



TROUBLESHOOTING THE MOST COMMON PROBLEMS IN METALWORKING FLUIDS

Ferrous corrosion & rust



Corrosion or rust as it is commonly known, is an electrochemical reaction between a metal surface and its environment. Corrosion is a costly problem in the job shop, resulting in rework, scrap, downtime, and reduced machine tool life. All metalworking fluids offer some degree of in-process corrosion protection to the workpiece, the tooling and the machine tool components themselves. The degree of protection, however, can vary widely among different products and product types. When corrosion occurs in a machine shop, many factors must be analyzed to determine the root cause and subsequent corrective action.

Concentration

The concentration of your metalworking fluid is the first item to investigate. For most metalworking fluids, low concentrations are those generally below 4%. If concentration is lean, simply add sufficient concentrate to bring the system within the recommended range.

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Hardness

If the concentration is acceptable, next check for dissolved minerals and ions in the solution. Pitting is the most common type of corrosion when metalworking fluids contain excessive minerals and ions. These minerals and ions usually come from the makeup water used for dilution and because they do not evaporate the result is a gradual buildup of water hardness and ions. Check the hardness, a level greater than 25 grains per gallon significantly increases the potential for corrosion. In addition to water hardness, chloride also increases the potential for corrosion. Laboratory tests show that corrosion becomes increasingly likely when chlorides are above 300 ppm.

pH

If the concentration and mineral levels are acceptable, check the fluid's pH. Most metalworking fluids are designed to have a pH of 8.0 to 9.5, partially to assist in corrosion protection. A fluid pH below the recommended range can be caused by several factors, including lean concentration, the presence of bacteria and contamination.

Metal particulate

If concentration, mineral levels and pH are all acceptable, check for high levels of metal particulate in suspension, or a fluid reservoir full of chips and swarf. Re-circulating metal fines in solution, and subsequently depositing these fines on a freshly machined metal surface, typically results in pitting corrosion. These fines increase the amount of metal-to-metal contact, trap moisture on the metal surface and interfere with the metalworking fluid's ability to form a uniform corrosion protective layer.

Finally, if none of the above situations apply, inspect the storage and operating conditions of the facility. Wet parts in contact with one another and hot, humid atmospheric conditions as an example, will increase the likelihood of corrosion.

Corrosion issues are often the most difficult and costly problems to resolve. Many shops dump and replace their metalworking fluids regularly to solve the problem, only to have corrosion re-emerge several months later. Utilizing the approach above can help identify the root cause of corrosion, and eliminate the problem permanently.