



# Chlorine Replacement Case Study

## Hydrogen Peroxide for Headworks Odor Control

### San Jose / Santa Clara Water Pollution Control Plant San Jose, CA

The San Jose / Santa Clara WPCP is a 130 MGD tertiary treatment facility that receives sewage from three interceptors. During peak evening flows, a portion of the primary effluent is diverted to a 20 MGD equalization basin and fed to the secondary units during the low flow early morning hours. A schematic of the plant and study area is shown below. For years, the plant injected chlorine at two primary locations for odor control from April to October: at the influent to the headworks (10,000-15,000 lbs/day); and at the influent to the equalization basin (3,000-5,000 lbs/day). This corresponded to a dose ratio at the headworks of 7-8:1 (w/w chlorine:sulfide). In the late 1990's, however, increasing sulfide related odor control problems had stressed the capacity of their current system.

As a result, they were faced with the need to perform significant upgrades to their chlorine facilities to add an additional 10,000 to 15,000 lbs/day of capacity to adequately control odors through their primary clarifiers. Because of newer fire codes, OSHA Process Safety Management (PSM) regulations and the rising unit cost of chlorine, the overall upgrades would have required a substantial capital investment and an increase in operating budget.

In an effort to address their need for improved odor control, but at a reduced cost, the San Jose / Santa Clara WPCP looked at the replacement of chlorine with alternative chemicals. In early 1997 they contracted with US Peroxide to conduct a two month comprehensive study to evaluate the cost effectiveness of replacing chlorine with hydrogen peroxide for sulfide and odor control. Key odor control points included the headworks, aerated grit basins, splitter to the primaries and the primary overflow channels.

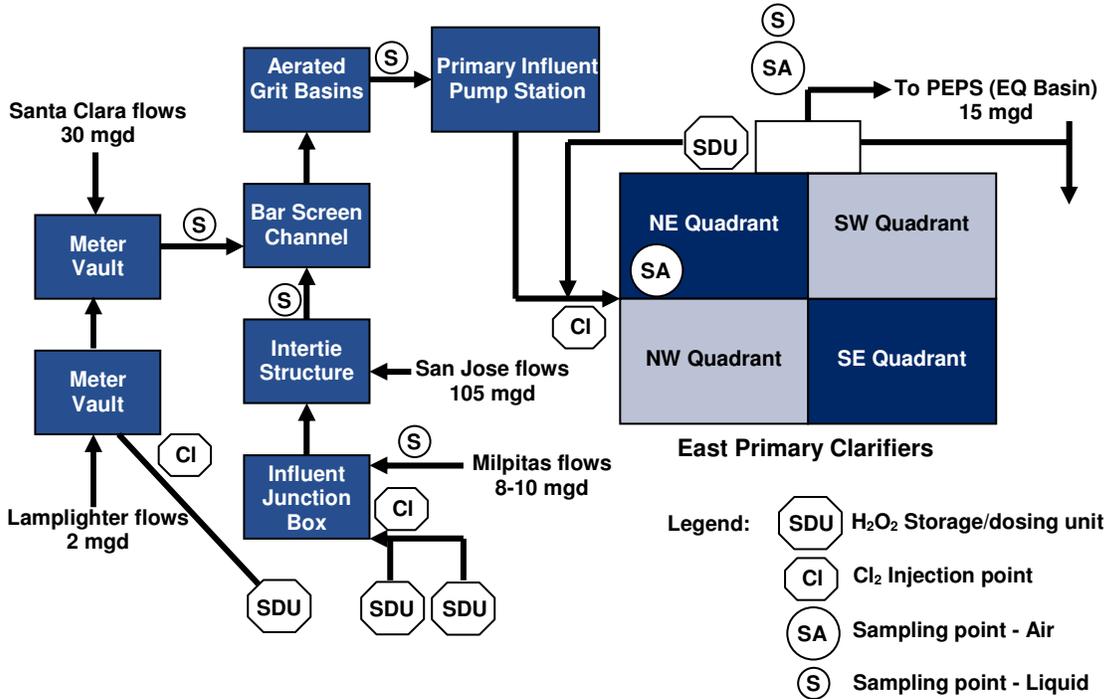
A number of factors led the City of San Jose to evaluate hydrogen peroxide ( $H_2O_2$ ) as a substitute. The primary reasons were the success of other regional municipalities in converting from chlorine to  $H_2O_2$  at no additional cost and with significant improvement in performance and the favorable market price trend for  $H_2O_2$ . Additionally, the regulatory drivers with regard to emergency containment and VOC emissions favored substitution of gas chlorine with less hazardous alternatives.

The initial baseline survey indicated that about 2,000 lbs/day (or 1.8 mg/L) of sulfide was entering the treatment plant from the collection system. Another 825 lbs/day (or 0.7 mg/L) was being generated within the primary clarifiers. This explained why chlorine injection at the headworks was not controlling odors off the clarifiers. Chlorine (or liquid hypochlorite) rapidly reacts not only with  $H_2S$ , but with ammonia and organic compounds and is quickly consumed, providing no residual downstream control of the sulfides formed in the clarifiers.

Hydrogen peroxide was employed at the influent structures to the headworks to oxidize sulfide entering the plant and at the influent to the primary clarifiers to oxidize sulfide generated within the solids blanket. By utilizing timer controlled metering pumps to match feed rates to sulfide loadings, an initial dose rate of 600-700 gpd reduced the aqueous sulfide levels at the headworks to < 0.5 mg/L, while a booster dose of 300-400 gpd maintained levels at < 0.5 mg/L through the primary clarifiers. This represents a dose ratio of about 1.2:1 and 1.6:1 respectively. It was also

found that controlling sulfide generation within the primary clarifiers reduced the need to control odors in the equalization basin. This degree of control was not obtained with the current chlorine system, especially in regards to the primary overflow weirs and equalization basin.

### San Jose/Santa Clara System Schematic



Based on the results of the study, it was found that with judicious employment and management of H<sub>2</sub>O<sub>2</sub> dosing, more complete control of odors was obtained at a cost equal to or less than that of chlorine. Since successful completion of the study, the San Jose / Santa Clara WPCP has continued to use hydrogen peroxide for H<sub>2</sub>S odor control in the headworks and primary clarifiers during their odor season of April to October.