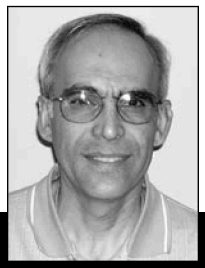
Plating & Surface Finishing

Finishers' Think Tank
Waste Water Treatments: Some Basic Facts



Stephen F. Rudy, CEF
Hubbard-Hall Inc.
563 South Leonard Street

sfrudy@optonline.net

[redacted]

r membrane
erations select
ss waters in
s have in place a
process the water
nder a set of
g procedures.
on consists of the

ollects in an
ank. Various
waste waters are
thoroughly mixed, producing a uniform mixture ready for subsequent treatment.

2. pH adjustment and a coagulant are introduced to initiate metal precipitation. This initiates charge neutralization, destabilizing the colloid and conditioning precipitants to settle densely.
3. A polymer is introduced to agglomerate solid metal hydroxides into larger particles, thereby accelerating settling.
4. Treated water passes through a clarifier, further settling solids.
5. Processed water may pass through a carbon filter or similar unit, such as a sand filter. This step polishes the water to excellent clarity.
6. Collected, thickened sludge passes through a dewatering press.

Some treatment systems may have additional steps, needed to accommodate additional requirements. One is the two-step cyanide oxidation using sodium hypochlorite (bleach). Another is sodium metabisulfite or ferrous sulfate reduction of hexavalent chromium.

The two-step cyanide oxidation is accomplished in two separate tanks. In the first tank, bleach and caustic

without fines or potential shutdown. Failure to meet regulations can lead to fines and the potential for shutdown that can be crippling to the operation. Some installations opt to have a certified waste hauler remove and properly treat their waste water. Others may operate without a sewer permit, whereas there is no discharge. This can incorporate use of a waste hauler or purification technology, such

(liquid sodium hydroxide) are added in a pH range of 10.0-11.5. In the second tank, additional bleach and caustic are added to maintain a pH of 8.0-8.5. Sufficient holding time is required, approximately 45 minutes to complete each of the two-step reactions. Completion of the second step results in the formation of nitrogen and carbon dioxide. Once the second step reaction is completed, this effluent can be combined with the previously segregated waste waters, for basic treatment, as described in steps 2-6, above.

Hexavalent chromium reduction is accomplished by solution pH adjustment to 2.0-2.5. Most commonly, sodium metabisulfite is the reducing agent. The reaction is monitored by the oxidation reduction potential (ORP). The reducing agent is metered in by an ORP probe that is interfaced to a dosing pump. The reduction of hexavalent chromium to trivalent chromium is complete when the stable ORP reading quickly drops. Once the second-step reaction is completed, this effluent can be combined with the previously segregated waste waters, for basic treatment, as described in steps 2-6, above.

Some metal finishing processes include chelated systems, such as electroless nickel, alkaline copper, descalers and burnishing. The problem occurs where these chelates are strongly chemically bound to metals. The conventional waste treatment process may have little or no effect on breaking these strong bonds. Precipitants are used with excellent effect to release metals, so they can be readily precipitated in the waste treatment system. Polysulfides and thiocarbamates are typically used in this step.

Due to the use of highly foaming baths in the metal finishing operation, foam can be an issue during waste treatment. Cleaners and mass finishing compounds are examples of highly foaming solutions. Defoamers, silicone or non-silicone types, are effectively used to knock down objectionable foam rapidly.

The waste treatment process, operating under proper conditions and steps, will effectively precipitate metals. These may also be referred to as heavy metals (*e.g.,* chromium, nickel, iron, copper, zinc, silver and tin). Earlier, we also mentioned two other water treatment technologies. One is Reverse Osmosis (RO). It incorporates selected membranes that are subject to certain pressures. The mechanism filters out dissolved solids and other contaminants, such as oils and grease. Maintenance service for the membranes is very important. The other process is Ion Exchange. Negative or positive ions are chemically switched for similarly charged particles. This reaction occurs in a column that is packed with resins or zeolites in large packed columns. Metal salts, acids and bases are removed in the columns. However, oils and grease are not. A regeneration cycle using caustic soda is used to regenerate the resins or zeolites. ***P&SF***

Answers to I.Q. Quiz #462
From Page 8.

1. Low - 1-4% P; Medium - 5-9% P; High - 10-13% P
2. n-dimethylamine borane, sodium borohydride, hydrazine (in alkaline E-Ni).
3. n-dimethylamine borane, sodium hypophosphite
4. cobalt, palladium, gold
5. c. Lead.