

**Ministry of Higher Education and Scientific Research Al-Mustaqbal University College**

**Department of Chemical Engineering and petroleum Industrials**

***Properties of petroleum products***

**3rd Stage**

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**LUBE BASE STOCKS**

**CLASSIFICATION OF LUBRICATING OILS**

Lubricating oils and greases can be classified in many ways;

– by viscosity grades,

– by their additives package, or

– by their producers’ brand names.

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• The most popular classification of lubes is according to their usage:

• Engine oils (petrol and diesel engines, aircraft, marine engines)

• Turbine oils

• Gear oils

• Compressor (refrigeration, air) oils

• Quench oils used in metalworking

• Cutting oils (in metal cutting)

• Insulating oils used in transformer and circuit breakers

• Hydraulic oils

• CLASSIFICATION BY VISCOSITY

Classification according to viscosity has been done by these professional societies and organizations:

• SAE (Society of Automotive Engineers. USA)

• API (American Petroleum Institute)

• AGMA (American Gear Manufacturers Association)

• NLGI (National Lubricating Grease Institute)

**CLASSIFICATION BY ADDITIVE TYPES**

Lube oils may be classified by additive type as follows:

• Inhibited or RO (rust and oxidation inhibitor containing additives)

• Anti-wear (AW) containing lube oils

• Lubes with extreme pressure (EP) additives

• Compounded oils: containing 3 to 10 percent fatty or synthetic fatty oils

• Residual compounds

**AUTOMOTIVE ENGINE OILS**

• Viscosity is considered the most important single property of lubricating oils.

• Automotive crankcase and gear oils used in gasoline and diesel engine lubrication.

• The viscosity classification takes into account the temperature at which the oils are to be used.

• The SAE viscosity rating was based on average time



**AUTOMOTIVE OIL ADDITIVES**

– Viscosity index improvers

– Detergents

– Dispersants

– Anti-wear/Extreme pressure additives

– Friction modifiers

– Antioxidants/Corrosion inhibitors

– Rust and corrosion control additives

– Anti-foam agents

**ENGINE OIL FORMULATION**

• In an engine oil. o the base oil components may be 75 to 85 percent of the total formulated lube,

o and the remaining 15 to 25 percent may be different types of additives.

• Viscosity modifiers and detergent inhibitors are the most prominent additives.

• Other additives used in lube formulation are dispersants. AW/EP agents, oxidation inhibitors, antifoamants. rust inhibitors, and demulsifiers.

• Base oils of a required viscosity are obtained by blending different base stocks such as neutrals and bright stocks.

• The additives are added to the base oil to enhance its performance when used in various types of engines.

• The most important properties of a lubricating oil are its viscosity and alkali reserve (base number, or BN).

• In addition, many other properties of the oil affect the performance of the engine.

• Fuel quality significantly affects the kind of lubricating oil to be used.

• For example, for a low-sulfur fuel such as natural gas. o little sulfur dioxide is formed during combustion.

o In this case a lubricating oil with a low BN. 4 to 7. may be OK.

• In case the fuel contains high sulfur. 0.5 to 5 percent, o a higher alkali reserve is required to prevent corrosion damage.

• For fuels containing 2 percent or more sulfur,

• The high water content can be reduced by efficient centrifuging, which can extend the life of lubricating oil.





**SYNTHETIC LUBRICANTS**

• Synthetic lubricants were developed more than 50 years ago and became widely used in jet engines.

• Lower than -120°F operating temperatures, 60.000 r/min shaft speed, and 500°F+ exhaust temperatures proved too much for conventional lubes.

• Synthetic lubes were created specifically for these harsh operating conditions, and at present every jet engine in the world uses synthetic lubricants.

• A synthetic lubricant base stock is a product made from a chemical reaction of two or more simple chemical compounds.

• These base stocks are manufactured to meet specific physical and chemical characteristics not found in petroleum lubricant base stocks.

• This base stock is then used to formulate lubricants by the addition of performance additives.

• Some of the most common synthetic lubricants are as follows:

• Polymerized alpha olefins, olefin polymers, olefin oligomers

• Dibasic acid esters

• Polyols esters

• Polyalkaylene glycol ethers

• Phosphate esters

• Alkylated benzenes, a synthetic hydrocarbon

• Silicons

• Their viscosity indexes and flash points are higher, however, and their pour points are considerably lower.

The following performance features are claimed for synthetic lubricants over mineral oil lubes:

• Engine cleanliness

• Improved fuel economy

• Lower oil consumption

• Good low temperature (cold starting) fluidity

• Outstanding performance in extended oil drain intervals

• Superior high-temperature oxidation resistance

• Excellent wear protection

The main disadvantage of synthetics is that they are

– inherently more expensive than mineral oil and

– available in limited supply.

• This limits their use only to specialty oils and greases that command a premium price.

• Esters suffer the further disadvantage