Addressing Pressing Needs for Wastewater Treatment and Contaminant Removal from Plating Process Solutions.

With Ion Exchange and Adsorbent Resins.

Heavy Metals/Total Organic Carbon/Oils:

Are any of these affecting your operations?

Circular Economy

Since the industrial revolution, wastewater generation has constantly grown. Faced with strong regulations and a highly competitive environment, industries have taken actions that are ultimately more environmentally sustainable and economically feasible, particularly in the development of sustainable waste solutions and residuals management. Moving towards a circular economy is at the heart of the sustainability agendas for governments and corporations. What used to be regarded as ‘waste’ can now be turned into a valuable resource.

Importance of Effective Removal of Contaminants

Water scarcity is a global pressing issue. Preserving and restoring the world’s water supply remains as one of the world´s top challenges for future generations. Minimizing waste is one of the principles behind any of the circular economy initiatives. Failing to purify water before discharging it back to the environment has dire consequences. More stringent legislation across the globe as well as an increased awareness of corporate social responsibility towards sustainability are

leading towards enforcing and implementing more measures to actually tackle some of the issues that an uncontrolled disposal of these pollutants may pose to our planet.

Suspended Solids Removal

Effective removal of critical contaminants can help avoid: 1) Hindering downstream unit operations 2) Fines/penalties for exceeding discharge permits 3) Polluting the environment. In the end, it can be costly to ignore the importance of effectively removing certain contaminants. Finding cost-effective solutions is as important as ever.

The very first consideration for any wastewater treatment process should be the removal of suspended solids because if they are not properly filtered out, it has the potential to significantly impact the operating cost of the necessary downstream processes meant to remove dissolved solids.
For many waters, ultrafiltration (UF) systems can effectively remove suspended solids in a continuous, relatively low-pressure operation.

Organics Removal

Discussion of wastewater treatment capabilities requires a focus on organic compound removal. The organic composition of a wastewater stream is often the key parameter for meeting National Pollutant Discharge Elimination System (NPDES) discharge permits or for recycling that water.
• for discharge, the organic load expressed as BOD, COD, TOC or O&G is usually a limit for wastewater discharge permits. For water that is sent to a municipal wastewater treatment plant (WWTP), surcharges are often added to the cost of treating the water based on the organic load.
• Downstream water recycle and recovery processes (such as reverse osmosis) are often sensitive to the organic load so pretreatment is required.

Synthetic, Engineered Adsorbents

The paradigm shift proposed by ARS is the use of an engineered adsorbent with designed pore size distribution that enables effective removal of organic contaminants in wastewater streams. Synthetic adsorbents can either replace or be complementary to traditional methods.

The principle at the core of polymeric adsorbents is quite simple. Wastewater is passed through a column containing the spherical polymeric adsorbent. The organic materials are retained on the resin while water and simple salts pass through. When the resin is fully loaded, the organics are stripped from the resin with steam, solvents, or a dilute caustic solution. In some cases, the organic

material may be concentrated by orders of magnitude. The choice of solvent, or regenerant, usually depends on the availability at the particular location.

Oil Removal from Produced Water and Wastewater

Oil appears in industrial wastewater in a number of different forms including free oil; emulsified oil, oil- wet solids, and dissolved oil. One source of oily water is from the overhead distillates from refineries and chemical processors. Also, the treatment of water associated with hydraulic fracturing as a byproduct of oil and gas drilling, in particular that known as produced water, presents an opportunity to recover valuable hydrocarbons as well as to make water suitable for recycling or disposal.

Oil Wet Solids

This category includes oil that adheres to sediments and other particulate matter that is common in industrial wastewater or produced water. Such oily solids can be removed with special filters.

Free Oil

Free oil rises rapidly to the surface of the water tank under calm conditions when the oil drops are large enough. This type of oil can normally be removed using an overflow weir in the tank and a skimmer. However, small oil droplets, a few microns in size, can be difficult to remove in this manner.

Emulsified Oil

Oil can be mixed with water as an emulsion due to shear that can result from travelling through a pump, splashing into a tank, or anything that will break up and disperse larger oil drops. Mechanically emulsified oil is stabilized by electrical charges and other forces that result in droplets with varying size from single-digit microns up to hundreds of microns. The smallest droplets, especially, can be very difficult to remove with conventional mechanical techniques, but this emulsified oil can be removed by coalescing and decanting, using an ion exchange resin bed containing resin. Some features of this packed bed oil removal system include: • No chemical addition of coagulants • Continuous operation • Systems can be designed for up-flow or down-flow operations • No regeneration of the resin• Tolerant of elevated temperatures that are beneficial for processing heavy oils• Very long resin lifetime. Emulsified oil can also coat suspended solids. Special filters can help remove oily solids down to 15 μm in a convenient, self-cleaning filter.

Because individual manufacturing facilities can produce their own unique combination of metal wastes, the ion exchange removal process will be site specific. To learn more about the best solution for your facility, contact Paul Cook at ARS LLC.

Elements:

Ni^{2+}
Fe^{2+}
Co^{2+}
Mn^{2+}
Fe^{3+}
Cu^{2+}
Sn^{4+}
In^{3+}
Zn^{2+}
Cd^{3+}
Pb^{3+}

Many elements are present as anionic complexes in the presence of HCl at various concentrations and can be removed by ion exchange processes. Purification of phosphoric acid is also accomplished by various ion exchange resin methods.

Mercury Removal

An extremely toxic metal, mercury pollution is under increased scrutiny and is being regulated to extremely low levels in waste and discharge water. For example in the Great Lakes of North America, the discharge limit is 0.7 parts per trillion and other regions have similarly low levels. In spite of its toxicity and persistence as a pollutant, mercury still plays important roles in industry Mercury is a very reactive molecule that can exist in multiple forms – the most common forms include the volatile zero- valence Hg (0), the charged ion Hg^{2+}, and organo-mercury compounds such as methyl mercury.