



## Ultrapure & Industrial Services, LLC.

For removal of metals and treatment of heavily laden waste streams, we use advanced designs in Oxidation and Colloidal De-Stabilization;

- Ozonation: Ozone causes a chemical breakdown of large solids in water so that it could be flocced
- Flocculation: stage uses a water based clay/polymer formulation designed for each application
- Reverse Osmosis: Depending upon the purity of the treated water required for reuse.

### Caustic Etch Water Recycling Unit

This unit was designed for a heavy loading treatment and worst case scenario of treatment. Recirculation pressures, filter sizing, pump operating ranges, and monitor settings are initially set for this worst case scenario operating range, yet changes were expected leveling to a continual range in the first week of operation. Filtration was set up to run in series or parallel, with series flow and stair step filtration sizing for the hardest and parallel flow with medium filtration sizing in all filters for the easiest. It was anticipated once filtration becomes consistent; an exact range of operation can be set and daily noted for the most efficient treatment range. A laminated check list was supplied for the unit initially and changed with each change to the list. The following is a daily check which was designed for existing waters and will be the parameters for operation until an anticipated new daily check list in the second week of operation or sooner:

### Caustic Recycling Unit

**General Description:** The purpose of the design is to continuously maintain the integrity of the caustic etching fluid with the reduction of suspended aluminum in solid form while balancing the fluid with small additions of replacement etching solution. This process will illuminate the high cost of spent fluid haul off and limit all haul off disposal to Class 2 Non Hazardous Commercial Solid Waste.

The solution in the dip tank will be continuously recirculated with a variable drive computer controlled stainless steel pump at 16 gallons per minute. All framing, distribution and assembly piping, and mechanical filtration equipment will be constructed of stainless steel. All monitoring and electronics will be PLC controlled. The dip tank will be drawn from one end and returned to the other, with the entire volume of the tank recirculated each 8 hour shift. The temperature will be monitored at the inlet to the pump as well as the ORP, pH, and EC.

### Hexavalent Chromium Waste Water Treatment

Hexavalent chromium is a chemical compound that contains the element [chromium](#) in the +6 [oxidation state](#). To remove it and safely dispose of the chromium, it must be converted to trivalent chromium and encapsulated into sodium bentonite clay. The process will involve blending the hexavalent chromium waste water with spent florescent penetrant dye wastewater and other plant waste waters to achieve the most cost efficient treatment chemistry and solids removal ratio.

### *Pre-Treatment Mix Chamber 1*

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The first treatment process involves the addition of sodium metabisulfite. Sodium metabisulfite is an inorganic compound used to chemically reduce hexavalent chromium to trivalent chromium which can then be precipitated and removed from an aqueous waste stream. The hexavalent chromium is converted into trivalent chromium in the PTMC1 and is ready for precipitation and treatment.

Also in a final phase of treatment in this loop, ozone is venturi injected into the water in each recirculation. Ozone has many purposes throughout the treatment in the unit. It obviously eliminates the organic loading from start to finish in the treatment process, but it also is a predominant stair step treatment of the treatment process. At different point during the pre-treatment, flocculation and post-treatment ozone is monitored with ORP to achieved planned treatment strategy for the waste water targeted. Ozone; with oxygen having an electronegative value of 3.44 on the Pauling Scale, is the perfect catalyst for ORP potential. This insures treatment of the water for each phase; coagulation and oxidation in the PTMC2 for efficiencies in flocculation, coalescing and agglomeration in the AGC 1 and oxidation balance in the TWS 1.

Pretreated water enters the FTF8 for polymer colloidal attraction, separation and encapsulation of all contaminants. A large variety of polymers may be used with varieties targeting mole strength, charges and chain makeup. Other components may be added as a binder and Sodium Bentonite will be added as an encapsulant. Bentonite is clay consisting of mostly Montmorillonite. The solids are filtered on an advancing filter paper which travels across a dewatering table, creating a filtrate cake which gravity dewateres and is vacuumed at the end of the filter table. The filtrate cake and paper roll off the end of the table and the paper is separated from the solids and rolled automatically for disposal while the solids and go to the final stage of dewatering. The solids are collected in a dewatering auger for final compression to remove any remaining water and deposited in a collection bin for removal. Water filtering through the filter table is automatically pumped on to post-treatment.

### ***Multi Media Filtration Pod***

Water leaving the filter table then passes through a back flushable, Multi Media Filtration Pod for any residual suspended solids which may have passed through the filtration table. The media pod is automatically back flushed on pressure demand. The media filters can be a combination on mechanical and chemical filtration with targets being suspended solids, dissolved polymers or even residual emulsified compounds which may have been sloughed off in the filtration process.

### ***Agglomeration Clarifier***

The Agglomeration Clarifier, AGC, is a post flocculation ozonation treatment to break out and agglomerate, join together, any suspended solids, dissolved polymers or even residual emulsified compounds which may still be in suspension or colloidal, chemically bonded or emulsified in the water. This is a final phase of ozonation treatment. As in previous ozonation recirculation loops, the ORP is monitored for critical post treatment diagnosis as is the pH for potential post treatment adjustments necessary for continuing polishing of the recycled water. In this AGC ozonation recirculation loop, additional media pods are prior to ozonation for the collection and removal of aggregated solids and targeted residuals utilizing the same potential media loading as in the multi media filtration pod.

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## ***Encapsulated Contaminants***

Contaminants are encapsulated in Sodium Bentonite Clay and will pass Paint Filter Testing for moisture and Toxicity Characteristic Leaching Process Testing for land fill acceptance.

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