CORRGUARD®-95

The Key Building Block for Low Cobalt-Leaching Metalworking Fluids

Cemented tungsten-carbide tooling is widely used for the machining of hard metals. The “cement” which holds the tool together is a cobalt binder. If the metalworking fluid (MWF) used by the carbide tool manufacturer dissolves cobalt, the following problems may occur:

- Dermatitis in workers handling fluids containing dissolved cobalt
- Inhalation of coolant mist containing dissolved cobalt
- Waste disposal problems due to cobalt content in used fluids

One way of controlling cobalt leaching is to include inhibitors, such as triazoles, in the metalworking fluid formula. While this approach is effective initially, the inhibitor can be depleted as the fluid is used, necessitating possible tank-side inhibitor treatment. This is inconvenient and can increase operating costs.

The best solution is to build a fluid formulation that does not leach cobalt. One of the major culprits contributing to cobalt leaching in metalworking fluids can be amino alcohols. However, these products vary widely in their tendency to leach cobalt. Studies in the research laboratories of ANGUS Chemical Company have shown that there is minimal leaching of cobalt demonstrated with CORRGUARD®-95 Amino Alcohol, and it is an excellent commercial amine for use in metalworking fluids.
Cobalt-leaching results for 1% aqueous solutions of commonly used amino alcohols are shown in Figure 1. The solutions were circulated for five days with carbide swarf obtained from a tool manufacturer; this test has given good correlation with field results. The final solutions were filtered and analyzed for dissolved cobalt by atomic absorption. The CORRGAURD-95 solution leached only slightly more cobalt than deionized water with no amine. The solutions of monoethanolamine (MEA), mixed isopropanolamines (Mixed IPAs), and triethanolamine (TEA-99) leached significantly more cobalt than the CORRGAURD-95 solution.

Building a metalworking fluid formulation with CORRGAURD-95 Amino Alcohol as the sole amino alcohol results in a fluid which inherently leaches minimal cobalt. A commercial synthetic fluid was tested to compare the cobalt-leaching properties of the standard fluid with an identical fluid containing only CORRGAURD-95. The results are shown in Figure 2. The "standard" fluid contained Mixed IPAs and diethanolamine (DEA). When the IPAs were replaced with CORRGAURD-95, cobalt leaching was reduced by 100 ppm. When both IPAs and DEA were replaced with CORRGAURD-95, cobalt leaching was further reduced.

The amino alcohol of choice for building low cobalt-leaching metalworking fluids is CORRGAURD-95. In addition to low cobalt leaching, CORRGAURD-95 provides the following performance benefits for all types of water-dilutable metalworking fluids:

- Efficient pH development and neutralization of acidic ingredients
- Enhanced performance of triazine biocides
- Stable soluble-oil emulsions at higher pH levels
- Low foam in soluble oils
- Minimal ammonia release
- Control of formaldehyde release (e.g. from other fluids containing triazine biocide)

**Product Stewardship**

ANGUS encourages its customers to review their applications of ANGUS products from the standpoint of human health and environmental quality. To help ensure that ANGUS products are not used in ways for which they are not intended, ANGUS personnel will assist customers in dealing with environmental and product safety considerations. For assistance, product Safety Data Sheets, or other information, please contact your ANGUS representative at the numbers provided in this document. When considering the use of any ANGUS product in a particular application, review the latest Safety Data Sheet to ensure that the intended use is within the scope of approved uses and can be accomplished safely. Before handling any of the products, obtain available product safety information including the Safety Data Sheet(s) and take the necessary steps to ensure safety of use.