

CIMCOOL[®]

Technical Report

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RESIDUE

The dictionary defines residue as something that is left behind. In the application of metalworking fluids two basic kinds of residue can develop which we refer to as insoluble deposits and product residues.

If a metalworking fluid undergoes chemical changes or picks up contaminants, insoluble deposits are likely to occur. Such deposits, called residue, can plate out on hard surfaces in direct contact with the circulating fluid. The presence of tramp oil, rust preventatives and insoluble soaps due to water hardness or dissolved metals (such as iron or aluminum) lead to this type of residue which may contain or attract very fine metal or graphite particles. These deposits, sometimes referred to as "varnish" because of appearance and texture, can interfere with production if they build up on tools, chucks, fixtures, gauges and transfer equipment. They also contribute to "dirty" machine tools.

Not all residues are insoluble. If any fluid splashes on hot motor housings, flat surfaces or guard shields, the water can evaporate and leave concentrated metalworking fluid. Although the amount of product residue formed by evaporation should be a direct function of product concentration, this amount is significantly affected by the kind of fluid, the presence of additives and contaminants, the machine tool design and shielding, the amount of fluid spray generated, and the "housekeeping" practices employed.

Product concentration, oil contamination, water hardness, and relative humidity are key factors in defining the nature and amount of residue obtained when the metalworking fluid evaporates. In addition to this, used mixes can be expected to contain a significant buildup of salts introduced from the water used for makeup.

Wintertime introduces two factors, which promote residue problems. Cold process water generates more hard water soap scum formation. Low relative humidity promotes more rapid evaporation of water, causing mixes to become richer and making evaporated residues drier. Thus, decreasing humidity, increasing water hardness or increasing inorganic salt content will change a semi-liquid residue to a sticky residue, or a sticky residue to a dry residue.

Since deposits in the fluid flow area or the splash area contain metal chips, it is probable that we are dealing with two separate problems. This may require different

approaches to resolve inadequate "washing" action by the flowing liquid or tackiness of the evaporated residue, which attracts the chips to the splash area.

Another situation that arises is extended sump life. New technology in metalworking fluids often results in (to the benefit of the end user) longer sump life. Longer sump life, while conducive to good economy, also allows fluids to become more contaminated with hard water minerals as well as other contaminants. A fluid that lasts for thirty days when discarded will carry less contaminant than a fluid lasting for sixty to ninety days. These longer lasting fluids can now become problematic with regard to cleanliness.

For this reason, the end user may consider using deionized (D.I.) or reverse osmosis treated (R.O.) water to minimize the buildup of mineral salts that contribute significantly to residue. Even good quality water will begin to create hard water conditions over time. Another alternative is to use dilute premix daily to top machines. Premix adds many of the components that are depleted through normal aging. Components such as water conditioners and detergents added in small amounts through premix can minimize the problem of dirty residues left on parts and equipment.

A final note on residue is its contribution to skin irritation. Residue consists of highly concentrated fluid and contaminants. Handling parts or fixtures with these residues can contribute to dermatitis (skin irritation). For this reason, we encourage regular flushing of machines with used coolant to wash off any residues. This minimizes the amount of residue that can accumulate.

In most cases following the above corrective actions can control residue. It is also encouraged to contact your local fluid supplier to help determine the specific cause of residues and any other fluid related issues.

"Residue"