

SVP-Pure®: Chlorate-Based Chlorine Dioxide Generator Makes Controlling Odor Easy and Effective for U.S. Rendering Plant

GOALS

Replace the existing chlorine dioxide (ClO₂) generation and feed system with a safer, simpler, and more reliable system.

SITE

A rendering plant in the western United States.
Summer 2003

HISTORY

In the mid-1990s, a rendering plant found itself located in an area experiencing a population boom. Neighboring citizens complained regularly about the odor emitted from the plant. While the plant used a masking agent for designed for odor control, the mixture of odors proved even more offensive. In addition, two oil refineries, two feed mills, a food processing plant, and an animal food plant were also located in the same vicinity—all of which contributed to the nuisance of foul odors. In 1997, the county and state health departments began to take action to address the odor issues. About that same time, the rendering plant made a transition from the masking agent to chlorine dioxide (ClO₂) as an oxidizing agent for odor control. A traditional three-precursor ClO₂ generation system using sodium chlorite, hydrochloric acid, and sodium hypochlorite was installed and provided an immediate reduction in the odors being emitted from the plant.

PROBLEM

The three-precursor ClO₂ generation system did not have the capacity to maintain the oxidant level at the necessary ORP set point—500 mV—especially during the high volume times that occurred in conjunction with summer's warmer temperatures.

The generation system required constant monitoring to ensure it was operating effectively. Operators needed to check and adjust precursor rotometer settings every 15-30 minutes, and had to check for air bubbles in lines. Eduction was used to deliver precursors into the generator and ClO₂ solution was educted from the batch tank into the scrubber system. Multiple eduction processes resulted in very poor dosage control. Most importantly, if the system failed, it was not easy for on-site personnel to fix the problem.

The generation system relied on the use of a ClO₂ batch tank in order to provide the necessary conversion of precursors to ClO₂. In order to accelerate the rate of ClO₂ generation, excess acid and sodium hypochlorite were used to speed production. The presence of the batch tank, containing ~1000 ppm ClO₂ with excess HCl and NaOCl was a serious safety concern to plant operators. Despite the use of excess acid and bleach, the ClO₂ conversion only achieved 80% to 85%_far below performance expectations, especially when managers factored in the amount of time and effort operators invested in keeping the system operational.

Because of chlorine dioxide's excellent ability to eliminate odor—and because citizen complaints had dropped off dramatically following the implementation ClO₂ for odor control—the plant wanted to

continue using the molecule. However, they needed to upgrade to a larger, safer, simpler, and more reliable ClO₂ generation system.

SOLUTION

The rendering plant installed an SVP-Pure® Chlorate-Based Chlorine Dioxide Generator. The two-chemical ClO₂ generation system uses Purate® (40% sodium chlorate/10% hydrogen peroxide) and 78% sulfuric acid solution. Advantages of the SVP Pure® system includes:

- » Improved safety, simplicity, and reliability
- » Savings on cost of chemical precursors
- » Savings from improved ClO₂ conversion efficiency
- » Savings on operator service time (automated feed control)
- » Reduced citizen odor complaints

RESULTS

The plant staff were very pleased with the performance and simplicity. During the first couple of months of the trial, PureLine service technicians visited often to perform standard changes to the ClO₂ dosage settings in order to optimize the feed rate with the system flow rate, and to train on-site personnel to troubleshoot problems. Once the feed rate was optimized, the generator automatically provided the appropriate ClO₂ dose via flow-pacing software built into the SVP-Pure® control system. Multiple safety interlocks and alarm features ensured safe and simple operation, and the PureLine generator was much easier for on-site personnel to troubleshoot than the previous three-precursor generator. Service visits decreased and were replaced with monthly system check-ups and quarterly preventative maintenance—all performed by PureLine field technicians as part of the contract.

Daily operator time for generator maintenance was reduced from constant monitoring to a routine, once-a-day, five-minute system check, as well as periodic level check in the Purate and sulfuric acid storage tanks. This new simplicity and improved reliability allowed plant personnel to focus on other projects instead of monitoring previous old generator every 15-30 minutes. The plant manager was pleased that “The generator just ran, and it ran well.”

Equally important, the SVP-Pure® system did not require a batch tank since SVP-Pure® technology rapidly converts two precursors into a high purity ClO₂ solution at >95% efficiency. This ClO₂ product solution is then educted into the rendering scrubber water system using the generator’s automated feed control system directed by ORP. Chlorine dioxide generation without the batch tank greatly improved the safety and simplicity of the feed system while the SVP Pure automation system ensured optimal feed control with minimal operator involvement.

In order to produce the same pounds per day of ClO₂, the SVP-Pure® generator used 25% less Purate than the amount of sodium chlorite required by the plant’s outdated system. Even if the dollar-per-pound cost of Purate were the same as sodium chlorite, there would be a 25% reduction in the cost for replacing sodium chlorite with Purate. In addition, replacement of hydrochloric acid and sodium hypochlorite with sulfuric acid generated even greater cost savings.



Additional savings were realized due to improved ClO₂ conversion efficiency. While the old, three-chemical generator operated at 80% to 85% efficiency, the SVP-Pure® system achieved 95% to 99% efficiency.

The following table compares statistics that reflect the plant's switch first from a "masking agent" to the three-precursor ClO₂ generator, and finally to the SVP-Pure® generator during the summer months.

Odor Control Agent	Frequency of Complaints
"Masking agent"	1-5 per day
3-Precursor ClO ₂ Generator	1-2 per week
Pureline SVP-Pure ClO ₂ generator (unoptimized)	1 every two weeks
Pureline SVP-Pure ClO ₂ generator (optimised)	1-4 a year

CONCLUSION

While the plant's initial transition from a "masking agent" to chlorine dioxide did result in better odor control and a drop off in citizen complaints to from daily to weekly, complaints did persist because of the three-precursor ClO₂ generator's poor reliability and insufficient capacity. By upgrading to the SVP-Pure® ClO₂ generator, odor complaints were dramatically reduced from weekly to quarterly.

The SVP-Pure® ClO₂ generator was able to provided a dramatic improvement in safety and simplicity over the old generator for several reasons—two versus three chemical precursors; elimination of the ClO₂ batch tank; a more reliable automated ClO₂ feed system; and low-maintenance operation.

The SVP-Pure® ClO₂ generator is more cost effective than the plant's old three-precursor generation system for several reasons—only two, not three, chemical precursors are needed; the system uses 25% less Purate® than sodium chlorite; and a 10% to 15% improvement in ClO₂ conversion efficiency.