**American Chemical Technologies**
485 E. Van Riper Rd
Fowlerville, MI 48836
(517) 223-0300 Fax: (517) 223-1703

## Resistivity and EHC Hydraulic Fluids

**Resistivity**: *Electrical resistivity (also known as specific electrical resistance) is a measure of how strongly a material opposes the flow of electric current. A low resistivity indicates a material that readily allows the movement of electrical charge. The SI unit of electrical resistivity is the ohm meter.*

**Dielectric Strength**: *It measures the resistance of a fluid, known as its dielectric strength, to an electric arc passing through it. The minimum voltage when this occurs is the breakdown voltage under prescribed conditions.*

Phosphate ester EHC fluids exhibit poor hydrolytic stability, which is the tendency of a fluid to resist chemical reaction with water. It is the most common form of degradation and the one that frequently dictates the fluids life. The hydrolysis reaction is not rapid at ambient temperatures but accelerates with increasing temperatures and is catalyzed by the presence of strong acids. Since the hydrolysis by-product of phosphate ester fluids is phosphoric acid, the reaction is said to be "autocatalytic". This is the reason for the "neutralization" filter loop on all EHC HPU's. If the acid-top-acid chain reaction is not broken, the fluid would spiral to death. It should also be noted that metals such as copper, some copper alloys and lead act as pro-oxidation catalysts, which, at elevated temperatures in the presence of water, will accelerate hydrolysis of phosphate ester fluids.

Resistivity is being used as a "condemning indicator" for phosphate ester fluids. These same contaminants and oxidation by-products are what change the resistivity of phosphate ester fluids. The water, acid and metals become the conductors. Thus a reduction in resistivity (from new fluid) gives an indication as to the extent of oxidation the fluid has seen. The "condemning limit" (lowest allowable resistivity) is really an indication that there is so much oxidation compounds in the fluid that the system should be changed and filled with new fluid. This "condemnation by resistivity" is just another way of saying that the acid has built up to the point where chemical erosion will start to occur. At this point in a phosphate ester system, any corrosion is not from electrical erosion, rather from chemical (acid) corrosion.

By contrast, EcoSafe® EHC is much more stable and not subject to the hydrolytic stability problems that a phosphate ester fluid is subject to. In addition to being more stable, the degradation products of EcoSafe® EHC are weak organic acids, which are less aggressive toward the hydraulic system. EcoSafe® EHC also contains corrosion inhibitors that are effective in protecting the system from corrosion at least to a Total Acid Number (TAN) of 2.0. For this reason, TAN is a much simpler test to perform in order to monitor the aging of the fluid.