

Pure Results (continued)

In order to determine when ClO₂ is the best solution for smaller TES systems, decision makers should determine if the costs associated with using ClO₂ will provide a minimum two-year payback on the required capital investment when eliminating the use of either Gluteraldehyde or Isothiazolone.

The capital and chemical consumption costs associated with purchasing a PureClO₂ Generator that produces 10 PPD (including a chlorine dioxide air monitor and installation services) from an approved PureLine distributor are estimated below:

Capital and Installation Costs:	\$60,000
Chemical Cost (20 days/yr):	
10 PPD ClO ₂ or 66 PPD PureCide E x 20 days/yr x 2 years x \$2.35/lb	\$6,204
Two-year generator spare parts and power consumption estimate:	\$5,000
Estimated two -year capital and operating expense:	\$71,204

At a price of \$6.60/lb, \$71,204 could be used to purchase approximately 10,788 pounds of Gluteraldehyde.

8 treatments = 1,348.5 lbs per treatment

1,348.5 lbs @75 PPM concentration = 18.0 MM lbs of water treatment capacity

18.0 MM lbs @ 8.33 lb/gal= 2.2 MM Gallon TES System

For systems larger than 2.2 MM gallons, ClO₂ will be more cost effective than Gluteraldehyde based on chemical cost savings alone. Energy savings and improved safety provide additional benefits.

CONCLUSION

PureLine's PureClO₂ HP-40 Generator has provided a safe, reliable and cost-effective solution for removing biofilm and reducing microbiologically induced corrosion in the TES system. The economics of the PureClO₂ electrochemical chlorine dioxide program are compelling for TES systems with at least two million gallons capacity when compared to the chemical costs associated with both Gluteraldehyde and Isothiazolone. Because ClO₂ is produced on-site utilizing a single precursor, the hazards associated with the human handling of both Gluteraldehyde and Isothiazolone are also eliminated. In addition, the use of chlorine dioxide has improved heat transfer in the TES system and reduced energy costs.

PureClO₂ Generators are available in 3, 10, 20, 40 and 100 lbs/day capacities, making them ideal for a variety of industry applications.



PureLine. The Pure Choice.

» CASE STUDY: TES SYSTEM

PureClO₂® Electrochemical Generator reduces biofilm and corrosion in a large Thermal Energy Storage (TES) System while substantially reducing costs associated with Gluteraldehyde and Isothiazolone treatments.



GOAL

- » Reduce biofilm
- » Eliminate microbiologically-induced corrosion
- » Find a safe and cost-effective alternative to Gluteraldehyde and Isothiazolone
- » Improve heat transfer and energy savings

SITE

A TES System was installed at a large Midwest industrial complex to lower annual energy expense.

HISTORY

This large industrial TES system was experiencing difficulty due to accelerated corrosion (mild steel >0.30 MPY and copper >0.1 MPY). The corrosion was caused by poor microbiological control in the bulk recirculation water. The size and complexity of the distribution system made the consistent and effective treatment of bacteria and microbiologically-induced corrosion a problem because of stagnation in various system loops. The facility was facing extensive repairs and lost production that could easily exceed one million dollars annually.

The Problem

The TES system had been in place for years and required increased maintenance that caused unacceptable downtime. As a result, the TES facility investigated possible remedies. The facility's management considered both 35% Gluteraldehyde at a recommended dosage of 75PPM and Isothiazolone at a recommended dosage of 150PPM as potential treatments to remove biofilm and control unwanted microbiological growth.

Both Gluteraldehyde and Isothiazolone are known to be effective in the removal of biofilm. Other non-oxidizing biocides typically do not remove the biofilm so the anaerobic bacteria found under the biofilm are unaffected and microbiologically induced corrosion goes unchecked. Traditional oxidants often require pH adjustments (acid addition) to be effective. This can actually increase system corrosion. Even in instances where pH adjustment is not required, the oxidizing biocide will simply "burn off" the top layer of biofilm—leaving the anaerobic layer untouched and microbiologically-induced corrosion unchecked.



MORE »

The Problem (continued)

While Gluteraldehyde and Isothiazolone are well-known for their effectiveness in removing biofilm when fed at recommended dosage levels, the size of the system in this particular case made feeding the recommended dosage levels cost-prohibitive as outlined below:

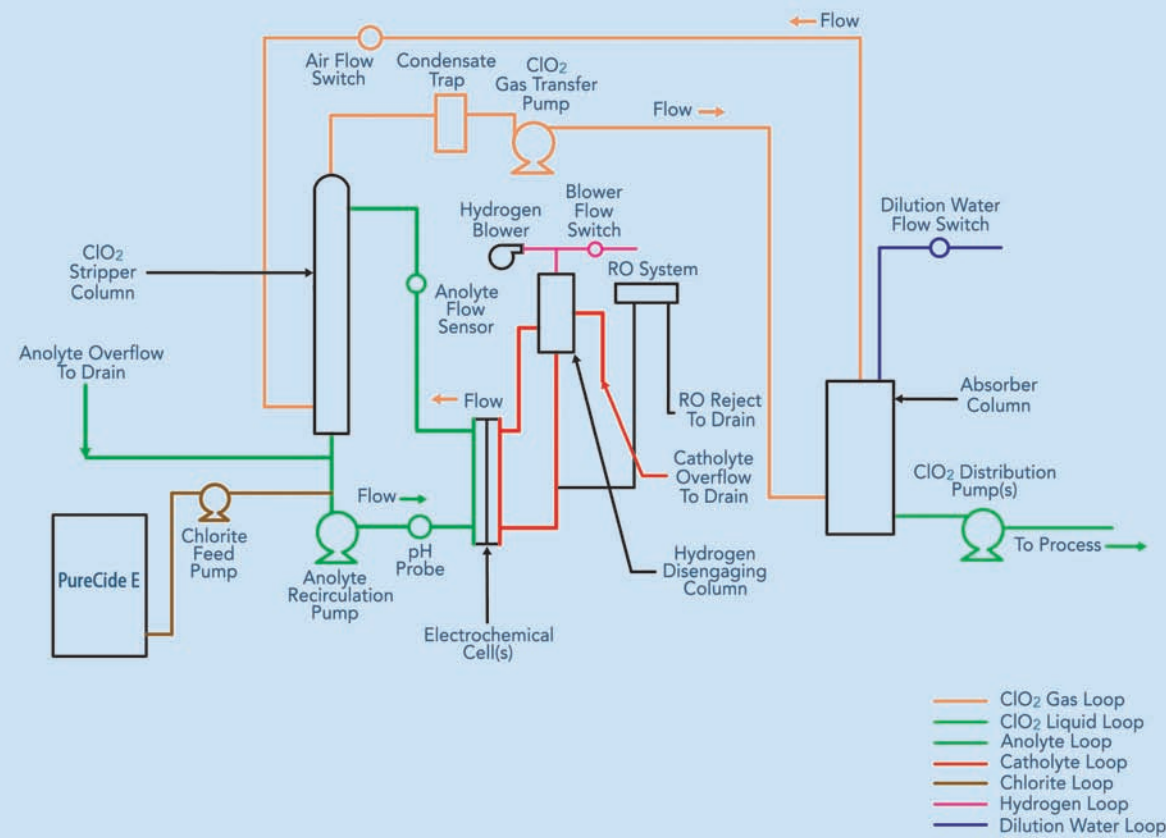
Gluteraldehyde 35%

Estimated system volume: 5 million gallons or 41.5 MM lbs
 At 75 PPM, slug dosage: 41.5 MM lbs x 75 PPM = 3,112.5 lbs
 At \$6.60/lbs: 3,112.5 lbs x \$6.60 = \$20,542 per treatment
Total cost for four quarterly treatments \$82,170.00 per year

Isothiazolone

Estimated system volume: 5 million gallons or 41.5 MM lbs
 At 150 PPM, slug dosage: 41.5 MM lbs x 150 PPM = 6,225 lbs
 At \$3.50/lb: 6,225 lbs x \$3.50/lb = \$21,787 per treatment
Total cost for four quarterly treatments \$87,150.00 per year

PROCESS FLOW DIAGRAM



The Solution

An approved PureLine distributor responsible for management of the chemical water treatment program for the TES facility convinced its management to utilize PureLine Treatment Systems' innovative PureCLO₂® HP Series Electrochemical Generators. Using PureCide® E as a single precursor, PureLine's patented generation technology produces 99.5% pure, chlorine-free CLO₂ solution on site and on demand. Chlorine dioxide can be fed quarterly until a residual concentration of 1.5 PPM or greater is maintained. A CLO₂ concentration of 1.5 PPM has proven to be a cost-effective solution for removing biofilm in TES systems and reducing microbiologically-induced corrosion. Additionally, CLO₂ provides added safety because it is produced on-site utilizing a single precursor. Both Gluteraldehyde and Isothiazolone are extremely hazardous to humans and handling is dangerous.

Each PureCLO₂ HP-40 produces up to 40 pounds per day (PPD) of pure chlorine dioxide. Like all of the models in the PureCLO₂ series, the HP-40 has been engineered for safe, simple and completely reliable operation.

Pure Results

Not only is the PureCLO₂ HP-40 Generator effectively eliminating biofilm in the system and reducing microbiologically-induced corrosion, the TES system is achieving improved heat transfer and energy savings. Chemical cost savings associated with the PureCLO₂ electrochemical chlorine dioxide program are also compelling when compared with conventional Gluteraldehyde and Isothiazolone chemical treatment methods that the facility had previously considered.

A turnkey HP series electrochemical installation rated at 40 PPD—complete with a chlorine dioxide air monitor supplied by an approved PureLine distributor—will cost approximately \$100,000. A 40 PPD generator will require approximately 265 pounds per day of PureCide E at a cost of approximately \$2.35 (single tote LTL shipment) per pound, or about \$625 per day. Typically, the TES system will be dosed for five days or less per quarter—bringing the annual cost to about \$12,500 for the PureCide E. Over a two-year period, spare parts and power consumption requirements for an HP-40 are expected to be approximately \$20,000.

When compared to the costs associated with non-oxidizing biocide or costs incurred as the result of no treatment and increased maintenance, chlorine dioxide becomes the treatment of choice in large TES systems.

As previously noted, both Gluteraldehyde and Isothiazolone are considered effective in the control of biofilm and microbiologically-induced corrosion. Because there is a capital cost associated with generating chlorine dioxide, CLO₂ will not always be the best choice. To determine the best treatment protocol for an individual application, one must consider the return on investment and payback period for the capital investment. Most companies are prepared to make capital investments that facilitate payback within two years or less.