
LUBRICATION & RELIABILITY
VIRTUAL SUMMIT
2020
Synthetic Ester Based Lubricants
Long Life, Performance & Reliability

Synthetic Ester Based Lubricants
Long Life, Performance and Reliability

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Zschimmer & Schwarz, INC

ZSCHIMMER & SCHWARZ

lexolube synthetic esters

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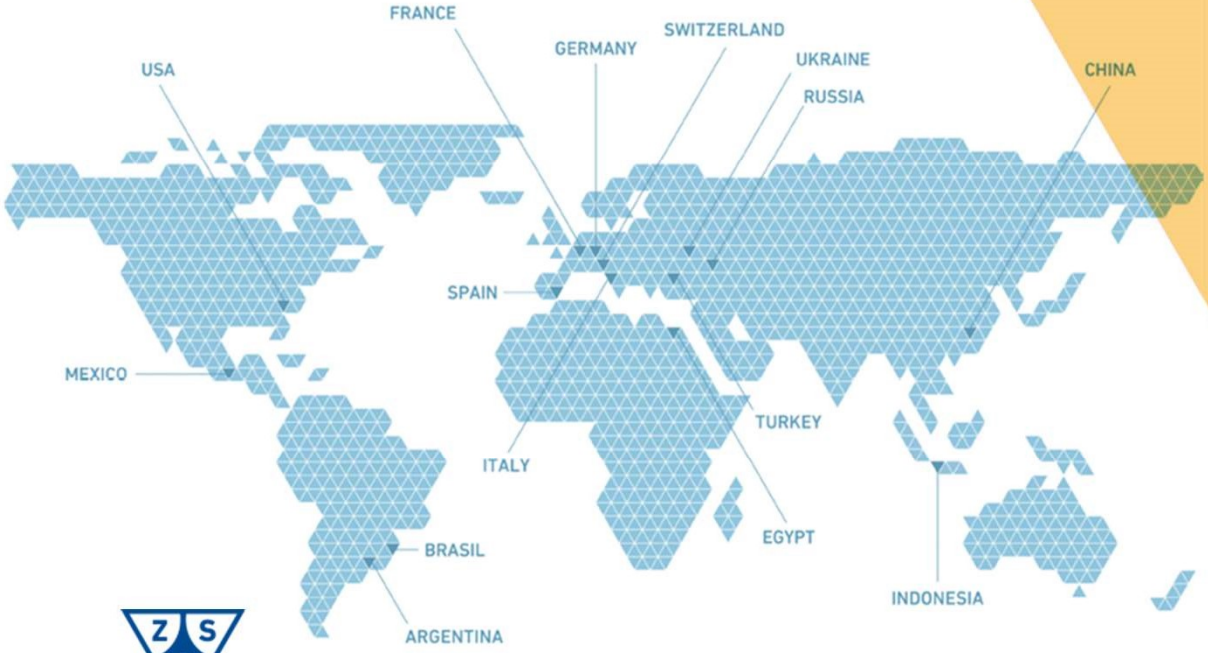
Zschimmer & Schwarz today

- HQ in Lahnstein, Germany
- Global manufacturer of tailor made chemical solutions
- 9 product divisions
- 16 countries, 30 subsidiaries
- more than 1,400 employees
- € 600 million (~$700M) group revenue in 2018



OUTLINE

Introduction to Synthetic Lubricants

Where do Synthetic Esters fit?

Types of Synthetic Esters

Hydraulics- Fire Safety

Compressors- Reliability/Long Life

Chains- High Temperature

Environmental Benefits

Food Processing Applications

What are Synthetics?

Synthetic is a marketing term that signifies higher performance and generally denotes the base oil is made by chemical synthesis

The American Petroleum Institute (API) defines 4 categories of hydrocarbons used in lubricants

API Group I- Not Synthetic

Solvent refined mineral oil, low VI, high sulfur

API Group II- Not Synthetic

Hydrotreated mineral oil, low VI, low sulfur

API Group III- May be Synthetic

Hydrocracked mineral oil, high VI, low sulfur

API Group IV- Synthetic

PAO- polymerized olefins.

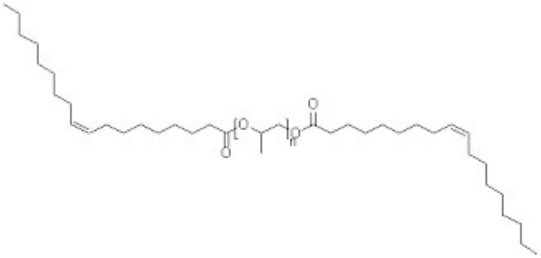
API Group V

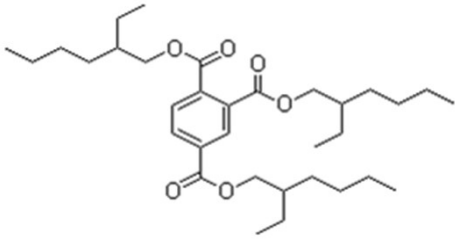
For Everything Else

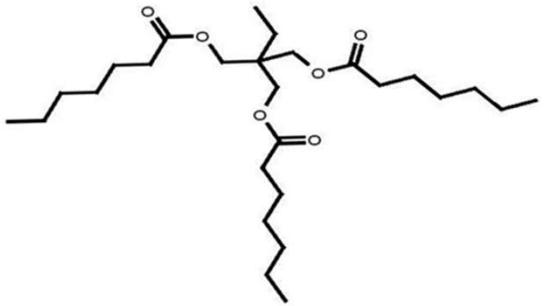
All other lubricant basestocks are in Group V.

Synthetic Esters (POE, diesters)
Vegetable Oils
Polyalkylene Glycols (PAG)
Phosphate Esters
Silicones
Polyisobutylene (PIB)
Fluorinated Compounds (PFPE)
Alkylated Naphthalenes (AN)

Esters are Different





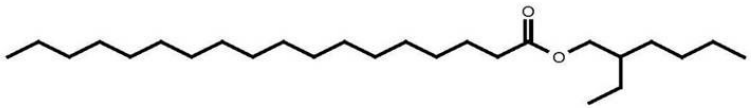


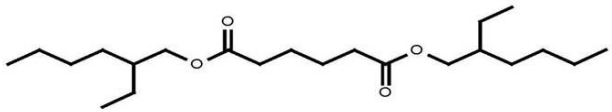
The ester bond can link virtually any organic acid and alcohol

Many starting materials available → many possible esters

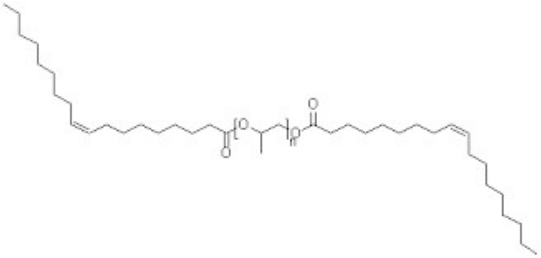
Choose the feedstocks based on the demands of the application

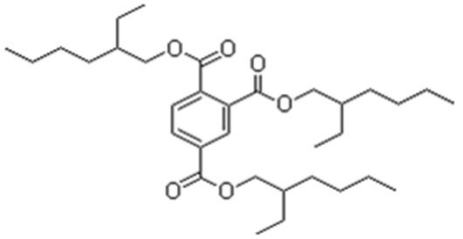
Esters are designed to be fit for purpose





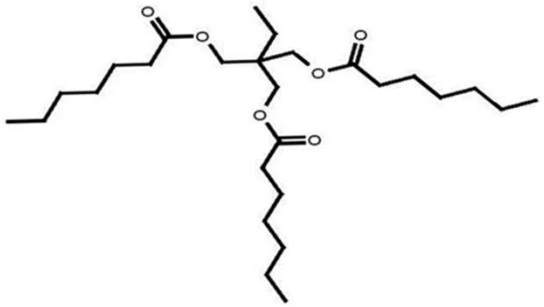
Diesters





Diesters = two ester groups with different chain lengths and branching

No biobased content

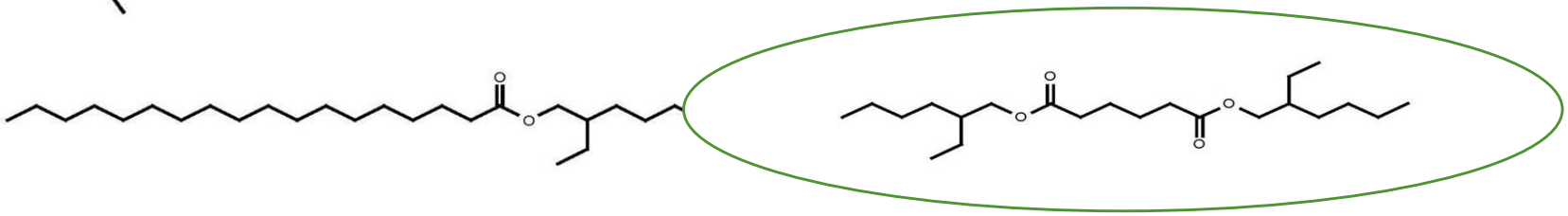


Low viscosity (2-5 cSt at 100°C, ISO VG 10-22)

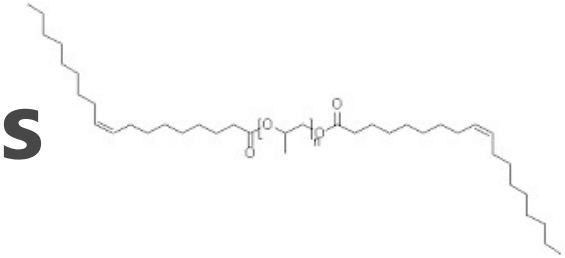
Engine oils, compressors, industrial

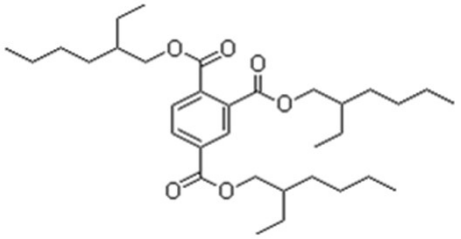
Low volatility, oxidative stability, excellent cold flow

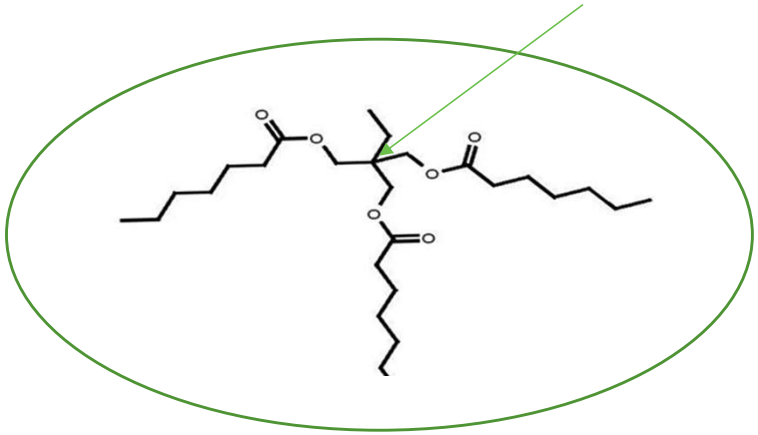
Wide temperature range



Polyol Esters







Polyol Esters (POE)- stabilized at weakest carbon

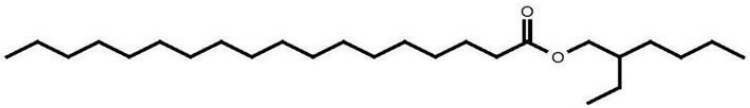
Many are biobased, biodegradable

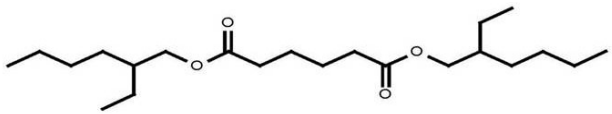
Higher viscosity (2-25 cSt at 100°C/ ISO VG 15-320)

Engine oils, compressors, chain, hydraulic, food processing

Low volatility, oxidative stability

High flash point





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Performance in Diverse Applications

Synthetic Esters are designed to perform under the specific conditions the application demands

Work with an expert to make sure you have the right ester-based lubricant for the job

Hydraulic Fluids

Fire resistance and more

Compressor Oils

Long life under extreme conditions

Chain Lubricants

Clean and efficient at high temperature

Hydraulics

Performance under pressure

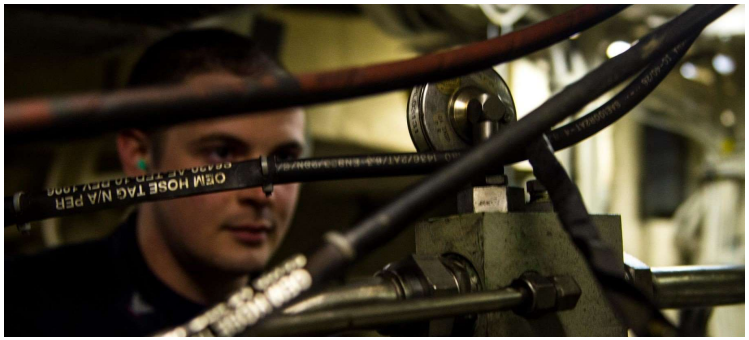
Low sludge- clean, long life
High viscosity index- energy efficient
Environmentally friendly

Fire Resistant- FM Approved/HFDU
→Polyol ester oleates
Marine (VGP), mining, forestry, farming
→ Biobased, biodegradable esters
Food processing plants
→ NSF H1 Polyol ester-based fluids

Hydraulic Fluids

FM APPROVED

High performance,
Factory Mutual fire resistant,
Environmentally friendly,
H1 (Food grade)



Ester based HF ISO 46	ASTM	Typical
Flash point	D-92	320°C
Fire point	D-92	360°C
Pour point	D-97	-30°C
Viscosity index	D-2270	200
FZG gear test	D-5182	Stage 12
Vane Pump Test	D-2882	<5 mg wear
Copper Corrosion	D-130	1a
Rust prevention A/B	D-665	Pass
Biodegradability (OECD)	301B	Readily

Photo courtesy US Navy, Data courtesy Zschimmer & Schwarz

Compressors

Reliability and long life

Low volatility- less lubricant carryover
Low varnish- no sticking valves
Compatibility with HFC refrigerants

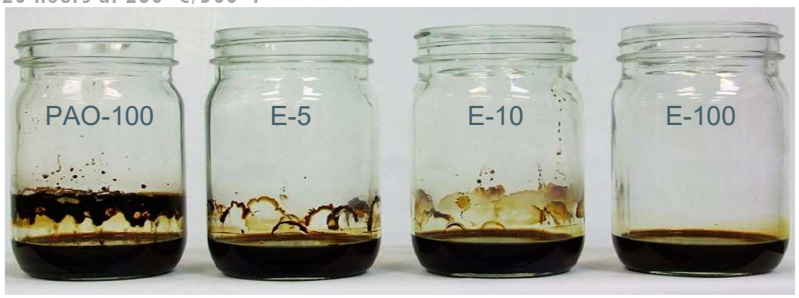
Reciprocating and rotary vane compressors
→Diesters for lubricity and solvency
Rotary screw and centrifugal compressors
→Polyol esters for oxidation stability
Food processing applications
→NSF H1 polyol ester-based fluids

Compressor Lubricants

2X

Polyol Esters can give double the life of other synthetics in compressor applications

20 hours at 260°C/500°F



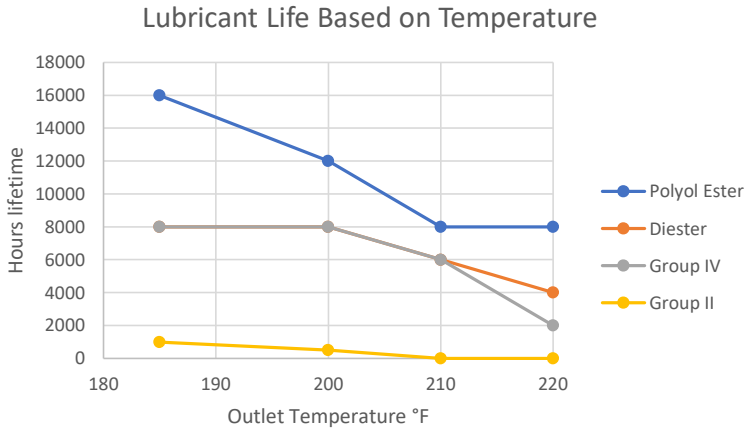


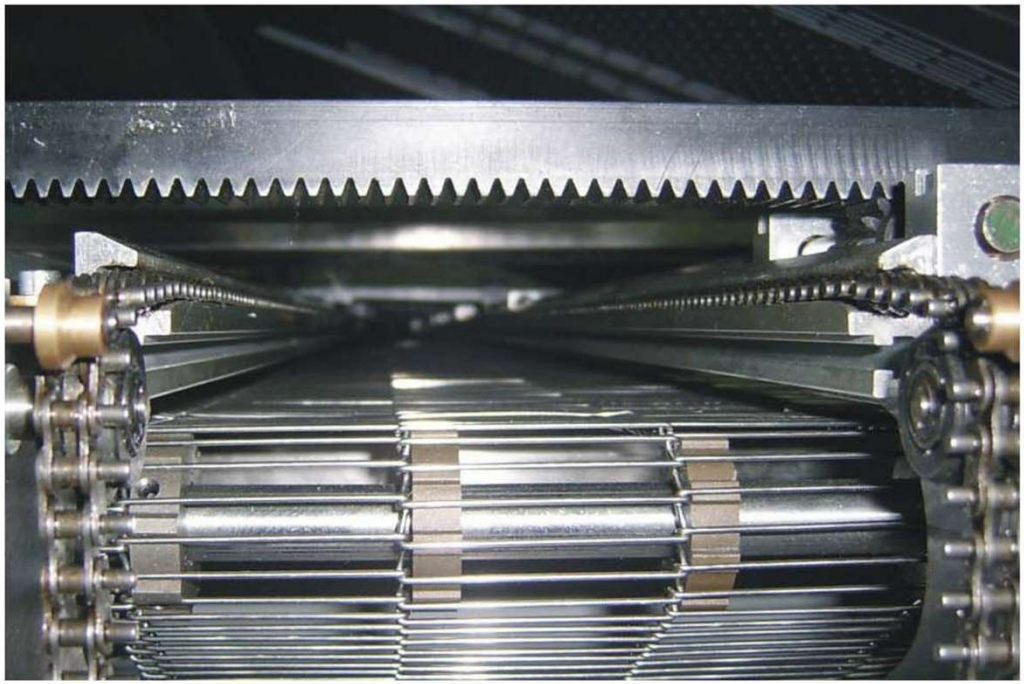
Photo courtesy Zschimmer & Schwarz, Graph courtesy Ray Thibault

Oven Chain

Clean lubrication above 250°C

Low volatility- long relubrication intervals
Low varnish- links move freely
Surface lubrication- thin film wear prevention

Industrial oven chains
→POE/aromatic esters optimum clean
Bakery tunnel ovens
→H1 POE for clean and safe lubrication
Food conveyors
→Biobased H1 POE- synthetic vegetable oil

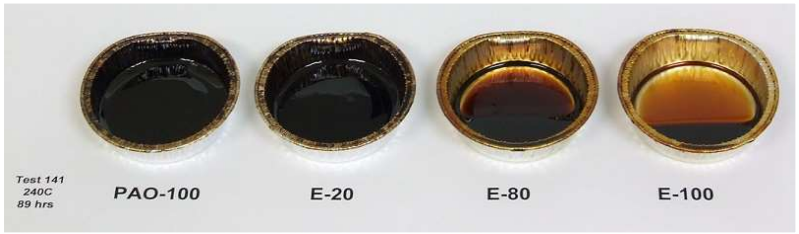


Oven Chain Lubricants

200°C+

Esters are the best option for high temperature chains

89 hours at 240°C/464°F



TGA Isothermal 6 hours at 250°C

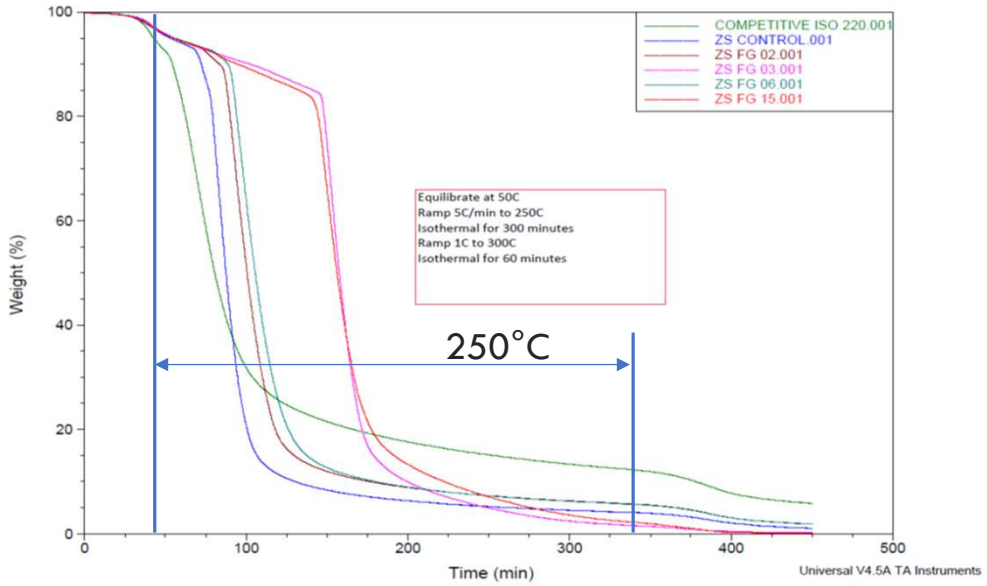


Photo and graph courtesy Zschimmer & Schwarz

Eco-friendly Esters

A sampling of how Synthetic Ester based lubricants benefit the environment and reduce risk

European Ecolabel

Biodegradable, sustainable and non-toxic Synthetic Esters qualify for EU Ecolabel lubricants

USDA Biopreferred program

Lubricants made from bio-based Synthetic Esters qualify for preferential government procurement contracts

VGP- marine lubricants

The US Vessel General Permit (VGP) requires ships to use eco-friendly lubricants wherever possible in marine applications

Worker friendly

Esters are widely used in skin care products. There are no adverse health effects from occupational exposure of Synthetic Esters.

CODEX ALIMENTARIUS
International Food Standards
World Health Organization
Food and Agriculture Organization of the United Nations

NSF H1 Esters

High performance- Food safety

NSF H1 follows 21CFR 178.3570 guidelines for incidental food contact lubricants

Kosher and Halal certifications confirm products comply with religious standards

Synthetic Ester based lubricants meet performance and food safety requirements

Almost time for lunch

FDA U.S. FOOD & DRUG ADMINISTRATION

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Thank You

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