



WHAT ARE ADDITIVES ?

Additives are oil-soluble substances which are added to the mentioned base oils. They chemically and/or physically change or enhance the properties of lubricants.

Chemically active additives:

- Detergents
- Dispersants
- Antioxidants
- Wear-protecting additives
- Corrosion inhibitors

Physically active additives:

- Viscosity index modifier
- Pour point modifier
- Friction characteristics modifier



Detergents

Detergents are washing substances that counteract formation of deposits on the component parts exposed to high temperatures. Detergents virtually keep the engine clean. Moreover, they build up alkaline reserves in the engine oil, so that acidifying combustion products can be neutralized.

Detergents are ash-compounding (metal organic) additives, which prevent depositing of solid dirt particles on metal surfaces (agglomerating).

Dispersants

The dispersants' task is to envelope solid and liquid particles (e.g. dust, water, combustion products, oxidation products) and to keep them dispersed and in suspension to avoid deposits.

The process of peptization: It refers to enveloping of solid particles in oil and keeping them in suspension by means of ash-free (organic) dispersants.

The process of solubilisation: Enveloping and keeping in suspension of fluid particles (water, acids). No neutralisation.

Antioxidants

Under the influence of heat and oxygen, lubricants tend to oxidise (ageing). This corrosion process is accelerated by acid combustion products and traces of metals which have catalytic effects (abrasive or corrosive wear). The result is deterioration, which entails the development of acid as well as lacquer, resin, and sludge consistent deposits; these are insoluble in oil (e.g. like oil carbon). By adding antioxidants, ageing protection can be enhanced significantly. Though they cannot entirely prevent ageing process, antioxidants demonstrably decelerate it.

Anti-wear (AW) additives

With the help of appropriate additives, it is possible to establish an extremely thin layer on slides; its shearing strain stability is significantly lower than that of metals. This layer is solid under normal conditions, but turns lubricant under wearing conditions (pressure, temperature). This way excessive wear (galling or welding) can be prevented. If required (a metal/metal contact), the film is continuously renewed by means of a chemical reaction.

Extreme-pressure (EP) Additives

The oldest EP additive is pure sulphur. The EP and AW additives are substances that are active on interfaces; additives of polar group usually contain different combinations of the elements zinc, phosphorus, and sulphur. The best-known representative of this kind is zinc dithiophosphate (ZDP), which is also effective for preventing ageing and corrosion.

The EP additives are mixed to transmission, engine, hydraulic system, metalworking oils in order to increase their bearing pressure properties and to decrease wear in the areas with mixed friction. The effect is based on establishing layers on surfaces (metal surfaces). They are supposed to prevent welding of rough spikes in the areas with mixed friction characteristics and to grant possibly wearless sliding of contacting metal surfaces. The reducing of friction is also desirable.

Corrosion Inhibitors

Generally speaking, corrosion is a chemical or electrochemical effect on metal surfaces. As a protection against corrosion, additives that act on interfaces qualify best; these can be either ash-free or ash-producing. The products of polar group attach themselves to metal surfaces, while the rest of alkyls build up thick, fur-like, hydrophobic (water-resistant) barriers. Due to their polar structure, corrosion inhibitors compete with the EP and AW additives, meaning that the effectiveness of the latter can be thus affected.

Modifiers

The use of VI modifiers (VI = viscosity index) enables manufacturing of multigrade engine oils. The VI modifiers increase or elongate the viscosity of particular oil and thus enhance its viscosity-temperature properties.

Viscosity-Temperature Modifiers

Metaphorically speaking, they are very long, fiber-like molecules that are existent in oil and are conglomerate when cold; they offer relatively low resistance to the movement of oil molecules. With increasing temperature, they loosen, take a bigger volume, and create a meshed network that slows down the movement of oil molecules and protracts a too quick thinning-out of oil.

Modifiers of Shearing Strain Stability

Under strain, the VI modifiers can be sheared, i.e. their long molecules are downright torn. This entails a loss in viscosity. The viscosity loss is irreversible and in this regard referred to as permanent shearing strain. The torn molecules have a smaller volume and thus the thickening effect is short. For the most part, the shearing strain stability of a lubricant is determined by the quality of the VI modifiers.

High shearing strain is on hand e.g. in the area of piston rings (high revolutions, sliding speed, pressure, temperature).

Pour Point Modifier

Pour point is the lowest temperature (in degree Celsius) at which an oil is just pouring. Solidification of a particular oil is determined by paraffin waxes in the base oil, which begin to crystallize at low temperatures. The addition of substances that reduce the pour point protracts this process and enhances the low temperature characteristic of oils.

Friction Modifier

Friction modifiers (FM) are additives that lower friction and are only effective in areas with mixed friction rates. On surfaces, the active substances create fur-like layers (physical process) which are able to keep metal surfaces separated. The FM are very polar, i.e. they possess high affinity to surfaces in connection with friction-preventing properties

Role of additives in lubricants-

Additives have three basic roles:

- 1) Enhance existing base oil properties with antioxidants, corrosion inhibitors, anti-foam agents and demulsifying agents.
- 2) Suppress undesirable base oil properties with pour-point depressants and viscosity index (VI) improvers.
- 3) Impart new properties to base oils with extreme pressure (EP) additives, detergents, metal deactivators and tackiness agents.