weld Point	Load Wear	4 Ball Wear	Weld Point	Load Wear	4 Ball Wear
Control		250	47	0.63	315	55	0.75
BiLUBE 8109	5%	620	105	0.90	800	121	0.91
BiLUBE 8123	5%	800	130	0.89	800	118	0.84
BiLUBE 8211	5%	800	138	0.75	800	129	0.90
BiLUBE 8325	5%	620	106	0.78	620	99	0.85
	Alternate Treat Rate						
BiLUBE 8123	2.50%	620	96	0.97	620	89	1.01
BiLUBE 8211	2.50%	—	—	—	620	102	0.82
BiLUBE 8325	2.50%	—	—	—	500	77	0.88
BiLUBE 8325	7.00%	—	—	—	800	13	0.89

Samples were tested in a blend of 100N Group II oil and Bright Stock to 80W90 Grade
 Weld Point = ASTM D 2783 - Weld Point (Kg) Load Wear = ASTM D 2783 - Load Wear Index (Kg)
 4 Ball Wear = ASTM D 4172 - Four Ball Wear (mm) - 40 kg, 1200 rpm 1 hr @ 75°C

STABILITY OF BiLUBE® IN DIFFERENT OILS

Trade Name	Treat Rate	Stability @							
		21°C		45°C		21°C		45°C	
		Group I	Group II	PAO	Canola Oil - High Oleic				
BiLUBE 8109	5%	Stable	Stable	Stable	Stable	Stable	Opaque	Stable	Stable
BiLUBE 8123	5%	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Ppt
BiLUBE 8211	5%	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Ppt
BiLUBE 8325	5%	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable

Stable = No precipitation following 4 week stability test

Ppt = Precipitate

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 ISO 9001:2000

