

Ultraviolet Advanced Oxidation Peroxide (UV/AOP) Reactor System

Innovative Cleantech for PCB Impacted Groundwater

Client: *CONFIDENTIAL*

Location: Northwest, USA

Application Type: Degradation of PCB waste from impacted groundwater.

Pilot System Build Time: 6-8 weeks

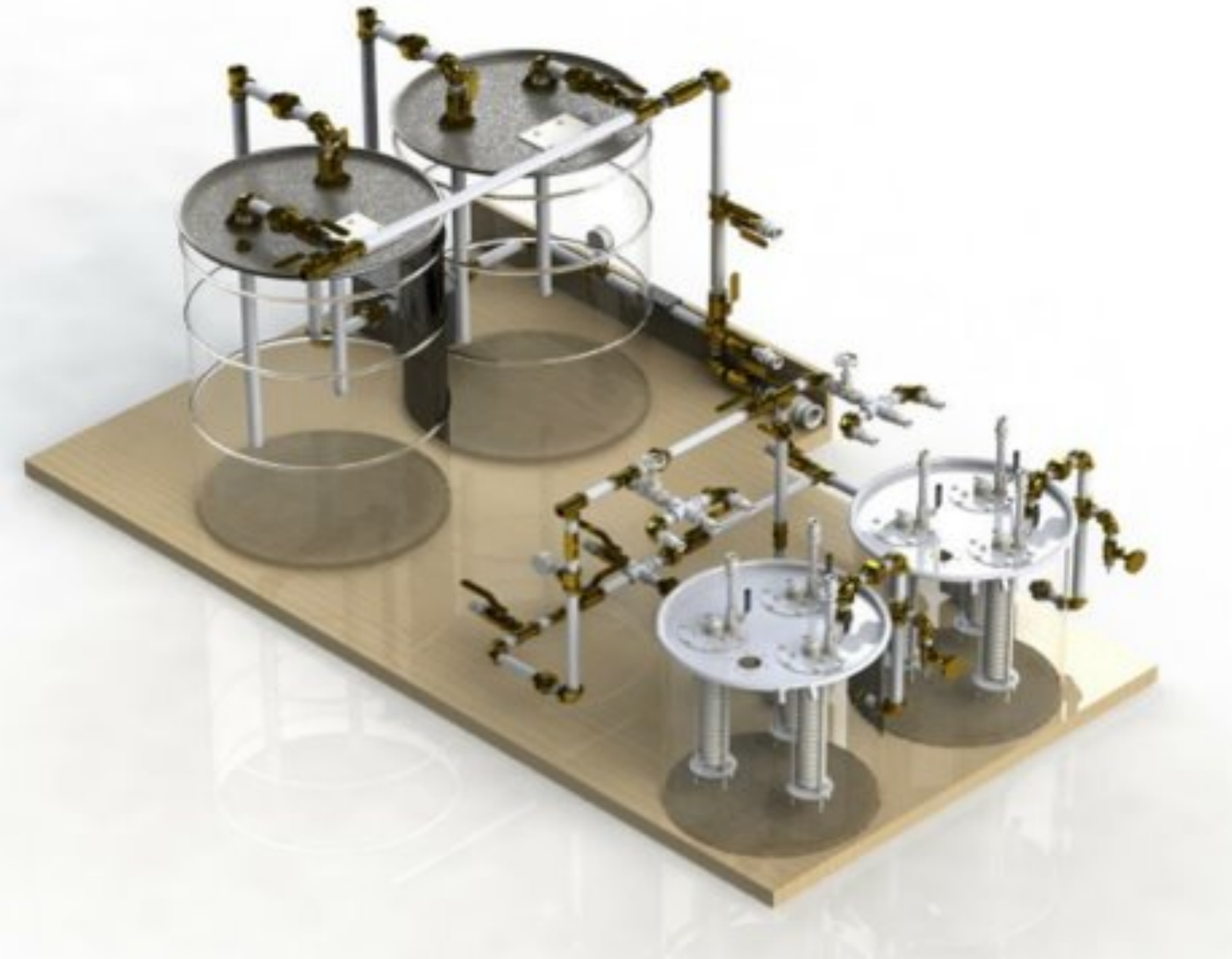
Pilot System Flow Rate: 3-5 GPM

Reactor Specs:

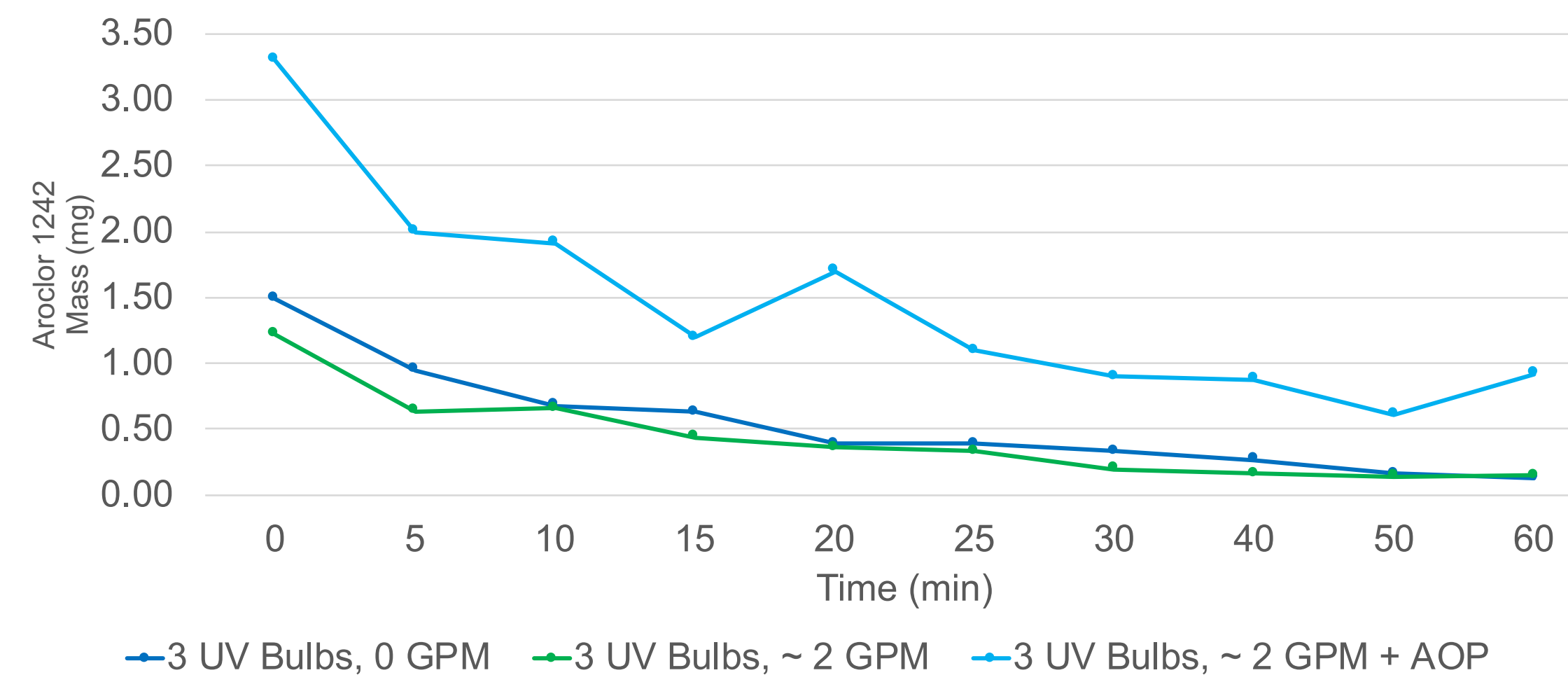
- Dual, 20-gal UV/AOP Reactor
- Three (3) UV bulbs with Violet Defense lens
- High-intensity 240nm, 48W UVC Bulbs

Source & Supply Specs: Two (2) 55-gal drums

The UV/AOP system is a continuous-batch pump-and-treat solution to degrade chlorinated contaminants (PCB, TCE, PCE, 1,4 Dioxane) and other POPs from impacted water and groundwater. The system is a versatile design and capable of being installed independently or with other in-line treatment systems.



PROVEN & SUCCESSFUL



Test 1: A static test with three (3) UVC bulb at a starting PCB mass of 1.49g with a final ending PCB mass at 60 minutes of 0.13g.

Test 2: A circulation test at 2GPM with three (3) UVC bulb at a starting PCB mass of 1.22g with a final ending PCB mass at 60 minutes of 0.15g.

Test 3: A circulation test at 2GPM with three (3) UVC bulb + H₂O₂ at a starting PCB mass of 3.30g with a final ending PCB mass at 60 minutes of 0.92g.

FASTER – BETTER – CHEAPER

The UV/AOP Reactor is designed to degrade and destroy PCBs upon exposure without creating a secondary waste stream that needs to be transported to a proper disposal or landfill. The system is designed to be efficient in its usage of power and uses minimal chemical solutions thus reducing operations and maintenance cost for the Client.

The UV/AOP Reactor is designed with multiple UVC light sources wrapped with a proprietary non-fouling UV lens. In partnership with Violet Defense Technologies the lens technology does not require problematic quartz sleeves that foul and degrade performance over time.

In addition to the UV light source technology, the UV reactor also incorporates Hydrogen Peroxide (H₂O₂) that is introduced to the system through an in-line metering valve. The UV light and H₂O₂ interaction produces hydroxyl radicals that then further degrades contaminants within the media.

A LEGACY TOXIN IN GROUNDWATER

In 2010, verified low level PCB concentrations was leaking from under the Client's plant and into the groundwater which lead to a nearby river. Concerns of PCBs contaminating fish, a source of protein for several native American tribes living within the river, called for action from the Client and State Regulators.

The Client entered the State's Voluntary Action Program to study the extent of environmental contamination as well incorporate innovative technologies, onsite, to fix their legacy contamination issue.

From 2015-17, the Client pilot tested a media-based filtration system which not only proved to be unsuccessful at remediating the contamination, but also caused a higher than expected operations and maintenance cost. Additionally, the media-based filtration system did NOT degrade or destroy the PCB contamination, instead, it created another waste stream that required to be transported to PCB classified landfill which resulted in additional risk to the community and cost to the Client.

In 2018, ecoSPEARS began working with the Client via small research & development (R&D) program to test various chemistry and innovative solutions from NASA-Kennedy Space Center environmental program.

CLEAN TECHNOLOGY FOR A BETTER FUTURE

Through a successful bench scale – lab study using UV & UV/AOP to degrade PCBs, the Client partnered with ecoSPEARS to develop a bench scale – pilot UV/AOP Reactor system that can process 3-5 GPM of PCB impacted groundwater. The UV/AOP Reactor was delivered in May 2020 to the Client's site to commence onsite pilot study.

Since the delivery of the UV/AOP Reactor, ecoSPEARS has executed a multi-program, 3-5 year partnership with the client to; 1) manufacture additional UV/AOP Reactors for testing, 2) conduct follow-on testing and optimization R&D to the existing design, and 3) design and manufacture a larger pilot system capable of processing 30-50 GPM, equivalent, which will then lead to a 250 GPM system.

The future is clean – through ecoSPEARS' sustainable cleantech solutions improving health and safety the community, and the environment. Additionally, making environmental cleanup cost-effective for our client.