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MERICHEM COMPANY

LO-CAT® PROCESS

FOR WASTE WATER TREATMENT PLANTS

In 1980, Los Angeles began exploring alternatives to control the H_2S concentration in the digester gas produced at the Hyperion Waste Water Treatment Plant (WWTP), which treats nearly 420 MGD, wastewater generating over 475 tons of raw sludge per day. The digester gas H_2S concentration had to be controlled so that the SO_X emissions from the on-site combustion of the gas could be kept within acceptable regulatory limits, allowing the gas to be burned on-site to generate steam for heat or electricity or sold to local utilities. The Stretford process was chosen for desulfurization and the plant went into operation in 1985. The next several years saw numerous problems arise, most concerning the inability of the unit to effectively treat higher levels of H_2S and the plugging of the packed columns with solid sulfur. Hyperion spent many years trying to solve the problems but met another obstacle — the vanadium catalyst used in the Stretford process. Vanadium in the sulfur cake was making disposal increasingly difficult and becoming an environmental problem, so the City decided to investigate alternatives.

After extensive research by a team composed of City staff and engineers from its consultant, Montgomery Watson, the City chose the LO-CAT® Process because of its proven process, environmental track record, and its ability to utilize the existing Stretford plant equipment. The retrofit would leave the basic plant process unchanged, modifying the existing packed column absorbers to Mobile Bed Absorbers and utilizing the remaining process vessels and equipment.

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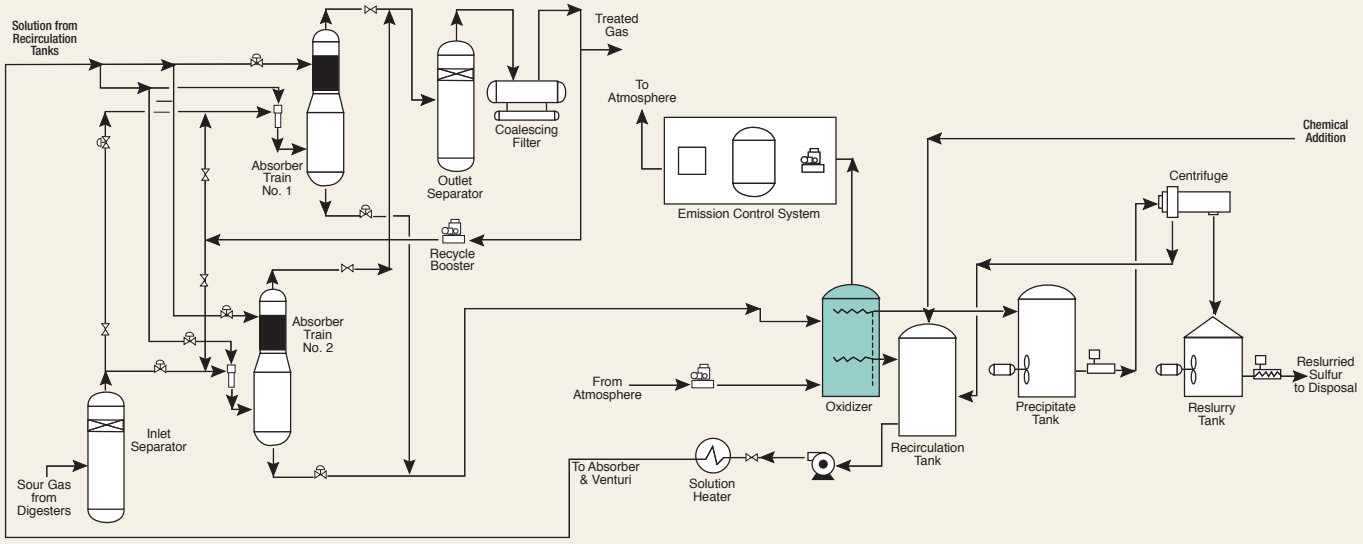
Hyperion WWTP LO-CAT® System



LO-CAT worked with the City to design the plant modifications required by the LO-CAT® Process. The existing packed columns were converted to Mobile Bed Absorbers (MBA). The remaining process was essentially unchanged from the original Stretford design. The Stretford practice of floating sulfur for separation was even retained. Outwardly, the unit looks the same; the only difference is the catalyst.

After initial training, the retrofitted plant was started, undergoing an intensive battery of performance and optimization tests. The LO-CAT unit exceeded all requirements, and in fact, allowed a significant decrease in the use of ferrous chloride in the digesters, increasing the H_2S concentration to the unit, yet producing a treated gas with a H_2S content significantly below the required outlet levels.

In the LO-CAT Process, H_2S in the process gas is converted to innocuous, solid elemental sulfur by the use of an environmentally safe chelated iron catalyst, according to the reaction:

$$H_2S + \tfrac{1}{2}O_2 \xrightarrow[(Fe)]{} H_2O + S°$$

The oxygen shown in the reaction comes from the air introduced in the oxidizer vessel, which also acts as air floatation for the sulfur separation process. The iron is not consumed in the reaction, only acting as a catalyst to speed the reaction, so oxygen is the only compound consumed. The only chemical replacement required is a small amount of iron and chelates to make up for losses with the sulfur cake and caustic to maintain the catalytic solution in the mildly alkaline pH range.

The Hyperion LO-CAT unit is shown in the flow diagram. Dual Venturi/ Mobile Bed Absorbers, operating in either parallel or in series, treat the sour gas containing up to 500 ppm H_2S. The treated gas is discharged at or below the required 40 ppm H_2S level. The partially reduced catalyst solution goes into the oxidation vessel. Reoxidized solution is pumped back to the absorbers, and sulfur is skimmed to precipitate tanks and filtered in a centrifuge. It is then reslurried and discharged to sludge blending tanks and disposed with the waste sludge. The ventilation air is treated by a biofilter to remove any VOCs stripped from the biogas and discharged to the atmosphere.