

Concentration Control of Washing Compounds by Conductivity

The ability to accurately measure and control the concentration of any metalworking fluid (MWF) is critical to the success of both the fluids management program as a whole, and the specific operation.

Nowhere is the capability to measure and control concentration more critical than when dealing with water miscible parts cleaning operations. There is pressure on the system from the dirt that you are washing off, the carryoff on the cleaned parts, as well as the evaporation caused by heated bath.

Unlike water miscible coolant and rust preventatives where there is typically very little heat present; in parts washing, whole tanks are heated and then maintained at the elevated temperature for extended periods of time. In these situations the heat will tend to “drive off” some of the chemistry present in the bath as well as large quantities of the water. For these and other reasons the concentration of parts washing baths is always dynamic and therefore in need of continuous monitoring and frequent adjustments.

While titration is the preferred method of checking washing fluid concentration both in the lab and tank side, conductivity comes in a very close second. Note: it would not be advisable to try and run a system with concentration control based on conductivity readings only; however, it can be done using titration alone. Conductivity provides a very effective cross check in the laboratory and on the shop floor. Many parts washing systems use conductivity meters to constantly measure and adjust the concentration in a bath.

Titration is considered more accurate than conductivity because it directly measures one of the key constituents of the washing compound, e.g. the alkaline “builder” system. Over time hard water salts and other metal ions will affect the conductivity of a fluid and thus the accuracy of the reading will be affected. Because of this tendency of the conductivity to shift over time it is most often used as a method of “controlling concentration” rather than measuring it.

When automated systems, based on conductivity, are used to control concentration it is good practice to periodically check concentration by titration in the lab and then adjust the conductivity meter for the affect of mineral build up in the fluid.

On a practical basis the only time that concentration by conductivity, refractive index, and titration agree is when the parts washing system is freshly charged.



NOTES:

1. Micro-mhos (μm) and micro-Siemens (μS) are the “English” and Metric terms respectively for 1/1000 of an Ohm.



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2. Other TRIM® Technical Bulletins deal with concentration control in general and checking concentration by titration.
3. Laboratory test protocols for TRIM brand cleaners are available from the Master Fluid Solutions laboratory.