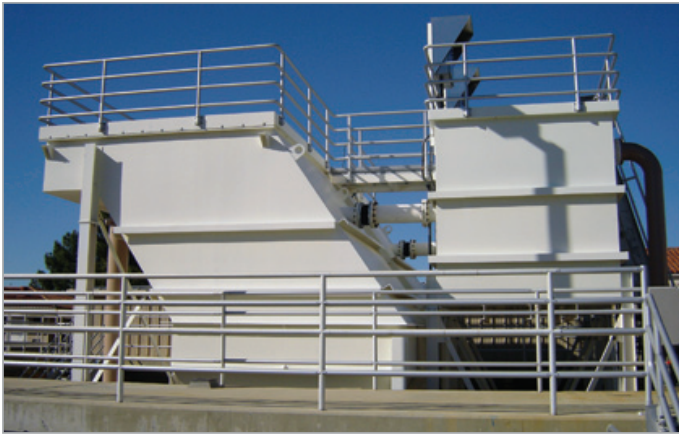


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Low TDS AMD Wastewater Treatment

WESTECH
DWN: RCS DATE:



WesTech inclined **SuperSettler™ Plate Packs** are designed for installation on support beams in rectangular concrete basins. After the inlet flow enters the basin, it is directed to inlet ports on the side of each inclined plate. Outlet launders at the top of the plate packs collect the clarified water as solids settle out on the plates and then the basin floor. The ZICKERT Shark™ is an ideal sludge removal device for SuperSettler™ basins.

Low Total Dissolved Solids (TDS)

While the majority of waste streams generated from acid mine drainage (AMD) are characterized by low pH (2-4) and high dissolved iron (1,000 – 10,000 ppm), there are some AMD streams which are not contaminated to these extremes. These streams may have relatively high pH levels (5-7) and dissolved iron levels as low as several hundred ppm.

With water sources from industrial applications, especially hydraulic fracturing (“fracing”) operations, becoming harder to obtain, these marginal quality water streams are becoming more attractive for reclaim and use as process makeup waters.

Treatment Options

Depending on the quantity of water required, water quality of the existing mine pools, and the water quality required for the process, there are a number of treatment options. This process flow diagram depicts one possible treatment design for flow rates of 500 gpm or less.

Dissolved ferrous iron (Fe_2^+) is first oxidized to ferric iron (Fe_3^+), which readily forms the insoluble iron hydroxide complex $\text{Fe}(\text{OH})_3$. In addition to providing the oxygen required to precipitate the iron, the use of surface aerators allows CO_2 to be stripped from the water. This increases the pH of the water stream as well.

In the case of these relatively small flows, caustic (NaOH) is used as the sodium hydroxide source. Caustic, while having its own hazardous properties, is easier to prepare and add to the stream, involves less capital cost, and produces less sludge than the addition of lime slurry which is commonly used on large AMD flows. The caustic also increases the pH to a neutral level for further treatment and subsequent use.

Polymer is added to the stream to aid in floc formation and the stream is subjected to high energy mixing

either in an inline mixer or a rapid mix tank. This is done to ensure that the polymer solution is completely dispersed in the stream. The flow then enters a slow mix tank which allows the floc that is beginning to form to grow to a point where it is large enough and heavy enough to readily settle.

SuperSettler™ Lamella Plate Clarifier

A WesTech SuperSettler™ lamella type unit can be used for this purpose. This unit provides a large projected area in a relatively small footprint. In addition, it has no moving parts making for easy operation and low maintenance. Solids settled in the lamella section are collected in a bottom hopper. This hopper can have a thickening mechanism or rake added as an option to thicken the sludge.

SuperSand™ Continuous Backwash

The SuperSettler™ is perfectly coupled with a SuperSand™ continuous backwash sand filter. This is due to the fact that the water can flow through both units without having to be repumped. The SuperSand™ unit creates its own filtered water backwash stream so there is no need for filtered water storage or backwash pumps. The unit generates a constant dirty backwash stream of approximately 3–5% of the inlet flow.

If low TDS water is required for downstream processes (i.e., boiler feed), then ultrafiltration and reverse osmosis can be added to the system to produce this type of high quality effluent.

Depending on the mine site, the waste streams from each treatment step may be returned to a separate section of the mine for disposal. At installations where this is not possible due to either logistics or regulations, conventional sludge thickening and dewatering technologies may be applied.