

# LUBRICANT ADDITIVES



**R. T. Vanderbilt Company, Inc.**  
INDUSTRIAL MINERALS AND CHEMICALS

A Responsible Care® Company



# R. T. Vanderbilt Company, Inc.

INDUSTRIAL MINERALS AND CHEMICALS

A Responsible Care® Company

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rev05/11/2012



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# Lubricants with R.T. Vanderbilt additives give superior performance.

## ANTIOXIDANTS

- VANLUBE® AZ - Zinc diamyldithiocarbamate.
- VANLUBE EZ - Zinc diamyldithiocarbamate and diamyl ammonium diamyldithiocarbamate.
- VANLUBE NA - Alkylated diphenylamine.
- \*VANLUBE 81 - Purified dioctyldiphenylamine.
- VANLUBE 818DM - Antioxidant/rust inhibitor.
- VANLUBE 887 - Ashless antioxidant synergist.
- VANLUBE 915M - Antioxidant blend.
- \*VANLUBE 961 - Octylated and butylated diphenylamine.
- \*VANLUBE 7723 - Methylene-bis-dibutyldithiocarbamate.
- VANLUBE BHC - Phenolic antioxidant.

## FRICITION REDUCERS/EP-ANTIWEAR AGENTS

- MOLYVAN® L - Molybdenum phosphorodithioate.
- MOLYVAN 2000 - Sulfurized molybdenum dtc.
- MOLYVAN 822 - Molybdenum dithiocarbamate.
- \*\*MOLYVAN 855 - Molybdenum friction reducer/no sulfur, no phosphorus.
- \*VANLUBE 73 - Antimony dithiocarbamate.
- VANLUBE 73 Super Plus - Antimony dithiocarbamate and zinc diamyldithiocarbamate.
- \*VANLUBE 829 - Thiadiazole dimer derivative.
- VANLUBE 869 - Synergistic zinc dithiocarbamate/ sulfurized olefin mixture.
- VANLUBE 871 - Ashless antioxidant/antiwear additive for engine oils.
- VANLUBE 972M - Ashless extreme pressure additive for greases.
- \*VANLUBE 7611M - Ashless additive containing sulfur and phosphorus.
- VANLUBE 8610 - Synergistic antimony dithiocarbamate/ sulfurized olefin mixture.
- \*VANLUBE 9123 - Ashless antiwear/antirust additive.

## METAL DEACTIVATORS

- \*CUVAN® 303 - Corrosion inhibitor and metal deactivator.
- CUVAN 826 - Copper corrosion inhibitor.
- NACAP® - Aqueous sodium mercaptobenzothiazole.
- VANCHEM NATD - Aqueous disodium dimercaptothiadiazole.
- VANLUBE 601 - Heterocyclic sulfur-nitrogen compound.
- VANLUBE 601E - Heterocyclic sulfur-nitrogen compound.
- VANLUBE 704S - Metal deactivator, rust inhibitor.

## RUST INHIBITORS

- \*VANLUBE RI-A - Oil-soluble rust inhibitor.
- VANLUBE RI-BA - Neutral barium sulfonate rust inhibitor.
- VANLUBE RI-G - Ashless rust inhibitor for greases.
- VANLUBE 8912E - Synthetic neutral calcium sulfonate.

## NEW PRODUCTS

- TUNGSTEN COMPOUNDS - VANLUBE W324
- TPS™ 20 - Antiwear and extreme pressure additive for metalworking fluids.
- TPS 32 - High active sulfur content for metalworking fluids.
- TPS 44 - Polysulfide used in industrial and automotive gear oils.
- VANLUBE 289 - Borate Ester.
- VANLUBE 996E - Ashless DTC antioxidant.
- VPS™ 15 - Vegetable based fatty acid ester for semi-synthetic metalworking fluids.

## INTRODUCING

- VANLUBE 0902 - Multi functional sulfur and phosphorus package for industrial oils and greases.



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**We have over 50 lubricant additives available to meet your specific requirements. Our technical staff can also custom-develop products for you.**



**R. T. Vanderbilt Company, Inc.**

INDUSTRIAL MINERALS AND CHEMICALS

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*Before using any of these products, read and comply with the information contained in the MSDS, label and other product literature.*

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# TABLE OF CONTENTS

<b>Quick-Scan Application Guide</b>	Page 1,2
<b>Antioxidants</b>	
<b>VANLUBE® 915M</b>	Page 18
<b>Aromatic Amines</b>	
<b>VANLUBE NA</b>	Page 8
<b>VANLUBE RD</b>	Page 9
<b>VANLUBE SL</b>	Page 10
<b>VANLUBE SS</b>	Page 11
<b>VANLUBE 81</b>	Page 12
<b>VANLUBE 887</b>	Page 17
<b>VANLUBE 887E</b>	Page 17
<b>VANLUBE 961</b>	Page 18
<b>VANLUBE 9317</b>	Page 21
<b>Hindered Phenols</b>	
<b>VANLUBE BHC</b>	Page 8
<b>Sulfur Compounds</b>	
<b>VANLUBE AZ</b>	Page 7
<b>VANLUBE EZ</b>	Page 8
<b>VANLUBE 869</b>	Page 16
<b>VANLUBE 996E</b>	Page 19
<b>VANLUBE 7723</b>	Page 19
<b>VANLUBE 8610</b>	Page 20
<b>Organo-molybdenum</b>	
<b>MOLYVAN® A</b>	Page 4
<b>MOLYVAN L</b>	Page 4
<b>MOLYVAN 807</b>	Page 4
<b>MOLYVAN 822</b>	Page 5
<b>MOLYVAN 855</b>	Page 5
<b>MOLYVAN 856B</b>	Page 5
<b>Antiwear &amp; Extreme Pressure Additives</b>	
<b>MOLYVAN A</b>	Page 4
<b>MOLYVAN L</b>	Page 4
<b>MOLYVAN 807</b>	Page 4
<b>MOLYVAN 822</b>	Page 5
<b>VANLUBE EZ</b>	Page 8
<b>VANLUBE SB</b>	Page 10
<b>VANLUBE 73</b>	Page 12
<b>VANLUBE 73 Super Plus</b>	Page 12
<b>VANLUBE 289</b>	Page 13
<b>VANLUBE 622</b>	Page 14
<b>VANLUBE 672</b>	Page 14
<b>VANLUBE 692</b>	Page 14
<b>VANLUBE 719</b>	Page 15
<b>VANLUBE 727</b>	Page 15
<b>VANLUBE 829</b>	Page 16
<b>VANLUBE 869</b>	Page 16
<b>VANLUBE 871</b>	Page 17
<b>VANLUBE 972M</b>	Page 18
<b>VANLUBE 7611M</b>	Page 19
<b>VANLUBE 8610</b>	Page 20
<b>VANLUBE 9123</b>	Page 20

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## Metal Deactivators

CUVAN® 303	Page 3
CUVAN 484	Page 3
CUVAN 826	Page 3
NACAP®	Page 6
VANCHEM® DMTD	Page 6
VANCHEM NATD	Page 6
VANLUBE® 601	Page 13
VANLUBE 601E	Page 13
VANLUBE 704S	

Page 15

## Friction Reducers

MOLYVAN® A	Page 4
MOLYVAN L	Page 4
MOLYVAN 807	Page 4
MOLYVAN 822	Page 5
MOLYVAN 855	Page 5
MOLYVAN 856B	Page 5
VANLUBE 622	Page 14

## Chemical Intermediates

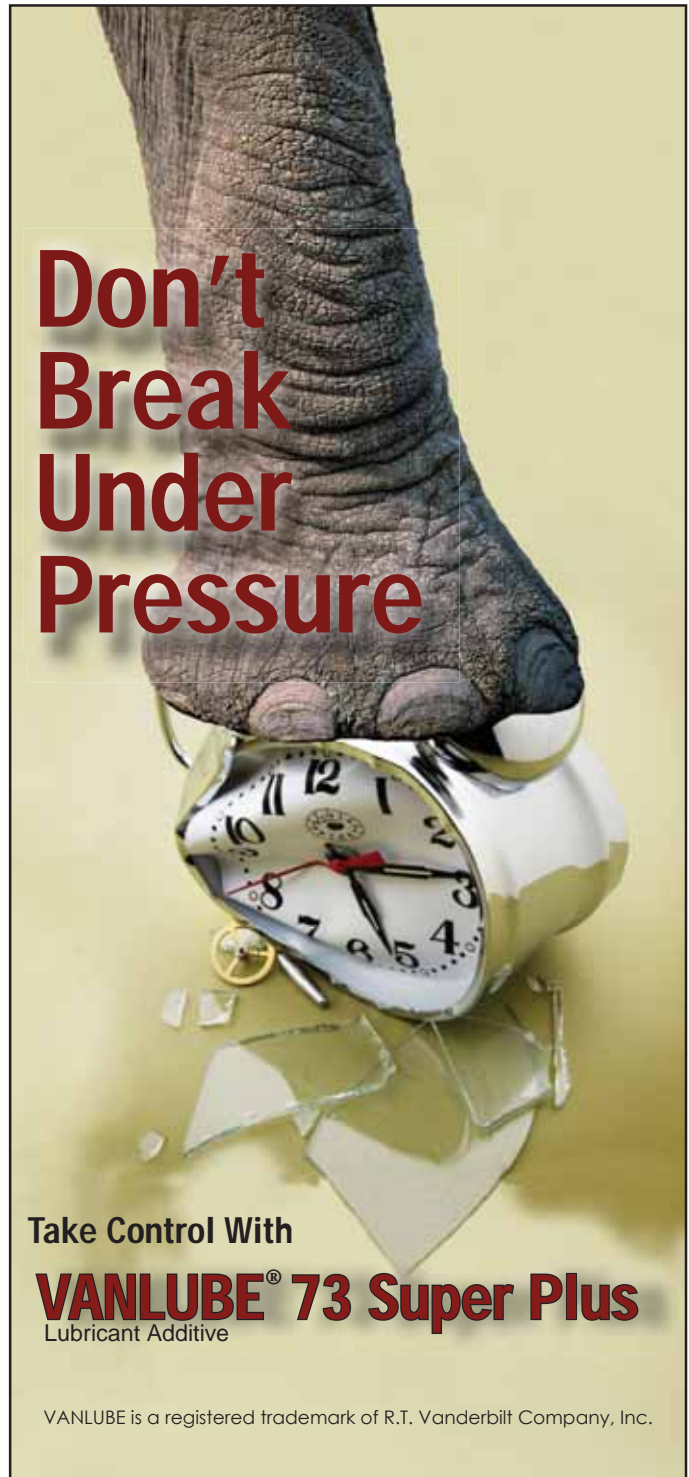
NACAP	Page 6
VANCHEM DMTD	Page 6
VANCHEM NATD	Page 6

## Rust Inhibitors

VANLUBE RI-A	Page 9
VANLUBE RI-BA	Page 9
VANLUBE RI-G	Page 10
VANLUBE 739	Page 16
VANLUBE 8912E	Page 20
VANLUBE 9123	Page 20

## Other

VANLUBE TK-100	Page 11
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An elephant's foot is shown stepping on a silver alarm clock that has shattered into several pieces. The background is a light yellow-green color. The text 'Don't Break Under Pressure' is written in large, bold, red letters across the top of the image. Below the image, the text 'Take Control With VANLUBE® 73 Super Plus Lubricant Additive' is displayed. At the bottom, a small line of text reads 'VANLUBE is a registered trademark of R.T. Vanderbilt Company, Inc.'

**Don't  
Break  
Under  
Pressure**

Take Control With  
**VANLUBE® 73 Super Plus**  
Lubricant Additive

VANLUBE is a registered trademark of R.T. Vanderbilt Company, Inc.

This brochure contains brief descriptions of most of the products sold by R.T. Vanderbilt Company, Inc. to the lubricating oil and grease industry. The products not included in this brochure are either experimental, or those that are only available on a local basis.

We also welcome inquires with regard to custom-made lubricants or joint research projects.

For more detailed information, please contact your R.T. Vanderbilt Company Technical Sales Representative, or the Petroleum Department at our corporate office in Norwalk, Connecticut.

**R.T. Vanderbilt Company, Inc. will continuously improve all products and services to consistently meet customer expectations the first time and every time.**

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## Quick-Scan Application/Function Guide

APPLICATION	CUVAN® 303	CUVAN 484	CUVAN 826	MOLYVAN® A	MOLYVAN L	MOLYVAN 807	MOLYVAN 822	MOLYVAN 855	MOLYVAN 856B	NACAP®	VANCHEM® DMTD	VANCHEM NATD	VANLUBE® AZ	VANLUBE BHC	VANLUBE EZ	VANLUBE NA	VANLUBE RD	VANLUBE RI-A	VANLUBE RI-BA	VANLUBE RI-G	VANLUBE SB	VANLUBE SL	VANLUBE SS	VANLUBE TK-100*	VANLUBE® 73	VANLUBE 73 Super Plus	
Coolant										✓	✓	✓															
Water-Based Fluids										✓	✓	✓															
Auto Transmission Fluid	✓												✓	✓		✓							✓	✓			
Compressor Oil	✓	✓	✓										✓	✓		✓							✓	✓		✓	
Engine Oil	✓	✓	✓		✓	✓	✓	✓	✓				✓	✓		✓						✓	✓	✓		✓	
Fuel	✓		✓																								
Gear Oil	✓	✓	✓		✓	✓	✓						✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓
Grease	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hydraulic Oil	✓	✓	✓											✓		✓		✓	✓	✓			✓				
Metalworking	✓	✓	✓		✓			✓			✓	✓	✓	✓	✓	✓			✓		✓	✓		✓			
Rust Preventive													✓					✓	✓	✓			✓		✓		
Synthetic Lube	✓			✓	✓	✓	✓						✓	✓	✓	✓	✓						✓	✓		✓	
Turbine Oil	✓	✓	✓										✓		✓			✓	✓				✓	✓			
<b>FUNCTION</b>																											
Ashless	✓	✓	✓								✓			✓		✓	✓	✓	✓		✓		✓	✓			
High Temperature				✓																			✓				
Antioxidant		2	2	2	2	2	2	2		2			1	1	1	1	1						1	1		2	2
Antiwear/Antiscuff		2		1	1	1	1	1	2				2		1						2					2	1
Friction Reducer				1	1	1	1	1	1																	2	
Biocide																											
Corrosion Inhibitor	1	1	1							1	1	1	2						2	2	2						
Demulsifier																				2							
Chemical Intermediate										1	1	1															
Extreme Pressure				2	2	2	2								1							1				1	1
Metal Deactivator	1	1	1							1	1	1	2														
Rust Inhibitor																			1	1	1						

✓ = Application/Function      1 = Primary Function      2 = Secondary Function      \* = Tackifier  
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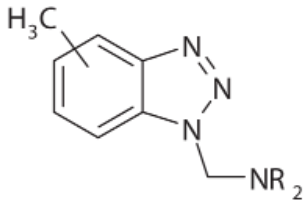
APPLICATION	VANLUBE® 81	VANLUBE 289	VANLUBE 601	VANLUBE 601E	VANLUBE 622	VANLUBE 672	VANLUBE 692	VANLUBE 704S	VANLUBE 719	VANLUBE 727	VANLUBE 739	VANLUBE 829	VANLUBE 869	VANLUBE 871	VANLUBE 887	VANLUBE 887E	VANLUBE 915M	VANLUBE 961	VANLUBE 972M	VANLUBE 996E	VANLUBE 7611M	VANLUBE 7723	VANLUBE 8610	VANLUBE 8912E	VANLUBE 9123	VANLUBE 9317	
Coolant																											
Water-Based Fluids																											
Auto Transmission Fluid	✓	✓								✓	✓				✓	✓		✓		✓	✓						
Compressor Oil	✓	✓									✓				✓	✓	✓	✓		✓		✓					
Engine Oil	✓	✓			✓			✓		✓	✓			✓	✓	✓	✓	✓		✓	✓						
Fuel			✓	✓																							
Gear Oil		✓	✓	✓	✓	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	
Grease	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hydraulic Oil			✓	✓				✓		✓	✓				✓	✓		✓		✓	✓	✓		✓			
Metalworking		✓	✓	✓		✓	✓	✓	✓	✓										✓	✓			✓			
Rust Preventive																								✓	✓		
Synthetic Lube	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓				✓		✓	✓	✓	✓	✓				✓	
Turbine Oil	✓		✓	✓				✓			✓				✓	✓	✓	✓	✓		✓		✓		✓		
<b>FUNCTION</b>																											
Ashless	✓	✓	✓	✓		✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	
High Temperature	✓											✓			✓	✓	✓			✓		✓				✓	
Antioxidant	1		2	2	2	2	2		2	2		2	2	2	1	1	1	1		1	2	1	2			1	
Antiwear/Antiscuff		1			1	1	2		2	1		2	2	1					2		1	2	2		1		
Friction Reducer		1			1							2											2				
Biocide																											
Corrosion Inhibitor			1	1				1			2	2								2				2			
Demulsifier								2																			
Chemical Intermediate																											
Extreme Pressure					1	1	1		1			1	1						1				1	1			
Metal Deactivator			1	1				1				2						2									
Rust Inhibitor								1			1														1	1	

✓ = Application/Function

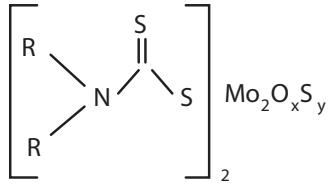
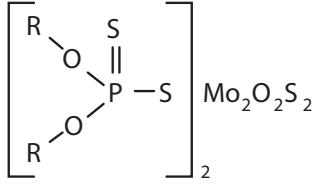
1 = Primary Function


2 = Secondary Function

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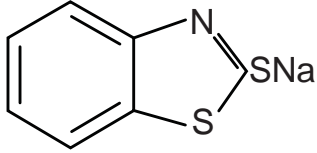
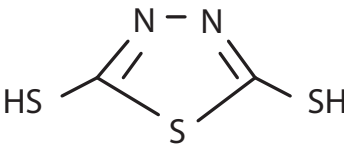
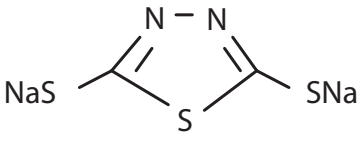
	<b>CUVAN® 303</b> Metal Deactivator	<b>CUVAN 484</b>	<b>CUVAN 826</b>
<b>Formula</b>		Proprietary	Proprietary
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Turbine Oil	Compressor Oil, Engine Oil, Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Turbine Oil
<b>Function</b>	Ashless, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant, Antiwear/Antiscuff, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant, Corrosion Inhibitor, Metal Deactivator
<b>Chemical Composition</b>	N, N-bis(2-ethylhexyl)-5-methyl-1H-benzotriazole-1-methanamine	2,5 dimercapto-1,3,4-thiadiazole derivative	2,5 dimercapto-1,3,4-thiadiazole derivative
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Amber	Amber
<b>Density @ 15.6 °C Mg/m<sup>3</sup> (lb/gal)</b>	0.95 (7.9) @ 25°C	1.07(9.0)	1.04(8.6)
<b>Viscosity @ 100 °C cSt</b>	5.81	11	3.32
<b>Flash Point (PMCC), °C</b>	125	76	192
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum lubricating bases.
<b>Use Concentration, % mass</b>	0.05 - 0.20	0.10 - 0.50	0.10 - 0.50
<b>Typical Uses</b>	<b>CUVAN 303</b> is an oil-soluble corrosion inhibitor and metal deactivator for lubricants, greases and metalworking fluids. As a corrosion inhibitor, it is effective in protecting copper, copper alloys, cadmium, cobalt, silver and zinc. As a metal deactivator, it is effective in precipitating ions of the same metals, thus preventing galvanic corrosion of other metal surfaces and inhibiting these ions from acting as oxidation catalysts.  <b>NSF® Registered HX-1, 138995</b>	<b>CUVAN 484</b> is an ashless oil-soluble corrosion inhibitor and metal deactivator for nonferrous metals, particularly for copper. Useful in industrial and automotive oils and greases, metalworking fluids, etc. <b>CUVAN 484</b> may also enhance the antiwear and oxidation properties of lubricants.	<b>CUVAN 826</b> is a ashless oil-soluble corrosion inhibitor and metal deactivator for nonferrous metals, particularly for copper. It is useful in industrial and automotive oils and greases, metalworking fluids, etc. <b>CUVAN 826</b> has a unique composition enables it to suppress the corrosive action of hydrogen sulfide.

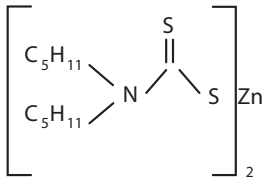
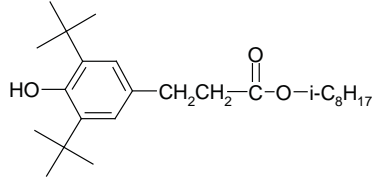
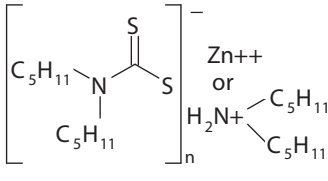
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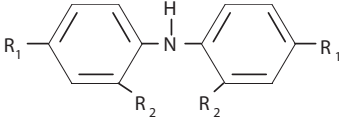
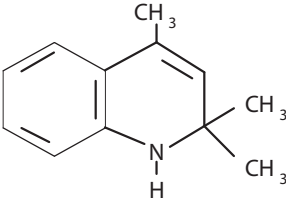
	<b>MOLYVAN® A</b> Friction Reducer	<b>MOLYVAN L</b>	<b>MOLYVAN 807</b>
<b>Formula</b>			Proprietary
<b>Application</b>	Grease, Synthetic Lube	Engine Oil, Gear Oil, Grease, Metalworking, Synthetic Lube	Engine Oil, Gear Oil, Grease, Synthetic Lube
<b>Function</b>	High Temperature, Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure
<b>Chemical Composition</b>	Molybdenum di-n-butylthio-carbamate	Molybdenum di(2-ethylhexyl)phosphorodithioate	Molybdenum dialkyldithio-carbamate in oil
<b>Physical State</b>	Powder	Liquid	Liquid
<b>Color</b>	Yellow	Dark Green	Dark Green
<b>Density @ 15.6°C Mg/m³ (lb/gal)</b>	1.59 @ 25°C	1.08 (9.0)	0.97 (8.1)
<b>Viscosity @ 100°C cSt</b>	—	8.6	13
<b>Flash Point (PMCC), °C</b>	—	142	135
<b>Solubility</b>	Slightly soluble in aromatic hydrocarbons. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.5 - 3.0	0.25 - 1.0	0.25 - 0.5
<b>Typical Uses</b>	<p><b>MOLYVAN A</b> is used in long life chassis greases for ball joints, steering linkages and other lubricating greases requiring good antioxidant and antiwear at high temperatures for long periods of time. It is an organic molybdenum extreme pressure and antiwear additive for petroleum and synthetic lubricants. It has good high temperature stability. In lubricating greases it is superior to inorganic molybdenum additives for both antiwear and antioxidant properties. <b>MOLYVAN A</b> is slightly basic and does not promote rusting. It has a low specific gravity which makes it easy to disperse with simple equipment. It is used in non-petroleum base valve lubricants.</p>	<p><b>MOLYVAN L</b> is an oil-soluble organic molybdenum additive containing sulfur and phosphorus. It functions as a friction reducer, antioxidant, antiwear, and extreme pressure agent. It is used in engine oils, metalworking compositions and in a variety of industrial and automotive lubricating oils, greases and specialties. <b>MOLYVAN L</b> is an outstanding antiwear agent. It is quite useful in automotive and industrial gear oils and greases which operate under heavy load conditions.</p> <p>Not recommended for diesel engine oils.</p>	<p><b>MOLYVAN 807</b> offers a unique molybdenum-sulfur combination in an oil-soluble form which is easy to blend into lubricants. It can be used to maintain the antifriction properties of an engine oil while reducing the phosphorus content. To obtain significant increases in extreme pressure properties and to impart improved antiwear performance. <b>MOLYVAN 807</b> can be used in combination with <b>VANLUBE® 7723</b> Antioxidant, a nonmetallic dithiocarbamate which functions as an antioxidant and extreme pressure agent.</p> <p>Not recommended for diesel engine oils.</p>

	<b>MOLYVAN® 822</b> Friction Reducer	<b>MOLYVAN 855</b>	<b>MOLYVAN 856B</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Engine Oil, Gear Oil, Grease, Synthetic Lube	Engine Oil, Grease, Metalworking	Engine Oil
<b>Function</b>	Antioxidant, Antiwear/ Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/ Antiscuff, Friction Reducer	Antioxidant, Antiwear/ Antiscuff
<b>Chemical Composition</b>	Molybdenum dialkyldithiocarbamate in oil	Organomolybdenum complex	Organomolybdenum complex
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Brown	Brown	Dark Amber
<b>Density @ 15.6 °C Mg/m³ (lb/gal)</b>	0.97 (8.1)	1.08 (8.9)	0.98 (8.2)
<b>Viscosity @ 100 °C cSt</b>	13	55	15.0
<b>Flash Point (PMCC), °C</b>	135	193	174
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water	Soluble in petroleum and synthetic lubricant bases. Insoluble in water	Soluble in petroleum and synthetic lubricating bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.25 - 0.5	0.1 - 0.5	0.1 - 0.5
<b>Typical Uses</b>	<p><b>MOLYVAN 822</b> may be used to maintain or improve the antifriction properties of an engine oil while reducing the phosphorus content.</p> <p>Not recommended for diesel engine oils.</p>	<p><b>MOLYVAN 855</b> is a liquid organomolybdenum friction modifier specifically designed for crankcase oils. <b>MOLYVAN 855</b> provides engine oils with a substantial reduction in the coefficient of friction.</p>  <p>Not recommended for diesel engine oils.</p>	<p><b>MOLYVAN 856B</b> is specifically designed for crankcase oils to significantly modify the coefficient of friction.</p> <p>Not recommended for diesel engine oils.</p>

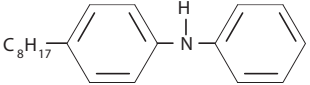
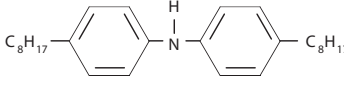
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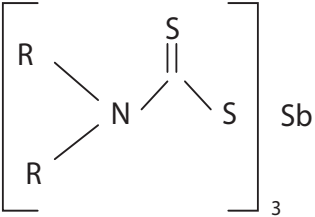
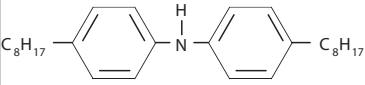
	<b>NACAP<sup>®</sup></b> Corrosion Inhibitor	<b>VANCHEM<sup>®</sup></b> <b>DMTD</b> Metal Deactivator	<b>VANCHEM</b> <b>NATD</b>
Formula			
Application	Coolant, Water-Based Fluids	Coolant, Water-Based Fluids, Metalworking	Coolant, Water-Based Fluids, Metalworking
Function	Antioxidant, Corrosion Inhibitor, Chemical Intermediate, Metal Deactivator	Ashless, Corrosion Inhibitor, Chemical Intermediate, Metal Deactivator	Corrosion Inhibitor, Chemical Intermediate, Metal Deactivator
Chemical Composition	Sodium 2-mercaptobenzothiazole, 50% aqueous solution	2,5-dimercapto-1,3,4-thiadiazole	Disodium 2,5-dimercaptothiadiazole, 30% aqueous solution
Physical State	Liquid	Powder	Liquid
Color	Light Amber	Cream to Light Yellow	Amber
Density @ 15.6°C Mg/m <sup>3</sup> (lb/gal)	1.27 (10.6)	1.79	1.22 (10.2)
Viscosity @ 100°C cSt	—	—	—
Flash Point (PMCC), °C	—	—	—
Solubility	Soluble in water, alcohols and glycols. Insoluble in petroleum hydrocarbons.	Soluble in water, ethanol, acetone and diesters. Slightly soluble in petroleum lubricant bases, hexane, petroleum ether, chloroform and toluene.	Soluble in water.
Use Concentration, % mass	0.1 - 0.6	Chemical Intermediate	0.1 - 0.25
Typical Uses	<b>NACAP</b> is a corrosion inhibitor for water, alcohol and glycol systems. It is particularly effective in preventing corrosion of copper and brass. Widely used in antifreeze, where it functions as a copper corrosion inhibitor and alkaline buffer. It is an excellent corrosion inhibitor for aluminum in systems where aluminum is used in the presence of copper and copper alloys. <b>NACAP</b> is one of the standard copper corrosion inhibitors for the antifreeze industry. Used as a chemical intermediate.	<b>VANCHEM DMTD</b> 's common reactions are double decomposition reactions with soluble metal salts, salt formation with alkaline metal hydroxides, oxidation reactions involving mercaptans, addition reactions with organic compounds containing activated double bonds, reactions with epoxy groups, reactions with aldehydes and alcohols, salt formation with amines and ammonia and reactions with acyl chlorides. The two active sites on <b>VANCHEM DMTD</b> can generally be reacted successively.	<b>VANCHEM NATD</b> is a corrosion inhibitor and metal deactivator for nonferrous metals in aqueous systems. It is particularly indicated for the protection of solder, aluminum, copper and copper alloys. It is stable and active at lower pH values than many mercapto compounds. <b>VANCHEM NATD</b> as a stable reactive dimercaptide which is readily alkylated, oxidized to the disulfide, or converted to metal salts.

	<b>VANLUBE® AZ</b> Lubricant Additive	<b>VANLUBE BHC</b> Antioxidant	<b>VANLUBE EZ</b>
<b>Formula</b>			 n = 2 or 1 respectively
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Metalworking, Rust Preventive, Synthetic Lube	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Gear Oil, Grease, Metalworking, Synthetic Lube
<b>Function</b>	Antioxidant, Antiwear/Antiscuff, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant	Antioxidant, Antiwear/Antiscuff, Extreme Pressure
<b>Chemical Composition</b>	Zinc diamyldithiocarbamate in oil	Butylated hydroxyhydrocinnamate	Zinc diamyldithiocarbamate and diamyl ammonium diamyldithiocarbamate
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Yellowish	Yellowish/Amber
<b>Density @ 15.6°C Mg/m³ (lb/gal)</b>	1.02 (8.2)	0.9665	1.1
<b>Viscosity @ 100°C cSt</b>	9.8	—	40 - 70
<b>Flash Point (PMCC), °C</b>	136	152	93
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.25 - 1.5	0.1 - 2.0	0.1 - 2.0
<b>Typical Uses</b>	<b>VANLUBE AZ</b> is used in engine oils, in industrial oils, and in soap and clay-thickened greases. Used in both gasoline and diesel crankcase oils to inhibit oxidation, bearing corrosion and wear. Used in combination with detergents, it inhibits corrosion and wear by inhibiting oxidation of the oil and also by the formation of protective films on metal surfaces. Used as a partial replacement for zinc dithiophosphates. Because of its effectiveness at high temperatures, it is a good additive for crankcase oils in heavy duty service. In industrial oils and automatic transmission fluids it functions as a high temperature oxidation and corrosion inhibitor. Used in lubricating greases both as an oxidation inhibitor and metal deactivator. An excellent copper corrosion inhibitor of film-forming type.	<b>VANLUBE BHC</b> is an effective general purpose, nonstaining, ashless antioxidant that provides excellent oxidative stability to wide range of automotive and industrial lubricants. It has excellent solubility in mineral and nonconventional base stocks, and contains no diluents. It is easy to handle and will not crystallize at low temperatures. It has low volatility and helps control oxidation and high temperature deposits especially when combined with alkylated diphenylamines, molybdenum compounds, sulfur-containing antioxidants and/or phosphites in many industrial oils and automotive lubricants.	<b>VANLUBE EZ</b> is a multifunctional additive that imparts excellent antiwear, extreme pressure, corrosion resistance and antioxidant properties to industrial lubricants and greases. It is a concentrated version of <b>VANLUBE AZ</b> .

	<b>VANLUBE® NA</b> Antioxidant	<b>VANLUBE RD</b>	<b>VANLUBE RI-A</b> Lubricant Additive
<b>Formula</b>			Proprietary
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Grease, Synthetic Lube	Gear Oil, Grease, Hydraulic Oil, Rust Preventive, Turbine Oil
<b>Function</b>	Ashless, Antioxidant	Ashless, Antioxidant	Ashless, Corrosion Inhibitor, Rust Inhibitor
<b>Chemical Composition</b>	Alkylated diphenylamines	Polymerized 1,2-dihydro-2,2,4-trimethylquinoline	Dodecenylsuccinic acid reaction product
<b>Physical State</b>	Liquid	Small Pastilles	Liquid
<b>Color</b>	Brown	Amber	Amber
<b>Density @ 15.6 °C Mg/m³ (lb/gal)</b>	0.94 (7.8)	1.06	0.96 (8.0)
<b>Viscosity @ 100 °C cSt</b>	15	—	19
<b>Flash Point (PMCC), °C</b>	213 (COC)	—	165
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in diesters, polyglycols and Ucon® fluids. Insoluble in water and petroleum oils.	Soluble in petroleum lubricant bases.
<b>Use Concentration, % mass</b>	0.25 - 1.5	0.1 - 1.0	0.05 - 0.25
<b>Typical Uses</b>	<b>VANLUBE NA</b> is a versatile liquid amine antioxidant with several advantages over other antioxidants of this type. The amine group in <b>VANLUBE NA</b> is hindered by oil-soluble alkyl groups which contribute to antioxidant efficiency by reducing some of the undesirable properties of other amines. <b>VANLUBE NA</b> is a general purpose antioxidant for turbine, hydraulic, circulating, compressor and other industrial oils. It is an effective non-discoloring grease antioxidant and is applicable to ashless crankcase oils for automotive, aviation, diesel and gas engine service. Synergistic effects are obtained with <b>VANLUBE PCX</b> , <b>VANLUBE AZ</b> and <b>VANLUBE 73</b> .	<b>VANLUBE RD</b> inhibits oxidation in polyglycols, Ucon fluids and diester synthetic lubricants. Good high temperature inhibitor for both petroleum and synthetic lubricants. Widely used in Ucon and polyglycol brake fluids at concentrations of 0.1 to 0.25%. Prevents the depolymerization of polyoxyethylene and similar polymers. Used as a high temperature oxidation inhibitor in both petroleum and synthetic base lubricating greases. Effective in both static (ASTM grease bomb and dynamic (bearing life or spindle) oxidation tests.	<b>VANLUBE RI-A</b> is an oil-soluble rust inhibitor recommended for steam turbine oils, circulating oils and hydraulic oils. In industrial gear oils with extreme pressure additives, levels of approximately 0.25% are recommended. <b>VANLUBE RI-A</b> is most effective in greases when used with a sulfonate such as <b>VANLUBE RI-BA</b> in a 50/50 ratio.  <b>NSF® Registered H2, 139738</b>

	<b>VANLUBE® RI-BA</b> Lubricant Additive	<b>VANLUBE RI-G</b>	<b>VANLUBE SB</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Gear Oil, Grease, Hydraulic Oil, Metalworking, Rust Preventive, Turbine Oil	Gear Oil, Grease, Hydraulic Oil, Rust Preventive	Engine Oil, Gear Oil, Grease, Metalworking
<b>Function</b>	Corrosion Inhibitor, Rust Inhibitor	Ashless, Corrosion Inhibitor, Rust Inhibitor	Antiwear/Antiscuff, Extreme Pressure
<b>Chemical Composition</b>	Barium sulfonate	Fatty acid derivative of 4,5-dihydro-1H-imidazole	Sulfur-based additive
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Dark Brown	Amber	Amber
<b>Density @ 15.6°C Mg/m<sup>3</sup> (lb/gal)</b>	1.00 (8.3)	0.94 (7.8)	1.14 (9.5)
<b>Viscosity @ 100°C cSt</b>	90	117	10
<b>Flash Point (PMCC), °C</b>	175	271	79
<b>Solubility</b>	SoSoluble in petroleum lubricant bases. Insoluble in water.	Soluble in petroleum lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.05 - 0.15	0.25 - 0.50	1.0 - 2.0
<b>Typical Uses</b>	<b>VANLUBE RI-BA</b> is an oil-soluble barium sulfonate with excellent rust-inhibiting and water-resistant properties. Useful in many industrial and automotive lubricant applications. <b>VANLUBE RI-BA</b> is compatible with additives such as antioxidants, extreme pressure and antiwear agents, and other corrosion inhibitors used in turbine, hydraulic, and circulating oil formulas. Useful in hard and soft rust-preventive coatings.	<b>VANLUBE RI-G</b> was specifically designed to provide excellent rust inhibition for greases. It is compatible with other <b>VANLUBE</b> extreme pressure, antioxidant and antiwear additives.	<b>VANLUBE SB</b> is a sulfur-based additive used in the formulation of industrial gear oils, automotive and industrial greases of various types, and other formulations where noncorrosive sulfur is desired. <b>VANLUBE SB</b> is an economical source of sulfur in a form that provides good load-carrying and antiwear properties combined with low copper corrosion.

	<b>VANLUBE® SL</b> Antioxidant	<b>VANLUBE SS</b> Lubricant Additives	<b>VANLUBE TK-100</b>
<b>Formula</b>			Proprietary
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Rust Preventive, Synthetic Lube, Turbine Oil	Auto Transmission Fluid, Compressor Oil, Engine Oil, Grease, Synthetic Lube, Turbine Oil	Gear Oil, Grease, Metalworking, Rust Preventive
<b>Function</b>	Ashless, Antioxidant	Ashless, High Temperature, Antioxidant	Tackifier
<b>Chemical Composition</b>	Mixture of alkylated diphenylamines	Octylated diphenylamines	Solution of a copolymer of ethylene and propylene
<b>Physical State</b>	Liquid	Powder	Liquid
<b>Color</b>	Reddish Brown	Light Tan	Amber
<b>Density @ 15.6°C Mg/m³ (lb/gal)</b>	1.01 (8.4)	1.02	0.89
<b>Viscosity @ 100°C cSt</b>	16.28	–	4,500
<b>Flash Point (PMCC), °C</b>	210 (COC)	–	121
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.25 - 1.5	0.5 - 2.0	0.5 - 5.0
<b>Typical Uses</b>	<b>VANLUBE SL</b> is a general-purpose antioxidant for industrial lubricants including compressor, hydraulic, turbine, gas engine and circulating oils. One of the most versatile amine antioxidants available for use in petroleum products. Used in greases of all types. Effective in both static and dynamic oxidation tests. Often used in combination with <b>VANLUBE PCX</b> in turbine and hydraulic oils. An outstanding oxidation inhibitor in solvent-refined oils that are high viscosity improvers. A good ashless antioxidant for use in automotive, diesel and aviation crankcase oils.	<b>VANLUBE SS</b> is a general-purpose antioxidant. It is used as a high temperature antioxidant in petroleum and synthetic lubricants. Effective as an antioxidant and corrosion inhibitor in silane and siloxane synthetic lubricants - both in fluids and greases. Used in hydraulic fluids, various industrial oils, automatic transmission fluids and synthetic and petroleum-based engine oils.	<b>VANLUBE TK-100</b> is used to provide adherence in way oils, chain lubricants and greases. It provides excellent aerosol resistance in pneumatic system lubricants.

	<b>VANLUBE® 73</b> Lubricant Additive	<b>VANLUBE 73</b> Super Plus	<b>VANLUBE 81</b> Antioxidant
<b>Formula</b>		Proprietary	
<b>Application</b>	Compressor Oil, Engine Oil, Gear Oil, Grease, Synthetic Lube	Gear Oil, Grease	Auto Transmission Fluid, Compressor Oil, Engine Oil, Grease, Synthetic Lube, Turbine Oil
<b>Function</b>	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Ashless, High Temperature, Antioxidant
<b>Chemical Composition</b>	Antimony tris(dialkyldithiocarbamate) in oil	Proprietary blend of dialkyldithiocarbamates	p,p'-dioctyldiphenylamine
<b>Physical State</b>	Clear to Hazy Liquid	Liquid	Powder
<b>Color</b>	Dark Amber	Amber	Off White
<b>Density @ 15.6°C Mg/m³ (lb/gal)</b>	1.03 (8.6)	1.0987	1.01
<b>Viscosity @ 100°C cSt</b>	11	33.34	–
<b>Flash Point (PMCC), °C</b>	171	> 118	–
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.1 - 1.0 as antioxidant 2.0 - 5.0 as extreme pressure agent.	2.0 - 4.0	0.5 - 2.0
<b>Typical Uses</b>	<p><b>VANLUBE 73</b> is one of the most versatile of the dithiocarbamate additives. It has excellent antiwear, extreme pressure and antioxidant properties. It is used as an antiwear additive, a bearing corrosion inhibitor in motor oils, gas engine oil, compressor oils, etc. It is used in lubricating greases of all types as an antioxidant, antiwear and extreme pressure additive.</p> <p><b>NSF® Registered HX-2, 137553</b></p>	<p><b>VANLUBE 73 Super Plus</b> is a proprietary mixture of dialkyldithiocarbamates. Based on equivalent antimony content, the load-carrying capability of <b>VANLUBE 73 Super Plus</b> is superior to that of antimony dialkyldithiocarbamate (SDDC), and comparable to that of combinations of SDDC and sulfurized olefin. As an antioxidant, <b>VANLUBE 73 Super Plus</b> outperforms both SDDC and SDDC/sulfurized olefin and, unlike sulfurized olefin, it does not lower the dropping point of lithium complex grease. <b>VANLUBE 73 Super Plus</b> does not have the pungent odor of sulfurized olefin.</p>	<p><b>VANLUBE 81</b> is similar chemically to <b>VANLUBE SS</b> but is a better high temperature oxidation inhibitor because of its high purity and high p,p'-dioctyldiphenylamine content. <b>VANLUBE 81</b> can be used in a variety of petroleum and synthetic lubricants where an ashless oxidation inhibitor with good high temperature properties is needed. Effective in silane, siloxane, silicone and diester fluids at concentrations of 0.5 to 2.0% and temperature of 400 to 500°F. In lubricating greases, <b>VANLUBE 81</b> is effective in both oxidation bomb tests and in high speed spindle tests. Siloxane greases containing 2% <b>VANLUBE 81</b> have given outstanding results in bearing performance tests at 350°F. Has a good color stability. Widely used as a high temperature antioxidant in jet engine oils.</p> <p><b>NSF® Registered HX-1, 143815</b></p>

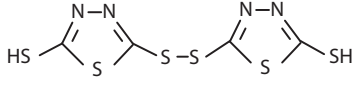
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	<b>VANLUBE® 289</b> Lubricant Additive	<b>VANLUBE 601</b>	<b>VANLUBE 601E</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Metalworking	Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil
<b>Function</b>	Ashless, Antiwear/Antiscuff, Friction Reducer	Ashless, Antioxidant, Corrosion Inhibitor, Metal Deactivator	Antioxidant, Corrosion Inhibitor
<b>Chemical Composition</b>	Borate ester	Heterocyclic sulfur-nitrogen compound	Heterocyclic sulfur-nitrogen compound
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Yellowish	Dark Amber	Dark Amber
<b>Density @ 15.6 °C Mg/m<sup>3</sup> (lb/gal)</b>	0.99	0.98 (8.1)	0.98 (8.1)
<b>Viscosity @ 100 °C cSt</b>	22.3	10.5	7
<b>Flash Point (PMCC), °C</b>	191	122	157
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.5 - 1.0	0.02 - 1.0	0.02 - 1.0
<b>Typical Uses</b>	<b>VANLUBE 289</b> is an oil-soluble borate ester that is an effective antiwear additive, by itself or in synergistic combinations with other antiwear/extreme pressure additives such as dithiophosphates, dithiocarbamates and alkyl thiadiazoles. It contains no phosphorous, sulfur or metals. It is therefore useful in eliminating and/or reducing levels of these elements in lubricants and greases while maintaining cost-effective performance.	<b>VANLUBE 601</b> is a copper passivator, corrosion and rust inhibitor of the film-forming type. It exhibits synergistic properties with various metal organic extreme pressure additives such as the dithiocarbamates. Used in petroleum fuels and solvents at concentration of 1 to 10 pounds per 1,000 barrels to prevent copper stain and corrosion. Used in petroleum base oils and greases and in synthetic base greases at concentrations of 0.02 to 0.5% to protect copper. <b>VANLUBE 601</b> has color stabilizing properties in oils and greases stored at elevated temperatures. It is useful EP/synergist with a variety of extreme pressure and antiwear additives.	<b>VANLUBE 601E</b> is a copper passivator, corrosion and rust inhibitor of the film-forming type. It exhibits synergistic properties with various metal organic extreme pressure additives such as the dithiocarbamates. Used in petroleum fuels and solvents at concentrations to 1 to 10 pounds per 1,000 barrels to prevent copper stain and corrosion. Used in petroleum base oils and greases and in synthetic base greases at concentrations of 0.02 to 0.5% to protect copper. <b>VANLUBE 601E</b> has shown color stabilizing properties in oils and greases stored at elevated temperatures. It is a useful extreme pressure/synergist with a variety of extreme pressure and antiwear additives.

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	<b>VANLUBE® 622</b> Lubricant Additive	<b>VANLUBE 672</b>	<b>VANLUBE 692</b>
<b>Formula</b>		Proprietary	Proprietary
<b>Application</b>	Engine Oil, Gear Oil, Grease, Synthetic Lube	Gear Oil, Grease, Metalworking, Synthetic Lube	Gear Oil, Grease, Metalworking, Synthetic Lube
<b>Function</b>	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Ashless, Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Ashless, Antioxidant, Antiwear/Antiscuff, Extreme Pressure
<b>Chemical Composition</b>	Antimony o,o-dialkylphosphorodithioate in oil.	Amine phosphate	Aromatic amine phosphate
<b>Physical State</b>	Clear to slightly hazy liquid	Viscous Liquid	Viscous Liquid
<b>Color</b>	Amber	Light Amber	Dark Amber
<b>Density @ 15.6 °C Mg/m<sup>3</sup> (lb/gal)</b>	1.20 (10.0)	1.02 (8.5)	0.99 (8.2)
<b>Viscosity @ 100 °C cSt</b>	5	250	53
<b>Flash Point (PMCC), °C</b>	150	113	165
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in water, petroleum and synthetic lubricant bases.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.5 - 3.0	1.0 - 3.0	1.0 - 3.0
<b>Typical Uses</b>	<p><b>VANLUBE 622</b> is an antiwear and extreme pressure additive for steel mill and other industrial gear oils. <b>VANLUBE 622</b> has outstanding extreme pressure and antiwear properties in a variety of base lubricants. It will give unusually high Timken, Falex and 4-Ball extreme pressure values at economical concentrations of 1 to 3%. It shows promise as an extreme pressure and antiwear additive in automotive gear oils. Radioactive Ring Wear Tests in crankcase oils show <b>VANLUBE 622</b> to be superior to zinc dithiophosphates at equivalent treat costs. Friction reducer in engine oils and gear oils.</p>	<p><b>VANLUBE 672</b> is an extreme pressure and antiwear additive for industrial lubricants, including lubricating oils, greases and synthetic fluids. Used as an extreme pressure and antiwear additive in various metalworking lubricants such as drawing, stamping and forming compounds. Improves extreme pressure performance of conventional extreme pressure materials such as sulfurized olefins, fatty oils, chlorinated paraffins, metal dithiocarbamates and phosphorodithioates. Effective in low concentrations as an antiwear additive in synthetic lubricants.</p>	<p><b>VANLUBE 692</b> is used in nonmetallic industrial gear oils to give high load carrying properties. Extreme pressure and antiwear additive for lubricants based on petroleum oils and synthetics. <b>VANLUBE 692</b> enhances the extreme pressure properties of sulfurized olefins, chlorinated paraffins, dithiocarbamates and phosphorodithioates.</p>

	<b>VANLUBE® 704S</b> Lubricant Additive	<b>VANLUBE 719</b>	<b>VANLUBE 727</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Gear Oil, Metalworking, Synthetic Lube	Auto Transmission Fluid, Engine Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube
<b>Function</b>	Corrosion Inhibitor, Demulsifier, Metal Deactivator, Rust Inhibitor	Antioxidant, Antiwear/Antiscuff, Extreme pressure	Ashless, Antioxidant, Antiwear/Antiscuff
<b>Chemical Composition</b>	Barium sulfonate blend	Amine phosphate package	Organosulfur-phosphorus compound
<b>Physical State</b>	Viscous Liquid	Liquid	Liquid
<b>Color</b>	Dark Amber	Dark Amber	Light Amber
<b>Density @ 15.6°C Mg/m<sup>3</sup> (lb/gal)</b>	1.03 (8.5)	0.99 (8.2)	1.01 (8.4)
<b>Viscosity @ 100°C cSt mm<sup>2</sup>/s</b>	72	48	2.6
<b>Flash Point (PMCC), °C</b>	188	85	100
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.05 - 0.25	1.0 - 4.0	1.0 - 2.0
<b>Typical Uses</b>	<p><b>VANLUBE 704S</b> is used in petroleum and synthetic lubricants as a multifunctional rust and corrosion inhibitor.</p> <p><b>VANLUBE 704S</b> is a synergistic blend of polar additives capable of forming films or complexes on metal surfaces, particularly copper and copper alloys that might be exposed to free sulfur or active sulfur compounds. It is used in a variety of lubricants based on petroleum oils or synthetics. Economical concentrations enhance antioxidants by passivating catalytic metal surfaces in the lubricant system.</p>	<p><b>VANLUBE 719</b> was developed primarily for steel mill and similar industrial gear oils. It gives good extreme pressure and antiwear properties, good high temperature stability, and good demulsibility. <b>VANLUBE 719</b> at a concentration range of 2 to 3% will meet the requirements of most steel mill gear oil specifications. It is also used in 2-cycle engine oils.</p>	<p><b>VANLUBE 727</b> is a versatile additive for various types of automotive and industrial lubricating oils. <b>VANLUBE 727</b> functions as an antiwear agent and antioxidant. Its nonmetallic nature makes it of interest for ashless or low ash applications. Some suggested applications are: automotive engine oils, railroad diesel oils, compressor oils, gas engine oils, antiwear hydraulic and turbine oils, and various types of industrial oils. Bench tests indicate that the performance of <b>VANLUBE 727</b> is competitive with that of commonly used zinc dithiophosphates. One percent in SAE 90 gear oil gives a 12-stage pass in the FZG test.</p>

	<b>VANLUBE® 734</b> Lubricant Additive	<b>VANLUBE 829</b>	<b>VANLUBE 869</b>
<b>Formula</b>	Proprietary		Proprietary
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Turbine Oil	Grease, Synthetic Lube	Gear Oil, Grease
<b>Function</b>	Ashless, Corrosion Inhibitor, Rust Inhibitor	Ashless, High Temperature, Antioxidant, Antiwear/Antiscuff, Friction Reducer, Corrosion Inhibitor, Extreme Pressure, Metal Deactivator	Antioxidant, Antiwear/Antiscuff, Extreme Pressure
<b>Chemical Composition</b>	Ashless rust inhibitor in oil	5,5-dithiobis(1,3,4-thiadiazole-2(3H)-thione)	Zinc dithiocarbamate/sulfurized olefin blend
<b>Physical State</b>	Liquid	Powder	Liquid
<b>Color</b>	Light Amber	Yellow	Amber
<b>Density @ 15.6°C Mg/m³ (lb/gal)</b>	0.92 (7.7)	2.09	1.14 (9.5)
<b>Viscosity @ 100°C cSt</b>	5	–	28
<b>Flash Point (PMCC), °C</b>	130	–	100
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Dispersible in grease.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.05 - 0.5	1.0 - 3.0	1.25 - 2.0
<b>Typical Uses</b>	<b>VANLUBE 739</b> was designed to improve rust protection in lube oils and greases.	<b>VANLUBE 829</b> possesses excellent extreme pressure properties when dispersed in various greases. It also functions as an antiwear agent and an antioxidant. <b>VANLUBE 829</b> should be used in greases in applications where extreme pressures prevail, such as steel mills and heavy equipment lubrication.	<b>VANLUBE 869</b> is an effective extreme pressure/antioxidant suitable for lubricating oils and greases. <b>VANLUBE 869</b> is compatible with other <b>VANLUBE</b> rust inhibitors/antioxidants and metal deactivators.

NSF® Registered HX-2, 138302

	<b>VANLUBE® 871</b> Lubricant Additive	<b>VANLUBE 887</b> Antioxidant	<b>VANLUBE 887E</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Engine Oil, Grease	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Turbine Oil	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Synthetic Lube, Turbine Oil
<b>Function</b>	Ashless, Antioxidant, Antiwear/Antscuff	Ashless, High Temperature, Antioxidant	Ashless, High Temperature, Antioxidant
<b>Chemical Composition</b>	2,5-dimercapto-1,3,4-thiadiazole alkyl polycarboxylate	Tolutriazole compound in oil	Tolutriazole compound in ester
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Amber	Light Amber
<b>Density @ 15.6 °C Mg/m<sup>3</sup> (lb/gal)</b>	1.10 (9.3)	1.00 (8.36)	1.01 (8.4)
<b>Viscosity @ 100 °C cSt</b>	19.6	17	20
<b>Flash Point (PMCC), °C</b>	178	146	180
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.5 - 2.0	0.5 - 1.0	0.5 - 2.0
<b>Typical Uses</b>	<b>VANLUBE 871</b> is a liquid ashless antioxidant/antiwear agent. Possible uses include both gasoline and diesel engine oil formulations to improve existing additive packages.	<b>VANLUBE 887</b> is a liquid ashless antioxidant. It is most effective as an antioxidant synergist with mixtures of hindered phenols and /or ashless dithiocarbamates such as <b>VANLUBE 7723</b> . <b>VANLUBE 887</b> possesses excellent high temperature stability. Combined with <b>VANLUBE 7723</b> and a suitable base stock, it will pass the Cincinnati Milacron Thermal Stability Test, Procedure A.	<b>VANLUBE 887E</b> is a liquid ashless antioxidant. It is most effective as an antioxidant synergist with mixtures of hindered phenols and /or ashless dithiocarbamates such as <b>VANLUBE 7723</b> . <b>VANLUBE 887E</b> possesses excellent high temperature stability.

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	<b>VANLUBE® 915M</b> Antioxidant	<b>VANLUBE 961</b> Lubricant Additive	<b>VANLUBE 972M</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Compressor Oil, Engine Oil, Gear Oil, Grease, Turbine Oil	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Synthetic Lube, Turbine Oil	Grease, Synthetic Lube
<b>Function</b>	Ashless, High Temperature, Antioxidant, Metal Deactivator	Ashless, Antioxidant	Ashless, Antiwear/Antiscuff, Extreme Pressure
<b>Chemical Composition</b>	Antioxidant blend	Mixed octylated and butylated diphenylamines	Thiadiazole derivative in polyalkylene glycols
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Light Amber	Amber
<b>Density @ 15.6°C Mg/m<sup>3</sup> (lb/gal)</b>	1.01	0.98 (8.2)	1.24 (10.2)
<b>Viscosity @ 100°C cSt</b>	10.5	9.9	6.0
<b>Flash Point (PMCC), °C</b>	160	190	110
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble PAG fluids. Insoluble petroleum lubricant bases and water.
<b>Use Concentration, % mass</b>	0.5-1.0	0.5 - 1.0	0.5 - 3.0
<b>Typical Uses</b>	<b>VANLUBE 915M</b> is a liquid ashless antioxidant recommended for use in high quality mineral and synthetic base stocks. It can be used in a broad range of industrial and automotive applications, and is particularly effective in turbine and compressor oils.	<b>VANLUBE 961</b> is a liquid ashless antioxidant for use in oils and greases of various types. It may be used in industrial lubricants, including compressor, hydraulic, turbine, gas engine and circulating oils. <b>VANLUBE 961</b> may be used as an ashless antioxidant in all types of crankcase oils.	<b>VANLUBE 972M</b> , a thiadiazole derivative in polyalkylene glycol, is an ashless extreme pressure additive recommended for use in grease and some polyalkylene glycols (PAG) and some synthetic esters. The advantages this product offers are that it contains no metals, is easily handled, is readily biodegradable, is a cost effective alternative to other metal-containing EP additives and does not have the strong sulfur odor that is typical of the other sulfur EP additives.

NSF® Registered HX-1, HX-2, 135573

	<b>VANLUBE® 996E</b> Antioxidant	<b>VANLUBE 7611M</b> Lubricant Additive	<b>VANLUBE 7723</b>
<b>Formula</b>	Proprietary	Proprietary	
<b>Application</b>	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Auto Transmission Fluid, Engine Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube	Compressor Oil, Gear Oil, Grease, Hydraulic Oil, Synthetic Lube, Turbine Oil
<b>Function</b>	Ashless, High Temperature, Antioxidant, Corrosion Inhibitor	Ashless, Antioxidant, Antiwear/Antiscuff	Ashless, High Temperature, Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure
<b>Chemical Composition</b>	Methylene bis (dibutyldithiocarbamate) and toluotriazole derivative	Ashless phosphorodithioate	Methylene bis(dibutyldithiocarbamate)
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Light Amber	Amber
<b>Density @ 15.6 °C Mg/m<sup>3</sup> (lb/gal)</b>	1.06 (8.8)	1.08 (9.0)	1.06 (8.8)
<b>Viscosity @ 100 °C cSt</b>	16.4	2.54	15
<b>Flash Point (PMCC), °C</b>	191	142	177
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	0.1 - 1.0 as antioxidant; 1-4 as extreme pressure agent	1.0 - 2.0	0.1 - 1.0 as antioxidant; 2.0 - 4.0 as extreme pressure agent.
<b>Typical Uses</b>	<p><b>VANLUBE 996E</b> is a liquid ashless antioxidant that finds application in petroleum lubricants of all types. It possesses excellent high temperature stability and is noncorrosive despite having high sulfur content.</p> <p><b>VANLUBE 996E</b> also exhibits extreme pressure performance alone and in combination with other additives.</p>	<p><b>VANLUBE 7611M</b> is an organic liquid additive containing sulfur and phosphorus. 4-Ball Wear tests show that <b>VANLUBE 7611M</b>, at a 20 kg load, performs equivalently to typical zinc dialkylidithiophosphates. At a 40 kg load it is superior to these products. <b>VANLUBE 7611M</b> will improve the antiwear properties of sulfurized extreme pressure additives. It is a useful component for extreme pressure/antiwear lubricant formulations and additive packages. <b>VANLUBE 7611M</b> does not contain metallic elements. Thus, it is applicable to ashless and low ash formulations.</p> <p><b>NSF® Registered HX-2, 136048</b></p>	<p><b>VANLUBE 7723</b> is a general purpose, ashless antioxidant which should find application in petroleum lubricants of all types. It is effective at economical concentrations, readily soluble, and easy to blend.</p> <p><b>VANLUBE 7723</b> has been tested in a variety of base stocks commonly used in compounding turbine, hydraulic and circulating oils. In addition to being an effective antioxidant, <b>VANLUBE 7723</b> also exhibits good extreme pressure performance alone and in combination with other additives. Useful as a component of additive packages.</p> <p><b>NSF® Registered HX-1, HX-2, 136049</b></p>

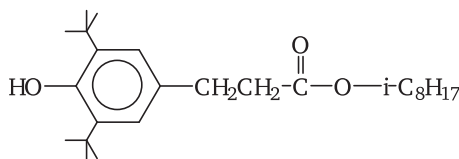
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	<b>VANLUBE® 8610</b> Lubricant Additive	<b>VANLUBE 8912E</b>	<b>VANLUBE 9123</b>
<b>Formula</b>	Proprietary	Proprietary	Proprietary
<b>Application</b>	Gear Oil, Grease	Gear Oil, Grease, Hydraulic Oil, Metalworking, Rust Preventive, Turbine Oil	Gear Oil, Grease, Rust Preventive
<b>Function</b>	Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Corrosion Inhibitor, Rust Inhibitor	Ashless, Antiwear/Antiscuff, Rust Inhibitor
<b>Chemical Composition</b>	Antimony dithiocarbamate/sulfurized olefin blend	Calcium sulfonate	Amine phosphate
<b>Physical State</b>	Liquid	Liquid	Liquid
<b>Color</b>	Amber	Dark Brown	Amber
<b>Density @ 15.6°C Mg/m<sup>3</sup> (lb/gal)</b>	1.16 (9.42)	0.97	0.94 (7.8)
<b>Viscosity @ 100°C cSt</b>	28.5	19	24
<b>Flash Point (PMCC), °C</b>	100	150 (COC)	96
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.
<b>Use Concentration, % mass</b>	1.25 - 2.0	0.05 - 0.10	0.10 - 1.0
<b>Typical Uses</b>	<p><b>VANLUBE 8610</b> is an extreme pressure/antioxidant useful for various lubricating oils and greases. Impressive Timken loads of 90 to 100 lbs. are achieved with 2% treatment levels. <b>VANLUBE 8610</b> is compatible with other <b>VANLUBE</b> rust inhibitors/antioxidants and metal deactivators.</p>	<p><b>VANLUBE 8912E</b> is an oil-soluble calcium sulfonate with excellent rust-inhibiting and water-resistant properties.</p>	<p><b>VANLUBE 9123</b> is an excellent antiwear additive and rust inhibitor in a wide range of industrial oils and lubricating greases.</p> <p>NSF® Registered HX-1, HX-2, 135575</p>

	<b>VANLUBE® 9317</b> Antioxidant		
<b>Formula</b>	Proprietary		
<b>Application</b>	Synthetic Lube		
<b>Function</b>	High Temperature, Antioxidant		
<b>Chemical Composition</b>	Organic amine compounds in a synthetic ester		
<b>Physical State</b>	Liquid		
<b>Color</b>	Dark Brown		
<b>Density @ 15.6 °C Mg/m³ (lb/gal)</b>	0.98 (8.1)		
<b>Viscosity @ 100 °C cSt</b>	128		
<b>Flash Point (PMCC), °C</b>	254		
<b>Solubility</b>	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.		
<b>Use Concentration, % mass</b>	0.5 - 4.0		
<b>Typical Uses</b>	<b>VANLUBE 9317</b> is an amine antioxidant designed to give excellent high temperature performance in synthetic polyolester based lubricants. At high temperatures, it significantly reduces the sludge and varnish typically seen with more conventional amine antioxidants.		

# VANLUBE<sup>®</sup> BHC

## PHENOLIC ANTIOXIDANT



Composition:	Butylated hydroxy-hydrocinnamate
Physical State:	Yellowish liquid
Specific Gravity, 25°C	0.96
Viscosity at 40°C, mm <sup>2</sup> /s	140
Ash content, %	< 0.1

**VANLUBE BHC** is an effective general-purpose, nonstaining, ashless antioxidant that provides excellent oxidative stability to a wide range of automotive and industrial lubricants. It has excellent solubility in mineral oil and non-conventional base stocks, and contains no diluents. It is easy to handle and will not crystallize at low temperatures like some commercial phenolic antioxidants.

**VANLUBE BHC** has low volatility and helps control oxidation and high temperature deposits/sludge. It is effective at concentrations of 0.1% to 2.0% and works well when combined with alkylated diphenylamines, molybdenum compounds, sulfur-containing antioxidants, or phosphites in many industrial oils and automotive lubricants, especially modern engine oils meeting the ILSAC GF-4 specification.

Figure 1

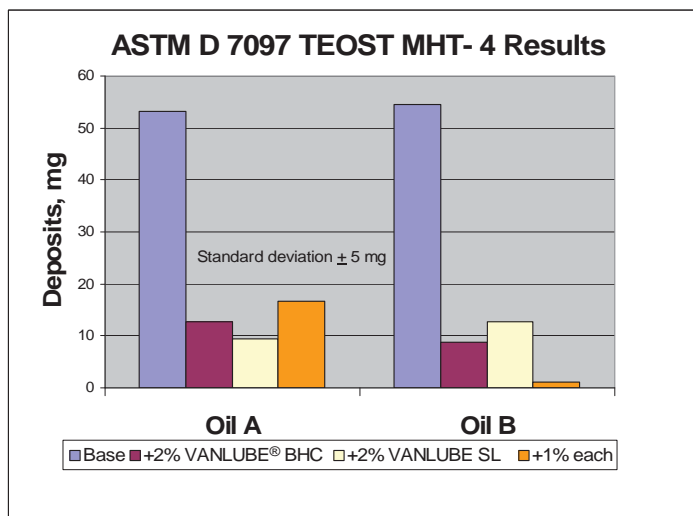
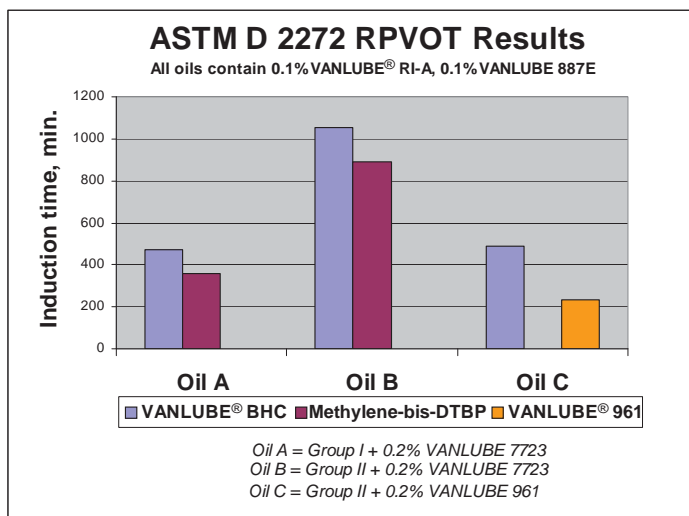


Figure 2



**VANLUBE SL** and **VANLUBE 961** are alkylated diphenylamines; **VANLUBE 7723** is methylene-bis-dibutyl-dithiocarbamate

Fig. 1 **VANLUBE BHC** controls deposits in TEOST MHT- 4 as well as diphenylamine antioxidants.

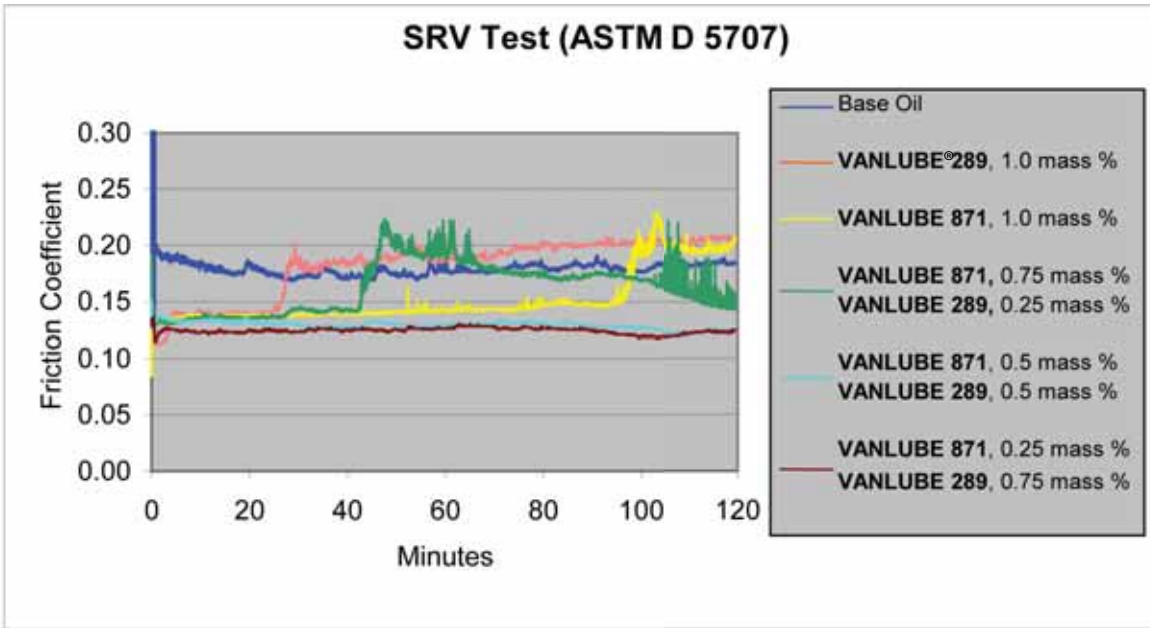
Fig. 2 **VANLUBE BHC** boosts RPVOT induction time better than methylene-bis-2'6'-di-tert-butyl phenol.

# VANLUBE® 289

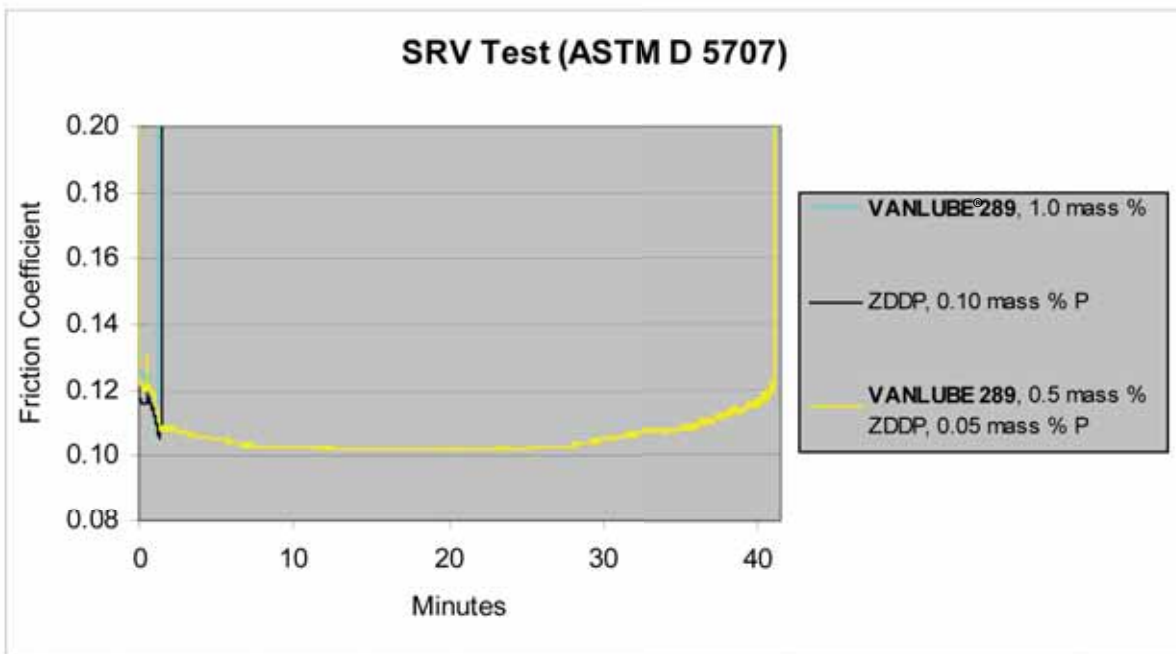
Lubricant Additive

Ask about our new boron antiwear additive, **VANLUBE 289** and its synergistic performance with ZDDP.

Please e-mail us at: [petro@rtvanderbilt.com](mailto:petro@rtvanderbilt.com)



**Figure 4.** Test Parameters: 80°C; 50 N break-in load; 200 N test load; 50 Hz; 1.00 mm stroke; test duration of 120 minutes.

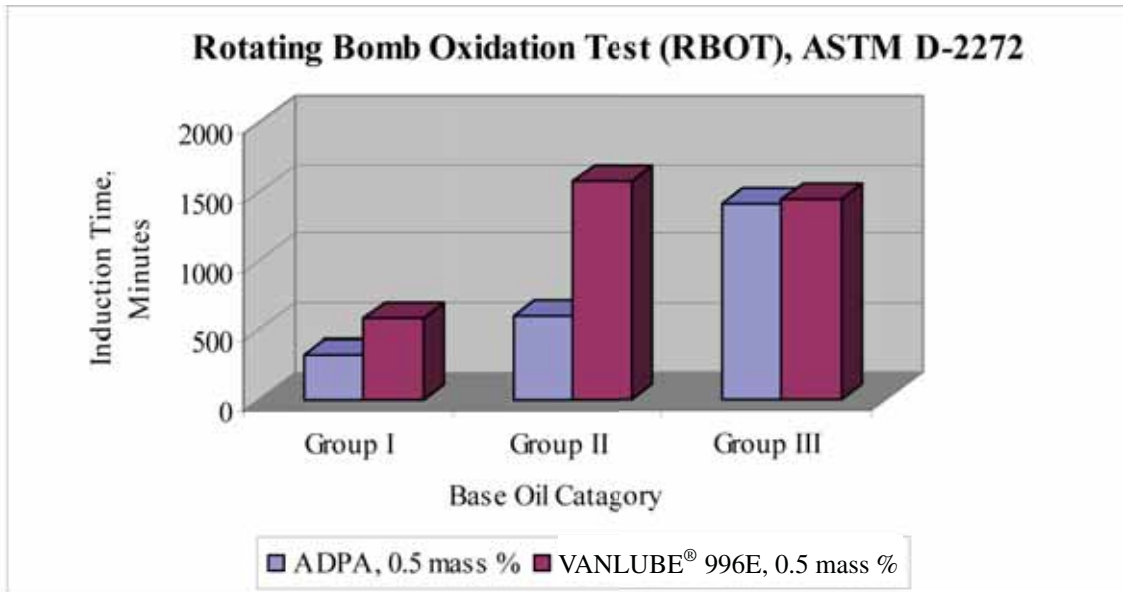


**Figure 5.** Test Parameters: 25°C; 50 N break-in load; 1000 N test load; 50 Hz; 1.00 mm stroke. Experiments ran until failure as indicated by a large and sudden increase in the friction coefficients

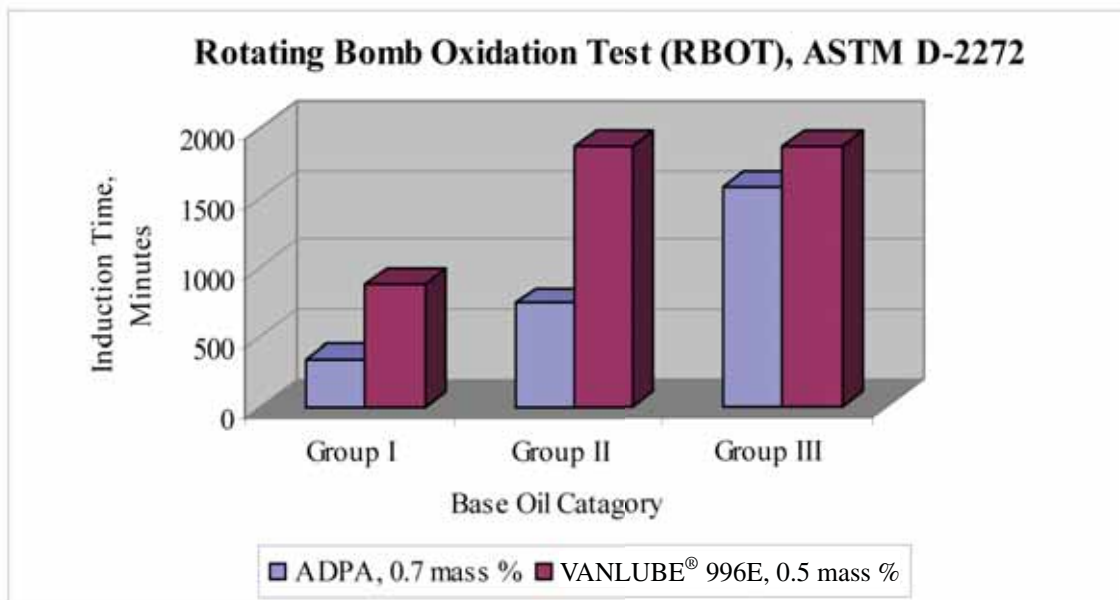
# VANLUBE<sup>®</sup> 996E

Antioxidant

Looking for effective antioxidants with proven synergism in Group I-III base oils?  
Please e-mail us at: [petro@rtvanderbilt.com](mailto:petro@rtvanderbilt.com)



**Figure 1.** Rust inhibitor (VANLUBE RI-A Lubricant Additive, 0.05 mass %) was added to all test oils. ADPA is acronym for alkylated diphenylamine. The ADPA that was used for this study consisted of a mixture of butylated/octylated DPA components.



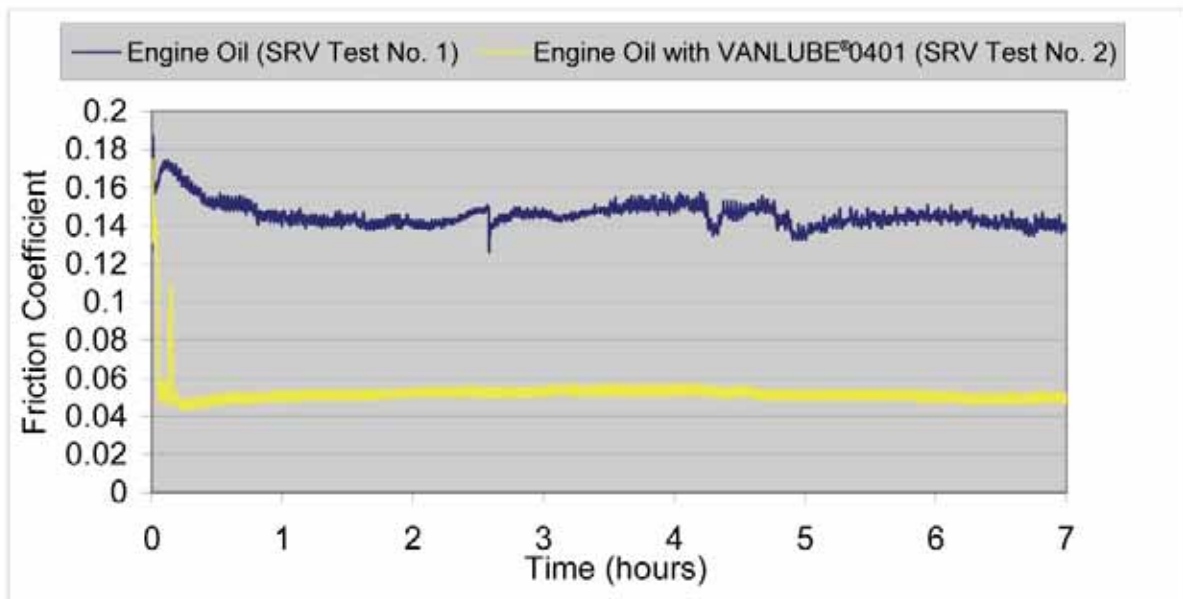
**Figure 2.** Rust inhibitor (VANLUBE RI-A Lubricant Additive, 0.05 mass %) was added to all test oils. ADPA is acronym for alkylated diphenylamine. The ADPA that was used for this study consisted of a mixture of butylated/octylated DPA components.

# VANLUBE® 0401

Lubricant Additive

Are you working on GF-5 formulations for PCMO that require low phosphorus and low sulfur but improved antiwear, antioxidant and friction retention properties?

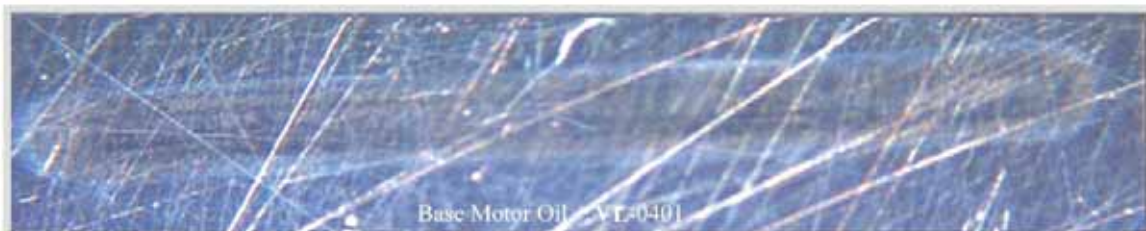
Please e-mail us at: [petro@rtvanderbilt.com](mailto:petro@rtvanderbilt.com)



**Figure 1.** Test Parameters: ball on disk; 120N; 40 Hz; 4.00 mm stroke; 7 hours. The engine oil is 5W-30 grade containing 0.05 mass percent of phosphorus.



**Figure 2.** Image of the wear scar on disk for SRV Test No. 1. The mirror finish and the removal of the surface features of the disk, i.e. the deep etching marks, are evidence of polishing wear.



**Figure 3.** Image of the wear scar on disk for SRV Test No. 2. The surface features of the disk are intact; the dark coloration indicates the protective surface film.

# VANLUBE® 73 Super Plus

## Lubricant Additive

*Extreme Pressure*

*Antiwear*

*Antioxidant*

### Typical Properties

Composition:	Metal dialkyldithiocarbamate mixture
Physical State:	Liquid
Color, ASTM D 1500:	7.0 maximum
Density at 25°C, Mg/m <sup>3</sup> :	1.05
Viscosity at 40°C, mm <sup>2</sup> /s:	1.190
Viscosity at 100°C, mm <sup>2</sup> /s:	33.34
Flash Point, PMCC, °C:	245 minimum
Antimony Content, %:	5.8
Zinc Content, %:	4.5
Sulfur Content, %:	18.5
Nitrogen Content, %:	4.5

**VANLUBE 73 Super Plus** is a proprietary mixture of dialkyldithiocarbamates. Based on equivalent antimony content, as shown in the table below, the load-carrying capability of **VANLUBE 73 Super Plus** is superior to that of antimony dialkyldithiocarbamate (SDDC), and comparable to that of combinations of SDDC and sulfurized olefin. As an antioxidant, **VANLUBE 73 Super Plus** outperforms both SDDC and SDDC/sulfurized olefin and, unlike sulfurized olefin, it does not lower the dropping point of lithium complex grease. **VANLUBE 73 Super Plus** does not have the pungent odor of sulfurized olefin.

Component	Treat Rate, Mass Percent				
<b>VANLUBE® 73 Super Plus</b> Lubricant Additive	3.0				
Compound A (SDDC)		2.5			
Compound B (SDDC)			2.5		
Compound C (SDDC/sulfurized olefin 1:1 blend)				2.3	
Lithium Complex Grease, NLGI 2	97.0	97.5	97.5	97.7	100
Antimony content in grease, %	0.17	0.17	0.17	0.17	0
Timken OK Load (ASTM D 2509), lb	70	25	Fail 20	60	<20
4-Ball Wear (ASTM D 2266), 1200 rpm, 75 °C, 40 kgf, 1h, mm	0.57	0.54	0.56	0.60	0.69
4-Ball EP (ASTM D 2596), Weld Point, kgf	400	400	400	400	250
Dropping Point (ASTM D 2265), °C	283 273	277	267	252 247	273
PDSC Oxidation Induction Time (ASTM D 5483), minutes at 180 °C	76.6	61.7	54.1	45.4	0.8

# BREAK OUT!

A PRODUCT  
THAT WILL MEET  
YOUR MOST  
CHALLENGING  
NEEDS!

**BREAK THROUGH YOUR  
MOST CHALLENGING  
ISSUES WITH  
VANLUBE® 0902, A  
NEW MULTI-PURPOSE  
PACKAGE FOR  
INDUSTRIAL GEAR OILS  
AND GREASES.**

- ★ GLOBAL REGISTRATION
- ★ METAL-FREE
- ★ PROTECTS AGAINST  
CORROSION
- ★ REDUCES OXIDATION
- ★ MINIMIZES WEAR
- ★ CARRIES A HIGH LOAD  
AT EXTREME PRESSURE  
CONDITIONS

# VANLUBE® 0902

LUBRICANT ADDITIVE

FOR ADDITIONAL INFORMATION OR TO REQUEST A SAMPLE, PLEASE VISIT US AT [WWW.RTVANDERBILT.COM](http://WWW.RTVANDERBILT.COM)



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# Now You Can Have Your Pie And Eat It Too!

**VANLUBE® 7723**  
Lubricant Additive

**FDA Cleared**

Lubricant manufacturers now have available the ashless dithiocarbamate of choice to formulate lubricants and greases for incidental food contact.

For more information visit [www.rtvanderbilt.com/7723](http://www.rtvanderbilt.com/7723)



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