

PanTEx

2011 EStar Award Elimination of Chlorine Gas to Protect Workers and the Environment

May 17, 2012
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Mixed-Oxidant Disinfection

- **Replacement of the chlorine (gas) disinfection systems at the Water Treatment Facility with a Mixed-Oxidant System while proving a much safer workplace and better for the environment.**

Current Disinfection Process

- **Disinfection of the potable water supply is accomplished by injecting chlorine gas into the water, prior to storage and distribution.**
- **Disinfection of the wastewater is accomplished by injecting chlorine gas into the treated wastewater, prior to discharge to Playa 1.**

Chlorine Gas

- Chlorine gas is a toxic substance that poses many potentially deadly hazards to humans, when not handled properly.
- Shipment of chlorine gas via public roadways poses a threat to a larger population.
- Chlorine is intended for use only by trained, experienced personnel, under the supervision of the registrant and in accordance with state and municipal regulatory requirements.
- Chlorine hydrolyses in water to form hypochlorite and hypochlorous acid. Hypochlorous acid is an oxidizing agent--it has a sanitizing effect on organic and inorganic contaminants. Disinfection by chlorination is achieved by maintaining a "free residual chlorine" concentration in solution.
- When treated effluent is released into receiving waters, free residual chlorine dissipates rapidly (it has a half-life of 1.3 to 5 hours). The ultimate fate of chlorine-containing effluent is site specific, and depends on factors such as the chemical constituents of the receiving waters, their temperature, the dilution ratio and the intensity of sunlight.
- Chlorine By-Product Formation: When chlorine interacts with organic matter, chlorine by-products are formed. These by-products include Trihalomethanes (TTMs) and Haloacetic Acids (HAA5).

MIOX

- **What is it?**
 - MIOX stands for mixed oxidants. The mixed-oxidant solution is a mixture of chlorine and other chlor-oxygen compounds that are generated through electrolysis using salt, water, and electricity.
- **How is it produced?**
 - The mixed oxidants are produced by electrolyzing salt water (brine) and separating the resulting products.
- **How does it disinfect the water?**
 - Mixed oxidants have been shown to achieve more rapid and thorough inactivation of a wider range of microbial contaminants than conventional chlorine. Mixed oxidants usually are several orders of magnitude more effective in microbial contaminant inactivation than conventional chlorine, achieving up to 2 logs higher inactivation of even extremely resistant organisms.

MIOX

- **Why are we changing the disinfectant?**

- Although chlorine gas is a very effective means of providing disinfection to drinking water and wastewater, the hazards associated with shipping, handling, and using chlorine are also very real. In addition, regulations concerning chlorine by-products are becoming more stringent.

- **Is it safe?**

- Yes. Although care must be taken to ensure that the system is operating properly, the mixed oxidant system is much safer than chlorine gas systems. MIOX Corporation received NSF certification on November 27, 2006, for their high capacity on-site chlorine generators. The listing is under NSF / ANSI Standard 61, Drinking Water System Components - Health Effects.

- **Is there special training involved?**

- MIOX Level 1 and Level 2 Technical Certifications are now available. Level 1 certification is designed for equipment operators, to assist them with regular maintenance and upkeep of their systems. Level 2 certification is designed for technicians in the field who will be servicing MIOX equipment.

Obstacles & Resolution

■ **Problems encountered:**

- Existing facility too small for the mixed-oxidant system
- 2-Stage TCEQ Approval Process
- Pressure and flow rate issues causing high amp draw on electrolytic cells
- Electrical energy use
- Increased water use
- Increased maintenance

■ **Resolution:**

- Expanded footprint to house the new system.
- Worked diligently with the TCEQ to gain approval and authorization
- Upgrade project has been requested to alleviate this issue
- Negligible increase (electrolytic cells)
- Due to softening and a continuous monitor
- Upgrade project should reduce maintenance

Mixed-Oxidant

- **Advantages of using MIOX.**

- Improved safety both on-site and off-site.
- Eliminates the potential for an accidental release.
- Eliminates the risk of violating the Clean Air Act.
- Eliminates the potential for an intentional release through terrorist activities.
- The chlorine residual endures throughout long distribution systems, and for extended periods of time.
- Removal or reduction of biofilms from distribution piping.
- Provides an effective means of microbial contaminant inactivation than conventional chlorine, even extremely resistant organisms.
- Reduces the formation of chlorine by-products.
- Reduces the risk of exceeding stringent drinking water limits for trihalomethanes (TTHMs) and haloacetic acids (HAA5).