

## Experiencing rusting on machine surfaces and tools.

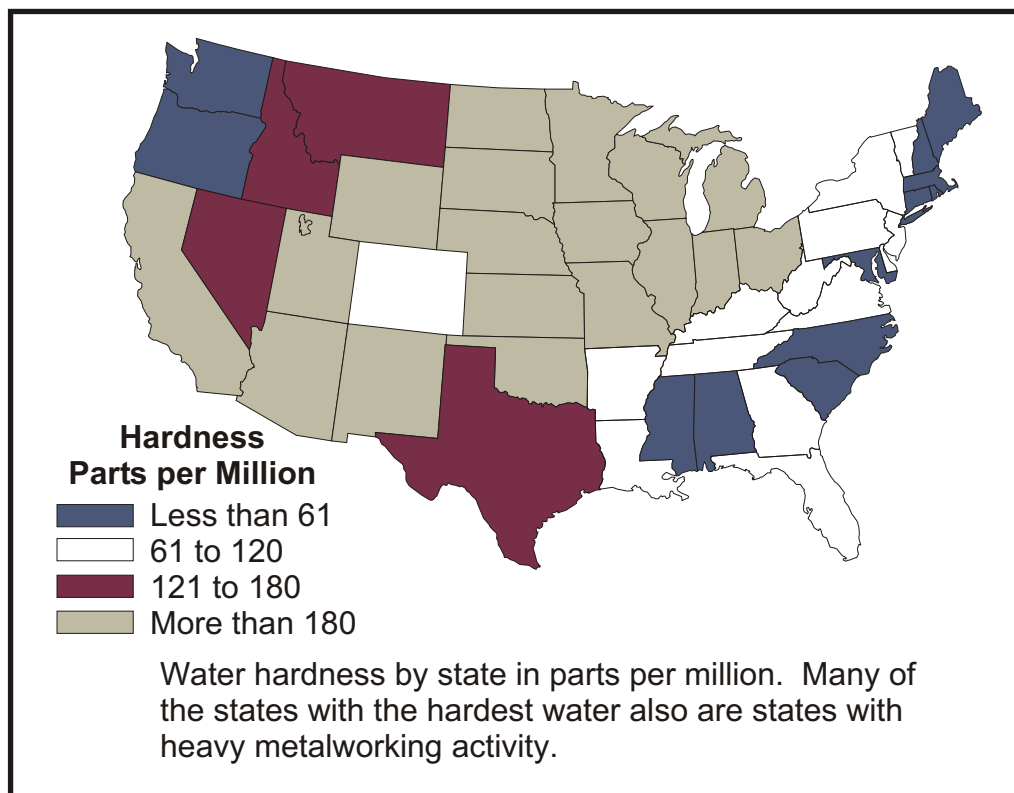
One role of metal working fluids is to resist and control rust. However, several factors can prevent the metalworking fluid from doing so. If rust is prevalent on machine surfaces and/or tools, it could be caused by one or more of the following factors; improper dilution, water condition, bacterial contamination, contaminating fluids, and/or metal being machined. In order to control rust, these factors need to be controlled or eliminated.

### **Improper dilution**

Weak concentrations will negate the effects of a rust inhibitor. To prevent weak dilutions, concentration levels should be checked at least once a week with a refractometer. The refractive index can be obtained by the supplier of the metalworking fluid. Concentrate should be added when needed based on refractive index.

### **Water conditions**

Water hardness is a big factor in the performance of the metalworking fluid. Water that is too hard will deplete the rust inhibitor. When hard water is used, minerals are left behind as the water evaporates. The evaporation increases the concentration of the coolant. To make up for evaporation loss, more water is added to the coolant with additional minerals. This makes the mineral level in the coolant much higher than the original mixture. Hard water above 10 grain hardness (170 PPM) is very destructive to a metalworking fluid. Water purity of less than 1 grain hardness (15 PPM) is ideal. A sample of water supply should be tested for hardness before mixing with a metalworking fluid. If water is hard it is suggested to use distilled or deionized water. Deionization, using ion-exchange resins, is one of the most effective and widely used ways to remove minerals from the water before it is mixed with the coolant concentrate. Deionizing units are generally connected to a shop's water supply between the source of the water and the point at which the water is used. Deionization removes all dissolved solids, leaving the treated water almost as mineral-free as distilled water.



## ***Contaminating fluids***

Contaminating fluids are tramp oils that enter into the metalworking fluid. Tramp oils are hydraulic oils, spindle oils, gear lube, way lube, rail lube, oil coated on raw material, cleaner, or any other contaminant that the metalworking fluid can collect during use. Tramp oils can be easily noticed because they coat the surface of the metalworking fluid. When tramp oils exist, they start to react with the water to form an acid. This acid starts to deplete the metalworking fluid and any additives in it, including the rust inhibitor. To prevent tramp oils, leaks should be detected and fixed immediately and installation of a continuous tramp oil separating system is recommended. Regular cleaning of the sump should be done to prevent bacterial growth due to tramp oils.

## ***Bacterial contamination***

A sump full of dirty oil, tramp oils, and chips help bacteria to grow. The bacteria produces corrosive acids and salts, which could damage machinery and workpieces, besides depleting the metalworking fluid itself. Bacteria can be eliminated if sumps are kept clean on a regular basis, chips are removed from the coolant with a good filtration system, and tramp oils are eliminated. Bactericides may be added to the coolant to retard the growth of bacteria. However, if bacteria is prevalent, the coolant is already weak and adding a bactericide will only weaken the coolant more.

## ***Metal being machined***

Most metalworking fluids have a negative charge. When some metals are in a machining state they create a positive charge. The reaction between the two will cause a breakdown in additives in a metalworking fluid such as; emulsion stability, wetting ability, and rust preventives. Problematic metals include cast or ductile iron or magnesium. These metals create a positive charge and may react with the metalworking fluid. Before machining these types of metals, verify that the metalworking fluid being used is compatible with these metals.

