EMULSION CLEANERS

Emulsion cleaners are usually made up of a combination of solvents and/or oils, rust inhibiting type chemicals such as petroleum sulfonates, crude soaps, vegetable oils, and/or synthetic detergents. The amount of soap or synthetic detergent included in the formulation will usually be carefully calculated to “couple” the oils and solvents with water in a milky white dispersion by reducing the interfacial tension between the water and the oil. In many respects an emulsion cleaner can be likened to the so called soluble oils.

Emulsion cleaners are usually not titratable. If they contain any alkalinity at all it is usually only to the extent needed to form a crude soap in the product, which means these emulsions might be in the pH range of 7.0 to 9.0.

The primary purpose of an emulsion cleaner is to treat metal parts, leaving a light rustproof oil film to protect them in storage or between manufacturing operations. It is intended only secondarily as a cleaner, usually to remove metal chips in milling and drilling. In certain specialized operations emulsion cleaners are formulated with high solvency products especially for removing buffing compounds prior to plating. In the same manner as the soap-detergent cleaner, the emulsion cleaner is frequently intended to condition soil for more rapid removal in a second step alkaline cleaner.

Since emulsion cleaners have no peptizing or sequestering value they must depend on solvency and on emulsification of oils and greases to prevent them from redepositing on the work. Therefore, because of the nature by which they work they become quickly contaminated, resulting in a short bath life. Also, their lack of water softening ability allows scale to form on equipment making later maintenance further complicated by the redeposition and intermingling of oily residues and soils with the scale.

The oily film left on the work can be objectionable especially when parts must be later handled by workers in assembly operations. This oil film can also cause problems when delicate gauging operations are required after cleaning. Finally, the degree to which the emulsion cleaner is emulsified in water can have a far reaching effect on rustproofing and cleaning. The proper balance is easily upset by contaminants, evaporation of solvents through overheating, and prolonged use of the bath. Since solvents will usually evaporate as fast as the water, loss of the cleaning portion of the formula can be relatively rapid.

STRAIGHT SOLVENTS & DI-PHASE SOLVENTS

In cleaning before plating, solvents are necessary because a soil may be so unusual and difficult to remove that the only way to remove it is by dissolving it. In the most severe cases straight solvents may be used either in soak or spray applications.

There is a limitation here. The life of the solvent is often very brief, since the oils and greases become dissolved in the solvents and as they build up they become part of the whole instead of being in suspension. Furthermore, straight solvents are costly to use because they are not diluted with water. Although kerosene and naphtha spirits were once in common use they have been largely supplanted due to their very low flash points which make them dangerous substances in the workplace, being flammable and explosive. They are also labeled as health hazards in that continuous or prolonged breathing of their vapors can cause irreparable damage to the kidney and liver.

The so-called safety solvents, the chlorinated hydrocarbons of which perchloroethylene is an example, though not flammable and therefore not explosive, still present a problem in that they are even more of a health hazard due to the high toxicity of their vapors.

A refinement of solvent cleaning is the class known as “di-phase” solvents. In this manner of cleaning the majority of the solvent floats on the water surface and it contains just enough coupling or wetting agent to only momentarily form a loose dispersion of solvent and soil in the water portion. This tends to rid the solvent of contamination build-up. In soak tanks, parts will pass through the solvent phase into the water phase beneath in which some slight cleaning also takes place due to the partial and loose dispersion.

The disadvantages of di-phase cleaning are related to rapid equipment scaling, fire hazard, and difficulty in controlling the baths. It will be readily obvious that the balance of the proper dispersion of solvent and water can be easily upset by minor variations in water hardness, temperature, types and amounts of soils, and equipment maintenance. As in all solvent and emulsion cleaning, the solvents will evaporate in most cases as fast as the water which means fairly rapid loss of the cleaning ingredients, resulting in higher costs and difficulties in maintaining optimum performance.

Next month: Rustproofing.