

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 diamylthiocarbamate.
- VANLUBE EZ - Zinc diamylthiocarbamate and diamyl ammonium diamylthiocarbamate.
- 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-dibutylthiocarbamate.
- 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 diamylthiocarbamate.
- *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.



*NSF® Registered



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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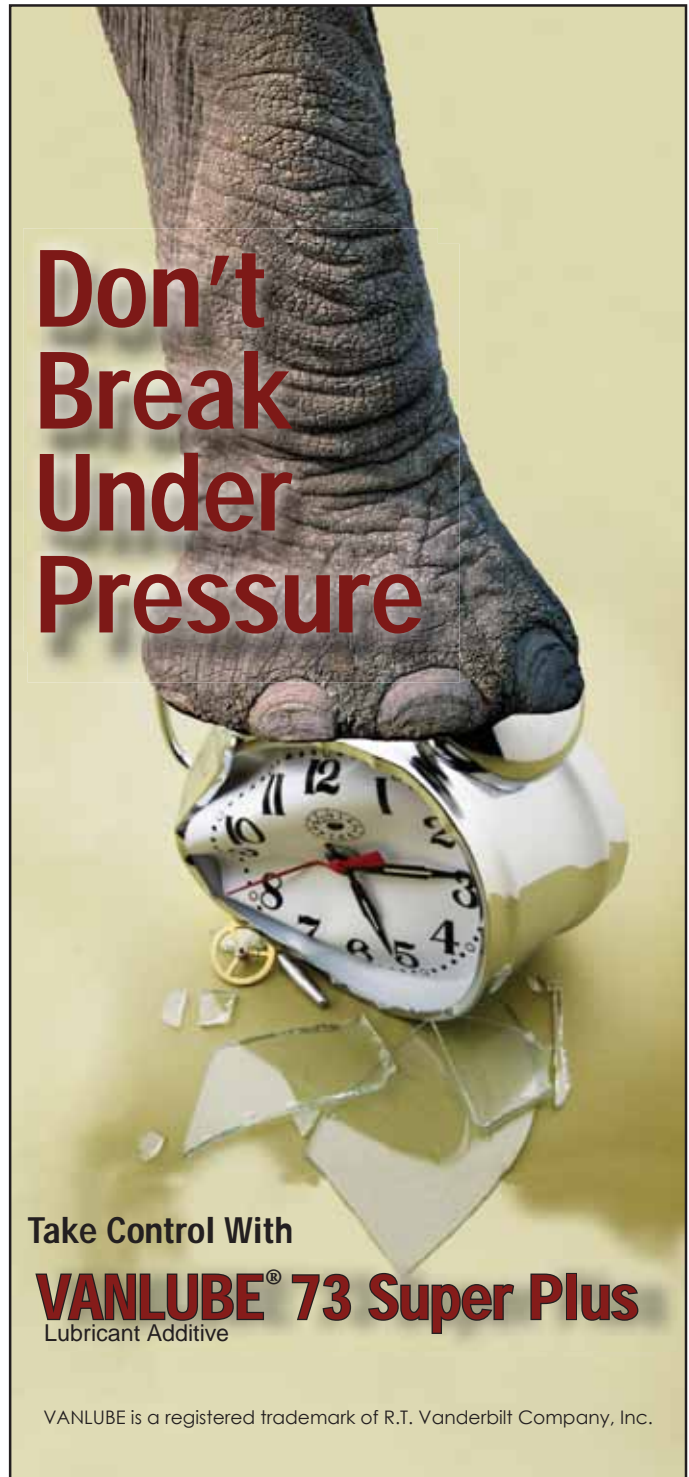
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An advertisement for VANLUBE 73 Super Plus Lubricant Additive. The main image shows a close-up of an elephant's foot, with its thick, wrinkled skin and large, dark toenails, stepping down on a silver and white alarm clock. The clock is shattered, with several pieces of clear glass or plastic lying on the surface below it. The background is a solid, light yellow color. Overlaid on the image is the text 'Don't Break Under Pressure' in a large, bold, red font. Below the image, the text reads 'Take Control With VANLUBE® 73 Super Plus Lubricant Additive'. At the bottom, in a smaller font, it says '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

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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 inquiries 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	✓	✓	✓											✓		✓		✓	✓				✓	✓			
FUNCTION																											
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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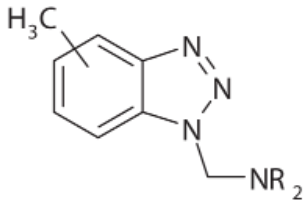
APPLICATION	VANLUBE® 81	VANLUBE 289	VANLUBE 601	VANLUBE 601E	VANLUBE 622	VANLUBE 672	VANLUBE 692	VANLUBE 704S	VANLUBE 719	VANLUBE 727	VANLUBE 739	VANLUBE 829	VANLUBE 869	VANLUBE 871	VANLUBE 887	VANLUBE 887E	VANLUBE 915M	VANLUBE 961	VANLUBE 972M	VANLUBE 996E	VANLUBE 7611M	VANLUBE 7723	VANLUBE 8610	VANLUBE 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	✓		✓	✓				✓			✓				✓	✓	✓	✓	✓		✓		✓		✓		
FUNCTION																											
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

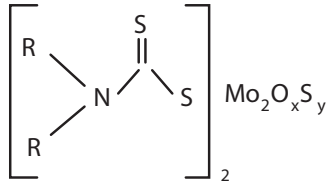
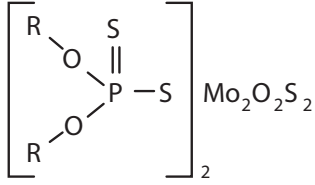
1 = Primary Function


2 = Secondary Function

VANLUBE Antioxidant and VANLUBE Lubricant Additive are registered trademarks of R.T. Vanderbilt Company, Inc.

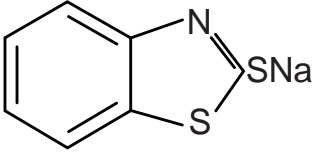
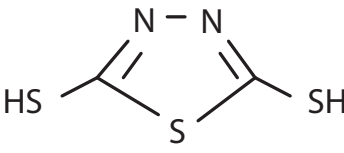
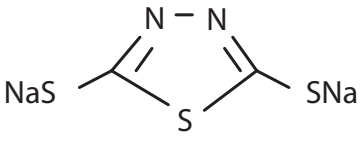
	CUVAN® 303 Metal Deactivator	CUVAN 484	CUVAN 826
Formula		Proprietary	Proprietary
Application	Auto Transmission Fluid, Compressor Oil, Engine Oil, Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Compressor Oil, Engine Oil, Gear Oil, Grease, Hydraulic Oil, Metalworking, Turbine Oil	Compressor Oil, Engine Oil, Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Turbine Oil
Function	Ashless, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant, Antiwear/Antiscuff, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant, Corrosion Inhibitor, Metal Deactivator
Chemical Composition	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
Physical State	Liquid	Liquid	Liquid
Color	Amber	Amber	Amber
Density @ 15.6 °C Mg/m³ (lb/gal)	0.95 (7.9) @ 25°C	1.07(9.0)	1.04(8.6)
Viscosity @ 100 °C cSt	5.81	11	3.32
Flash Point (PMCC), °C	125	76	192
Solubility	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.
Use Concentration, % mass	0.05 - 0.20	0.10 - 0.50	0.10 - 0.50
Typical Uses	CUVAN 303 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. NSF® Registered HX-1, 138995	CUVAN 484 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. CUVAN 484 may also enhance the antiwear and oxidation properties of lubricants.	CUVAN 826 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. CUVAN 826 has a unique composition enables it to suppress the corrosive action of hydrogen sulfide.

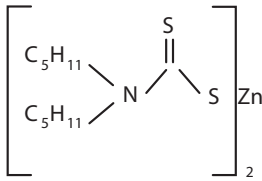
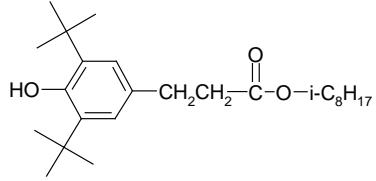
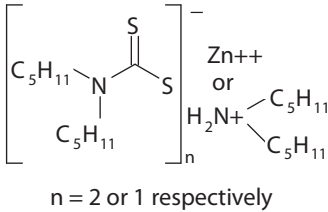
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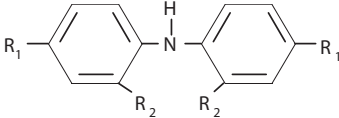
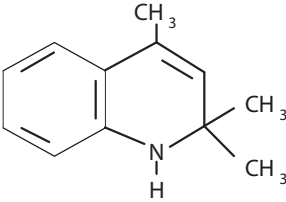
	MOLYVAN® A Friction Reducer	MOLYVAN L	MOLYVAN 807
Formula			Proprietary
Application	Grease, Synthetic Lube	Engine Oil, Gear Oil, Grease, Metalworking, Synthetic Lube	Engine Oil, Gear Oil, Grease, Synthetic Lube
Function	High Temperature, Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure
Chemical Composition	Molybdenum di-n-butylthio-carbamate	Molybdenum di(2-ethylhexyl)phosphorodithioate	Molybdenum dialkyldithio-carbamate in oil
Physical State	Powder	Liquid	Liquid
Color	Yellow	Dark Green	Dark Green
Density @ 15.6°C Mg/m³ (lb/gal)	1.59 @ 25°C	1.08 (9.0)	0.97 (8.1)
Viscosity @ 100°C cSt	—	8.6	13
Flash Point (PMCC), °C	—	142	135
Solubility	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.
Use Concentration, % mass	0.5 - 3.0	0.25 - 1.0	0.25 - 0.5
Typical Uses	<p>MOLYVAN A 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. MOLYVAN A 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>MOLYVAN L 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. MOLYVAN L 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>MOLYVAN 807 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. MOLYVAN 807 can be used in combination with VANLUBE® 7723 Antioxidant, a nonmetallic dithiocarbamate which functions as an antioxidant and extreme pressure agent.</p> <p>Not recommended for diesel engine oils.</p>

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

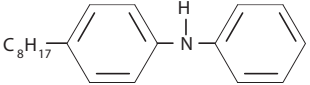
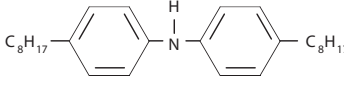
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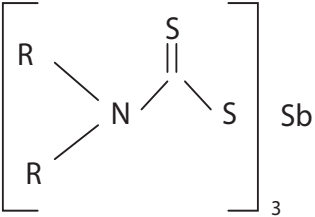
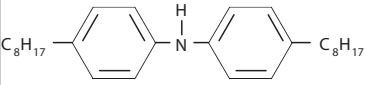
	NACAP[®] Corrosion Inhibitor	VANCHEM[®] DMTD Metal Deactivator	VANCHEM NATD
Formula			
Application	Coolant, Water-Based Fluids	Coolant, Water-Based Fluids, Metalworking	Coolant, Water-Based Fluids, Metalworking
Function	Antioxidant, Corrosion Inhibitor, Chemical Intermediate, Metal Deactivator	Ashless, 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 ³ (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	NACAP 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. NACAP is one of the standard copper corrosion inhibitors for the antifreeze industry. Used as a chemical intermediate.	VANCHEM DMTD '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 VANCHEM DMTD can generally be reacted successively.	VANCHEM NATD 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. VANCHEM NATD as a stable reactive dimercaptide which is readily alkylated, oxidized to the disulfide, or converted to metal salts.

	VANLUBE® AZ Lubricant Additive	VANLUBE BHC Antioxidant	VANLUBE EZ
Formula			
Application	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
Function	Antioxidant, Antiwear/Antiscuff, Corrosion Inhibitor, Metal Deactivator	Ashless, Antioxidant	Antioxidant, Antiwear/Antiscuff, Extreme Pressure
Chemical Composition	Zinc diamyldithiocarbamate in oil	Butylated hydroxyhydrocinnamate	Zinc diamyldithiocarbamate and diamyl ammonium diamyldithiocarbamate
Physical State	Liquid	Liquid	Liquid
Color	Amber	Yellowish	Yellowish/Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.02 (8.2)	0.9665	1.1
Viscosity @ 100°C cSt	9.8	—	40 - 70
Flash Point (PMCC), °C	136	152	93
Solubility	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.
Use Concentration, % mass	0.25 - 1.5	0.1 - 2.0	0.1 - 2.0
Typical Uses	VANLUBE AZ 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.	VANLUBE BHC 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.	VANLUBE EZ 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 VANLUBE AZ .

	VANLUBE® NA Antioxidant	VANLUBE RD	VANLUBE RI-A Lubricant Additive
Formula			Proprietary
Application	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
Function	Ashless, Antioxidant	Ashless, Antioxidant	Ashless, Corrosion Inhibitor, Rust Inhibitor
Chemical Composition	Alkylated diphenylamines	Polymerized 1,2-dihydro-2,2,4-trimethylquinoline	Dodecenylsuccinic acid reaction product
Physical State	Liquid	Small Pastilles	Liquid
Color	Brown	Amber	Amber
Density @ 15.6 °C Mg/m³ (lb/gal)	0.94 (7.8)	1.06	0.96 (8.0)
Viscosity @ 100 °C cSt	15	—	19
Flash Point (PMCC), °C	213 (COC)	—	165
Solubility	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.
Use Concentration, % mass	0.25 - 1.5	0.1 - 1.0	0.05 - 0.25
Typical Uses	VANLUBE NA is a versatile liquid amine antioxidant with several advantages over other antioxidants of this type. The amine group in VANLUBE NA is hindered by oil-soluble alkyl groups which contribute to antioxidant efficiency by reducing some of the undesirable properties of other amines. VANLUBE NA 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 VANLUBE PCX , VANLUBE AZ and VANLUBE 73 .	VANLUBE RD 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.	VANLUBE RI-A 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. VANLUBE RI-A is most effective in greases when used with a sulfonate such as VANLUBE RI-BA in a 50/50 ratio. NSF® Registered H2, 139738

	VANLUBE® RI-BA Lubricant Additive	VANLUBE RI-G	VANLUBE SB
Formula	Proprietary	Proprietary	Proprietary
Application	Gear Oil, Grease, Hydraulic Oil, Metalworking, Rust Preventive, Turbine Oil	Gear Oil, Grease, Hydraulic Oil, Rust Preventive	Engine Oil, Gear Oil, Grease, Metalworking
Function	Corrosion Inhibitor, Rust Inhibitor	Ashless, Corrosion Inhibitor, Rust Inhibitor	Antiwear/Antiscuff, Extreme Pressure
Chemical Composition	Barium sulfonate	Fatty acid derivative of 4,5-dihydro-1H-imidazole	Sulfur-based additive
Physical State	Liquid	Liquid	Liquid
Color	Dark Brown	Amber	Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.00 (8.3)	0.94 (7.8)	1.14 (9.5)
Viscosity @ 100°C cSt	90	117	10
Flash Point (PMCC), °C	175	271	79
Solubility	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.
Use Concentration, % mass	0.05 - 0.15	0.25 - 0.50	1.0 - 2.0
Typical Uses	VANLUBE RI-BA is an oil-soluble barium sulfonate with excellent rust-inhibiting and water-resistant properties. Useful in many industrial and automotive lubricant applications. VANLUBE RI-BA 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.	VANLUBE RI-G was specifically designed to provide excellent rust inhibition for greases. It is compatible with other VANLUBE extreme pressure, antioxidant and antiwear additives.	VANLUBE SB 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. VANLUBE SB is an economical source of sulfur in a form that provides good load-carrying and antiwear properties combined with low copper corrosion.

	VANLUBE® SL Antioxidant	VANLUBE SS Lubricant Additives	VANLUBE TK-100
Formula			Proprietary
Application	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
Function	Ashless, Antioxidant	Ashless, High Temperature, Antioxidant	Tackifier
Chemical Composition	Mixture of alkylated diphenylamines	Octylated diphenylamines	Solution of a copolymer of ethylene and propylene
Physical State	Liquid	Powder	Liquid
Color	Reddish Brown	Light Tan	Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.01 (8.4)	1.02	0.89
Viscosity @ 100°C cSt	16.28	–	4,500
Flash Point (PMCC), °C	210 (COC)	–	121
Solubility	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.
Use Concentration, % mass	0.25 - 1.5	0.5 - 2.0	0.5 - 5.0
Typical Uses	VANLUBE SL 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 VANLUBE PCX 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.	VANLUBE SS 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.	VANLUBE TK-100 is used to provide adherence in way oils, chain lubricants and greases. It provides excellent aerosol resistance in pneumatic system lubricants.

	VANLUBE® 73 Lubricant Additive	VANLUBE 73 Super Plus	VANLUBE 81 Antioxidant
Formula		Proprietary	
Application	Compressor Oil, Engine Oil, Gear Oil, Grease, Synthetic Lube	Gear Oil, Grease	Auto Transmission Fluid, Compressor Oil, Engine Oil, Grease, Synthetic Lube, Turbine Oil
Function	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Ashless, High Temperature, Antioxidant
Chemical Composition	Antimony tris(dialkyldithiocarbamate) in oil	Proprietary blend of dialkyldithiocarbamates	p,p'-dioctyldiphenylamine
Physical State	Clear to Hazy Liquid	Liquid	Powder
Color	Dark Amber	Amber	Off White
Density @ 15.6°C Mg/m³ (lb/gal)	1.03 (8.6)	1.0987	1.01
Viscosity @ 100°C cSt	11	33.34	–
Flash Point (PMCC), °C	171	> 118	–
Solubility	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.
Use Concentration, % mass	0.1 - 1.0 as antioxidant 2.0 - 5.0 as extreme pressure agent.	2.0 - 4.0	0.5 - 2.0
Typical Uses	<p>VANLUBE 73 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>NSF® Registered HX-2, 137553</p>	<p>VANLUBE 73 Super Plus is a proprietary mixture of dialkyldithiocarbamates. Based on equivalent antimony content, 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.</p>	<p>VANLUBE 81 is similar chemically to VANLUBE SS but is a better high temperature oxidation inhibitor because of its high purity and high p,p'-dioctyldiphenylamine content. VANLUBE 81 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, VANLUBE 81 is effective in both oxidation bomb tests and in high speed spindle tests. Siloxane greases containing 2% VANLUBE 81 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>NSF® Registered HX-1, 143815</p>

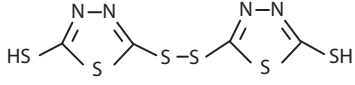
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	VANLUBE® 289 Lubricant Additive	VANLUBE 601	VANLUBE 601E
Formula	Proprietary	Proprietary	Proprietary
Application	Auto Transmission Fluid, Compressor Oil, Engine Oil, Gear Oil, Grease, Metalworking	Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil	Fuel, Gear Oil, Grease, Hydraulic Oil, Metalworking, Synthetic Lube, Turbine Oil
Function	Ashless, Antiwear/Antiscuff, Friction Reducer	Ashless, Antioxidant, Corrosion Inhibitor, Metal Deactivator	Antioxidant, Corrosion Inhibitor
Chemical Composition	Borate ester	Heterocyclic sulfur-nitrogen compound	Heterocyclic sulfur-nitrogen compound
Physical State	Liquid	Liquid	Liquid
Color	Yellowish	Dark Amber	Dark Amber
Density @ 15.6 °C Mg/m³ (lb/gal)	0.99	0.98 (8.1)	0.98 (8.1)
Viscosity @ 100 °C cSt	22.3	10.5	7
Flash Point (PMCC), °C	191	122	157
Solubility	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.
Use Concentration, % mass	0.5 - 1.0	0.02 - 1.0	0.02 - 1.0
Typical Uses	VANLUBE 289 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.	VANLUBE 601 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. VANLUBE 601 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.	VANLUBE 601E 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. VANLUBE 601E 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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	VANLUBE® 622 Lubricant Additive	VANLUBE 672	VANLUBE 692
Formula		Proprietary	Proprietary
Application	Engine Oil, Gear Oil, Grease, Synthetic Lube	Gear Oil, Grease, Metalworking, Synthetic Lube	Gear Oil, Grease, Metalworking, Synthetic Lube
Function	Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure	Ashless, Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Ashless, Antioxidant, Antiwear/Antiscuff, Extreme Pressure
Chemical Composition	Antimony o,o-dialkylphosphorodithioate in oil.	Amine phosphate	Aromatic amine phosphate
Physical State	Clear to slightly hazy liquid	Viscous Liquid	Viscous Liquid
Color	Amber	Light Amber	Dark Amber
Density @ 15.6 °C Mg/m ³ (lb/gal)	1.20 (10.0)	1.02 (8.5)	0.99 (8.2)
Viscosity @ 100 °C cSt	5	250	53
Flash Point (PMCC), °C	150	113	165
Solubility	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.
Use Concentration, % mass	0.5 - 3.0	1.0 - 3.0	1.0 - 3.0
Typical Uses	<p>VANLUBE 622 is an antiwear and extreme pressure additive for steel mill and other industrial gear oils. VANLUBE 622 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 VANLUBE 622 to be superior to zinc dithiophosphates at equivalent treat costs. Friction reducer in engine oils and gear oils.</p>	<p>VANLUBE 672 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>VANLUBE 692 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. VANLUBE 692 enhances the extreme pressure properties of sulfurized olefins, chlorinated paraffins, dithiocarbamates and phosphorodithioates.</p>

	VANLUBE® 704S Lubricant Additive	VANLUBE 719	VANLUBE 727
Formula	Proprietary	Proprietary	Proprietary
Application	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
Function	Corrosion Inhibitor, Demulsifier, Metal Deactivator, Rust Inhibitor	Antioxidant, Antiwear/Antiscuff, Extreme pressure	Ashless, Antioxidant, Antiwear/Antiscuff
Chemical Composition	Barium sulfonate blend	Amine phosphate package	Organosulfur-phosphorus compound
Physical State	Viscous Liquid	Liquid	Liquid
Color	Dark Amber	Dark Amber	Light Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.03 (8.5)	0.99 (8.2)	1.01 (8.4)
Viscosity @ 100°C cSt mm²/s	72	48	2.6
Flash Point (PMCC), °C	188	85	100
Solubility	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.
Use Concentration, % mass	0.05 - 0.25	1.0 - 4.0	1.0 - 2.0
Typical Uses	<p>VANLUBE 704S is used in petroleum and synthetic lubricants as a multifunctional rust and corrosion inhibitor.</p> <p>VANLUBE 704S 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>VANLUBE 719 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. VANLUBE 719 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>VANLUBE 727 is a versatile additive for various types of automotive and industrial lubricating oils. VANLUBE 727 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 VANLUBE 727 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>

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

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	VANLUBE® 871 Lubricant Additive	VANLUBE 887 Antioxidant	VANLUBE 887E
Formula	Proprietary	Proprietary	Proprietary
Application	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
Function	Ashless, Antioxidant, Antiwear/Antscuff	Ashless, High Temperature, Antioxidant	Ashless, High Temperature, Antioxidant
Chemical Composition	2,5-dimercapto-1,3,4-thiadiazole alkyl polycarboxylate	Tolutriazole compound in oil	Tolutriazole compound in ester
Physical State	Liquid	Liquid	Liquid
Color	Amber	Amber	Light Amber
Density @ 15.6 °C Mg/m³ (lb/gal)	1.10 (9.3)	1.00 (8.36)	1.01 (8.4)
Viscosity @ 100 °C cSt	19.6	17	20
Flash Point (PMCC), °C	178	146	180
Solubility	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.
Use Concentration, % mass	0.5 - 2.0	0.5 - 1.0	0.5 - 2.0
Typical Uses	VANLUBE 871 is a liquid ashless antioxidant/antiwear agent. Possible uses include both gasoline and diesel engine oil formulations to improve existing additive packages.	VANLUBE 887 is a liquid ashless antioxidant. It is most effective as an antioxidant synergist with mixtures of hindered phenols and /or ashless dithiocarbamates such as VANLUBE 7723 . VANLUBE 887 possesses excellent high temperature stability. Combined with VANLUBE 7723 and a suitable base stock, it will pass the Cincinnati Milacron Thermal Stability Test, Procedure A.	VANLUBE 887E is a liquid ashless antioxidant. It is most effective as an antioxidant synergist with mixtures of hindered phenols and /or ashless dithiocarbamates such as VANLUBE 7723 . VANLUBE 887E possesses excellent high temperature stability.

	VANLUBE® 915M Antioxidant	VANLUBE 961 Lubricant Additive	VANLUBE 972M
Formula	Proprietary	Proprietary	Proprietary
Application	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
Function	Ashless, High Temperature, Antioxidant, Metal Deactivator	Ashless, Antioxidant	Ashless, Antiwear/Antiscuff, Extreme Pressure
Chemical Composition	Antioxidant blend	Mixed octylated and butylated diphenylamines	Thiadiazole derivative in polyalkylene glycols
Physical State	Liquid	Liquid	Liquid
Color	Amber	Light Amber	Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.01	0.98 (8.2)	1.24 (10.2)
Viscosity @ 100°C cSt	10.5	9.9	6.0
Flash Point (PMCC), °C	160	190	110
Solubility	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.
Use Concentration, % mass	0.5-1.0	0.5 - 1.0	0.5 - 3.0
Typical Uses	VANLUBE 915M 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.	VANLUBE 961 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. VANLUBE 961 may be used as an ashless antioxidant in all types of crankcase oils.	VANLUBE 972M , 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

	VANLUBE® 996E Antioxidant	VANLUBE 7611M Lubricant Additive	VANLUBE 7723
Formula	Proprietary	Proprietary	
Application	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
Function	Ashless, High Temperature, Antioxidant, Corrosion Inhibitor	Ashless, Antioxidant, Antiwear/Antiscuff	Ashless, High Temperature, Antioxidant, Antiwear/Antiscuff, Friction Reducer, Extreme Pressure
Chemical Composition	Methylene bis (dibutyldithiocarbamate) and toluotriazole derivative	Ashless phosphorodithioate	Methylene bis(dibutyldithiocarbamate)
Physical State	Liquid	Liquid	Liquid
Color	Amber	Light Amber	Amber
Density @ 15.6 °C Mg/m³ (lb/gal)	1.06 (8.8)	1.08 (9.0)	1.06 (8.8)
Viscosity @ 100 °C cSt	16.4	2.54	15
Flash Point (PMCC), °C	191	142	177
Solubility	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.
Use Concentration, % mass	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.
Typical Uses	<p>VANLUBE 996E 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>VANLUBE 996E also exhibits extreme pressure performance alone and in combination with other additives.</p>	<p>VANLUBE 7611M is an organic liquid additive containing sulfur and phosphorus. 4-Ball Wear tests show that VANLUBE 7611M, at a 20 kg load, performs equivalently to typical zinc dialkylidithiophosphates. At a 40 kg load it is superior to these products. VANLUBE 7611M will improve the antiwear properties of sulfurized extreme pressure additives. It is a useful component for extreme pressure/antiwear lubricant formulations and additive packages. VANLUBE 7611M does not contain metallic elements. Thus, it is applicable to ashless and low ash formulations.</p> <p>NSF® Registered HX-2, 136048</p>	<p>VANLUBE 7723 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>VANLUBE 7723 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, VANLUBE 7723 also exhibits good extreme pressure performance alone and in combination with other additives. Useful as a component of additive packages.</p> <p>NSF® Registered HX-1, HX-2, 136049</p>

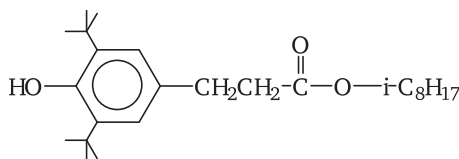
VANLUBE Antioxidant and VANLUBE Lubricant Additive are registered trademarks of R.T. Vanderbilt Company, Inc. NSF is a registered trademark of NSF International.

	VANLUBE® 8610 Lubricant Additive	VANLUBE 8912E	VANLUBE 9123
Formula	Proprietary	Proprietary	Proprietary
Application	Gear Oil, Grease	Gear Oil, Grease, Hydraulic Oil, Metalworking, Rust Preventive, Turbine Oil	Gear Oil, Grease, Rust Preventive
Function	Antioxidant, Antiwear/Antiscuff, Extreme Pressure	Corrosion Inhibitor, Rust Inhibitor	Ashless, Antiwear/Antiscuff, Rust Inhibitor
Chemical Composition	Antimony dithiocarbamate/sulfurized olefin blend	Calcium sulfonate	Amine phosphate
Physical State	Liquid	Liquid	Liquid
Color	Amber	Dark Brown	Amber
Density @ 15.6°C Mg/m³ (lb/gal)	1.16 (9.42)	0.97	0.94 (7.8)
Viscosity @ 100°C cSt	28.5	19	24
Flash Point (PMCC), °C	100	150 (COC)	96
Solubility	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.
Use Concentration, % mass	1.25 - 2.0	0.05 - 0.10	0.10 - 1.0
Typical Uses	<p>VANLUBE 8610 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. VANLUBE 8610 is compatible with other VANLUBE rust inhibitors/antioxidants and metal deactivators.</p>	<p>VANLUBE 8912E is an oil-soluble calcium sulfonate with excellent rust-inhibiting and water-resistant properties.</p>	<p>VANLUBE 9123 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>

	VANLUBE® 9317 Antioxidant		
Formula	Proprietary		
Application	Synthetic Lube		
Function	High Temperature, Antioxidant		
Chemical Composition	Organic amine compounds in a synthetic ester		
Physical State	Liquid		
Color	Dark Brown		
Density @ 15.6 °C Mg/m³ (lb/gal)	0.98 (8.1)		
Viscosity @ 100 °C cSt	128		
Flash Point (PMCC), °C	254		
Solubility	Soluble in petroleum and synthetic lubricant bases. Insoluble in water.		
Use Concentration, % mass	0.5 - 4.0		
Typical Uses	VANLUBE 9317 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[®] BHC

PHENOLIC ANTIOXIDANT



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

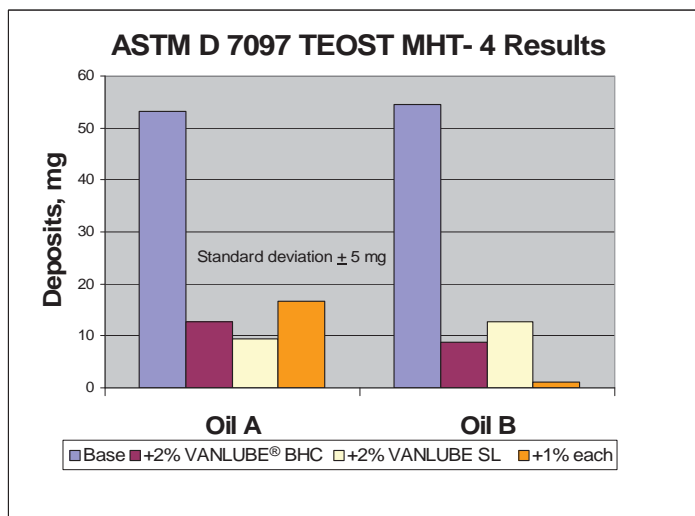
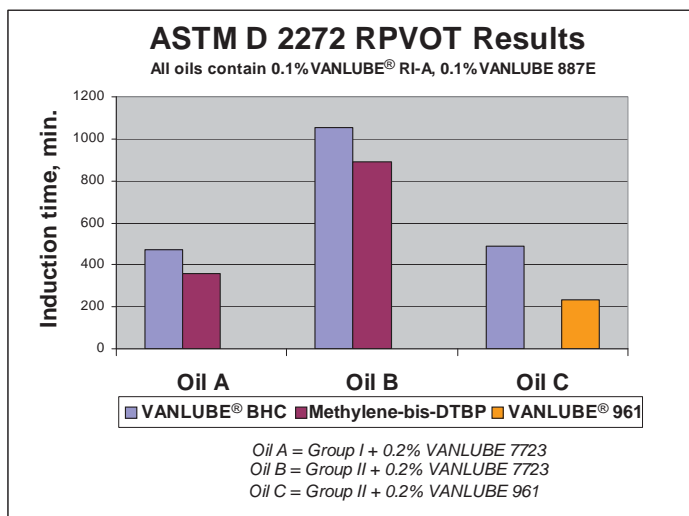


Figure 2



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.

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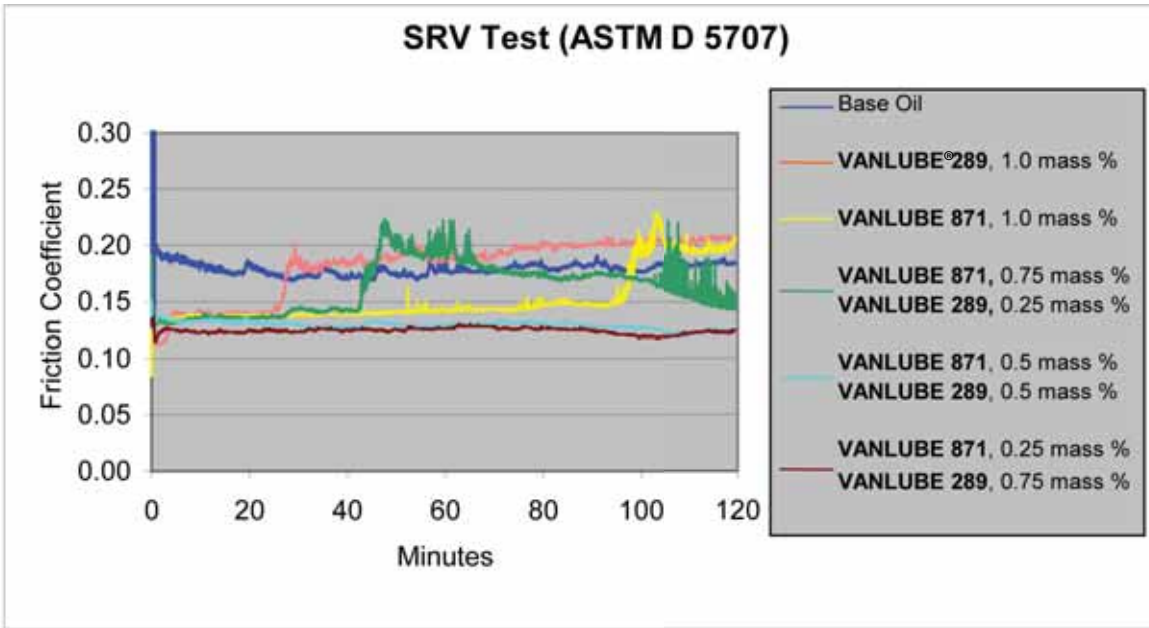


Figure 4. Test Parameters: 80°C; 50 N break-in load; 200 N test load; 50 Hz; 1.00 mm stroke; test duration of 120 minutes.

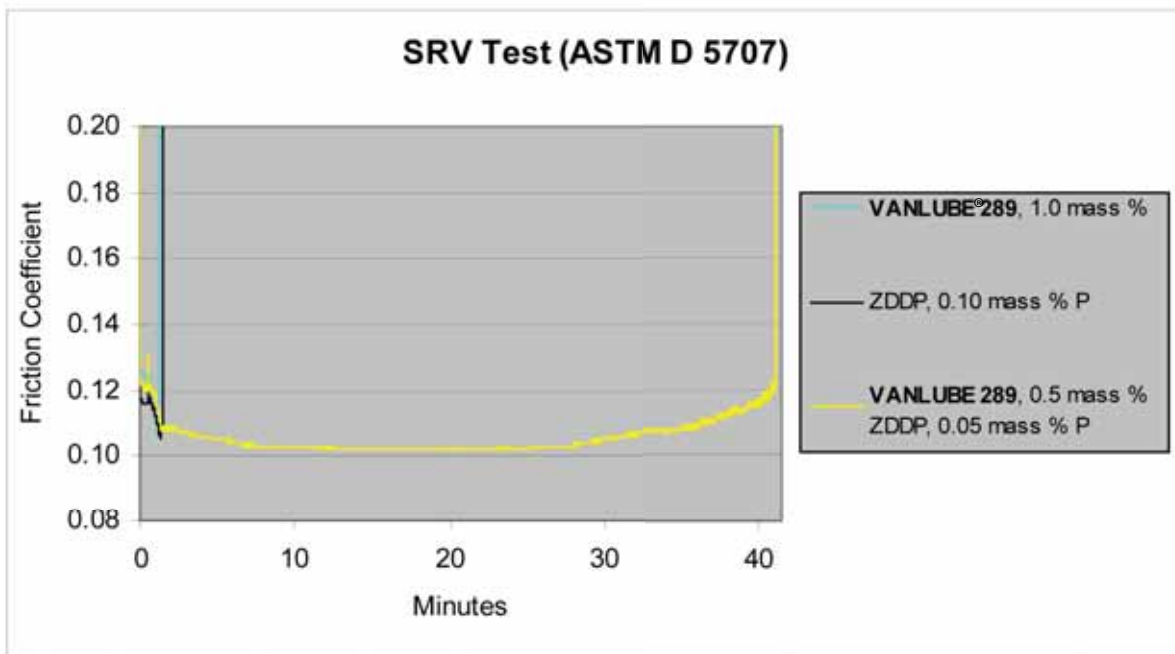


Figure 5. Test Parameters: 25°C; 50 N break-in load; 1000 N test load; 50 Hz; 1.00 mm stroke. Experiments ran until failure as indicated by a large and sudden increase in the friction coefficients

VANLUBE® 996E

Antioxidant

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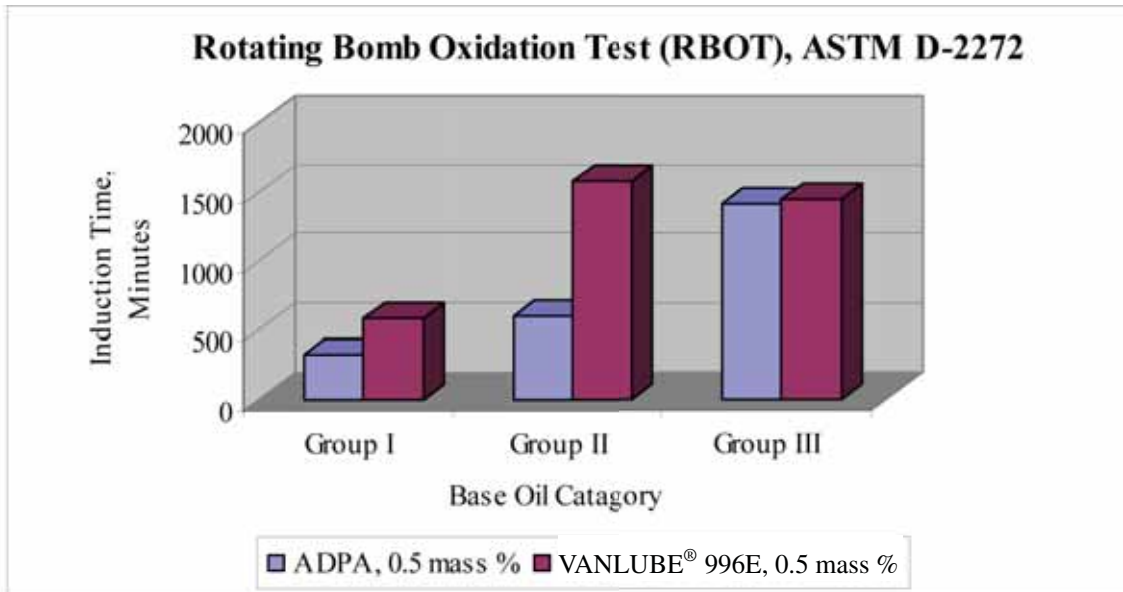


Figure 1. Rust inhibitor (VANLUBE RI-A Lubricant Additive, 0.05 mass %) was added to all test oils. ADPA is acronym for alkylated diphenylamine. The ADPA that was used for this study consisted of a mixture of butylated/octylated DPA components.

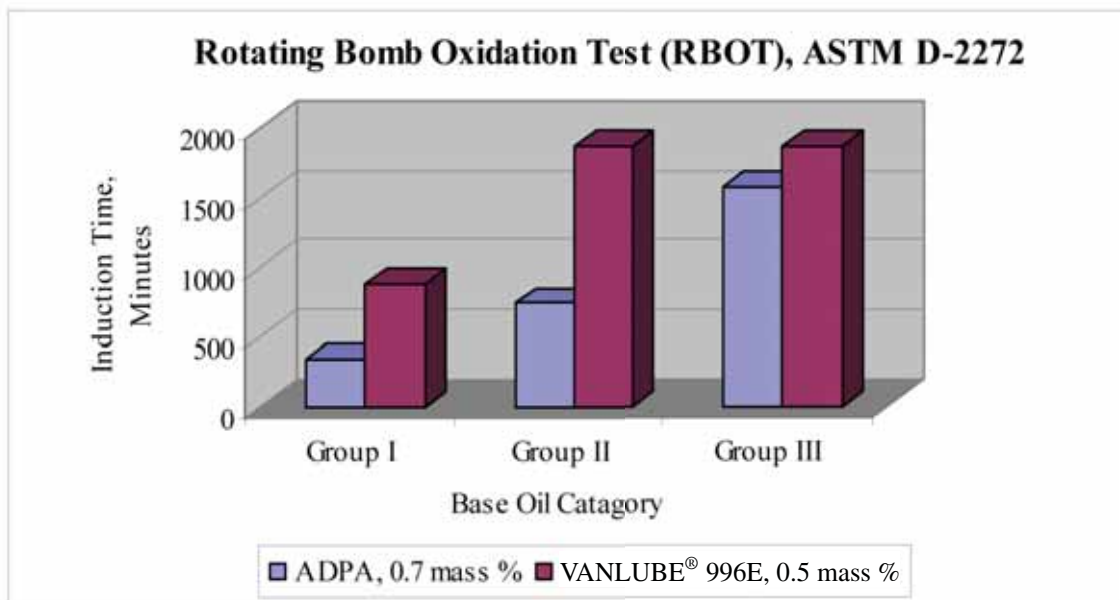


Figure 2. Rust inhibitor (VANLUBE RI-A Lubricant Additive, 0.05 mass %) was added to all test oils. ADPA is acronym for alkylated diphenylamine. The ADPA that was used for this study consisted of a mixture of butylated/octylated DPA components.

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?

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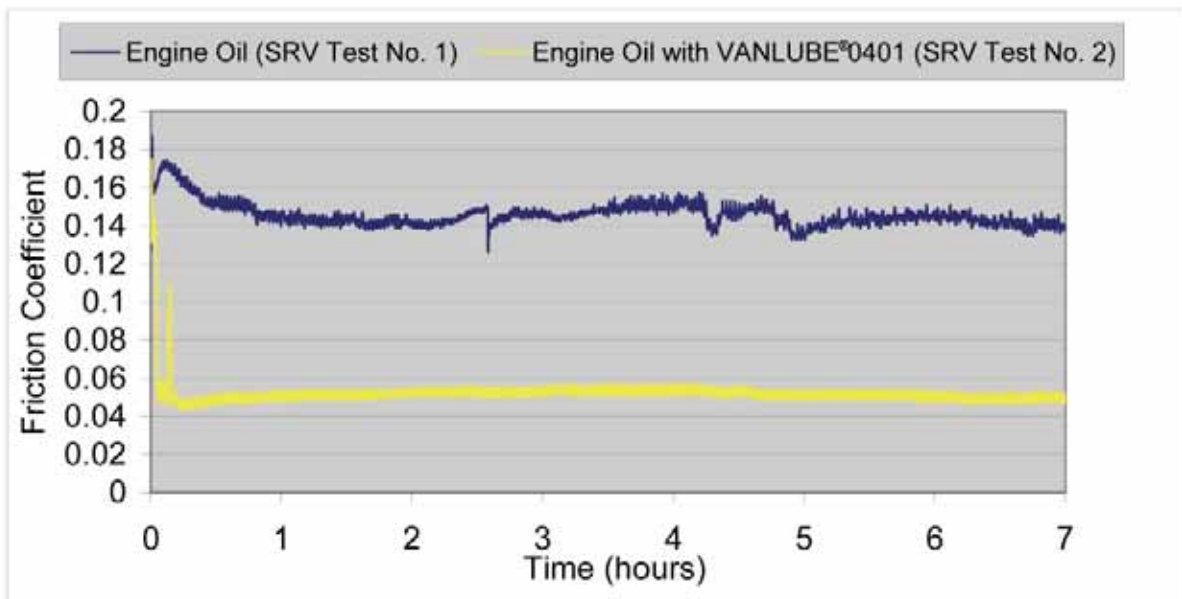


Figure 1. Test Parameters: ball on disk; 120N; 40 Hz; 4.00 mm stroke; 7 hours. The engine oil is 5W-30 grade containing 0.05 mass percent of phosphorus.



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.

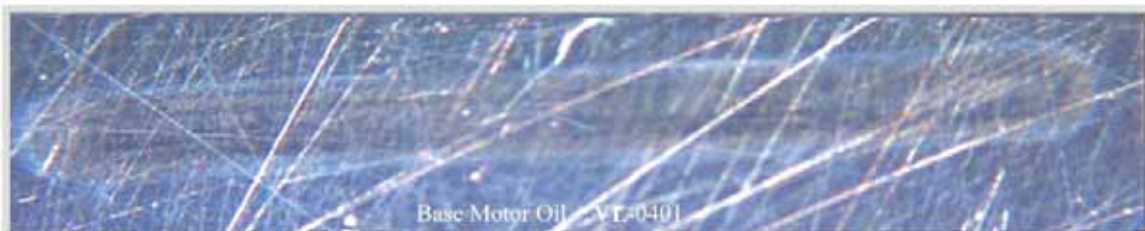


Figure 3. Image of the wear scar on disk for SRV Test No. 2. The surface features of the disk are intact; the dark coloration indicates the protective surface film.

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 ³ :	1.05
Viscosity at 40°C, mm ² /s:	1.190
Viscosity at 100°C, mm ² /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				
	3.0	2.5	2.5	2.3	
VANLUBE® 73 Super Plus 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
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- ★ METAL-FREE
- ★ PROTECTS AGAINST
CORROSION
- ★ REDUCES OXIDATION
- ★ MINIMIZES WEAR
- ★ CARRIES A HIGH LOAD
AT EXTREME PRESSURE
CONDITIONS

VANLUBE® 0902

LUBRICANT ADDITIVE

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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



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