

Additives Extreme Pressure (EP) and polar molecules

The choice of additives changes the properties of the oils and particularly affects behavior of the processes (polar additives and EP), behavior of the machine (foam, filtration, compatibility) and the behavior of environment (health, safety, stability).

One of the most important characteristics of a cutting oil used in the cutting of the gears is certainly that of guaranteeing the maximum resistance of the protective film that is interposed between the tool and the machined surface.

This layer of coolant has the purpose to reduce friction and therefore limits the generation of heat with a clear beneficial effect on tool life and the quality of the machined surface.

Additives that increase the lubricating capacity of cutting oil are called EP (Extreme Pressure).

These additives make the cutting oil strong resistance to breakage of the film due to so-called polar molecules.

A base mineral oil does not have this type of molecules which then are arranged on a metal surface at random, allowing even the areas not covered.

The polar molecules instead have a kind of affinity with the surface with which they come into contact, and then are distributed in an orderly manner and are anchored to the surface like small oriented magnets. Figure N°1 illustrates this concept.

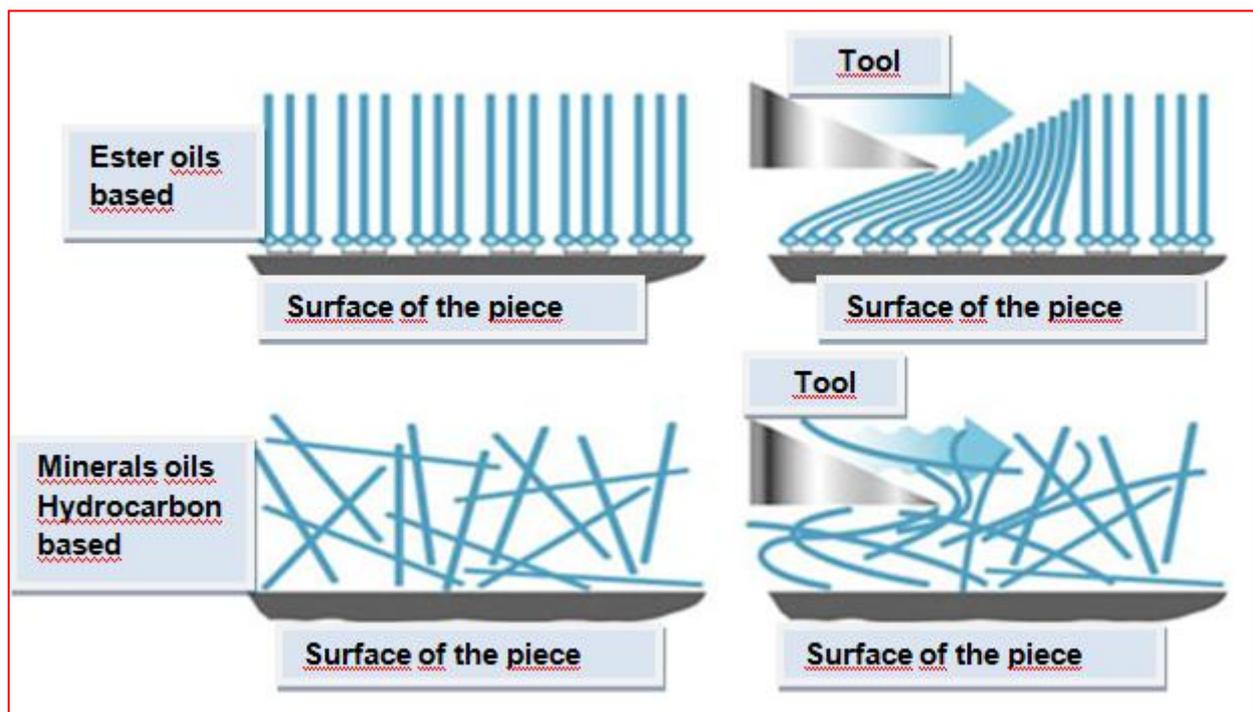


Figure N°1- Schematic representation of the operation of polar molecules

In the upper part of the figure are shown schematically polar molecules which remain well anchored to the surface.

The novelty consists in the fact that the synthetic esters are already equipped naturally of this type of molecules and therefore, unlike the mineral oils or other hydrocarbon-based oils, which have not, do not require to add additives.

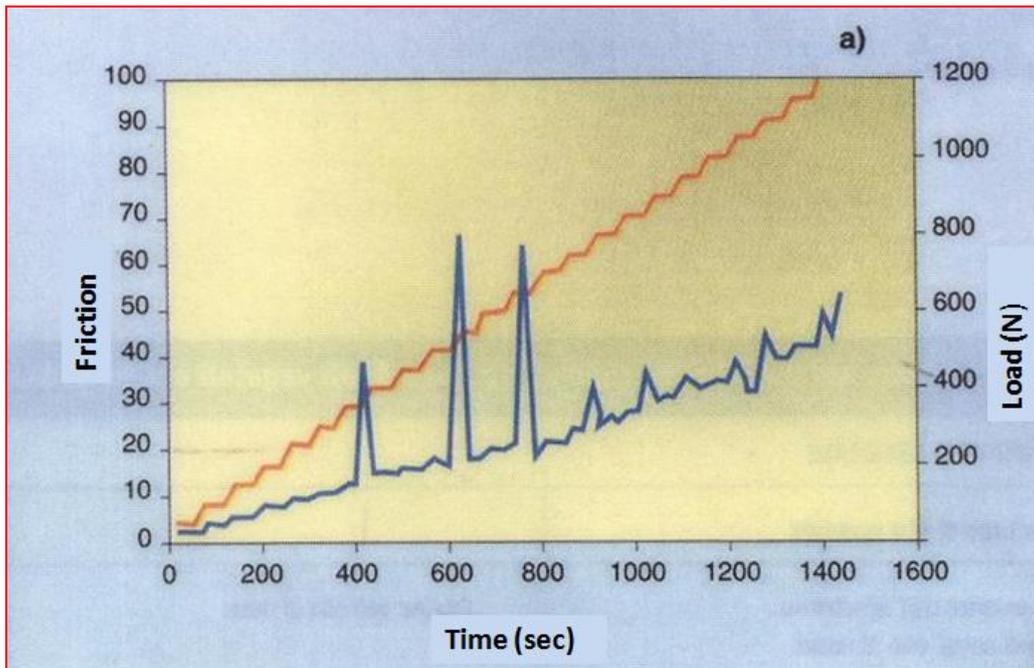


Figure N°2- Peaks of friction caused by the breakage of the film of lubricant

In figure N°2 you can see a diagram that shows how a mineral-based oil, with the increase of the load, presents points of discontinuity in which the lubricant film is broken causing the peaks of friction.

The red curve represents the theoretical friction without lubricant, while the blue one is the friction with lubricant admixed with 3% EP additives.

In the figure N°3 instead are represented the same diagrams but with lubrication performed with synthetic esters (Vascomill CSF35). It can be observed that there are no peaks of friction as the lubricant film does not break due to polar molecules naturally present in it.

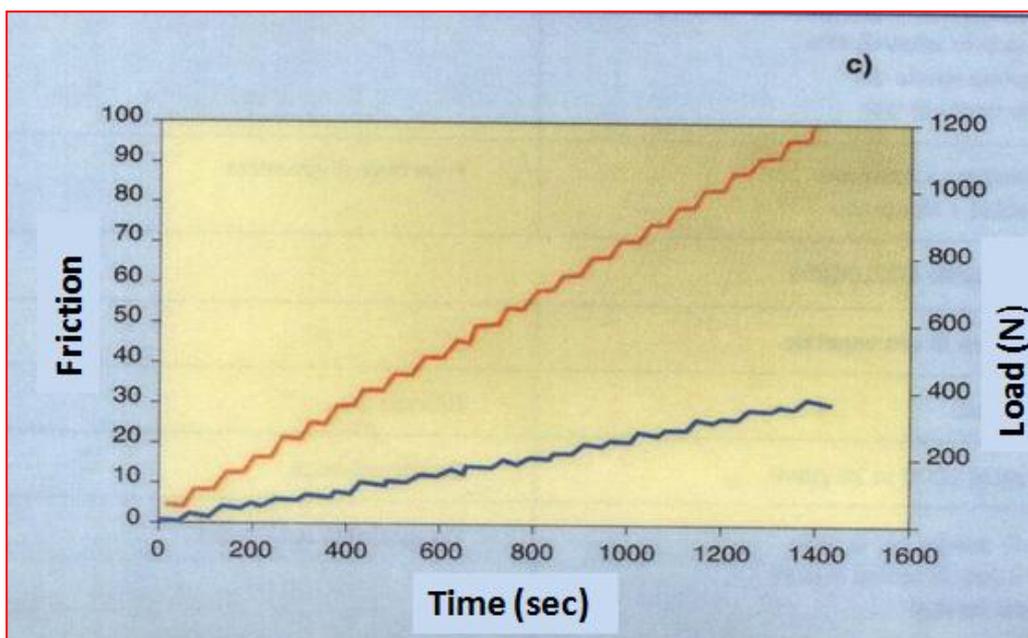


Figure N°3- Absence of peaks of friction with the use of synthetic esters