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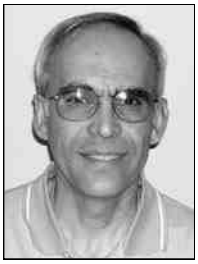

Diffusing the Confusion in Terminology

Words or terms can at times generate loose terminology that may incorrectly define a specific activity or condition. This could relate to a descriptive or conditional situation. Or, sometimes confusion may result, such as how the words qualitative and quantitative are used. Other examples may include: bind versus bond, strip versus remove, empty versus purge, wet versus hydrate, along with many other mixed terminology examples. In our industry, we do experience similar terminology twists. These can confuse meaning, intent and perhaps how appropriate work or corrective action is applied. Let us consider some chemical descriptive terminology, and the importance of waste treatment.

Chelating agent

The chelating agent is typically an organic acid having more than one very active bonding site. Some of the commonly referred to chelating agents as used in metal finishing include: EDTA (ethylenediaminetetraacetic sodium salt), NTA (nitrilotriacetic acid) and cyanides (salts of sodium and potassium). From a pure chemistry perspective, the chelating agent strongly attracts metal ions, involving the inner orbital electrons. The resulting complexes are very strong and stable, due to corresponding affinities for electronic stability. In layman's terms, the chelating agent acts as a strong bear trap, tightly holding on to a soluble metal. These chelating agents typically can be found in mass finishing compounds, metal strippers, cleaners, plating salts and additives. Their effects range from softening hard water, derusting and descaling, inhibiting chemical attack on sensitive metals, complexing metals in cyanide-based plating solutions and stabilizers in electroless plating.

Although essential to metal finishing processes, the presence of chelating agents can play havoc in waste treatment systems. The chelate-to-metal bond is very stable, even over a wide range of solution pH. Over the years, effluent discharge limitations have become progressively tighter. Very low parts per million (ppm) levels for most heavy metals are the norm. These tight chelate-to-metal bonds can be readily broken by the addition of metal precipitants. Examples of these treatment agents are the sulfides and polysulfides. Their effect is to split the chelate-to-metal bond chemically, forming the insoluble metal sulfide precipitate. This is the accepted procedure to convert soluble metals to their insoluble species. Metal precipitants are very essential in optimizing waste water treatment.

Complexing agents

These are organic compounds that also bond to metal ions. But they do so by the affinity for outer electrons. This accounts for the somewhat weaker stability of the bond to metals as compared to the previously discussed chelates. Some complexing agents include: citric acid, tartaric acid, gluconates, functional amines and certain phosphates. These chemical complexes are somewhat affected by solution pH and concentration. Applications in metal finishing include mass finishing, passivation of stainless steel, surface preparation (cleaning and activation) and plating additives. Their effects range from hard surface cleaning, descaling and derusting, water softening, plating bath purification, inhibiting attack on sensitive metals and anti corrosion action.

Complexed metals, if not treated properly, will also pose a big problem in waste water treatment. However, just as with metal chelate bonds, the addition of metal precipitants is very effective in breaking bonds in metal to complexing agents.

Complexing and deflocculating agents

These compounds may form complexes or suspend solid particles. Such particles can be rust, smuts or precipitated metal hydroxides. Examples of the compounds are gluconic acid, glycolic acid, complex sugars and colloidal materials such as glues and gelatins. Complexes are formed at high pH (over 11) and higher concentrations. Deflocculation is favored at lower concentrations. Complexers and deflocculating agents tend to slow the settling of precipitated solids in waste treatment. Organic polymers and inorganic salts are typically used to overcome this problem. This type of additive, combining both agents is referred to as a coagulant. In a standard waste treatment system coagulants are already commonplace. These additives destabilize colloidal suspensions and neutralize charges, allowing metal hydroxide particles to begin rapidly settling.

As a final step in waste treatment, flocculants are added after the coagulation step. The flocculant is a polymer. Its effectiveness is in bridging the unstable colloidal particles. By forming agglomerated larger species, the particles will tend to settle quickly, clarifying the treated water. Flocculants vary in molecular weight and charge densities, for optimum application to specific waste water treatment needs.

Years ago, chelates were first applied in electrocleaning to descale steel. To reduce formula cost and reduce the demand in waste treatment, complexers and deflocculants were introduced to take the place of chelates. Due to terminology being misused, complexers and deflocculants were termed as chelates, when they are actually not. In this regard, it is important to understand that all chelating agents are complexers, but that not all complexers are chelating agents. Consequently a cleaner may be referred to as a chelating type, when in effect it may not be. Be certain of the products being used by consulting your supplier and accompanying data sheets (MSDS). It will not only clarify what is being used and how, but ease the burden on the critical waste water treatment process. *P&SF*