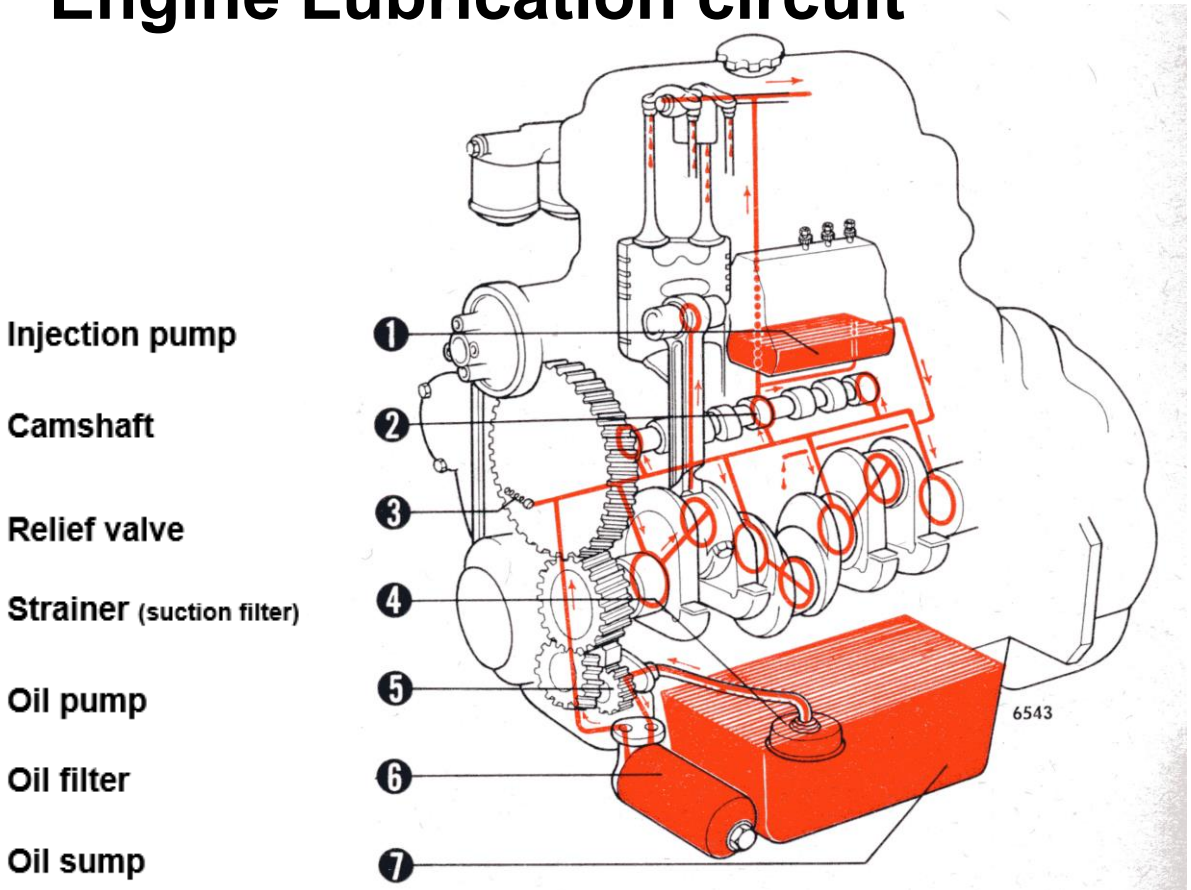
The Science of Lubrication

How Quality Oils Enhance Engine Efficiency and Longevity

What is Lubrication?

- The action of applying a substance such as oil or grease to an engine or component to minimize friction and allow smooth movement.

Engine Lubrication circuit



*** Average engine running @ 3000 rpm must open & close a valve 25 times per second. Each spark plug must fire at same speed.**

*** Top performance engines reach their upper rev range btw 7000 & 9000 rpm. Some formula one engines approach 20,000 rpm.**

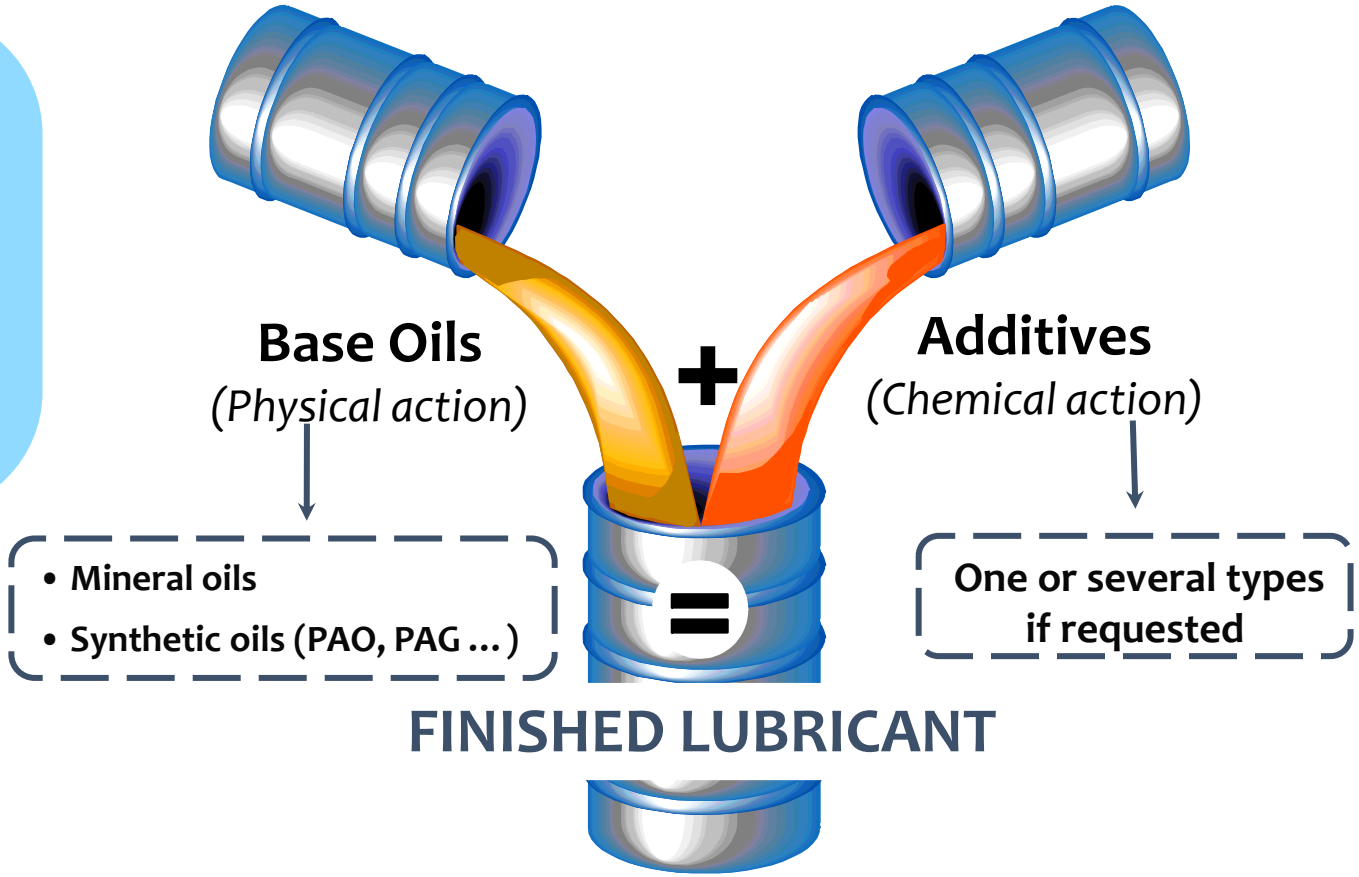
*** For these four stroke cycle engines the pistons must stop and start during every revolution of the crankshaft. At 18,000 rpm, each valve will have to open & close 150 times per second.**

How Does Quality Oil Enhance Engine Efficiency and Longevity?

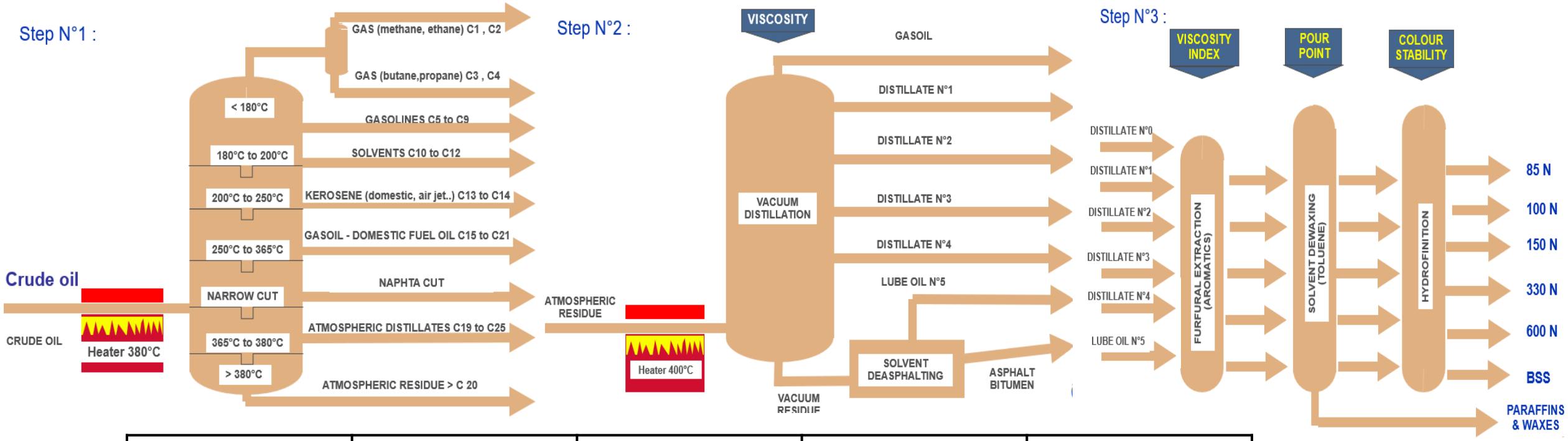
- Quality engine oils enhance performance and longevity by **reducing friction**, **preventing sludge buildup** and **protecting against wear and corrosion**. By minimizing wear, quality oil allows engine parts to operate more smoothly, which improves fuel efficiency and maintains optimal performance over time.

Quality systems must be in place to create quality oils or lubricants

- Raw materials
- Process and technology
- People



Base Oils process



Group	Sulphur		Saturated	VI
Group I	> 0.03%	and / or	< 90%	80 ≤ VI < 120
Group II	≤ 0.03%	and	≥ 90%	80 ≤ VI < 120
Group III	≤ 0.03%	and	≥ 90%	120 ≤ VI
Group IV	PAO			
Group V	All other base fluids			

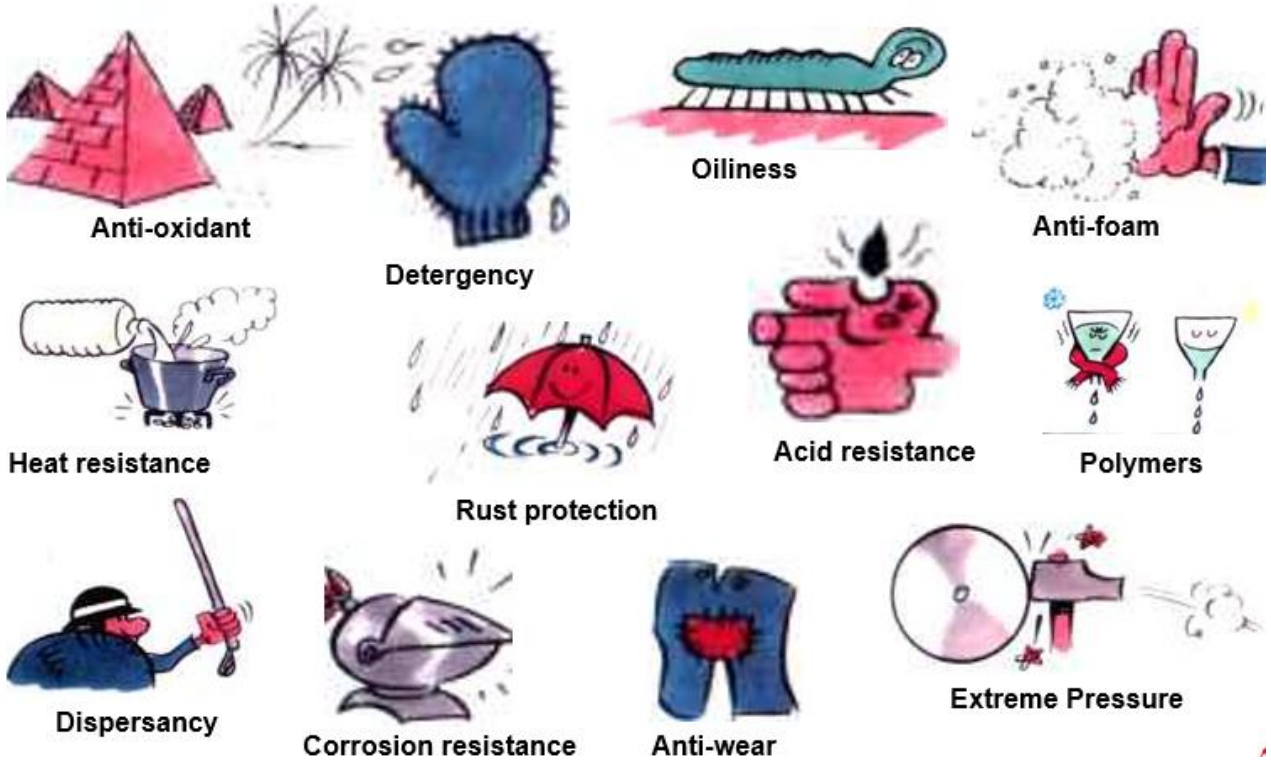
ADDITIVES

Why are they needed ?

- To strengthen some of the base oils' properties *(pour point, viscosity index and oxidation resistance)*

- To give base oils properties they do not originally possess *(detergents, dispersants, corrosion resistance, rust protection, anti wear and extreme pressure, …)*

Main additives



LUBRICANT FORMULATION

Table 9.1 Composition of a typical 'full SAPS' engine lubricant

	European lubricant for gasoline + diesel	North American lubricant for gasoline only
Component	Typical content (mass%)	Typical content (mass%)
Base oil	78	85
Additive package	12	8
Viscosity modifier[1]	10	7

[1] Viscosity modifier as a concentrated solution in base oil

R.M. Mortier et al. (eds.), *Chemistry and Technology of Lubricants*, 3rd edn.,
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Finally, how you handle lubricants matter a lot.

Thank you