

Briefing:

Chemical-Free Drinking Water Purification: Triple Barrier Protection in One Unit Operation

Photo-Cat is a **Triple Barrier** water treatment technology used for the purification and protection of potable water. Since 1994, Photo-Cat has been used to purify water in a variety of potable water source protection and high purity process water applications. Today, Photo-Cat is a highly developed technology that has been proven and demonstrated in numerous applications domestically and around the globe. Photo-Cat is a unique chemical-free, UF and Advanced Oxidation Process (AOP) that removes chemical contaminants, biologicals, NDMA, viruses, oocysts, bromate, sub micron particulate, and metals such as manganese, mercury, and iron. Photo-Cat eliminates pre-treatment chemistry and continues to exceed all current standards of purification.

By applying the unique Photo-Cat process to potable water, its many benefits will significantly

improve drinking water quality and reduce cost and complexity. Without the addition of water treatment chemicals, Photo-Cat will purify ground and surface water to the drinking water standard.

Photo-Cat not only **removes or destroys difficult contaminants like cryptosporidium, giardia, and 1,4-dioxane**, it also improves the taste, colour, and clarity of water while reducing odour to desired standards. In addition, it does not create any Bromate and reduces existing Bromate back into Bromide. With multiple 1,4-dioxane treatment installations and sustained operational performance of up to six log removal, Photo-Cat has success where other AOPs have failed. Through its many installations and applications, Photo-Cat has demonstrated sustained compliance and achieved higher levels of water purity than competing technologies.

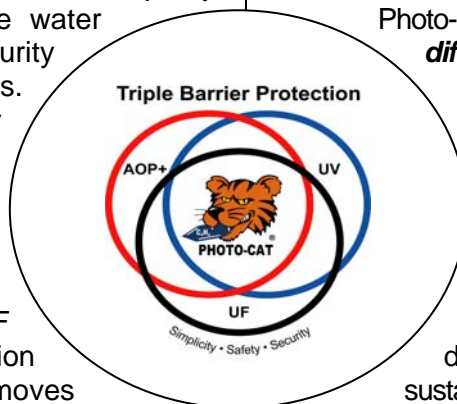


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Photo-Cat water purification combines the best of chem-free AOP technology; long life, wiper-free UV; and maintenance-free ceramic membranes to provide durable Triple Barrier protection for drinking water.



A Chemical Oxidant-Free Process

Unlike conventional AOPs, Photo-Cat **does not require** hydrogen peroxide, or the carbon or chlorine associated with post-removal. The use of these substances puts drinking water at risk of further contamination because contaminants can leach when approaching saturation in carbon and hydrogen peroxide contains stabilizers of concern.

Treatment for Bacteria, Viruses, and Spores

Photo-Cat not only disinfects contaminated water, it also kills bacteria, viruses, and oocysts such as e-coli and cryptosporidium. It is Photo-Cat's **Triple Barrier System** that allows for the elimination of such biologicals. Those biologicals resistant to AOP & UV treatment can be filtered out by a physical ceramic barrier. This barrier provides a complete method of purification and protection for potable water. The advantage of a ceramic membrane barrier is its invulnerability to fatigue and other forms of failure. Photo-Cat also eliminates cleaning and replacement requirements. With this triple barrier system, Photo-Cat provides unmatched peace of mind.

With a host of benefits including superior water treatment capabilities, no quartz wipers, low lifecycle cost, negligible consumables, and simplicity, the Photo-Cat purification process represents an alternative to the costly and complex treatment methods currently on the market. Photo-Cat must not be confused with conventional AOP technologies.

As a fully developed system that incorporates a plant-wide SCADA and control network, Photo-Cat represents a leap beyond traditional AOPs, providing a significant opportunity in capital and lifecycle cost reduction. Not only does Photo-Cat successfully purify water to drinking water standard, it has significant operating advantages. Without the use of potentially harmful consumables such as hydrogen peroxide, ozone, and chlorine, Photo-Cat truly minimizes waste and promotes sustainable development. With a 24,000 hour service interval on UV lamps and 41% lamp efficiency capability, the chemical oxidant-free Photo-Cat has easily defined performance and lifecycle costs. In addition, Photo-Cat is capable of detecting and reporting changes in water chemistry. It is Photo-Cat's fully developed automation that also allows it to identify future service requirements.

Cost Comparison

	Photo-Cat	Conventional
Power	✓	✓
Hydrogen Peroxide	Not required	✓
Ozone	Not required	✓
Carbon	Not required	✓
Clarifiers	Not required	✓
Lamp Life	18,000-24,000 hrs	3,000-14,000 hrs.
UF Replacement	Not required	8-10 yrs

When it comes to durable drinking water purification, look to Purifics for one-stop-shopping. Purifics can supply the full package, right down to the bricks and mortar. Not only that, Photo-Cat can be fully tailored to specific client needs. It can stand alone, or be integrated with existing operations to completely unify plant processes. For a fully operational Photo-Cat system, simply drop it in place and it is ready to run. Thus, Photo-Cat is ideal in situations where skill sets for operation and maintenance are limited.

As a single unit operation for organic contaminant removal, the Photo-Cat process reduces the complexity of potable water purification and improves the overall quality of drinking water, making it one of the most viable drinking water purification technologies on the market.

Purifics is the oldest and most experienced commercial vendor of AOPs and ceramic membrane systems, producing the most highly developed technology of its kind.

Applications

The Photo-Cat system is ideally suited for the treatment of ground and surface water in both small and large municipalities. Photo-Cat's modularity gives it the capability to process flow rates from a few litres per second to thousands of litres per second.

Expanded Capabilities

While Photo-Cat is used to treat water contaminated with both biological and chemical contaminants, it is also capable of handling a variety of other surface water challenges, including turbidity and water contamination due to fuel spills and surges of high sediment.

Ceramic Membrane Systems

Purifics has engineered **Ceramic Membrane Systems** since 1993. Today, Photo-Cat, with its physical ceramic barrier, is used in six countries in a variety of applications, including: the removal of micron and submicron particles; dewatering; boiler feedwater preparation; polishing iron, manganese and silica from water; high ppm iron removal; and TOC reduction. Purifics has been applying its ceramic membranes in its photocatalytic processes to replace hydrogen peroxide in AOP, for Emerging Contaminant Destruction, and for the elimination of bio-fouling without the use of disinfectant to provide a system with continuous duty and no service requirement. Ceramic membranes have an operating pressure differential of 5-10psi, low lifecycle cost, essentially 100% duty, and sustainable flux. In addition, these ceramic membrane systems are fully automated, designed to meet boiler pressure vessel code for 150psi rating, and are not vulnerable to fatigue failure, abrasion, or chemical attack. Purifics' ceramic membrane systems do not require cleaning, chemicals, replacements, or consumables. Each system has a 25 year design life and Purifics' oldest system has exceeded 57,000 hours of run time.

Dynamic Membrane Performance

Flux	>3750 l/m ² /hr @ 20 C, 1 bar (2210gal/ft ² /d)
UF	<24nm Bacteriophage; 12nm TiO ₂
Integrity	Continuous Online
Service	25 yr, 14 yr Op. Experience
Duty	Continuous
Density	500 l/hr per l of space (3753 gal/hr per ft ³)
Cleaning	None
Reject	None



Photo-Cat Membranes

NO
 Fatigue Failure
 Abrasion Failure
 Off-Gassing/Leaching
 Reject/Process Loss
 Cleaning
 Operational Failure Mode
 Backflow/Back flush
 "In-Service" Failure
 Replacements

Related Documentation:

On-site Pilot Validation & Qualification
 Ceramic Membrane Systems
 Third Party Verifications

Contact Purifics for detailed performance and economic data.



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