

# Drinking Water Case History: 1,4-Dioxane and cVOC Destruction



## Background

- A Photo-Cat system was installed in 2013 to destroy 1,4-Dioxane and carcinogenic VOCs which were impacting three municipal groundwater wells in a Southern US water district. The Photo-Cat achieves two log removal (99%) of these compounds to reduce 1,4-Dioxane levels to less than 1 ppb and to reduce cVOCs below their respective MCLs.
- Photo-Cat was installed because:
  - 1,4-Dioxane breaks through granulated activated carbon (GAC) very quickly; 1,1-DCE and cVOCs consume the GAC aggressively. GAC change-outs would be frequent and expensive.
  - UV/H<sub>2</sub>O<sub>2</sub> AOP consumes only a small portion of the H<sub>2</sub>O<sub>2</sub> that is injected into the process, and requires GAC or Chlorine post treatment to quench the bulk residual H<sub>2</sub>O<sub>2</sub>.
  - **(NOTE: Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) is a strong oxidizer chemical that can ignite materials and initiate potentially dangerous chain reaction, such as fires, cause severe burns and blindness; H<sub>2</sub>O<sub>2</sub> must be cautiously handled only by trained personnel donning proper PPE and was not favored due to public health/safety perception.)**
  - Required a small footprint as access areas are limited in size.



## Solution

Purifics Photo-Cat AOP+ technology is an upgrade to traditional AOP. The AOP+® process uses and recovers a true catalyst to generate the highest oxidative potential commercially available, without chemicals. This low energy process destroys the target compounds: 1,4-Dioxane, 1,1-DCE, cVOCs and eliminates the need for GAC.



## Benefits

**RELIABILITY:** Purifics Photo-Cat technology has a 20-year success record for reliably treating these compounds; it is the most effective, tried and proven technology.

**LOWEST OPERATING COST:** The operating cost of this technology is the lowest; no consumables chemicals, self-cleaning membrane, everlasting catalyst, fully automated operation, long-life UV lamps, minimal maintenance.

**LOWEST LIFE-CYCLE COST:** 25-year design, robust construction backed by the longest and most comprehensive system and component warranty.

**SMALL FOOTPRINT:** Efficient and compact system configuration requires the smallest infrastructure footprint.

**SAFETY:** No chemical hazards - no hydrogen peroxide to transport, handle, store, clean-up; no chemical residuals to quench, no operator exposure or public risk. No GAC and no GAC change out.

**FULLY AUTOMATED:** Can be monitored remotely via tablet or Smartphone.

## Bench Testing

Water samples were collected and shipped to Purifics for an in-house bench test using a small-scale Photo-Cat System. Influent and effluent samples were submitted to an independent certified lab for analysis. A bench test report was prepared to describe the bench testing equipment, procedures, observations, laboratory data and evaluate the lab analysis.

## Pilot Testing

Typically a Purifics Pilot Test System is delivered on-site, set-up and operating within 1 day. The pilot system processes up to 20 gpm. Purifics pilot test events typically last from 1 to 4 weeks, but may run longer to satisfy regulatory agencies and assess any long-term concerns. Samples are collected and analyzed for all contaminants.

On site pilot testing was not required in this application.



## Full-Scale System Design

- Purifics provided two (2) NSF-61 certified DDL sized Photo-Cats. This AOP+ water purification system has a design capacity of 1MGD (700 gpm) and 25 year service life.
- Photo-Cat AOP+ is a chemical-free, single-pass photocatalytic process that uses full spectrum UV and a TiO<sub>2</sub> catalyst slurry to produce the highest oxidation potential of all AOP technologies. This process oxidizes and destroys 1,4-Dioxane and cVOCs.
- Groundwater is pumped from existing municipal wells to a single feed at the Photo-Cat system, synchronized with the well pump operation. When a well pump starts, the Photo-Cat system starts and automatically adjusts to the number of wells and volume of water. Designed with a full 0 to 100% turn-down of water being processed, the system maximizes process efficiency and minimizes energy consumption.
- A cross-flow carbide membrane keeps the TiO<sub>2</sub> catalyst slurry in the process, while it continuously cleans the membrane and quartz UV sleeves. The catalyst, self-cleaning membranes and UV sleeves never need maintenance, cleaning or replacement.



## System Installation, Start-Up & Operation

The Purifics Photo-Cat AOP+ Systems were installed in August 2013. The system started up on October 21, 2013 and it began producing high quality water at design flow. The Photo-Cat system operators were trained and have taken responsibility for system operation and maintenance. Purifics provides worldwide technical support, spare parts and service for the 25 year service life of the system.



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