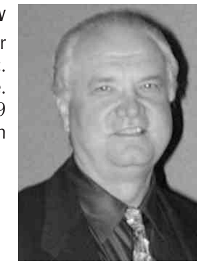
Frank Altmayer, MSF, AESF Fellow
AESF Technical Director
Scientific Control Laboratories, Inc.
3158 Kolin Ave.
Chicago, IL 60623-4889
E-mail: faltmayer@sclweb.com



A Batch of Trouble, Part 3: Wastewater Treatment Tips

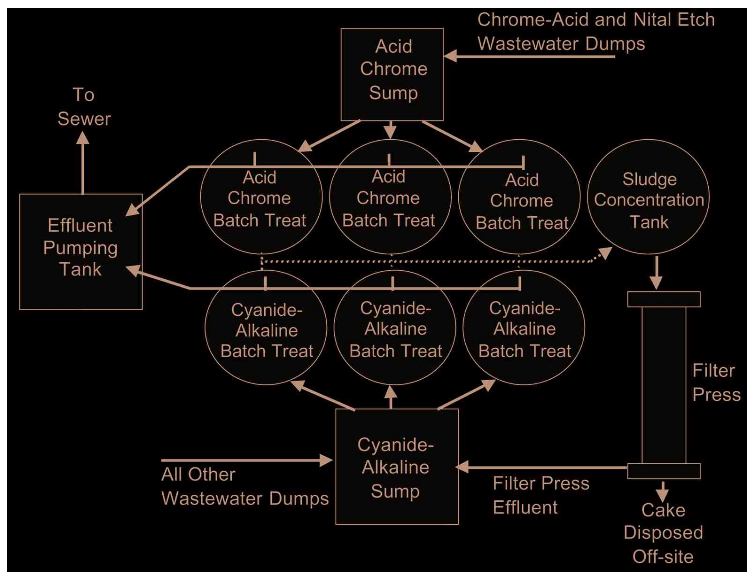
Finishing our response to Pressured and Recipe, let's take a peek at Recipe's treatment system:

Description of Existing Wastewater Treatment System

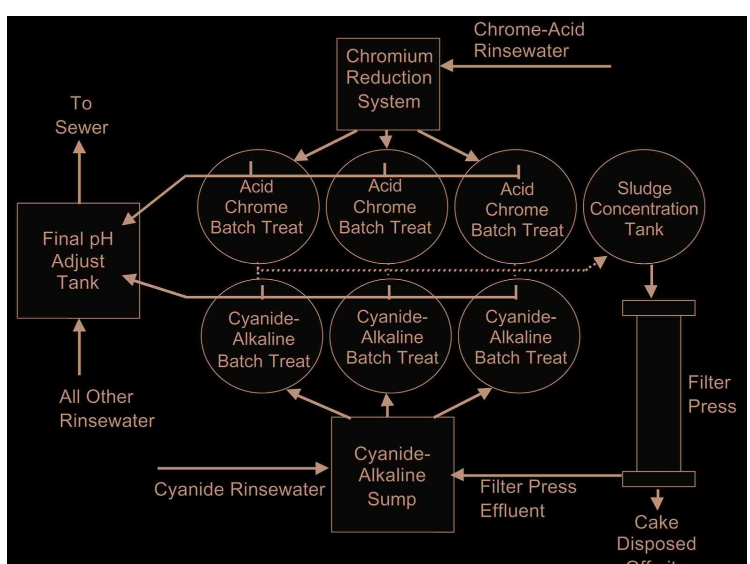
The existing wastewater treatment system is a batch treatment system employing six chemical reaction tanks—three for cyanide destruction and three for chromium reduction. The system also has a solids concentration tank and a filter press, along with all of the required chemical storage, chemical feed systems, and mixers. Following cyanide destruction and/or chromium reduction, the treated waste is adjusted for pH to render the metals as insoluble hydroxides. The wastewater is then allowed to settle to separate the effluent from the solids. A series of taps on the sides of the treatment tanks allows a portion of the clarified waste to be sent to the effluent pumping tank (an in-ground pit). The solids from each batch are transferred to the solids concentration tank. A five cubic foot filter press is used to concentrate the solids for eventual off-site disposal. The small amount of effluent from the filter press is returned to the cyanide-alkaline collection sump, and is re-routed through the batch treatment system.

Recommendations/Findings

1. Past experience with copper- and cadmium-containing effluents is that the highest level of insolubility is typically obtained at pH levels above 10. The installation of a final pH adjust system allows treatment of cadmium-bearing waste above a pH of 10 without pH violations at the discharge point.
2. The rinses on all process lines were stagnant and were periodically dumped by production personnel. Because the



Existing wastewater system (above) and proposed modifications (below).



rinses are stagnant, or because rinses are used on parts that are not well rinsed after cyanide plating operations, we found cyanide in many rinses that should be cyanide free. Elimination of some stagnant rinses and personnel training were required.

3. Dumping of stagnant rinses after days of operation resulted in very high concentrations of pollutants going to the waste treatment system. This made waste treatment to achieve low concentrations very difficult.

Each waste treatment unit operation has a treatment "efficiency" based upon retention time, reagents used, level of mixing, and the composition of the waste stream. The higher the concentration of the pollutant to be treated, the more efficient the waste treatment system needs to be.

Consider two raw wastes—one containing 1500 mg/L of cyanide, the other containing 15 mg/L. To achieve a treated concentration of 0.8 mg/L, the first waste must be treated at the following efficiency:

$$(1500 - 0.8)/1500 \times 100 = 99.95\%$$

The efficiency of treatment for the lower concentration waste is:

$$(15 - 0.8)/15 \times 100 = 94.7\%$$

The above calculations should convince anyone that it is easier to operate at about 95% efficiency than essentially 100%.

Dragout/dead rinses must be changed often enough to avoid producing waste that is too concentrated to be (easily) treated.

4. We recommended changing numerous dead rinses to running rinses. Each flowing rinse was to be controlled by flow restrictors that limit the maximum amount of water flow from each rinse. However, prior to installing flow restrictors, each rinse flow should be confirmed. Recommended flows for these rinses were based upon supplied production data, which allowed us to estimate drag-out rates for each process (drag-out for horizontal parts, very poorly drained, is estimated at 10 gal/hr per 1000 ft^2 surface area processed, as per *Electroplating Engineering Handbook*, 3rd ed. page 758).
5. We recommended the installation of a flow through chromium reduction system that would conduct chromium reduction on an automated basis, because the rinsewater flows from a separate collection system through the reduction system, and then into the existing chrome/acid collection system, for batch neutralization and precipitation. This should significantly reduce the workload of personnel conducting batch treatment and make chromium reduction more efficient. The existing acid/chrome sump can be converted to this treatment system. The sump may require a chemically resistant liner, or a tank can be placed inside the sump. The tank would be equipped with pH meter controller, ORP meter controller, mixer and required chemical feed pumps for lowering pH and automatically adding reducing agent.
6. The lead violations were found to be caused by the use of lead plater's tape, which the line personnel decided to use instead of plastic tape (reason unknown). Elimination of the tape eliminated the lead violations.
7. The shop had numerous rinses that required only pH adjustment. These added to the frequency of batch treatment. We recommended that they be routed to a new final pH adjust system.

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