



Additives for Aerosols

Rust Preventives & Lubricants

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Agenda

- Introductions
- Role of the additive supplier
- Rust Preventive
 - Additives & Performance
- Lubricity
 - Additives & Performance
- Trends



The Lubrizol Corporation: Formulating Solutions For The Specialty Chemicals Marketplace

Using the right mix of people, ideas and market knowledge, Lubrizol:

- Provides advanced chemical technology to global transportation, industrial and consumer markets
- Creates unique, hard-to-duplicate formulations resulting in successful solutions for our customers
- Pursues our growth vision to become one of the largest and most profitable specialty chemical companies in the world



Formulation is the Foundation of Every Successful Solution We Deliver



Business Portfolio: 2007 Revenues of \$4.5 Billion

Lubrizol Additives

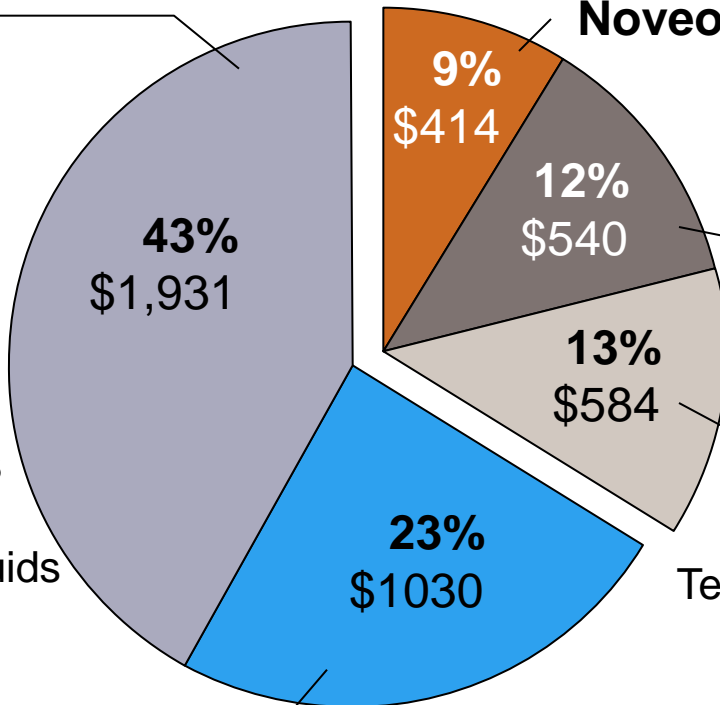
Lubrizol Advanced Materials

Engine Additives

- Passenger Car Engine Oils
- Heavy Duty Diesel Oils
- Marine Diesel Oils
- Fuel Additives

Driveline and Industrial Oil Additives

- Gear Oils
- Automatic Transmission Fluids
- Industrial Fluids
- Compressor Fluids



Noveon® Consumer Specialties

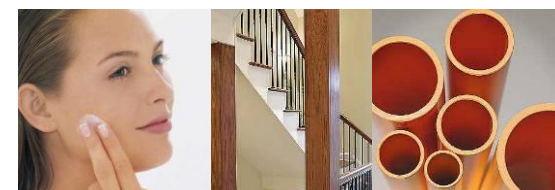
Ingredients for Personal Care and other consumer markets

Performance Coatings

Resins and Polymers
Coating Additives

Engineered Polymers

Estane® Engineered Polymers
TempRite® Engineered Polymers



Note: Revenues by product line in millions of dollars.



Industrial Additives

- Greases
- Industrial gear oils
- Antiwear hydraulic fluids
- Metalworking fluids*
- Compressor lubricants



* Rust Preventive & Lubricant Additives are found in the Metalworking fluids group



Lubrizon's Role as Additive Supplier

- Provide the compounder / blender with chemistry (additive) & application expertise
- Work directly with customers
 - Additive selection
 - Formulation support
 - Performance testing
- Collaborate with aerosolizers to understand propellant and additive compatibility
- Improved success rate & speed to market
 - Utilize available resources in tough economic times

Lubrizol Rust Preventive Additives



Metalworking

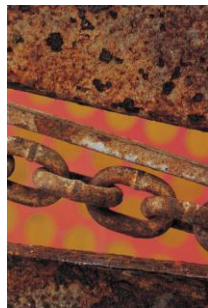


Industrial Additives



Rust Preventive (RP) Additives

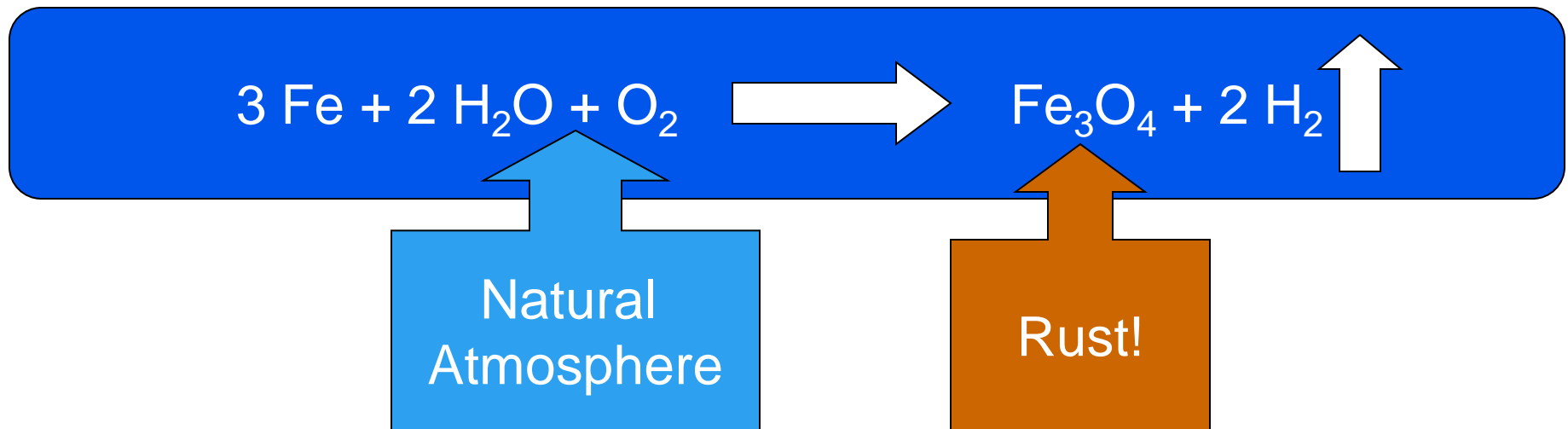
- Provide protection to metals
 - Films deposited prevent corrosion by displacing water and providing physical barrier to the atmosphere
 - Additive selection determined by carrier (diluent), desired performance (time) and film type
 - Removal of films can be achieved with appropriate cleaning methods
 - Chemical composition can provided enhanced performance
 - ‘Smart barrier’
- Lubrizol has a knowledge base that spans 80+ years from the start of the ALOX corporation in 1926





Chemical Corrosion Process

- In nature iron exists in oxide form
 - Metal will always try to return to the natural oxide state
 - RP additives shield the metal from the natural atmosphere to prevent oxidation reaction from occurring

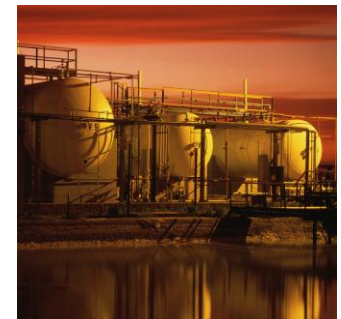


- Corrosion mechanism varies by substrate



Additive Selection

- Item to be protected
 - Metal
 - Surface features
 - Geometry
- Application environment
 - Indoor or outdoor?
 - Humidity/salt atmosphere/acid atmosphere?
 - Tightly stacked parts or coiled metal?
 - Amount of subsequent handling
- Desired film type and thickness
 - Hard, semi-permanent
 - Soft/waxy
 - Oily





Additive Selection - Diluent Type

- Type of diluent determines additive range

- Solvent
 - Rapid evaporation / film deposits quickly
 - Ability to provide hard or waxy residual film

- Oil
 - Residual film maintains oily nature
 - Possible film migrations / housekeeping concerns

- Water-based
 - Slower evaporation rate
 - Potential to deposit any film type
 - Reduction of flammability & VOC concerns



Additive Selection – Performance Measurement

- Variety of laboratory methods are applied to compare rust preventive performance under controlled conditions and predict field use results
 - Humidity Cabinet
 - Salt Spray
 - Acid Fume
 - Stack Stain
 - Water Displacement
 - Water Separation

Humidity Cabinet (ASTM D 1748)

- Accelerated testing for indoor storage
 - 120°F (49°C) water temperature
 - 100% relative humidity
 - Selected substrate panels & panel surface
 - Run to Failure
 - Fail: One or more dots larger than 1mm or 4 or more dots of any size. (disregard outer 1/8 inch of panel)



Salt Spray (ASTM B 117)

- Accelerated testing for outdoor storage and salt atmosphere conditions
 - Run at 95°F (35°C) atmospheric temperature
 - 5.0% NaCl solution
 - Selected substrate panels & panel surface
 - Run to Failure
 - Fail: One or more dots larger than 1mm or 4 or more dots of any size (disregard outer 1/8 inch of panel)



Acid Fume

- Accelerated testing for indoor storage under acid atmosphere conditions
 - Selected substrate panels & panel surface
 - Coat panel with RP solution
 - Place in 4N HCl acid atmosphere
 - Test chamber @ 72°F (22.2°C)
 - Run to failure
 - Fail: Any sign of stain or rust



Stack Stain Test (Mil-C-22235A)

- Accelerated testing to determine the effect of water contamination, heat and metal to metal contact on coiled or stacked metal surfaces
 - Selected substrate panels & panel surface
 - Neat
 - Contaminated with water
 - Stack panels in a sandwich arrangement
 - Store @180°F (82.2°C) for 24 hours
 - Fail
 - Any sign of stain or rust



Water Displacement (Mil-PRF-16173E)

- Test to show the ability of a rust preventive to displace water from a metal surface
 - Selected substrate panels & panel surface
 - Submerge panel in distilled water for 5 seconds
 - Submerge panel in RP solution for 15 seconds
 - Neat
 - Water contamination
 - Static humidity chamber @ 77°F (25°C) for 1 hour
 - Fail
 - Any sign of rust, mottling or surface stains



Water Separation

- Test to measure the ability of a rust preventive to separate water carryover from rinse operations
 - 75 mL of RP solution
 - 25 mL water
 - Invert six times in a 100 mL graduated cylinder
 - Record time to separate 25 mL of water
- Modifications are possible to better simulate specific real world conditions
- ASTM D-1401 can also be run upon request



Lubrizol Lubricity Additives



Metalworking

Industrial Additives



Lubricity Additives

- Additives that create a barrier between two surfaces
 - Tribology
 - The science and technology of interacting surfaces in relative motion, including the study of friction, lubrication, and wear
 - Deposited films contain chemically active or chemically inactive additives
 - Additive selection determined by carrier (diluent), application and desired performance
- Lubrizon has a knowledge base related to lubrication that spans 80+ years from our start in 1928



Additive Selection

- Chemically inactive
 - Friction modification achieved by creating a barrier that separates two surfaces
 - Lower surface tension provides complete coverage during application
- Chemically active
 - Additives react chemically with metal surface to form a protective film
 - Physical/chemical adsorption
 - Thermal decomposition
 - Film fills in surface asperities
 - Reduces friction
 - Prevents metal to metal contact
 - Prevents welding and surface wear



Lubricity Performance Tests

- MicroTap
- Falex:
 - Tap torque #8– ASTM D5619
 - Pin & V – ASTM D3233A
 - Pin & V – ASTM D3233B
 - Wear – ASTM D3704
- 4 Ball Wear – ASTM D4172
- 4 Ball EP – ASTM D2783
- Timken O.K. Load – ASTM D2782
- SLT/Draw Bead Simulator
- Twist Compression Tester



Additives Trends

- Industry trends drive new additive development
 - Give the customer (consumer) what they want
- Key drivers
 - Regulatory
 - VOC regulations
 - REACH & other new chemical inventory lists
 - Elimination of specific chemistries
 - Going “Green” (or at least renewable)
 - Cost & availability of petroleum feedstock's
 - Government preference programs
 - Desires and requests from workers’ unions and major manufacturers
 - Value of improved health, safety and environmental profile



Summary

- Broad range of available additives
 - Covered Rust Preventives & Lubricity Additives
 - Others: biocide & fungal control, corrosion inhibitors, emulsifiers, anti-mist, thickeners, additives for grease, dispersants
 - Additives can improve/modify a products form & function
- Additives suppliers assist in the product selection and proof of performance process
 - This service is in place to support your development efforts
- Lubrizol produces technologies that improve the quality and performance of our customers' products.



Thank You!

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