Technical Bulletin

Characteristics of Metalworking Fluids – Alkalinity

Alkalinity or AT is a measure of the ability of a solution to neutralize acid or the ability of a fluid to maintain its pH above a specific value. You will sometimes hear it defined as the "buffering" capacity of a fluid. It is sometimes useful to think of pH as being the strength of the system and alkalinity as being the stamina of the system, or if you prefer, pH is to alkalinity as °F is to BTU or °C is to kilocalorie. What we want in the MWF environment is to have a pH in a specific range or above a specific value. Alkalinity tells you how long it will be able to maintain the pH or pH range.

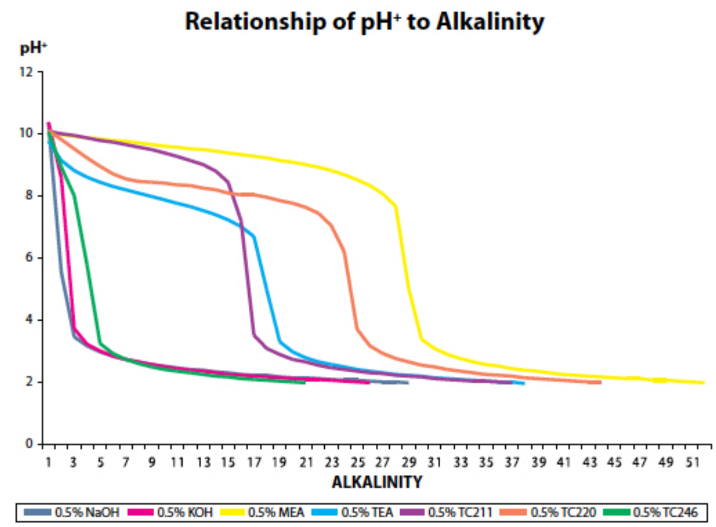
In different situations, different acids will be used as the titrant. The unit of measure and the end point will be different. In the Master Fluid Solutions' laboratory we titrate using reagent grade hydrochloric acid (HCl) using an automatic digital titrator and report our results as digits, but the principle remains the same. Depending on the reason for doing the titration we titrate to different end points. Each end point has a different name. Alkalinity is the volume of a selected acid at a selected concentration to depress the pH of a system to some agreed upon point. Thus when you are trying to use alkalinity numbers it is critical to insure the alkalinity numbers that are being compared were generated using the same analytical technique and method.

There are a wide variety of things used to raise pH and "build reserve useful alkalinity" tank side (alkalinity that is at a pH that is useable in the specific system) in metalworking fluid systems. The 'relationship of pH^+ to Alkalinity' chart compares some typical "raw materials" and formulated products that are often used tank side to raise pH and build reserve alkalinity.

The key point here is that if the pH is raised to approximately 10.5 by chemistry like NaOH or KOH, there is very little to keep the fluid at this working pH. With other chemistry, it may cost more to raise the pH to the desired point but it is more likely to stay there for an extended period of time.

Note:

1. 0.5% (volume percent) is a fairly typical add rate when attempting to raise pH and build alkalinity.



Comparison of some typical "raw materials" and formulated products that are often used tank side to raise pH and build reserve alkalinity.