

ESCONDIDO

Conversion to On-Site Sodium Hypochlorite Generation from Chlorine Gas Improves Safety and Sustainability at Southern California Water Treatment Plant

OVERVIEW

Life on the west coast of the United States is a contrast between scenic geographic beauty and the ever-present threat of earthquakes due to the convergence of tectonic plates along the edge of the continent. Damage to critical infrastructure from earthquakes is a risk that public agencies throughout the west coast must guard against and prepare for well in advance of any events. In California, hospitals, transit systems, power plants and water utilities are required to meet increasingly stringent seismic standards.

Like thousands of water utilities throughout California, the City of Escondido has been actively upgrading its water treatment facilities and distribution system infrastructure to meet increased safety requirements. Located 30 miles northeast of San Diego, Escondido's topography is made up of a shallow valley surrounded by mountains. The City, once known as the "Avocado Capital of the World," has transitioned from a predominantly rural, agricultural area into a large suburban community of over 150,000 people. The City provides treated drinking water to over 25,000 residential, industrial and agricultural customers. Much of the City's raw source water is held in large manmade reservoirs in the mountain canyons above the valley.

The Escondido-Vista Water Treatment Plant was constructed in 1976 directly below the Lake Dixon reservoir. The reservoir holds approximately 2,400 acre-feet of raw water pumped in from numerous sources, while the treatment plant produces 75 MGD through a combination of mechanical and chemical treatment processes. The plant was originally constructed with chlorine gas for water disinfection. As residential building has expanded into the foothills, both the treatment plant and the reservoir now have thousands of homes and numerous schools located on the slopes directly below.

Officials at the City of Escondido began an effort to upgrade critical infrastructure in 2011 and attention naturally focused on the aging treatment plant and the storage and use of chlorine gas in close proximity to homes and schools. Officials sought to reduce the risks associated with chlorine gas, both from transportation through a populated neighborhood as well as from an accidental release due to an earthquake. In addition, since drinking water is critical to public safety, they sought to increase the ability of the water treatment plant to produce water following a natural disaster – known as "sustainability." To that end, efforts were taken to ensure emergency power for the treatment and disinfection processes by adding large diesel generators capable of providing power in the case of a sustained outage



The City, together with its engineers, performed a comparison of alternative forms of chlorine for disinfection, evaluating the safety aspects as well as the costs. They compared industrial strength bulk hypochlorite to sodium hypochlorite generated on-site (OSHG). At 12.5% concentration, industrial strength bulk-delivered hypochlorite is highly corrosive and considered a hazardous material, requiring a Risk Management Plan (RMP) with the State of California. Sodium hypochlorite generated on-site, on the other hand, is 0.8% and is non-hazardous and does not require an RMP. OSHG systems utilize electricity, salt brine and softened water to electrolytically generate sodium hypochlorite. Because sodium hypochlorite is less reactive at 0.8% than bulk hypochlorite at 12.5%, there is little degradation and therefore no need to dispose of degraded product. The sodium hypochlorite remains stable, making it a reliable choice for water treatment processes. While bulk systems may have lower initial capital costs than OSHG systems, bulk systems have higher long-term operational costs, making the Microclor® OSHG system a better value over time.

After a detailed review of OSHG alternatives that included site visits, engineering reviews and other operational due diligence, officials at the City of Escondido selected the Microclor® On-Site Generation System from PSI Water Technologies of Milpitas, California. In particular, they were impressed with the operational and safety features on the Microclor® OSHG system. The vertical cells of the Microclor® system, for example, have no internal baffles to trap hydrogen nor gaskets to wear and fail. In addition, the cells may be removed for servicing while the system continues to operate. The skid-mounted design and easily accessible union connections allow quick access for routine cell maintenance and replacement.

Three Microclor® MC-2000 OSHG systems with a combined capacity of 6,000 pounds per day (PPD) chlorine equivalent were ultimately selected for the Vista Water Treatment Plant. The systems were installed in February 2016 and have been operating continuously since that time. The modular systems were easily customized to fit into the existing space, which was limited. The conversion from gas to on-site generation was smooth, thanks to careful planning and preparation. In addition, operators noticed that changes in residual levels with the OSHG system were immediately visible, compared to the previous gas chlorination system which often took 20 to 30 minutes to register changes in disinfectant. City officials and operators at the plant have one less piece of critical infrastructure to worry about, thanks to on-site sodium hypochlorite generation.

"The Microclor® systems from PSI Water Technologies have drastically improved safety for both our plant staff and the community. It has been a great addition to our water treatment process. Because of its intuitive automated controls and its simple, modular design it is a much easier system to operate and maintain compared to gas chlorine."

Reed Harlan, Plant Superintendent, City of Escondido

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