TEKTOR
DRY FILM LUBRICANTS

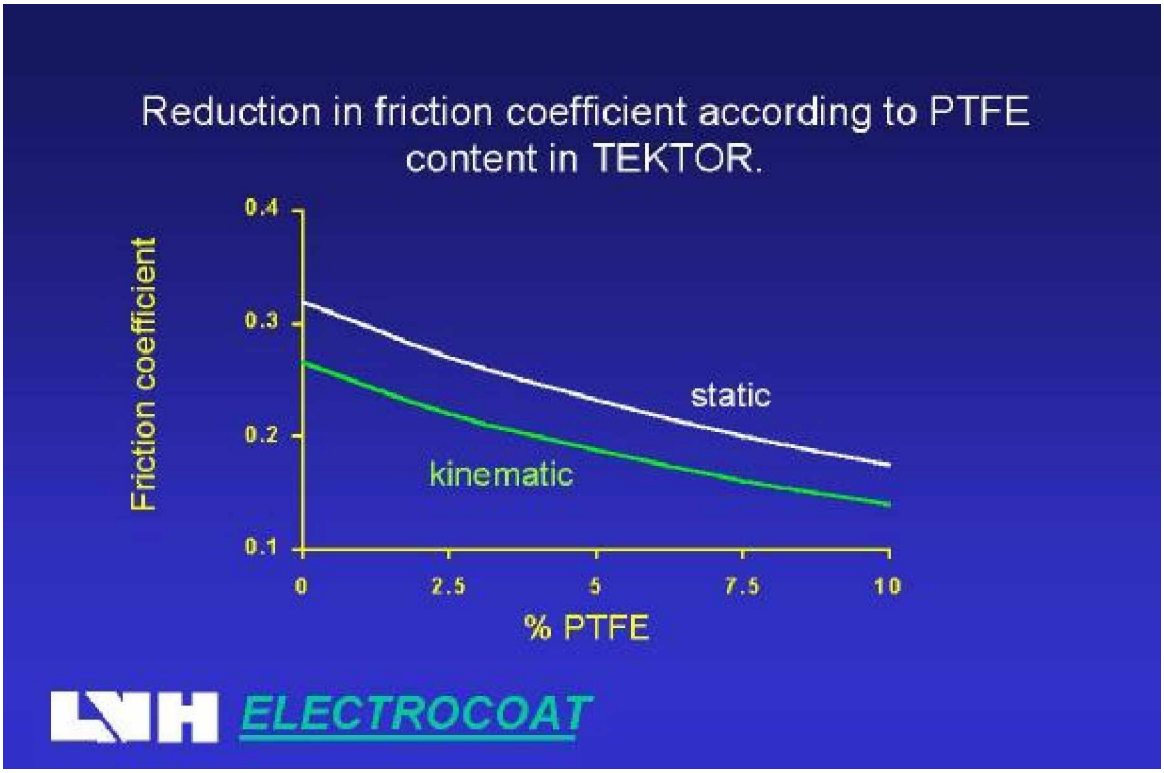
Electropaints and Dry Film Lubricants

The electrocoating, E-coat, method of applying paint is very suitable for parts where close tolerances are required to allow assembly and functioning of mechanical systems. It applies a coating of very consistent and controllable thickness and is able to coat fine structures without bridging or filling in. The Tektor family of E-coat lacquers has the added advantage of increasing lubricity and wear resistance of these coatings through the uses of dry film lubricants.

When you consider the attributes of a coating with these materials, there are two keywords:

- Friction
- Wear

Friction is defined in common language as “rubbing” or as “resistance”. For our purposes, we measure the coefficient of friction. This gives us a number, the lower the better. The chart below shows the relative reduction in the coefficient of friction of a TEKTOR coating as a function of the PTFE content.



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There are two types of friction – static and sliding (or dynamic). Static friction is the resistive force between two contact surfaces without any movement. Sliding or dynamic/kinematic friction is the resistive force during movement.

This is important for many applications where there is reciprocating movement – i.e. a repeated advance, stop & return motion. During motion, frictional forces are generally lower than when at rest. This is commonly experienced as a greater difficulty in "getting something going" than "keeping it going".

Wear is the removal of material from a surface. We want to distinguish this from *abrasion* in this context. For our purposes, abrasion means removal by "Gouging" or scratching of a surface by another, which is "rough". Wear means the reduction in thickness of "smooth" surfaces in moving contact with one another by frictional forces.

These are important distinctions because they define the applications for TEKTOR. For example, it is possible to reduce the coefficient of friction of ClearClad without improving wear resistance. Adding "slip aids" to ClearClad products give a reduction in friction by concentrating modified silicones on the coating surface. These act only as surface lubricants. There is no depth in their action and once "worn away" they offer no persistent benefit.

Reducing friction *enables* wear resistance – it does not guarantee it.

How does the TEKTOR concept work?

TEKTOR involves filling the coating with particles of various dry lubricants. These include PTFE, molybdenum disulfide (MOS2) and boron nitride (BN). These will be distributed through the cured coating as well as being at the surface.

This means that surface friction is permanently reduced while the coating remains in place. As the coating is worn, there is fresh lubricant available to lower friction and reduce wear.

The choice of dry lubricant can determine secondary properties such as color. PTFE is effectively colorless, but has a small degree of opacity. MOS2 is effectively dark grey/black. BN is white. Accordingly, truly transparent TEKTOR coatings are not practical. Light and/or bright colors are possible with PTFE and/or BN. Dark colors might be able to incorporate some MOS2.

The presence of MOS2 and/or BN increases real hardness as well as reducing friction/increasing wear. In addition, these mineral lubricants are better for high temperature applications. PTFE can break down at higher temperatures
The wear rate of TEKTOR coatings is limited by the very presence of the dry lubricant. However, reducing the wear rate further to extend the useful life of the part

can be achieved by incorporating a reinforcing material. For example, assume we have selected PTFE for the lubricating material but this is relatively soft and although it resists “rubbing” wear very well, it is not very resistant to “abrasive” wear.

Incorporation of hard ceramic particles into the coating alongside the PTFE enables an increase in resistance to abrasive wear without affecting the low friction properties given by the PTFE. The ceramic particles used are nano-sized – meaning they are less than 0.1-micron diameter. This makes the coating a “nano-composite” with hardness and abrasion resistance properties somewhere between a conventional resin-based paint and a ceramic.

The nano-particles also assist in controlling the gloss of the coating and are more stable during the electrocoat painting process. The result is a low friction durable coating process.

Note: TEKTOR is a trademark of LVH Coatings, Ltd.

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