

Advanced Water Purification - Overview

Special points of interest:

- New water purification technology
- Effectively processes organic compounds, pathogens, and heavy metals
- No waste water stream or hazardous material disposal
- Cost effective point of use system

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Puralytics has developed an advanced water purification product family. Utilizing recent advances in both semiconductor and nanotechnology, the Shield 500 solves an emerging class of water contamination problems.

Targets

These emerging problems include:

- Organic compounds, such as pharmaceuticals, pesticides, herbicides, petrochemicals, and personal care products
- Heavy metals including lead, mercury, and arsenic
- Micro-organisms including viruses, bacteria, protozoa, and cysts such as crypto-

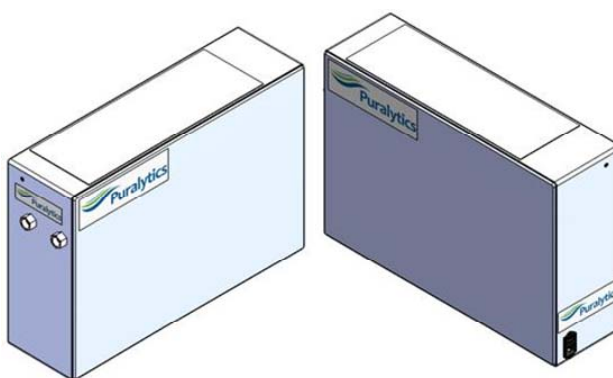
sporidium

Results

The Shield 500 provides a complete purification process in a self-contained unit. Exceptional reduction of targeted contaminants have been obtained with a single 500 gallon per day system.

Cost and environment

The Shield 500 is cost effective and environmentally superior, requiring no chemical additives or hazardous components. There is also no waste water stream adding to either cost or environmental problems.



Shield 500

The Puralytic Process

The Puralytics Process involves five powerful photo-chemical processes acting together in a single system. The individual processes are:

- Photocatalysis
- Photolysis

- Photoadsorption
 - Photocatalytic reduction
 - Germicidal irradiation
- Together, these complimentary processes provide unsurpassed capability to break down or neutralize most problem contaminants.

Photocatalysis

This patent pending, advanced oxidation process by Puralytics, using the latest semiconductor advances in UV LEDs, and recent nanotechnology coating

(Continued on page 3)

“Continuous operation over many years with virtually no consumables—a true revolution in water purification.”

Cost of Ownership

The Puralytics Shield 500 provides a very low cost of ownership and cost of water. The unit is a completely self contained water purification system. There are no chemicals to purchase, and no pressurization of the water required before or after processing.

The primary factors for cost savings are:

- 100% of the incoming water stream is purified. There is zero water wasted.
- There is virtually no pressure drop through the unit, eliminating the need for any pumps.
- The primary UV LEDs are carefully controlled to have an expected life of 10+ years.
- The photocatalyst is not consumed nor degraded during operation. The vast surface area will adsorb heavy metals for many years.
- There are no membranes to purchase or clean.
- There are no chemicals needed, which eliminates all storage and monitoring requirements.

The total cost of purified water is estimated at \$.02/gallon.

Optional accessories include two replaceable components: a low cost, post process filter, and a standard UVC sterilization lamp.

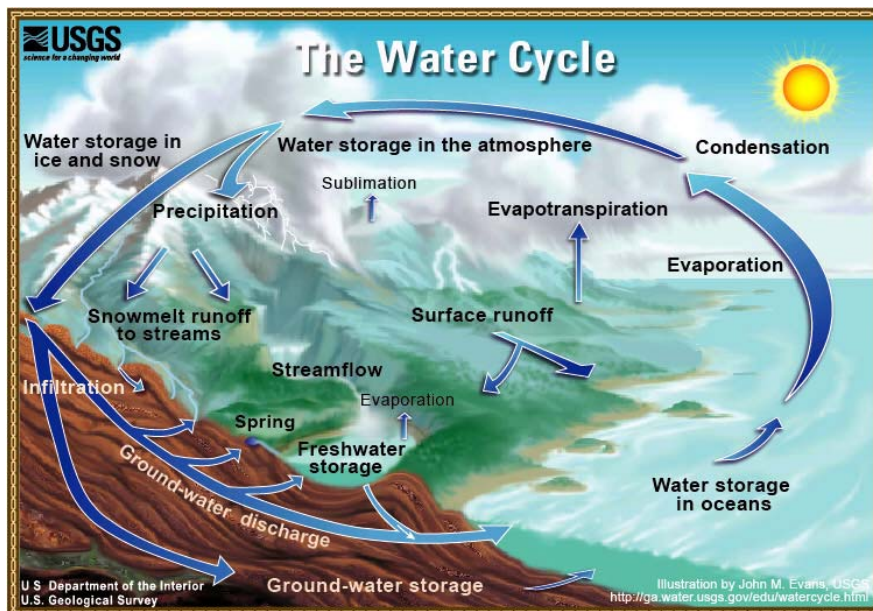
Environmental

The Puralytics products are designed to protect and enhance the environment. The Shield 500 breaks down or eliminates toxic materials that are an increasing problem, including:

- Pharmaceuticals
- Pesticides
- Herbicides
- Petrochemicals
- Heavy metals (lead, mercury, arsenic, etc.)
- Viruses, bacteria, and cysts

Additional environmental benefits include:

- No waste water stream (100% water utilization).
- No toxic disposal problems of filters or membranes
- No additional chemicals used
- An excellent E_{EO} rating of electrical energy consumed of 8.5 kWhr/m³/LRV for complex organic compounds



Puralytic Process, continued from Page 1

Shield 500

capability, photocatalytic reaction rates have greatly exceeded previously published data. This process is very effective in breaking down virtually all organic compounds to simple, harmless materials.

Photolysis

This process involves the direct decomposition of complex molecules by ultraviolet photons. This works in concert with photocatalysis to reduce compounds to simpler form and accelerates the overall process.

Photoadsorption

The catalytic material inside the reactor has a natural affinity to bond with heavy metals. This is significantly enhanced by the presence of the UV light, enabling rapid reduction in the concentration of heavy metals, such as lead, mercury, and

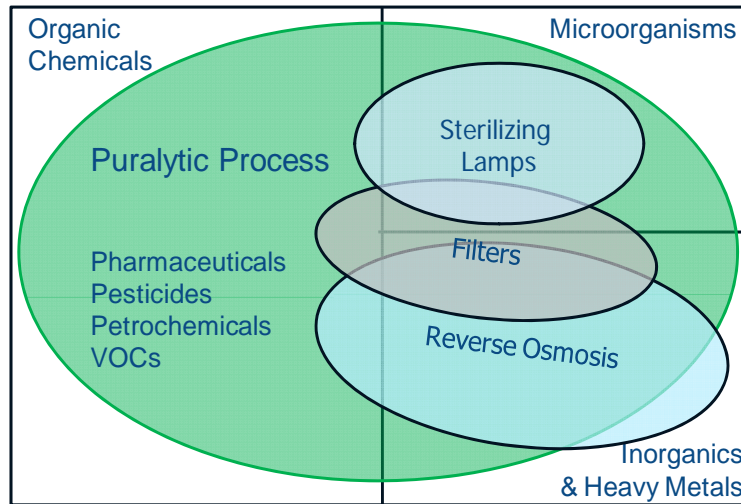


Figure 1 - Puralytic Process Contaminant Coverage

arsenic.

Photocatalytic reduction

Illumination of the photocatalyst generates free electrons which instantly react with many compounds. These reduced compounds are less toxic and demonstrate an enhanced affinity for permanent adsorption to the catalyst.

Germicidal irradiation

Intense UV light has been proven effective at sterilizing viruses, bacteria, and cysts. These pathogens are eliminated as a natural part of the Puralytic Process.

Applications

The combination of these processes provides the broadest contaminant coverage. The total effect of these combined processes can be seen in Figure 1.

The relative reduction rates can be seen in Figure 2. Pathogens are rapidly sterilized, and heavy metals and organic compounds are reduced at rates faster than any previously reported research, and the minerals that provide taste are not removed.

The Shield 500 solves emerging and existing

“Targeting the truly difficult challenges emerging in water purification”

drinking or grey/waste water problems in several markets:

- Commercial—food/beverage, hospitality
- Industrial—pharmaceuticals, electronics mfg.
- Institutional—embassies, schools, housing complexes

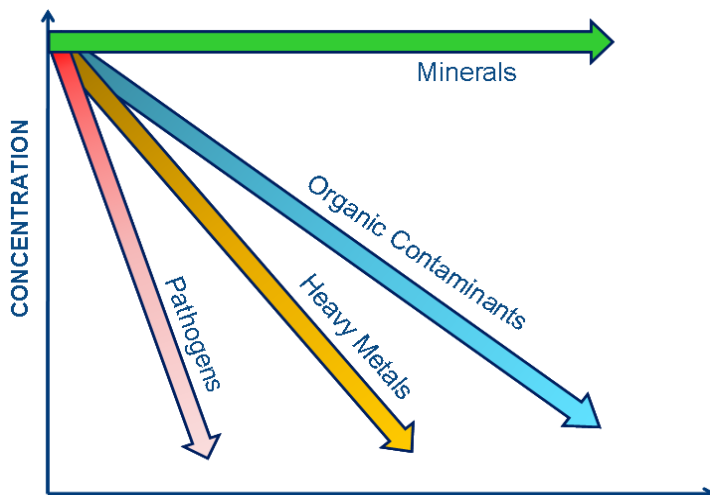


Figure 2 - Puralytic Process Reduction Rates



Shield 500 Product Description

Puralytics

15250 NW Greenbrier Parkway
Beaverton, OR 97006

Phone: 503 913-5194
Fax: 503 715-0485
E-mail:
dave.moser@puralytics.com

www.puralytics.com

The Puralytics Shield 500 is a stand-alone water purification unit. The primary advantages are:

- Disintegrates all organic compounds

No hazardous byproducts
No contaminated filters to dispose
Effective on:

Pharmaceuticals
Pesticides
Herbicides
Personal care products
Petrochemicals, MTBE

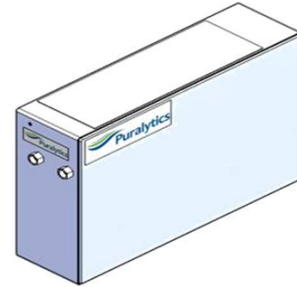
- Adsorbs heavy metals onto the vast surface area of photocatalyst

Removes:

Arsenic Chromium
Lead Mercury

- Provides complete sterilization of pathogens, including:

6 log reduction of bacteria
4 log reduction of viruses
Killing protozoa and cysts



100% of the incoming water is purified

No pressure drop through the system

Requires no chemical additives

Total cost of water: ~ \$.01/gallon

Low power: ~ 635 watts

Small size: 28" X 8" X 19"

Minimal weight: ~ 65 lbs

Simple to replace consumables

Digital control

Operation requires no specialized training

Puralytics Wins Artemis Project Award and an NSF and U.S. Army SBIR Grants

Artemis Project

Puralytics has been chosen by The Artemis Project as a Top 50 Global Water Technology Company competition winner, announced on Earth Day 2009.

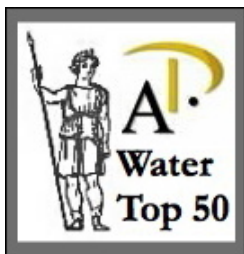
SBIR Grants

Puralytics has been awarded two Small Business Innovation Research (SBIR) grants. A U.S. Army grant for "Greywater Recycling System for Mobile Kitchens and Sanitation Centers." The project is researching greywater (sinks, showers, etc., but



not sewage) contaminant reduction to enable local disposal, rather than transporting waste to a central facility for processing.

A National Science Foundation SBIR grant has been awarded for "Novel UV Photocatalytic Process for Removing MTBE from Water" MTBE, a gasoline additive, has been polluting drinking water for the last 30 years, and cannot be removed with conventional methods



The Artemis Project Top 50 Water Technology Award

