



ZSCHIMMER & SCHWARZ

Z&S LUBRICANT COMPONENTS

YOUR PREMIER SOURCE FOR
SYNTHETIC ESTERS &
METALWORKING ADDITIVES

EsterTec
synthetic esters

LUBRICIT
synthetic esters

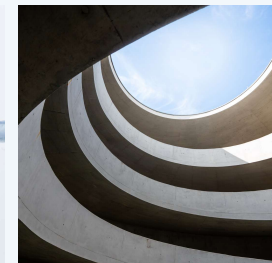
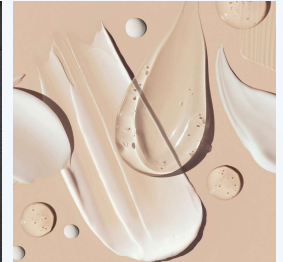
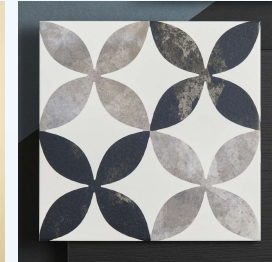
lexolube
synthetic esters

2026

MARKETS AND DIVISIONS



Z&S Business Divisions

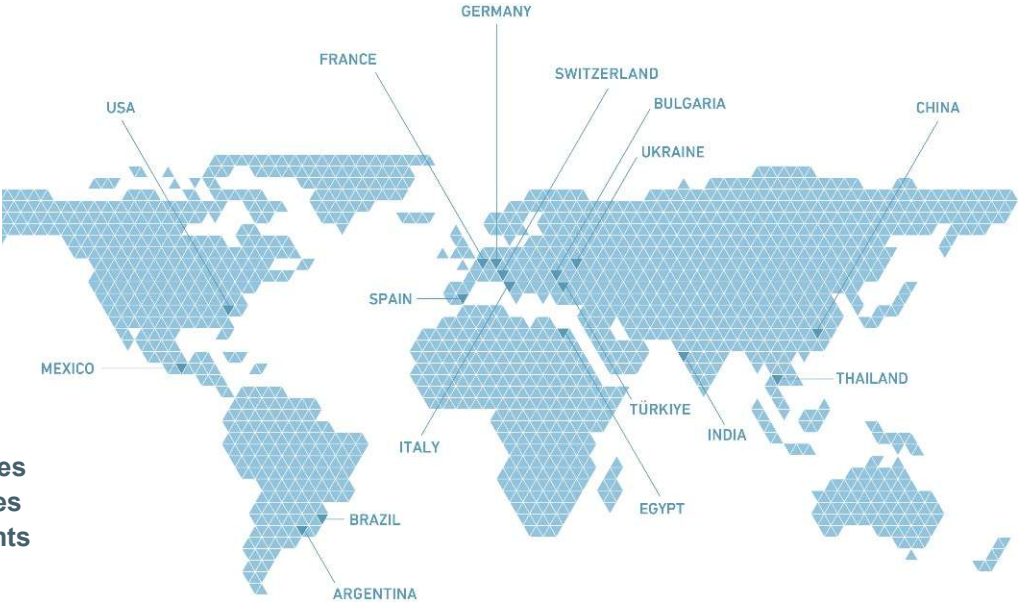
- ▶ Lubricants
- ▶ Leather Auxiliaries
- ▶ Fiber & Textile Auxiliaries
- ▶ Ceramic Auxiliaries
- ▶ Personal Care
- ▶ Cleaning Specialties
- ▶ Industrial Specialties










Zschimmer & Schwarz – Company Profile

Key figures 2025

	Turnover	€M 700
	Number of employees	1,500



-  Lubricants
-  Industrial Specialties
-  Fibre/Textile Auxiliaries
-  Personal Care
-  Ceramic Auxiliaries
-  Leather Auxiliaries
-  Cleaning Specialties

28 subsidiaries
in 17 countries
on 5 continents



1894

Foundation of the company in Chemnitz, Germany

1909



1959 - 2019

New company headquarters in Oberlahnstein, Rapid growth and globalisation



2019



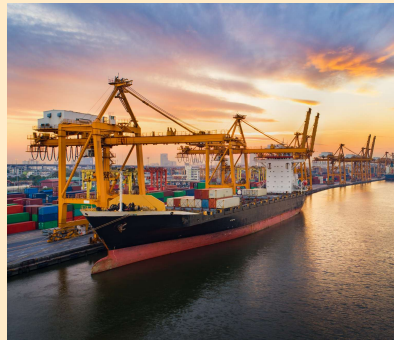
2020

Restructuring of business divisions

Z&S Lubricant Components

Offering the world's most extensive line of synthetic ester base stocks for industrial, marine, transport and dielectric applications

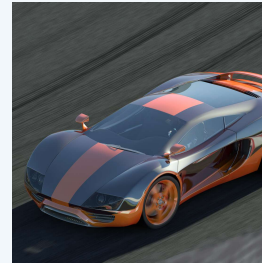
Explore our broad portfolio of high-performance lubricant base stocks and metalworking additives, or request a tailor-made product that meets your specific formulation needs



Applications for Z&S Synthetic Esters

- ▶ Metalworking fluids
- ▶ Engine oils
- ▶ Hydraulic fluids
- ▶ Transmission fluids
- ▶ Grease
- ▶ Gear oils
- ▶ Compressor fluids
- ▶ Drilling muds
- ▶ Transformer oils
- ▶ H1 lubricants for food processing
- ▶ Bearing lubricants
- ▶ Multifunctional dielectric/coolant/lubricants
- ▶ EALs for environmentally sensitive applications

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Synthetic Esters Provide Performance Features that Petroleum Cannot Deliver

- ▶ Fire resistance – less hazardous
- ▶ Low volatility – high flash point
- ▶ Enhanced lubricity
- ▶ Minimize deposit formation
- ▶ Extreme low temperature operation
- ▶ High VI for fluid energy efficiency
- ▶ Dielectric fluids with high water tolerance



- ▶ Factory Mutual certification



- ▶ EU EcoLabel



- ▶ USDA BioPreferred



- ▶ NSF HX-1 for Incidental food contact



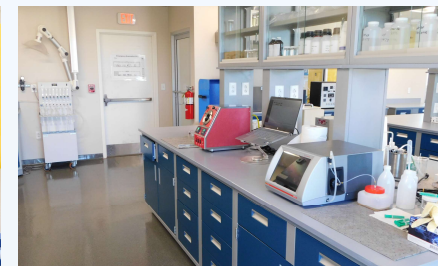
- ▶ IEC/UL dielectric fluid certification



Z&S AT Lab Testing Capabilities: Ready to Support your Formulation Development Program

- ▶ High and low temperature viscosity, pour point.
- ▶ Flash and fire point
- ▶ Foam tendency, Air release, Demulsibility
- ▶ Oxidative stability with DSC, RPVOT
- ▶ Deposit formation with Pan test and Panel Coker test
- ▶ Volatility by TGA (NOACK) and VOC methods
- ▶ Hydrolytic stability
- ▶ Copper corrosion
- ▶ Friction, Wear and Extreme Pressure measurements
- ▶ Material compatibility, seal swell testing
- ▶ Dielectric properties
- ▶ Thermal Conductivity

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Lubricants

MANUFACTURING SITES

ZS Lubricants division manufacturing

1. Milledgeville, GA, USA (2005)
 - Synthetic esters, Surfactants, EP/AW
2. Tricerro, Italy (2016)
 - Synthetic esters
3. Ivey, GA, USA (2019)
 - Synthetic esters, Surfactants
4. Future production in Lahnstein, Germany



Ivey manufacturing – QEC process

- ▶ Quality, Efficiency, Consistency
- ▶ Equipment designed for challenging, lubricant grade Synthetic Esters
- ▶ Accurate charging and temperature control for fast cycles
- ▶ Reduced losses in evaporation, filtration
- ▶ Less waste to process
- ▶ Significant efficiency improvement
- ▶ Automated process control leads to lower product variability



ZS Lubricants AT Lab Capabilities

- ▶ High and low temperature viscosity, pour point.
- ▶ Flash and fire point
- ▶ Foam tendency, Air release, Demulsibility
- ▶ Oxidative stability with DSC, TOST, RPVOT
- ▶ Deposit formation with Pan test and Panel Coker test
- ▶ Volatility with TGA (NOACK reporting capability)
- ▶ Hydrolytic stability
- ▶ Copper corrosion
- ▶ Friction, Wear and Extreme Pressure measurements
- ▶ Material compatibility, seal swell testing, paint/coatings/elastomers
- ▶ Hot/Cold stability and compatibility
- ▶ Dielectric properties



Z&S Italiana – Tricerro Technologies

- ▶ Sulfation
- ▶ Sulfonation
- ▶ Amidation
- ▶ Quaternarization
- ▶ Compounding & Blending
- ▶ **Esterification**
 - New production line built in 2016
 - Dedicated vessels for finishing/refining
 - On-line process control testing



Manufacturing synthetic esters to optimize performance

▶ QUALITY RAW MATERIALS

- Food safety standards
 - Select products are also Kosher/Halal
- Color, odor, viscosity, etc.

▶ ACCURATE REACTOR CHARGING

- Efficient use of raw materials
- Short cycle times
- Viscosity control
- Product consistency

▶ ESTERIFICATION KNOW-HOW

- Low acid value
- Low water content
- Tight specifications
- Filtration

▶ FORMULATED FLUIDS

- Blending
- Additive treatment
- Drumming and Private labelling



Lubricants

PRODUCT OVERVIEW

Product line overview

- ▶ Synthetic Esters (LEXOLUBE[®], LUBRICIT[®])
- ▶ VSP Synthetic Esters (ESTERTEC[®])
- ▶ PEG/PPG Esters (MULSIFAN[®])
- ▶ Phosphate Esters (PHOSPHEAL[™])
- ▶ Phosphonates (CUBLEN[®])
- ▶ Amides (PURTON[®])
- ▶ Emulsion Polymers for Metal forming (SYNTRAN[®])



Performance characteristics

▶ SYNTHETIC ESTER BASE OILS

- Boundary lubrication
- Thermal and oxidative stability
- Low volatility/high flash point
- Wide temperature performance
- Low sludge or deposit formation
- Energy efficient
- Biodegradable
- Environmentally and worker friendly

▶ ALKOXYLATE ESTERS (PEG/PPG)

- Non-ionic emulsifiers
- Hard water stable
- Boundary lubrication

▶ PHOSPHATE ESTERS & AMIDES

- Emulsifier/Co-emulsifiers
- Corrosion inhibitors
- Non-staining



Synthetic ester summary

- ▶ Z&S esters are tailor-made to meet the requirements of the formulator
- ▶ Multi-functional performance
 - Lubricity
 - Extreme temperature performance
 - Extended drain intervals
 - Clean operation
 - Low volatility
 - High VI for fluid energy efficiency
- ▶ Used in automotive and industrial lubricant formulations that outperform mineral oil products
- ▶ Excellent environmental safety and toxicological profile. EcoLabel, LuSC, VGP, BioPreferred grades available
- ▶ Incidental food contact (NSF HX-1) grades available
- ▶ Dielectric fluid quality available



Lubricants

ESTER
CHEMISTRY
DESIGN OPTIONS

Lubricant Synthetic Ester types

- ▶ Mono Esters
- ▶ Diesters
- ▶ Polyol Esters
- ▶ Complex Esters
- ▶ Aromatic Esters
- ▶ Food Grade (NSF H1) Formulated Fluids
- ▶ Food Grade (NSF HX-1) Base Stocks and Additives



Monoesters

- ▶ Typically made from natural fatty acids and mono-alcohols
- ▶ 60-90% renewable
- ▶ Low viscosity
- ▶ Excellent lubricity
- ▶ Low odor and color
- ▶ Environmentally and worker friendly
- ▶ Can be designed for excellent hydrolytic stability
- ▶ Biodegradable



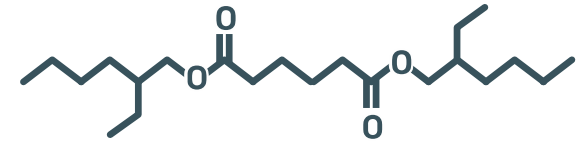
▶ FIELDS OF APPLICATION

- Metalworking
- Textile lubricants
- Aerosol products
- Adjuvants
- Oil field drilling mud
- Biobased lubricants
- HX1 grades available



Diesters

- ▶ Typically made from dibasic acid and mono-alcohol
- ▶ Not usually bio-based
- ▶ Low to medium viscosity
- ▶ Excellent lubricity
- ▶ Very low pour point
- ▶ Excellent oxidative stability
- ▶ Low odor and color
- ▶ Biodegradable



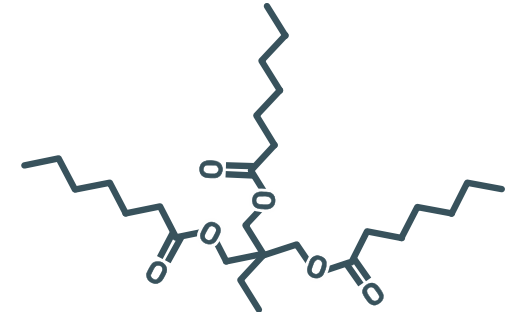
▶ FIELDS OF APPLICATION

- Engine oils
- Compressor oils
- Hydraulic fluids
- Gear oils
- Grease
- Bearings
- Seal swell additives



Polyol esters

- ▶ Made from neo-polyol and mono-acid
- ▶ Can be bio-based
- ▶ Low to high viscosity
- ▶ Low volatility / High flash point
- ▶ Low pour point
- ▶ Long drain intervals
- ▶ Outstanding oxidative stability
- ▶ Can be biodegradable



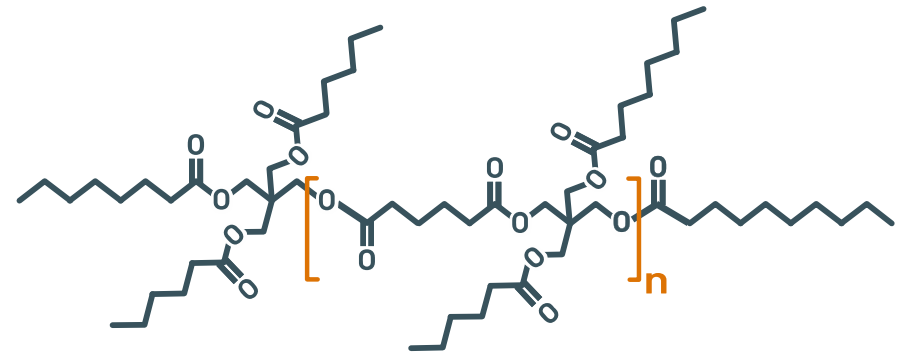
▶ FIELDS OF APPLICATION

- Compressor oils
- Fire resistant hydraulic fluids
- Oven chain oils
- Bearing lubricants
- Gear oils
- Engine oils
- Grease
- HX-1 products available



Complex esters

- ▶ Capped polymeric ester
- ▶ Can be bio-based
- ▶ Very high viscosity possible
- ▶ Low volatility/High flash point
- ▶ High viscosity index
- ▶ Antiwear/Extreme pressure
- ▶ Can be biodegradable



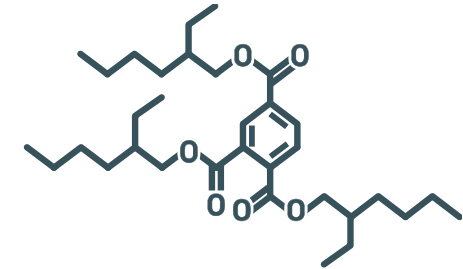
▶ FIELDS OF APPLICATION

- Compressor oils
- Gear oils
- Grease
- Thickening
- Metal protection
- HX-1 products available



Aromatic esters

- ▶ Made from aromatic anhydrides and mono-alcohols
- ▶ Not bio-based
- ▶ High viscosity
- ▶ Low viscosity index
- ▶ Low volatility / High flash point
- ▶ Reduced varnish
- ▶ Stable against oxidation & hydrolysis
- ▶ Long fluid life



▶ FIELDS OF APPLICATION

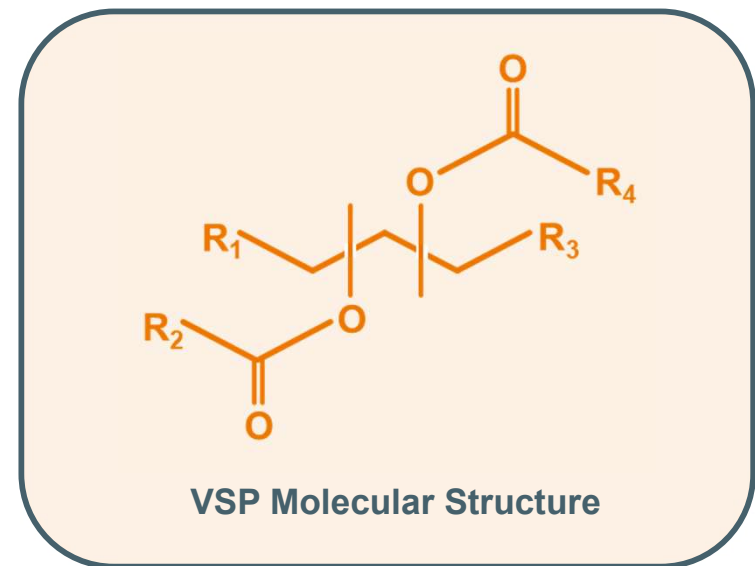
- Compressor oils
- Gear oils
- Grease
- Oven chain lubricants
- Plasticizers

A New Ester Technology is Now Available

EsterTec® “VSP” Synthetic Esters with Improved Performance

- ▶ Novel structure, unique production process
- ▶ Standard raw materials that are globally and readily available commodities
- ▶ High stability vicinal ester molecular positioning
- ▶ Steric hindrance improves oxidative stability
- ▶ Secondary alcohols on adjacent carbons improve hydrolytic stability

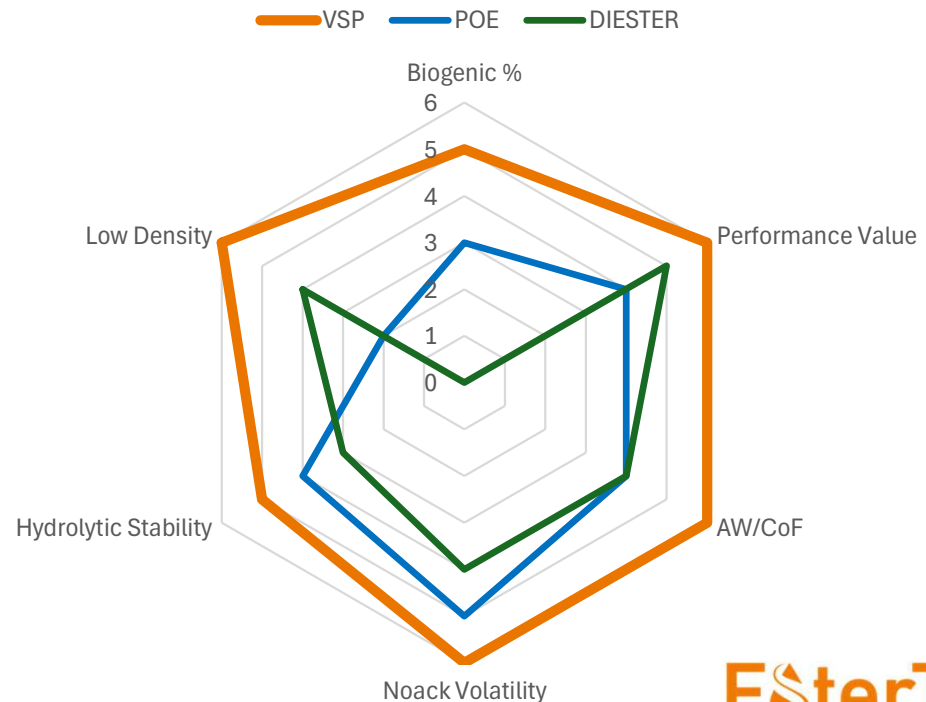
EsterTec
synthetic esters



All the Performance Advantages expected from a standard Diester or Polyol Ester, Plus....

Equal or Better Performance Features:

- Pour Point
- Flash Point
- Foam Tendency
- Demulsibility
- Copper Corrosion
- Oxidative Stability
- Thermal Stability
- Specific Heat
- Thermal Conductivity
- Sludge/Varnish/Deposit Control
- Color & Odor
- Clarity
- Miscibility with PAO
- Compatibility with Elastomers



EsterTec
synthetic esters

Lubricants

BENEFITS OF SYNTHETIC ESTERS

Synthetic Ester Design Considerations

- ▶ Determine critical application performance requirements
 - Low cost – Oleates, natural fatty acids, commodity raw materials
 - High viscosity – Dipentaerythritol, complex esters
 - High viscosity index – Linear structures, long chain fatty acids
 - Thermal stability – Polyols, branched acids, fully saturated components
 - Biodegradability – Natural fatty acids, less branching
 - Food contact – Ingredients with detailed information on toxicity, NSF listed
 - Dielectric strength – High purity, low water and acidity
- ▶ Build the ester from components that will deliver the desired properties



Esters as base oil blend components reduce deposits and sludge

▶ BLENDS OF PAO AND POE

- All fluids were ISO 68
- Tested 20 hours at 260°C

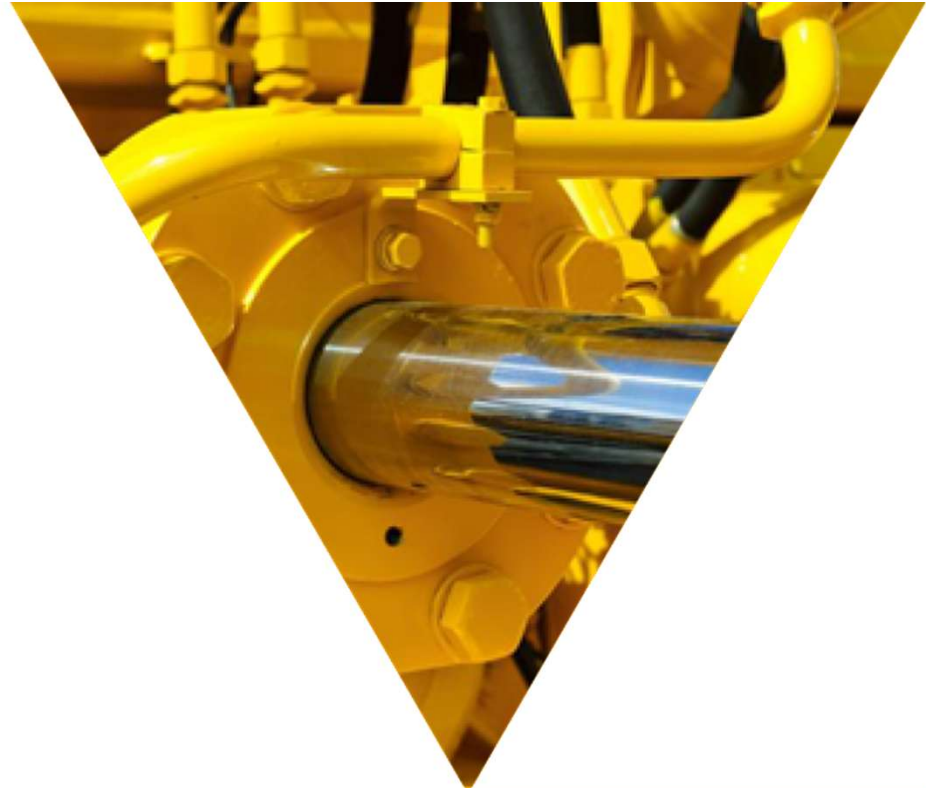
▶ RESULTS

- 6-7% evaporation for all samples
- 5% POE significantly reduces deposits



Hydraulic fluids

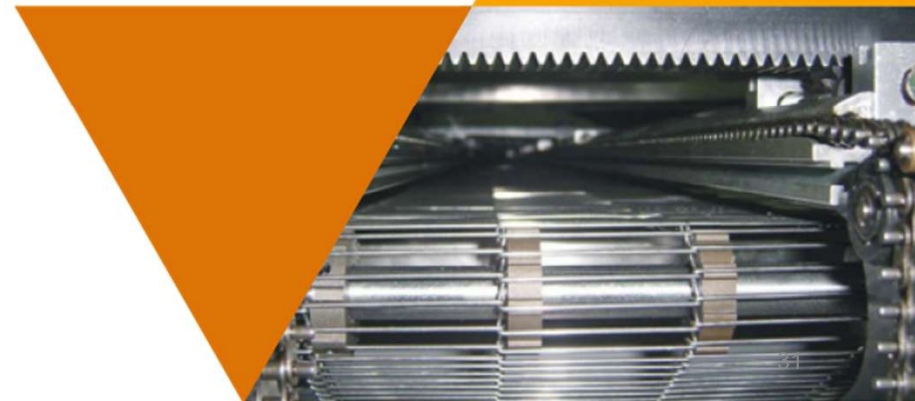
- ▶ Synthetic Esters provide excellent thermal and oxidative stability
- ▶ Low sludge formation
- ▶ Fire resistance (“Less Hazardous“ HFDU fluids)
- ▶ Low volatility
- ▶ Very low compressibility
- ▶ High VI provides improved energy efficiency
- ▶ Typical viscosity grades – ISO 32, 46, 68
- ▶ Good lubricity



Oven chain oils

- ▶ Synthetic Esters provide excellent thermal and oxidative stability
- ▶ Typical formulation (ISO 68-460)
 - 97% synthetic ester, 3% additives
- ▶ Polyol esters – up to 275°C
 - Best oxidative stability, very clean, low varnish
- ▶ Aromatic esters – up to 250°C
 - Higher evaporation, softer deposits

- ▶ Complex esters – up to 225°C
 - Better lubricity and antiwear, low evaporation



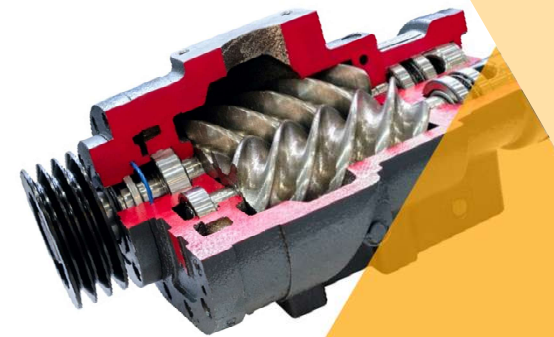
Grease

- ▶ Synthetic Esters allow wide temperature range performance
- ▶ Typically requires non-soap thickener (urea, silica, etc.)
- ▶ Polyol esters: up to 240°C
 - Best oxidative stability, very clean, low varnish
- ▶ Arctic grease: down to -60°C
 - Low viscosity diester or polyol ester
- ▶ Bio-based esters: -20 to +175°C
 - Excellent lubricity
 - Recommended for environmentally sensitive areas



Air Compressor Oils

- ▶ Synthetic Esters offer deposit control and long fluid life
- ▶ Excellent thermal/oxidative stability
- ▶ POE used in combination with PAO or Group III MO
- ▶ Reciprocating and rotary vane compressors
 - Diesters and Aromatic esters for lubricity and solvency
- ▶ Rotary screw and centrifugal compressors
 - Polyol esters for oxidation stability
- ▶ NSF HX-1 Polyol esters
 - For compressors in food processing plants



Refrigeration Compressor Oils

- ▶ Optimal solubility/compatibility with HFC and HC refrigerants
- ▶ Reciprocating, rotary vane and centrifugal compressors
 - High purity polyol esters for long life
- ▶ Excellent thermal and hydrolytic stability
- ▶ High thermal conductivity
- ▶ Excellent electrical resistivity
- ▶ Provides wear protection and noise reduction



Synthetic transformer oils and Dielectric fluids

- ▶ High flash and fire point
- ▶ Good thermal stability for long life
- ▶ Low viscosity with low volatility
- ▶ Good dielectric properties
- ▶ Compliant with IEC 61099
- ▶ Environmentally friendly
- ▶ Bio-based esters offer improvement over vegetable oils and mineral oils



Automotive applications

- ▶ Synthetic Esters have a long history of high performance in racing oils and premium synthetics
- ▶ Full synthetic oils typically utilize a combination of PAO and POE
- ▶ Diesters improve additive solubility
- ▶ Low viscosity trend (0W-20 and lower)
- ▶ Low NOACK volatility
- ▶ Clean, reduces sludge formation
- ▶ Long drain intervals



Environmentally acceptable lubricants (EAL)

- ▶ Synthetic Esters are environmentally friendly
 - Marine
 - Mining
 - Forestry
 - Agriculture
 - Transformers
 - Wind turbines
- ▶ Performance is as good or better than petroleum oils

- ▶ Most esters meet USA EPA Marine (VGP) Vessel General Permit standards



- ▶ Many esters are renewable, sustainable, and have USDA BioPreferred status

BioPreferred



- ▶ Wide variety of synthetic esters on LuSC list achieve EU Ecolabel status



Lubricants

PRODUCTS FOR METALWORKING FLUIDS

Esters in metalworking fluids

▶ SIMPLE ESTERS

- Excellent lubricity
- Non-toxic, Non-hazardous handling
- Low color and odor
- Biodegradable

▶ COMPLEX ESTERS

- Boundary lubrication
- Improves AW/EP

▶ ALKOXYLATE ESTERS (PEG/PPG)

- Non-ionic emulsifiers
- Hard water stable
- Boundary lubrication

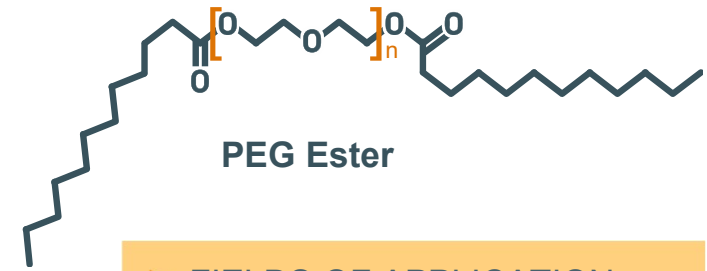
▶ PHOSPHATE ESTERS

- Emulsifier/Co-emulsifier
- Corrosion inhibitor
- Non-staining



MULSIFAN series

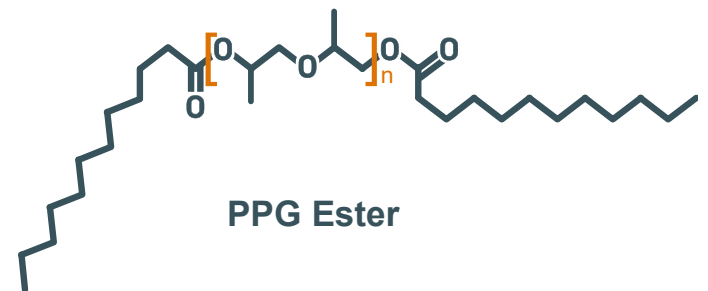
- ▶ Esters of natural fatty acids and polyglycols
- ▶ Emulsifiers with HLB 6 to 14
 - Higher PEG increases HLB
 - Longer fatty acid decreases HLB
 - Diesters have lower HLB
- ▶ Couplers, dispersants, defoamers
- ▶ Good lubricity
- ▶ Non-toxic, Non-hazardous handling
- ▶ Low foam, hard water stable



PEG Ester

▶ FIELDS OF APPLICATION

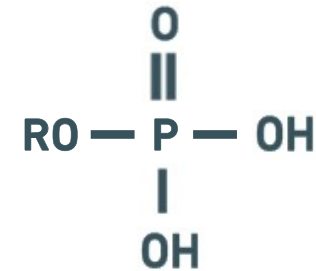
- Metalworking
- Textile lubricants
- Cosmetics
- Oil field
- Water treatment
- Agricultural products



PPG Ester

Phosphate esters (PHOSPHEAL)

- ▶ Monophosphoric acid esters of alcohols and alcohol ethoxylates
- ▶ Available as acid form or neutralized
- ▶ Corrosion inhibitors
- ▶ EP Enhancement
- ▶ Co-Emulsifiers
- ▶ Dispersing agents



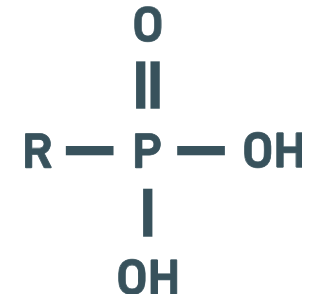
▶ FIELDS OF APPLICATION

- Metalworking
- Lubricants
- Textile finishing
- Oil field
- Water treatment
- Cleaning products



Phosphonates (CUBLEN)

- ▶ Organic carbon directly bonded to phosphorus
- ▶ Wide range of phosphonates available
- ▶ High stability in aqueous systems
- ▶ Outstanding metal chelation
- ▶ Effective at low concentrations
- ▶ Dispersion stabilizers
- ▶ Scale inhibitor



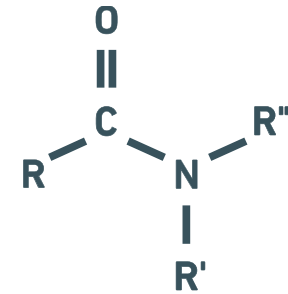
▶ FIELDS OF APPLICATION

- Metalworking
- Lubricants
- Textile finishing
- Oil field
- Water treatment
- Cleaning products



Amides (PURTON)

- ▶ Made from fatty acid + secondary amine
- ▶ Non-ionic emulsifier
- ▶ Corrosion inhibitor
- ▶ Antistatic additive
- ▶ High stability in aqueous systems
- ▶ Effective at low concentrations
- ▶ Dispersion stabilizers



- ▶ FIELDS OF APPLICATION
 - Metalworking
 - Oil field
 - Lubricants
 - Personal Care
 - Cleaning and Degreasing
 - Metal treatment
 - Paints and Coatings



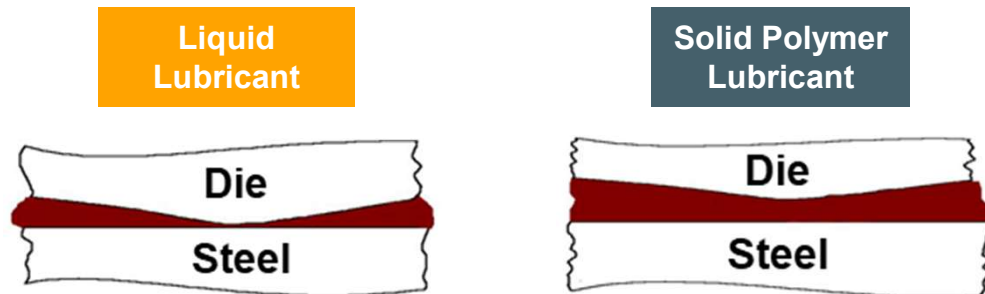
SYNTRAN® Metal forming Lubricants

A water-based emulsion polymer coating is applied over sheet metal, forming a solid film on the surface.

The polymer coating provides controlled and consistent lubrication when forming or stamping.

Product benefits include:

- Part Surface Finish Quality
- Production Cost Savings
- Improved Manufacturing Environment
- Worker Safety



SYNTRAN Metal forming Lubricants

The increased lubrication from polymer film technology will reduce costs by:

- ▶ Reducing defects due to galling, flaking, and forming failures.



- ▶ Extend the life of the molds and dies used for forming or stamping.



Lubricants

PRODUCTS FOR ELECTRIC VEHICLES

Synthetic Esters for Multipurpose EV Lubricant/Coolants

Ref #	Product Name	KV, cSt @20°C	KV, cSt @40°C	KV, cSt @100°C	Pour Point, °C	Flash Point, °C	DBV, kV IEC 60156 2.5mm
ULV-1	LUBRICIT EXP 23016A	2.6	1.8	0.8	<-80	115	>75
ULV-2	LUBRICIT EXP 23016B	3.8	2.6	1.1	<-80	140	>75
ULV-3	LUBRICIT EXP 23016D	4.0	2.7	1.0	-77	135	>75
ULV-4	LUBRICIT EXP 23016C	4.5	2.9	1.2	-80	150	>75
ULV-5	LUBRICIT 2-EH iC9	5.8	3.6	1.4	-75	150	>75
LV-8	LUBRICIT iC9-9	7.7	4.7	1.7	-75	145	>75
LV-11	LUBRICIT EXP 23018B	8.7	5.2	1.8	-20	190	>75
LV-12	LUBRICIT 2-EHL	8.7	5.2	1.8	-25	185	>75
LV-15	LEXOLUBE 2I-214	10.0	5.7	1.9	-70	190	>75
LV-17	LUBRICIT DOA	14.6	7.6	2.3	-50	215	>75
LV-18	LUBRICIT EXP 23018E	15	7.7	2.1	-50	195	>75
LV-19	LUBRICIT EXP 23018F	15	7.8	2.3	-80	200	>75
LV-22	LUBRICIT NG 710	15	8.3	2.5	-50	210	>75



Please inquire about tailor-made products that can be made to fit your exact performance requirements!



Thank you.

zslubes.com

zschimmer-schwarz.com



ZSCHIMMER & SCHWARZ

