



ADVANOX™

powered by **VAN REMMEN**
UV Technology

Advanox™

*The powerful solution for persistent micropollutants and
pharmaceutical removal*



Background

Persistent micropollutants and pharmaceuticals are a relatively new concern in wastewater treatment. To remove them, advanced oxidation processes can be used as a polishing step. One of the most popular types of advanced oxidation is the use of ozone (O_3) to break down the pharmaceuticals. This treatment method has several downsides:

- Production of ozone on site which is an energy intensive process with many safety issues;
- During the process carcinogenic by-products such as bromate (BrO_3^-) and chromate (CrO_4^{2-}) can be formed;
- The residual-ozone needs to be removed before discharge.

Antibiotic resistance

The World Health Organisation predicts antibiotic resistance is "one of the biggest threats to global health, food security, and development today". This is caused by the large amounts of medicines and other persistent micro-pollutants we use, but also flush away with our wastewater. Not just medicines but also other compounds get into our water cycle that have detrimental effects on our environment. Endocrine disruptor cause gender dysmorphism in aquatic species, pesticides damage ecological diversity and health, persistent industrial compounds can cause cancer. These, and many other examples, paint a clear picture; we need to remove these micro-pollutants from our water. The good news is that we have the perfect solution.

The solution: Advanox™

To offer you the solution, Van Remmen UV Technology have developed a technology: Advanox™. This concept lets UV-C light and hydrogen peroxide react with each other in a closed reactor. The reactor has been designed to provide an optimal water flow and great flexibility that achieves great benefits for UV-C application, specifically

aimed at oxidation. Powerful radicals are formed that break down pharmaceuticals in wastewater. This technology gives you all the tools to remove pharmaceuticals, but also other persistent micro-pollutants, up to and above 90%. It's flexible enough that lower removal efficiencies of 60-80% can easily be reached too with a direct positive effect on treatment cost, you can even set it yourself to flexibly scale with whatever demand your system has any minute. In addition, the process is faster, has a lower Total Cost of Ownership (TCO) and safer than the classic approach.

How it works

A small amount of hydrogen peroxide is added in-line to the wastewater. Next the water is led through the Advanox™ UV-C reactor. In the reactor, the UV-C light splits the hydrogen peroxide into hydroxyl radicals. These powerful radicals oxidize all micro-pollutants they can find a process that only takes milliseconds. The reaction transforms the pharmaceuticals to the less harmful and more biodegradable products. At full mineralisation these products are mainly water and CO_2 gas.

Pure removal, easy & clean

Scalable

One of the advantages of Advanox™ is that the process is modular and scalable. The flow through the system, the dosing of UV-C light and hydrogen peroxide can be adjusted separately from each other. The system is designed to be scalable from the start, so if anything changes it is easy to scale up or down your treatment accordingly. All this, with a positive effect on your operational costs.

As an example: At a transmittance of 90% (T10) a single Advanox-48 (shown here) has a capacity of 210 cubic meters an hour with a UV-C dose of >10.000J/m². On raw drinking water this dose was proven to yield a >90% average removal rate of 40 micro-pollutants tested by The Netherlands leading water research institute (KWR).

The results

The Advanox™ technology is set up in multiple pilot installation applications. This led to the following findings:

- It can remove >90% of micro-pollutants
- It works on a wide range of water qualities, from dirty wastewater to clean drinking water
- It is designed to be inherently flexible and scalable, solving problems now and in the future
- It is developed by experts with more than 20 years of experience, ready to think for and with you
- It is safe, efficient and needs a small footprint

Installation and monitoring

An Advanox™ installation takes up little space and it is relatively simple to fit to your situation. The system is automated: the settings and performance of Advanox™ are monitored remotely in a central control room or your own PC. Because of this, troubleshooting and maintenance is minimal. With an Advanox™ installation you always have a working and efficient system, without the worries.

Many problems, one solution

Besides pharmaceuticals the Advanox technology has also proven itself in many other fields. For the removal of pesticides from greenhouse discharge water. For the removal of cyanide from industrial wastewater. For the polishing of drinking water and the de-colouration of process water. We have a strong and flexible team waiting to see what solution they have for your challenges. Ask them, if you want to know more.

Product

Depending on water quality, removal rate or UV-C dose, the system can be staged, throttled or expanded to meet changing requirements. The system is designed to be modular and expandable in a multi reactor setup. Also with a single reactor measures and corrections can be integrated to yield optimal flexibility.



Inlet

Water enriched with hydrogen peroxide enters the reactor. Our patented hydrodynamical optimisation supplies fresh contaminants to the reaction zone and removes reactants for optimum efficiency.



Process

The most efficient low pressure UV-C lamps illuminate the product and generate radicals that react within milliseconds. Micro-pollutants are burned/oxidised in the water with minimal by-products.



Capacity

A single Advanox-48 can treat 50-250 cubic meters an hour depending on water quality and required performance with a power consumption of 28kWh.



Control

Water quality, system performance and operational parameters are measured in-line in real-time. A standard suite of operational sensors is always integrated and depending on clients request this can be expanded to include specific requests or protocols.



Pure removal, easy & clean



Electrical cabinet

For the UV-C lamps driven, stand-alone integrated safety PLC and a computer for remote operation are incorporated.



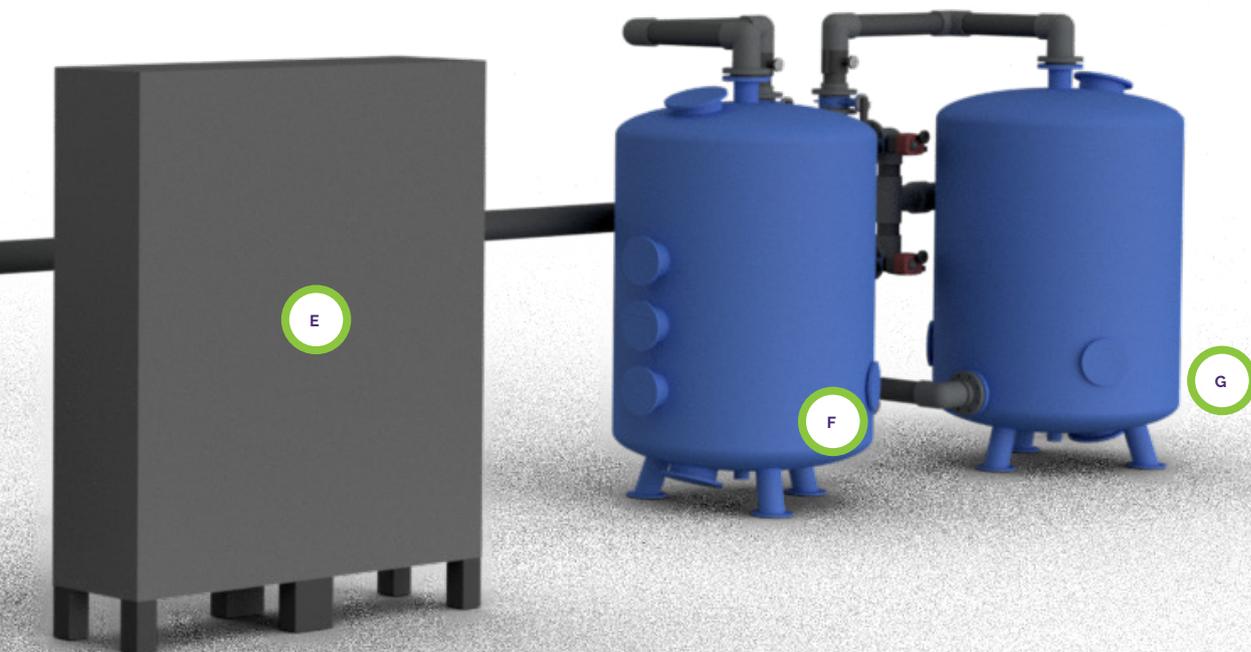
Catalytic beds

Remove residual hydrogen peroxide if needed.



Outlet

Treated water is discharged in compliance with clients requirements.





About Van Remmen UV Technology

Van Remmen UV Technology is a supplier of Europe's most sustainable UV disinfection systems. A unique approach and a great passion for our specialty is the driving force of our company. We look further, and think in solutions. We test and validate our equipment with microorganisms to make sure that our systems do what they need to do. Sustainability has a high priority in our company. From this line of thinking we have developed equipment that are the most energy efficient in the industry.

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