

ZSCHIMMER & SCHWARZ

ADVANTAGES OF SYNTHETIC ESTERS WHEN FORMULATING ENERGY EFFICIENT LUBRICANTS

Dr. Nne Meyer

Europe Sales Manager

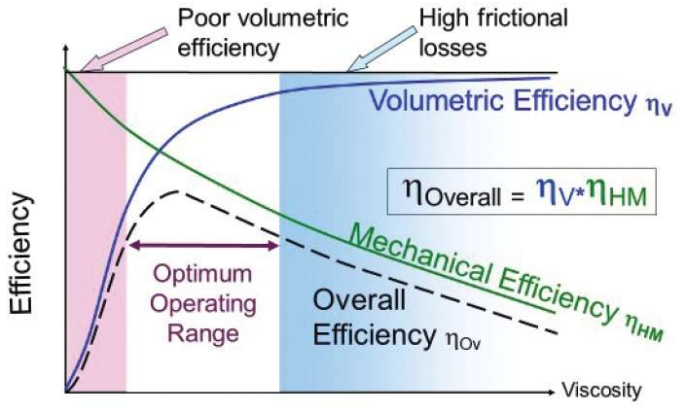
ACI EUROPEAN BASE OILS & LUBRICANTS SUMMIT

November 26, 2026

EsterTec
synthetic esters

Synthetic Ester Selection Criteria

High Viscosity Index Synthetic Base Oils Enable Formulators to Design Energy Efficient Lubricants



References: Evonik, Shell, ExxonMobil, Schrode, Hydrotex, Sany, Komatsu





Synthetic Ester Selection Criteria

1. **High Viscosity Index Synthetic Base Oils Enable Formulators to Design Energy Efficient Lubricants**

Additional Considerations Based on Application

2. Ester Base Oils with Superior Lubricity and Low Density are Optimum for Industrial Lubricants
3. Water based Metalworking Fluids demand Excellent Hydrolytic Stability
4. Ester Components for Energy Conserving Engine Oils must have low volatility

Lubricants with High Viscosity Index (VI) deliver Energy Efficiency Advantages

- Synthetic oils with high VI (>150) offer significant energy efficiency advantages over monograde mineral oils with standard VI (<100) in industrial oil formulations
- Maintaining higher viscosity under operating loads and speeds results in increased pump and gear efficiency
- Higher efficiency fluids maintain lower oil operating temperatures that can extend fluid service life and equipment durability

*Evonik Website: www.dynavis.com/en/applications/construction-machinery/Calculate-your-savings

Lubricants with High Viscosity Index deliver Energy Efficiency Advantages



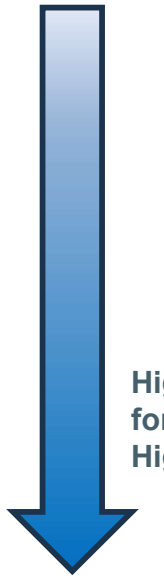
FIELD TRIAL STUDIES* DEMONSTRATE AN AVERAGE OF 8% ENERGY EFFICIENCY IMPROVEMENT IN A MEDIUM SIZED EXCAVATOR

- At today's price for diesel fuel, this could **save €7,000** in total operating costs over the course of a typical 2500 hour oil change interval
- Fuel savings directly correlate to a **reduction of 11 MT of CO_2 emissions**
- Operators with 10 pieces of equipment could **save €70,000 per year** when using a high VI synthetic oil compared to a standard VI oil
  - Cost savings are calculated with a synthetic ester price of 6€/l compared to mineral oil at 2€/l

*Evonik Website: www.dynavis.com/en/applications/construction-machinery/Calculate-your-savings

Synthetic Ester Base Oil Options

Synthetic Base Oil	Typical Viscosity Index Range
Group II+	110 - 120
Group III	120 - 135
GTL	130 - 140
Conventional PAO	120 - 150
Dibasic acid esters	130 - 150
Polyol esters	100 - 180
Vicinal Secondary Polyol Synthetic Ester	140 - 180



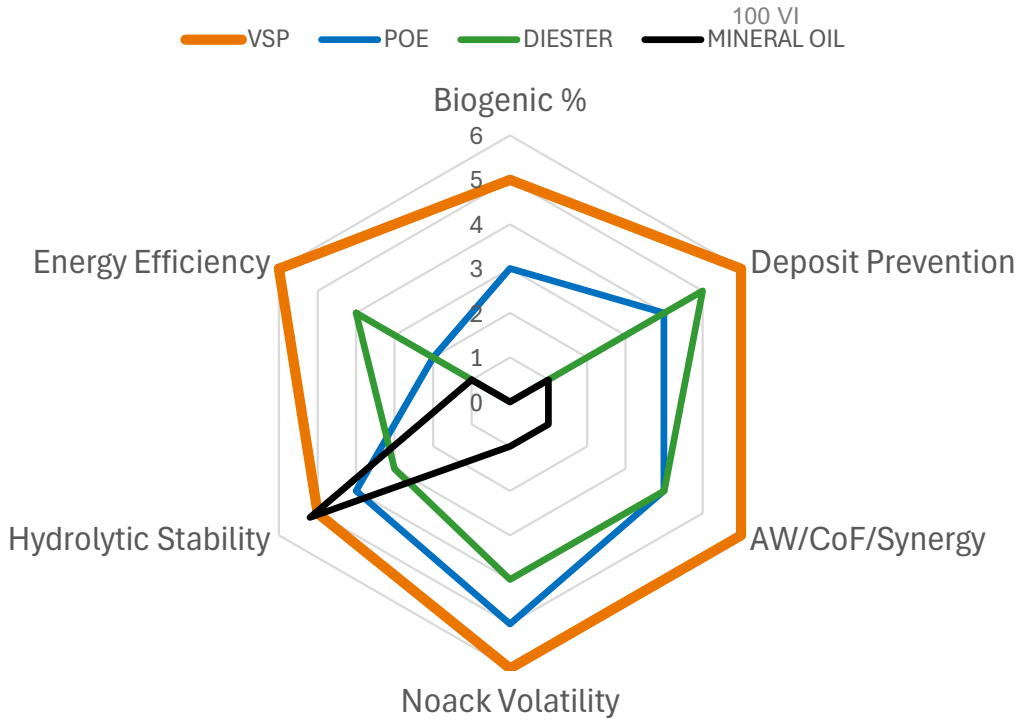
Higher VI
for
Higher Efficiency

Synthetic Ester Base Oil Options

Synthetic Base Oil	Typical Viscosity Index Range
Dibasic acid esters	130 - 150
Polyol esters	100 - 180
Vicinal Secondary Polyol Synthetic Ester	140 - 180

- Exceptional energy efficiency - Naturally high VI - Additives further enhance performance
- Standard products offer environmentally friendly “EAL” benefits – Biodegradability
- Select products deliver superior lubricity, oxidative/hydrolytic stability, low volatility

VSP Synthetic Esters Deliver All the Performance Advantages Expected from a Standard Diester or Polyol Ester, Plus…



Standard POE Features

- LOW POUR POINT
- HIGH FLASH POINT
- LOW FOAM TENDENCY
- GOOD DEMULSIBILITY
- NOT CORROSIVE TO COPPER
- GOOD OXIDATIVE STABILITY
- STRONG DIELECTRIC PROPERTIES
- GOOD THERMAL CONDUCTIVITY
- CLEAR WITH LOW ODOR & COLOR

Novel VSP Synthetic Ester Molecular Design. Exceptional Performance in a Wide Viscosity Range

Product Name	VSP 3.6	VSP 4.1	VSP 5	VSP 7	VSP 9	VSP 11	VSP 14	VSP 18
KV100, cSt	3.6	4.1	5	7	9	11	14	18
KV40, cSt	16	18	25	32	46	68	100	150
Viscosity Index	115	125	140	180	165	155	140	130
Pour Point, °C	-60	-40	-25	-50	-40	-40	-35	-35
Density	0.895	0.893	0.890	0.890	0. 900	0.915	0.925	0.935
NOACK volatility, %	9	7	3	1	1	1	1	1
Biogenic Content, %	64	65	70	74	60	50	40	30
Oxidative Stability	☑	☑	☑	☑	☑	☑	☑	☑
Hydrolytic Stability	☑	☑	☑	☑	☑	☑	☑	☑
Friction/Wear Reduction	☑	☑	☑	☑	☑	☑	☑	☑
Deposit Tendency	☑	☑	☑	☑	☑	☑	☑	☑
Energy Efficiency Advantage	☑	☑	☑	☑	☑	☑	☑	☑
Cost/Performance Advantage	☑	☑	☑	☑	☑	☑	☑	☑

☑ = Equal or Better than standard synthetic esters

Selecting a Synthetic Ester Base Oil for an Industrial Lubricant with Enhanced Energy Efficiency

- Superior Lubricity Reduces Friction and Wear
- Low Density Reduces Pumping Energy Loss and Equipment Weight

(Power or Pumping energy) $P = \rho * g * Q * H$

ρ = density
g = acceleration due to gravity
Q = flow rate
H = total head =
pressure Δ + vertical Δ + friction

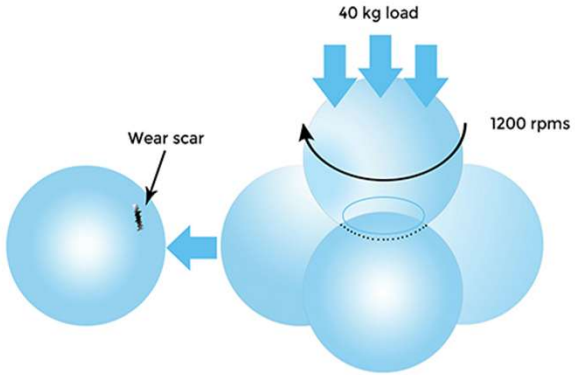
- Low Density Translates into Lower Cost per Liter

Friction and Wear Performance Data Details

Measuring Friction and Wear

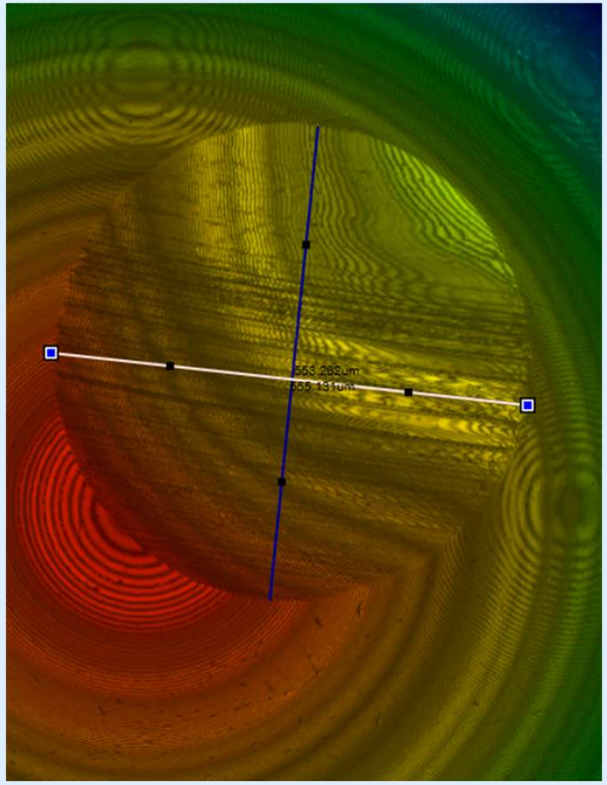
ASTM D4172: 4-Ball Wear test

- 40kg, 75°C, 1200 rpm, 60 min, 52100 steel



Measurements:

- Average Wear Scar, mm
- Average Coefficient of Friction



VSP Performance Data vs. 3.6 cSt Esters & PAO

Ester Class		VSP	Diester				Polyol Ester		Glyceryl Ester	PAO
	Test Method	VSP 3.6	DIDA	DINA	DIOA	DOA	TMP C7/8/10	TMP-C7	C8/10	PAO 3.6
KV100, cSt	ASTM D7042	3.6	3.6	3.1	2.7	2.3	4.0	3.4	4.0	3.6
KV40, cSt	ASTM D7042	16	14	11	9	8	18	14	15	15
Pour Point, °C	ASTM D5950	-60	-60	-60	-60	-50	-65	-65	-15	-60
Density	ASTM D4052	0.896	0.920	0.923	0.930	0.925	0.950	0.963	0.950	0.82
VSP Density Advantage	Δ	---	2.6%	2.9%	3.7%	3.1%	5.7%	7.0%	5.7%	---
4-Ball Wear, mm*	ASTM D4172	0.52	0.84	0.79	0.89	1.00	0.74	0.65	0.69	0.84
Wear Protection Advantage**	Δ	---	59%	55%	63%	69%	50%	37%	44%	59%
Coefficient of Friction*	ASTM D4172	0.167	0.208	0.221	0.247	0.223	0.183	0.217	0.196	---
VSP CoF Advantage, %	Δ	---	25%	32%	48%	34%	10%	30%	17%	---

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

VSP Performance Data vs. 4 cSt Esters & PAO

Ester Class	VSP	Diester	Polyol Ester				Glyceryl	PAO
	VSP 4	DIDA	TMP-C9	TMP C8/10	NGDC	TMP C7/8/10	C8/10	PAO 4.1
KV100, cSt	4.1	3.6	4.6	4.4	4.0	4.0	4.0	4.1
KV40, cSt	18	14	21	20	18	18	15	18
Pour Point, °C	-40	-60	-50	-40	0	-65	-15	-65
Density	0.893	0.92	0.94	0.94	0.90	0.95	0.95	0.82
VSP Density Advantage	Δ	2.9%	5.0%	5.0%	0.8%	6.0%	6.0%	---
4-Ball Wear, mm*	0.50	0.84	0.77	0.65	0.72	0.74	0.69	0.82
Wear Protection Advantage**	Δ	63%	57%	43%	52%	55%	49%	60%
Coefficient of Friction*	0.175	0.208	0.215	0.173	0.191	0.183	0.196	---
VSP CoF Advantage, %	Δ	19%	23%	-1%	9%	5%	12%	---

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

VSP Performance Data vs. 7 cSt Esters & PAO

Ester Class	VSP	Diester	Polyol Ester					PAO
	VSP 7	DTDA/1	TMP-TO	PE 4810	NGDO	PE C7/9	TMP C8/10	PAO 7
KV100, cSt	7.0	5.4	9.4	6.1	5.8	5.0	4.4	7
KV40, cSt	32	27	46	32	24	25	20	39
Pour Point, °C	-50	-60	-40	-5	-30	-55	-40	-43
Density	0.890	0.915	0.917	0.96	0.903	0.985	0.94	0.83
VSP Density Advantage	Δ	2.7%	2.9%	7.3%	1.4%	9.6%	5.3%	---
4-Ball Wear, mm*	0.63	0.75	0.77	0.58	0.72	0.81	0.65	0.80
Wear Protection Advantage**	Δ	27%	30%	-18%	21%	35%	6%	33%
Coefficient of Friction*	0.182	0.210	0.246	0.168	0.201	0.204	0.173	---
VSP CoF Advantage, %	Δ	15%	35%	-8%	10%	12%	-5%	---

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

VSP Performance Data vs. 9 cSt Esters & PAO

Ester Class	VSP	Polyol Ester			Aromatic	PAO
	VSP 9	TMP+C18	PE + C5/9	PE+2EH	Trimellitate	PAO-8
KV100, cSt	9	9	7	6	8	8
KV40, cSt	46	46	46	46	50	48
Pour Point, °C	-40	-40	-40	-15	-50	-48
Density	0.900	0.915	0.970	0.980	0.970	0.83
VSP Density Advantage	Δ	1.6%	7.2%	8.2%	7.2%	---
4-Ball Wear, mm*	0.61	0.77	0.89	0.95	0.99	0.74
Wear Protection Advantage**	Δ	34%	47%	52%	55%	30%
Coefficient of Friction*	0.178	0.218	0.227	0.235	0.257	---
VSP CoF Advantage, %	Δ	22%	28%	32%	44%	---

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

VSP Performance Data vs. 18 cSt Esters & PAO

Ester Class	VSP	Polyol Ester		
	VSP 18	DPE+C5/9	DPE + C5/12	Complex
KV100, cSt	18	18	19	20
KV40, cSt	150	160	170	150
Pour Point, °C	-35	-30	-25	-30
Density	0.935	0.980	0.970	0.962
VSP Density Advantage	Δ	4.8%	3.7%	2.9%
4-Ball Wear, mm*	0.80	0.90	0.88	0.85
Wear Protection Advantage**	Δ	17%	14%	9%
Coefficient of Friction*	0.180	0.246	0.232	0.200
VSP CoF Advantage, %	Δ	37%	29%	11%

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

Lower Density Translates into Product Cost Savings

SELECT INPUT

Select Unit System:

EUR

Select your current type of standard ester:

Complex ester (ISO 100 –3

- **Density:** 0.980 g/cc, 8.17 lb/gal

Select your VSP Type:

Series 8X (ISO 100 – 350)

- **Density:** 0.935 g/cc, 7.80 lb/gal

Cost of your Current ester (€/kg):

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

€6.00/kg

OUTPUT SAVINGS

Product Cost Savings

Cost savings for a 1250 liter IBC tote

€665.93

Cost Savings in %

4.81%

Cost of one liter EsterTec

€11.23

Cost of one liter Standard Ester

€11.76

Cost savings for one liter

€0.53

Weight Savings

Difference in IBC container weight

55 kg

Weight of EsterTec in a 1250 liter IBC tote

1168 kg

Weight of Standard ester in a 1250 liter IBC tote

1223 kg

Weight of Standard ester in a 22712 liter tanker

22235 kg

Weight of EsterTec in a 22712 liter tanker

21228 kg



Source: www.estertec.com/savings-calculator

Lower Density Translates into Less Transport Weight

SELECT INPUT

Select Unit System:

EUR

Select your current type of standard ester:

Complex ester (ISO 100 –3

- **Density:** 0.980 g/cc, 8.17 lb/gal

Select your VSP Type:

Series 8X (ISO 100 – 350)

- **Density:** 0.935 g/cc, 7.80 lb/gal

Cost of your Current ester (€/kg):

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

€6.00/kg

OUTPUT SAVINGS

Product Cost Savings

Cost savings for a 1250 liter IBC tote

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Cost Savings in %

4.81%

Cost of one liter EsterTec

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Cost of one liter Standard Ester

€11.76

Cost savings for one liter

€0.53

Weight Savings

Difference in IBC container weight

55 kg

Weight of EsterTec in a 1250 liter IBC tote

1168 kg

Weight of Standard ester in a 1250 liter IBC tote

1223 kg

Weight of Standard ester in a 22712 liter tanker

22235 kg

Weight of EsterTec in a 22712 liter tanker

21228 kg



Source: www.estertec.com/savings-calculator

Selecting a Synthetic Ester Base Oil for a Metalworking Fluid with Exceptional Hydrolytic Stability

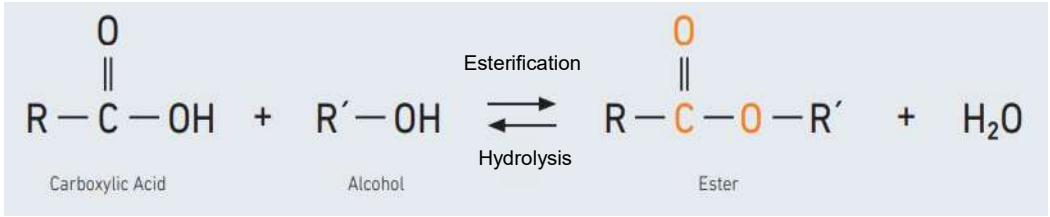
- VSP molecular structure is based on secondary alcohols
- Steric hindrance significantly limits water access to the carbonyl carbon of the ester group, minimizing hydrolysis
- Esters with excellent lubricity and strong hydrolytic stability are optimum for formulating water-based metalworking fluids



Hydrolytic Stability

Hydrolytic Stability Measurement

- ASTM D2619 Hydrolytic Stability of Hydraulic Fluids (Beverage Bottle Method)
- Standard Lubricants Industry Test Method
- Measures change in acidity of the oil and acid generation in the water phase
- Copper corrosion is visually measured by the ASTM D130 standard





75g Oil, 25g Water
Copper Strip
93 °C, 48 hours

Hydrolytic Stability, ISO 15 – 150 Viscosity Grades

VSP DEMONSTRATES BEST-IN-CLASS HYDROLYTIC STABILITY COMPARED TO DIESTERS, POLYOL ESTERS AND PAO

ASTM D2619	VSP 3.6	VSP 7	VSP 18	NGDO	DIOA	DTDA/1	PE C7/9	TMP C8/10	SN 150 MIN OIL	Pass/ Fail*
Oil Tan Δ, mg KOH/g	0.01	0.01	0.12	2.90	0.16	0.05	0.10	0.05	0.04	<0.2
Water Layer Acidity, mg KOH	0.84	0.56	0.28	18.0	3.47	3.75	1.65	1.26	1.50	<5.0
Copper Corrosion Rating, ASTM D130	1b	1b	1b	1b	1b	1b	1b	1b	3a	<2

Rating Scale:
0-2 = HIGH
2-5 = MED
>5 = LOW



*Typical limits for a formulated lubricant

VSP Performance Data vs. 2-4 cSt Esters & PAO

Test Method, ASTM D 2619	VSP 3.6	2-Ethylhexyl Adipate	2-Ethylhexyl Oleate	Diisooctyl Adipate Diester	Diisononyl Adipate	TMP C7	Diisodecyl Adipate	PAO 3.6
KV 100°C, ASTM D7042	3.6	2.3	2.7	2.7	3.2	3.5	3.6	3.6
KV 40°C, ASTM D7042	16	8	8	9	12	14	14	15
Oil Tan Δ, mg KOH/g	0.01	0.10	1.46	0.16	0.14	0.11	0.07	0.02
Water Layer Acidity, mg KOH	0.84	5.03	16.95	3.47	4.18	3.00	2.60	0.20
Copper Corrosion Rating, ASTM D130	1b	2b	1a	1b	1a	1b	1a	1b

All base stocks compared with no inhibitor or passivation additives

VSP Performance Data vs. 4-6 cSt Esters & PAO

Test Method, ASTM D 2619	VSP 4.1	Diisotridecyl Adipate Diester	Neopentyl Glycol Dioleate	TMP + C7/10	Neopentyl Glycol Dicocoate	TMP + C8/10	PE + C5/10	PAO 4
KV 100°C, ASTM D7042	4.1	5.3	5.7	4.0	4.1	4.5	4.7	4.1
KV 40°C, ASTM D7042	18	27	24	18	18	20	22	18
Oil Tan Δ, mg KOH/g	0.02	0.05	2.93	0.03	4.79	0.05	0.16	0.02
Water Layer Acidity, mg KOH	0.70	3.75	18.30	0.56	13.47	1.26	2.92	0.10
Copper Corrosion Rating, ASTM D130	1b	1b	2a	1b	2a	1b	1a	1b

All base stocks compared with no inhibitor or passivation additives

VSP Performance Data vs. 6-12 cSt Esters & PAO

Test Method, ASTM D 2619	VSP 7	TMP C18	PE C18	PE + C8/10	TMP + iC9	PAO 7
KV 100°C, ASTM D7042	7	9.5	12.3	6.2	7.1	7.0
KV 40°C, ASTM D7042	32	46	68	32	50	42
Oil Tan Δ, mg KOH/g	0.01	0.03	0.09	0.07	0.01	0.01
Water Layer Acidity, mg KOH	0.56	1.72	2.21	1.07	0.40	0.74
Copper Corrosion Rating, ASTM D130	1b	1b	1b	1b	1b	1b

All base stocks compared with no inhibitor or passivation additives

VSP Performance Data vs. 12-20 cSt Esters & PAO

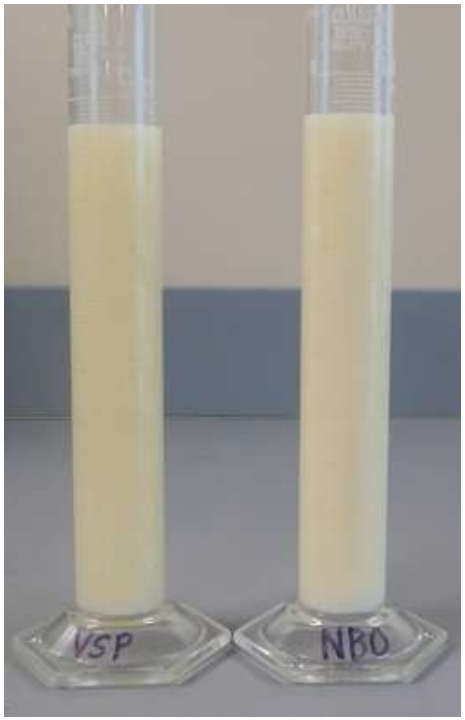
Test Method, ASTM D 2619	VSP 18	2EH Dimerate	DPE C18	DPE + C5/12	TMP + C18 Dimerate
KV 100°C, ASTM D7042	18	13	12	20	22
KV 40°C, ASTM D7042	150	88	110	220	140
Oil Tan Δ, mg KOH/g	0.12	1.26	0.09	0.06	0.02
Water Layer Acidity, mg KOH	0.28	18.0	2.21	0.28	10.1
Copper Corrosion Rating, ASTM D130	1b	1b	1b	1b	1b

All base stocks compared with no inhibitor or passivation additives

Standard Metalworking Fluid Concentrate Formula

Metalworking Concentrate Formulas			
Function	**Component**	**VSP**	**NBO**
VSP Ester Base Oil	**VSP-5**	**33.3**	---
Hydrocarbon Base Oil	Naphthenic 100	---	**33.3**
Emulsifier – Low HLB	PIBSA / DGA Amide	16.8	11.9
Emulsifier – High HLB	Tall Oil Fatty Acid	2.3	7.0
Amine	2-(2-Aminoethoxy) ethanol	9.0	9.5
Ferrous Rust Protection	Dodecanedioc Acid	1.5	1.5
Biocide	Boric Acid	4.0	4.0
Fungicide	Iodopropynyl Butyl Carbamate	1.0	1.0
Boric Acid crystal disrupter	Propylene Glycol	1.0	1.0
Copper passivator	Methyl-1H-benzotriazole	0.9	0.9
Diluent	Water	30.2	29.9
		100.0	100.0

Emulsion Concentrate Stability



VSP **NBO**

- Storage stability testing
  - Concentrates stored in oven
  - Both VSP and NBO candidates demonstrated acceptable storage life
  - The VSP concentrates lasted longer before separation was observed

VSP Ester MWF	
Concentrate	
Appearance	Clear Brown Liquid
Low Cloud Point	-22 °C
High Cloud Point	52 °C
5% Emulsion	
Appearance	Stable Macro
pH	9.2

Standard Naphthenic Base Oil MWF	
Concentrate	
Appearance	Clear Brown Liquid
Low Cloud Point	- 20 °C
High Cloud Point	55 °C
5% Emulsion	
Appearance	Stable Macro
pH	9.1

MicroTap Testing Measures Metalworking Fluid Efficiency

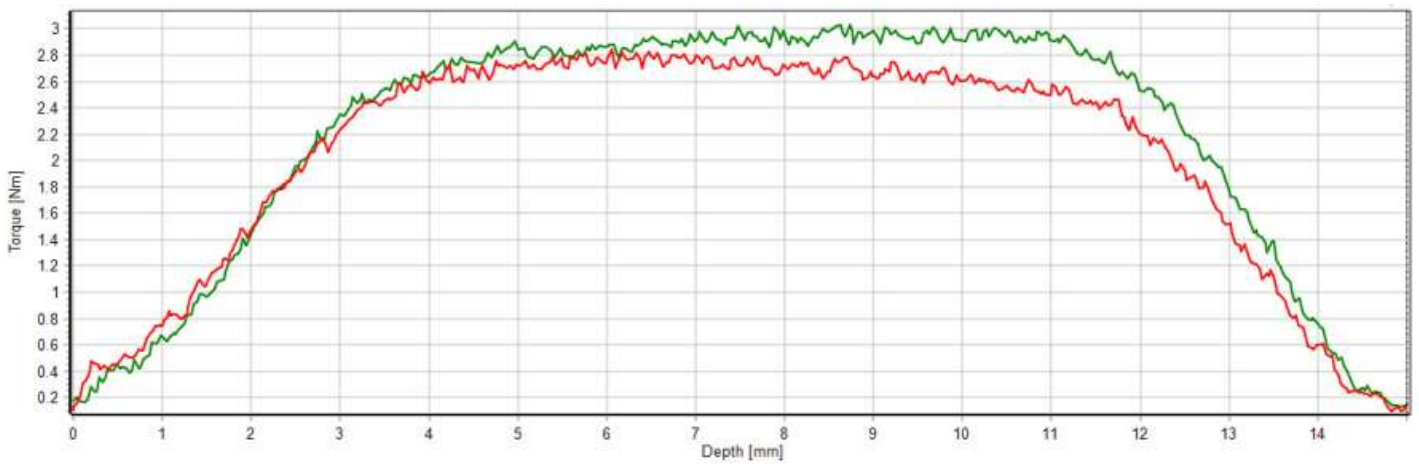




MicroTap Test Details

- Taps M6x1 Forming Tap, HSS
- 5 taps per fluid, per metal

6061 T6 Aluminum



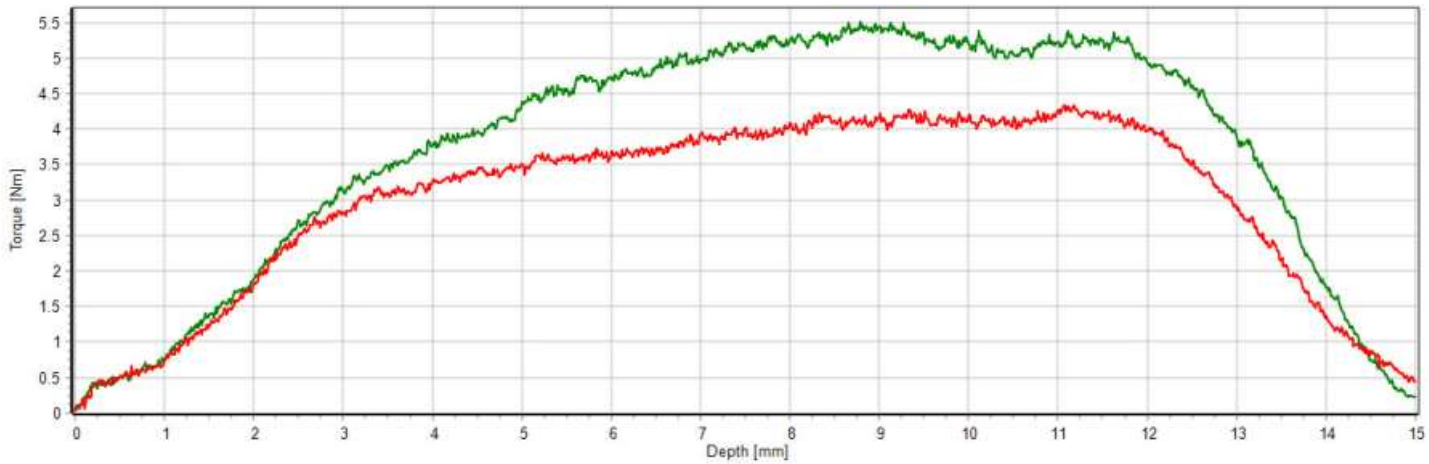
— NBO

— VSP

M6 X1 Form Tap HSS, Speed 1000 rpm

7.5% more efficient

1018 Steel



— NBO

— VSP

M6 X1 Form Tap HSS, Speed 500 rpm

24.4% more efficient

Selecting a Synthetic Ester Base Oil for an Engine Oil with Low Volatility

- Volatility of engine oils is typically measured by the Noack method
  - 250 °C for 60 minutes in air

- The VSP synthetic ester molecular structure has a higher dipole moment compared to standard esters, resulting in stronger intermolecular forces and lower vapor pressure



Volatility Data

VSP Performance Data vs. 2-4 cSt Esters & PAO

Ester Class		VSP	Diester				Polyol Ester		Glyceryl Ester	PAO
	Test Method	VSP 3.6	DIDA	DINA	DIOA	DOA	TMP C7/8/10	TMP-C7	C8/10	PAO 3.6
KV100, cSt	ASTM D7042	3.6	3.6	3.1	2.7	2.3	4.0	3.4	4.0	3.6
KV40, cSt	ASTM D7042	16	14	11	9	8	18	14	15	15
Pour Point, °C	ASTM D5950	-60	-60	-60	-60	-50	-65	-65	-15	-60
Noack Volatility, weight % loss	ASTM D6375	**9%**	**15%**	**19%**	**26%**	**32%**	**5%**	**10%**	**8%**	**13-17%**

VSP Performance Data vs. 3-4 cSt Esters & PAO

Ester Class	VSP	Diester	Polyol Ester				Glyceryl	PAO
	VSP 4.1	DIDA	TMP-C9	TMP C8/10	NGDC	TMP C7/8/10	C8/10	PAO 4.1
KV100, cSt	4.1	3.6	4.6	4.4	4.0	4.0	4.0	4.1
KV40, cSt	18	14	21	20	18	18	15	18
Pour Point, °C	-40	-60	-50	-40	0	-65	-15	-65
Noack Volatility, weight % loss	**7%**	**15%**	**3%**	**6%**	**12%**	**5%**	**8%**	**10 – 14%**

VSP Performance Data vs. 5-9 cSt Esters & PAO

Ester Class	VSP	Diester	Polyol Ester					PAO
	VSP 7	DTDA/1	TMP-TO	PE 4810	NGDO	PE C7/9	TMP C8/10	PAO 7
KV100, cSt	7.0	5.4	9.4	6.1	5.8	5.0	4.4	7
KV40, cSt	32	27	46	32	24	25	20	39
Pour Point, °C	-50	-60	-40	-5	-30	-55	-40	-43

Noack Volatility, weight % loss	**1.5%**	**7%**	**1%**	**1%**	**5%**	**5%**	**4%**	**5 – 6%**

VSP Performance Data vs. 6-9 cSt Esters & PAO

Ester Class	VSP	Polyol Ester			Aromatic	PAO
	VSP 9	TMP+C18	PE + C5/9	PE+2EH	Trimellitate	PAO-8
KV100, cSt	9	9	7	6	8	8
KV40, cSt	46	46	46	46	50	48
Pour Point, °C	-40	-40	-40	-15	-50	-48

Noack Volatility, weight % loss	**1.5%**	**3%**	**3%**	**6%**	**4%**	**3 – 4%**

CONCLUSIONS

- Synthetic esters can outperform mineral oil and PAO when selecting base oils for energy efficient lubricants
- Significant financial benefits have been measured in industrial applications based on:
  - Higher Viscosity Index
  - Superior Lubricity
  - Lower Density
  - Excellent Hydrolytic Stability
- Longer fluid life and increased equipment durability can be expected from lubricants that have higher stability and operate efficiently







ZSCHIMMER & SCHWARZ

THANK YOU !

Dr. Nne Meyer

Europe Sales Manager

n.meyer@zschimmer-schwarz.com

zschimmer-schwarz.com

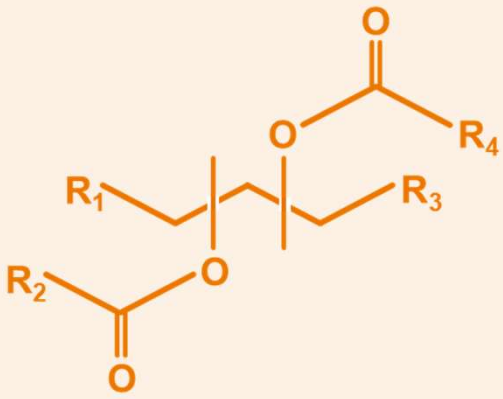
zslubes.com

EsterTec.com

A New Ester Technology Is Now Available

"VSP" Synthetic Esters with Improved Performance

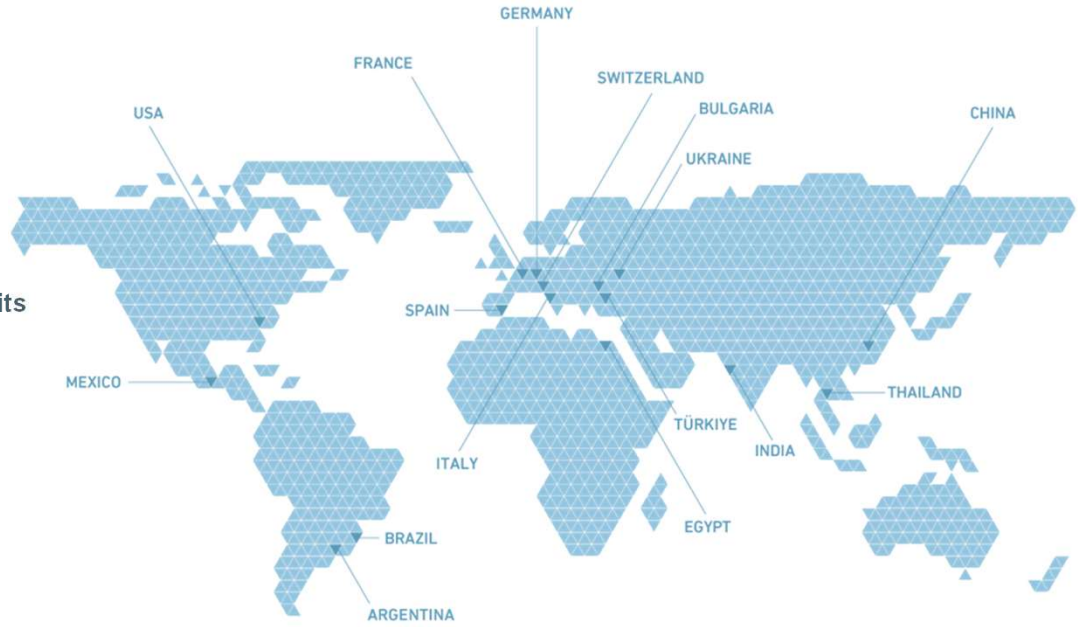
- Novel structure, unique production process
- Based on standard raw materials that are globally and readily available commodities
- High stability vicinal ester molecular positioning
- Steric hindrance that improves oxidative stability
- Secondary alcohols on adjacent carbons improve hydrolytic stability



VSP Molecular Structure

Zschimmer & Schwarz Group – Company Profile

28 subsidiaries
in 17 countries
on 5 continents
with 21 production units



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



1894

Foundation of the company in Chemnitz, Germany

1909

First in-house production



1959 - 2019

Rapid globalisation. New company headquarters in Oberlahnstein.



ISO 9001 ISO 14001 ISO 50001

2021

Joining the United Nations Global Compact

UN GLOBAL COMPACT

2020-26

Z&S Commitment to Sustainability

GOLD | Top 5% ecovadis Sustainability Rating JAN 2026

SILVER | Top 15% ecovadis Sustainability Rating JAN 2026

BRONZE | Top 35% ecovadis Sustainability Rating JAN 2026