Advice & Counsel

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Waste Treatment Queries

Dear Advice & Counsel,

We have been waste treating our spent cleaners in our batch treatment system for some time. We have had success with our treatment, which consists of neutralization to pH 8.5–9. We check the dissolved metals (chromium, copper, nickel) and usually find them below discharge standards. After discharging the treated waste we pressure filter the residuals. That's when the filter press gets coated with "slime" and when we open it up we have no cake—just a watery mess.

Is there something I can add to the waste to yield a more firm filter cake?

Signed,
No Slime-Ball

Dear No,

With all the detergents, silicates and wetters present in most cleaners, it is not surprising that you produce a slimy residual after pH adjustment. Try the following procedure:

The waste is acidified to a pH less than 2 using any available mineral acid such as sulfuric or hydrochloric. Under these acidified conditions, add alum (aluminum sulfate) or ferrous sulfate. The best amount required is typically determined by jar tests.

The treatment relies on the tendency of some chelates to be selective to the point that the bond between the chelate and the aluminum (from alum) or iron (from ferrous sulfate) is stronger than the bond between the chelate and the heavy metal(s) of concern.

Once this re-arrangement of chelate-metal bond is completed, the waste is pH adjusted up to the optimum pH for precipitating the heavy metal. For raising the pH use either lime (calcium hydroxide), or a combination of lime and sodium hydroxide, or a combination of magnesium hydroxide and sodium hydroxide. The calcium and/or magnesium ions tend to produce a less slimy waste for filtration. Given the choice, the magnesium works better than the calcium.

Comparing Treatment Systems

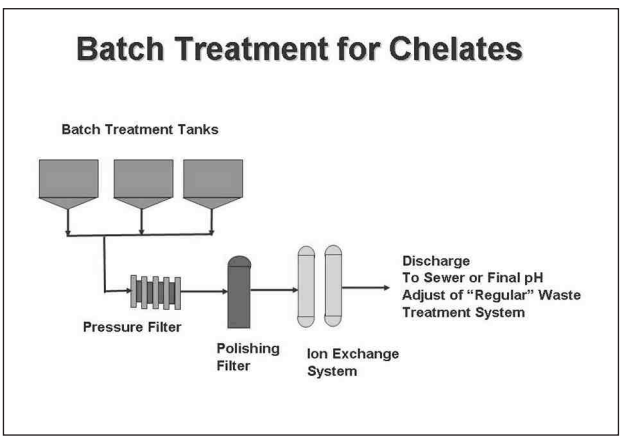
Dear Advice & Counsel,

Our company generates a small volume flow of wastewater from printed wiring board manufacturing and strip plating operations, plus dumps from numerous process tanks.

We wish to replace our existing elaborate system using evaporation and hauling with a more conventional treatment scheme. We have two proposals for treatment systems. One system looks like what I have seen at numerous electroplating facilities over the years.

The other proposal is significantly different. It utilizes the same chemical treatment, but employs batch reactor tanks, filtration and ion exchange (see diagram). We are confused as to which is a better way to go. Can you compare these for us?

Signed,
Dichotomy



Dear Dichotomy,

The first proposed wastewater treatment system consists of older technology (chemical reaction tanks, flocculating tank, inclined plate clarifier) that functions reasonably well when treating dilute, un-chelated, electroplating rinsewater. The system is not designed for treating large volumes of concentrates or chelated wastes, such as you intend to treat.

The system utilizes an inclined plate clarifier which relies on the use of flocculants (also known as polymers) to yield a waste that will rapidly settle. This system would be subject to upsets from hydraulic over-load, weak pH control, and inaccurate polymer addition. Since this design is a flow-through system, any upset on the part of the clarifier may produce a sewer discharge violation. If you chose to go this route we would strongly recommend that the clarifier be augmented with a polishing filter and a cationic ion exchange system follow the filter.

The second system is designed to operate as a batch treatment system. It utilizes tandem neutralizing tanks followed by a "process" tank, which we assume will be used to add polymers and filter aid. Each treated batch is to be routed through a pre-coated filter press. The effluent from the filter press is routed through one of three mixed bed ion exchange columns. Three ion exchange columns are connected in parallel. One column is used as a back-up and the third column is in regeneration mode, allowing for continued operation.

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been expected for an average August. Sid Perkins reports, "The heat waves struck during a traditional vacation period when many residents head for the countryside and doctors are hard to find. Many of the country's victims were elderly and either alone at home without air conditioning or confined to crowded hospitals or nursing homes."[8]

Rebecca Goldsmith adds, "Public investigations found that despite France's highly centralized form of government, the sprawling bureaucracy had no mechanism to recognize the magnitude of the disaster as it was happening. And once officials noticed the problem, there was no way to respond quickly and alert local authorities. The French private response to the heat wave also came under attack. In America, dangerous weather prompts a media blitz of warnings advising people on staying safe. No such thing occurred in France. In addition, families remained away on holidays and nursing home managers failed to call staff back from vacation to provide additional help."[9]

What About Tropical Diseases?

Some alarmists promote the idea that tropical diseases will spread because of global warming. However, the geographical spread of these diseases has very little to do with climate.[10] Throughout the Little Ice Age, malaria was a major epidemic disease in Europe and far into the Arctic Circle. In the nineteenth century, malaria, cholera, and other diarrhoeal and parasitic diseases were prevalent around the world, including northern Europe.[11] Malaria was endemic in England until the late 1800s and in Finland until after World War II. Malaria in the U.S. was still endemic in 36 states until after World War II[10]. Today these diseases are problems only in countries where the necessary public health measures are unaffordable or have been compromised. Past history reveals that combating malaria is primarily a question of development to ensure efficient monitoring of the disease and resources to secure a strong effort to eradicate the mosquitoes and their breeding grounds. Wealth and a functioning public health system is what matters when is comes to combating tropical diseases.[11]

Summary

Martin Ague concludes, "Global warming is not likely to have a negative effect on human health. Humans have successfully adapted to varying climates. There is no general temperature level at which heat suddenly becomes dangerous to human health. On the contrary, heat related mortality increases when the temperature rises above what the local population is accustomed to. In Finland heat related mortality set in at 17.3°C, in Athens at 25.7°C."[10]

Michaels and Balling add, "Over the course of a century, humans will adapt to rising temperatures, or they will adapt their environment to the temperature, and they will suffer no adverse health effects. In fact, since death rates due to extreme cold are double those to extreme heat, there might be a net benefit from warming in the number of lives saved."[12]

They also note, "Almost all global warming theory predicts that most of the warming will occur in the high latitudes and in winter. Furthermore, most of the warming is occurring in the coldest air masses—the ones responsible for the winter cold air outbreaks. Warming of those air masses would presumably reduce future winter mortality rates. In comparison, if the observed trends of the last third of the 20th century are meaningful, summer warming will be about 60 percent of what occurs in winter. When the additional future use of air conditioning is considered, summer mortality rates could very well decline, even with a modest warming."[12] ***P&SF***

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Following ion exchange, an accumulation tank is used to allow for verification of compliance prior to discharge.

We like the second system, but have the following comments:

1. The ion exchange columns must be protected from incoming solids, oils and greases. The resin can become clogged with solids/grease and will then no longer function. The supplier intends to provide a 50 micron pre-filter and indicates that this is sufficient filtration to protect the resin, but we have some reservations. The pre-filter may need to be a smaller pore size (5–10 micron) and be followed with a carbon pack to capture trace oils/greases to prevent resin fouling.
2. The use of a single filter press does not allow for smooth operation. We recommend using two filter presses in alternating mode.

A pre-coat system (tank, mixer) should be included in the design to allow for the use of pre-coat on the filter cloths. The effluent from the filter press needs to be piped in such a manner that the initial discharge is by-passed back to the neutralization tank, as the first 15–20 minutes of filter flow is high in suspended solids and may blind any filter used ahead of the ion exchange columns. ***P&SF***