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# Alkylated Naphthalene: A booster and a base stock

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Business Development Manager

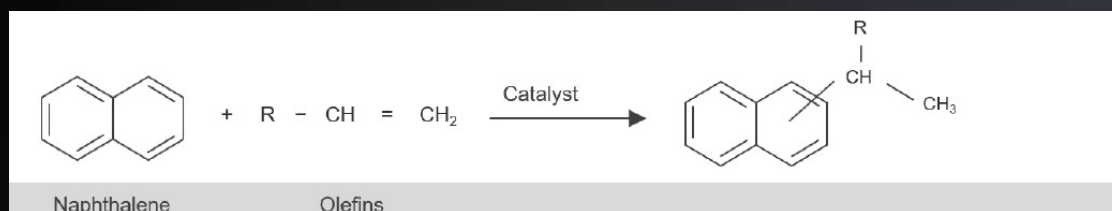
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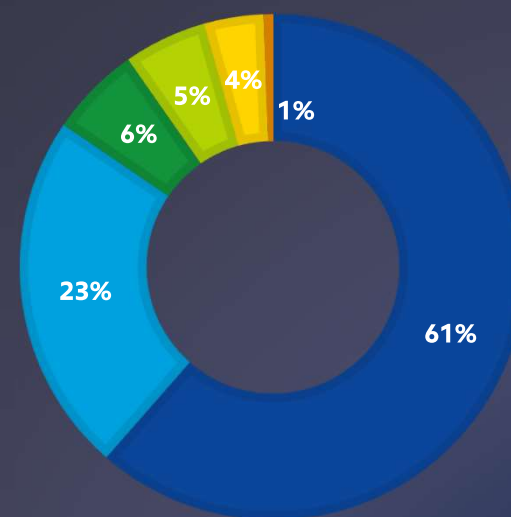
# Alkylated Naphthalenes | Overview



- API Grp V
- Used in lubricants since the 1940's
- Current uses across the entire lubricant spectrum
- Growing need for high performance properties

## APPLICATION USE

■ PCMO ■ Compressor ■ HDMO ■ IGO ■ Greases ■ EV

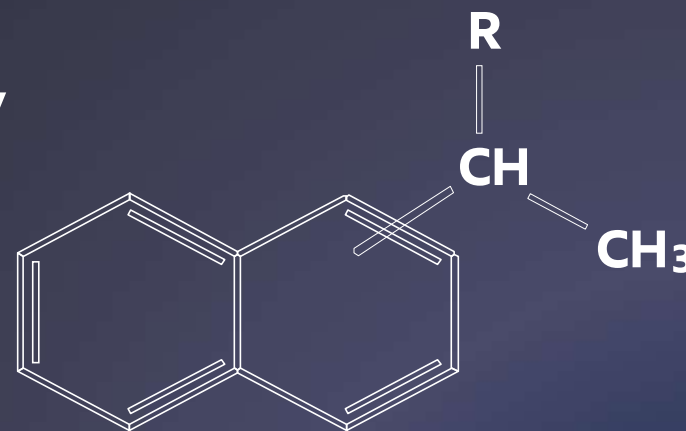


Source: ExxonMobil, Kline Grp V study

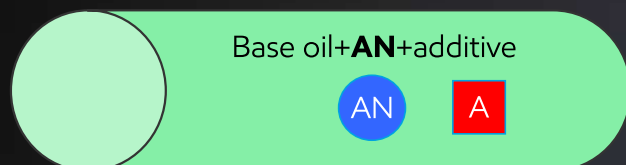
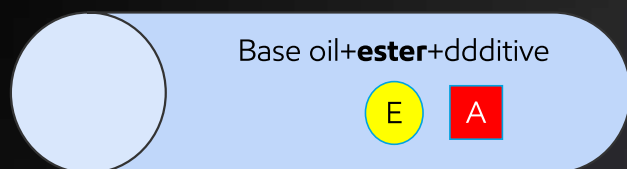
# Alkylated Naphthalenes | Performance

**Alkylated  
Naphthalene's are  
engineered  
high-performance  
molecules**

- Low volatility
- **High thermal & oxidative stability**
- Excellent hydrolytic stability
- Boosts oxidation resistance
- Seal swell capability
- Good solvency
- **Potential to improve additive response**



# Alkylated Naphthalenes | Boosting performance



 = Ester molecule   
  = Additive molecule   
  = AN molecule

## 4-BALL WEAR TEST<sup>1</sup>

### ISO VG 220 Industrial gear oil

40 cSt PAO  
 Adipate ester  
**Synesstic™ 5**  
 Additives\*

### Test conditions

4-Ball wear, 1800 rpm, 93°C,  
 60 kg load, 30 min\*\*  
 80 kg load, 30 min\*\*

Oil A*	Oil B*
78%	78%
20%	----
----	20%
2%	2%

### Wear scar, mm

0.822	<b>0.739</b>
2.094	<b>0.822</b>

<sup>1</sup>Source: ExxonMobil internal testing data

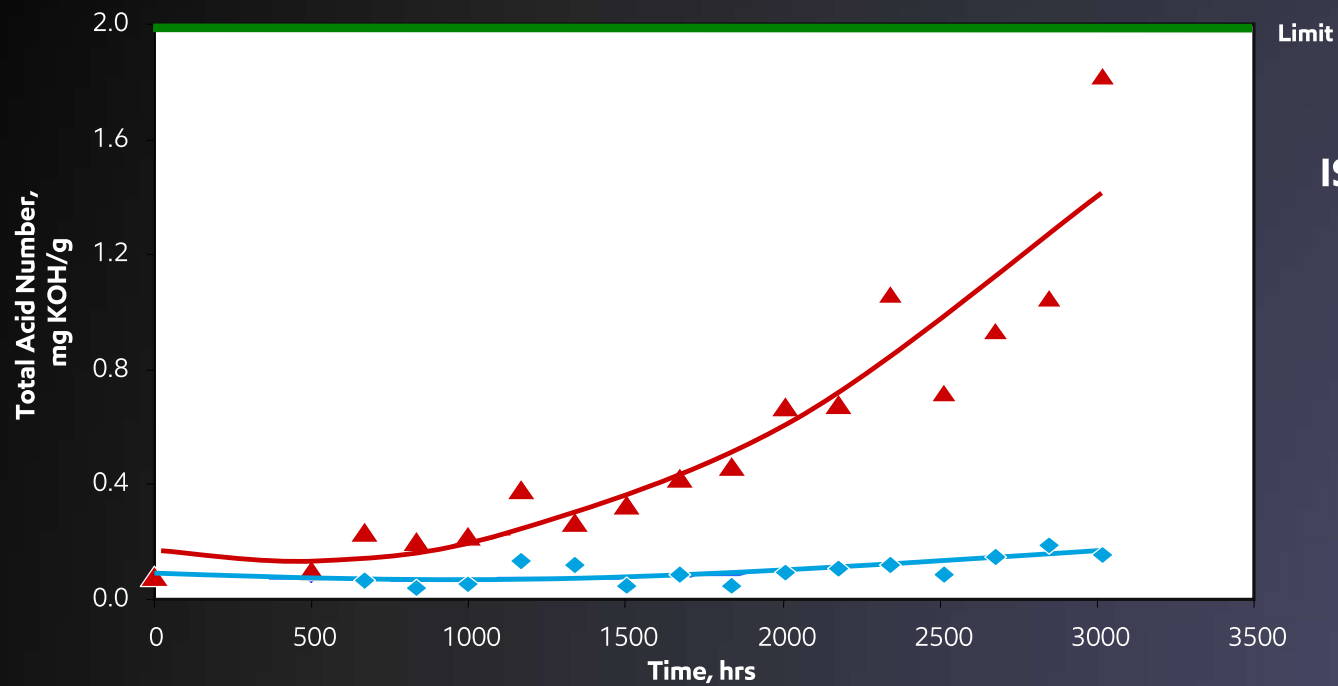
\* Same additives used in both formulations

\*\* Spot data measured, results may vary over time

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# Alkylated Naphthalenes | A base stock

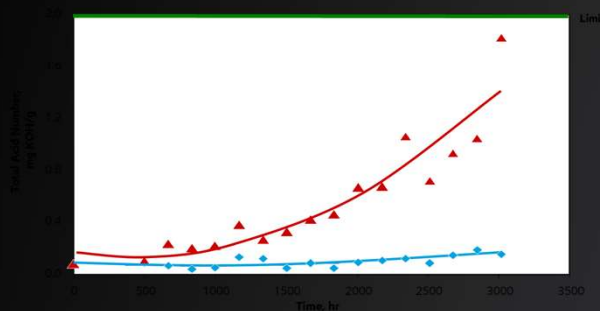
Turbine Oil Stability Test (TOST) ASTM D 943<sup>1</sup>



<sup>1</sup>Source: ExxonMobil internal testing data

# Alkylated Naphthalenes | A base stock taken further

Turbine Oil Stability Test (TOST) ASTM D 943



Formulation chemistry*	Mineral oil	Gp III, PIB	All ester	PAO/ 20% ester	PAO/ 20% AN	Mostly AN
AN wt%	0	0	0	0	20	86.6
Base oil type	Grp I	Grp III	Ester	PAO/Ester	PAO/AN	AN/PAO
RPVOT, ASTM D2272, mins	415	1940	1130	1240	1365	1848
TOST ASTM D 943, hrs.**	2928.00	10000+	<400	929.00	10000+	10000+
Air release, ASTM D3427, mins to 0.2% air**	8.40	2.20	2.00	2.10	2.50	7.70
ExxonMobil Proprietary Accelerated Test <sup>1</sup>						
Compressor Oil life, hours	654.00	645	1200	1313.00	2148	5000+

Use of concentrated Alkylated Naphthalene may substantially extend compressor oil lifespan

<sup>1</sup>Source: ExxonMobil internal testing data

\* Additive chemistry adjusted per formulation

\*\* Spot data measured, results may vary in time

# Alkylated Naphthalenes | Summary

Alkylated Naphthalene's are engineered high-performance molecules

	Synesstic™ 5	Synesstic™ 12	Synesstic™ 8 (Experimental)*
Specific gravity @ 15.6°C, ASTM D4052	0.908	0.887	0.893
Viscosity @ 100°C, cSt, ASTM D445	4.7	12.4	8.2 – 8.6
Viscosity @ 40°C, cSt, ASTM D445	29	109	60 – 64
Brookfield viscosity @ -30°C, cP, ASTM D2983	3,950	22,000	15,580
Color, ASTM 1500	<1.5	<4.00	0.5
Viscosity index, ASTM D2270	74	105	105
Flash point open cup °C, ASTM D92	222	258	237
Pour point, °C, ASTM D5950/D97	-39	-36	-33
Noack volatility, wt. % Loss, ASTM D5800	12.7	4.5	5.1
Total Acid number, mgKOH/g, ASTM D974 (mod)	<0.05	<0.05	<0.05

Future industry requirements continuing to drive the need for step out performance characteristics; ExxonMobil to provide an additional AN molecule for formulation selection





# Thank you

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