

**UV**

***Berson UV-techniek***

**for wastewater treatment**

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*UV units for wastewater*



# UV

## Berson UV-technik for wastewater treatment

### Environmentally friendly

#### bersonInLine<sup>+</sup>WW

- Lower operational costs
- CFD designed
- Bioassay validation
- Lowest number of lamps
- Smallest footprint
- Lowest headloss
- Highest MP lamp life
- Automatic wiping of all lamps



Szeged, Hungary  
 5 x bersonInLine 1500<sup>+</sup>WW  
 5000 m<sup>3</sup>/h wastewater disinfection to meet EU-bathing water directive



Vlaardingen, The Netherlands,  
 Berson InLine 2500  
 100 m<sup>3</sup>/h production internal process water from WWTP effluent at WWTP "de Groote Lucht"

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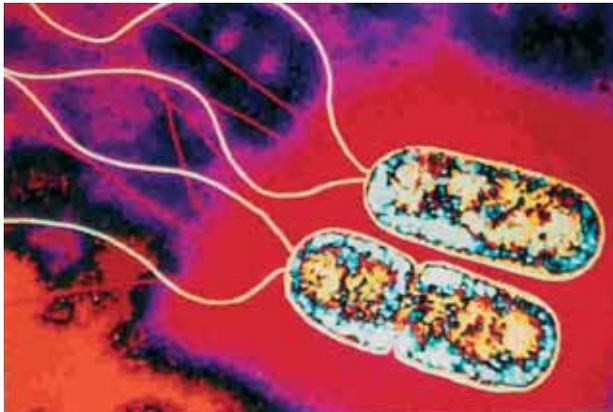
## Berson UV-techniek for wastewater treatment

# UV

Best technology

### Ultraviolet (UV) technology

As invisible component of sunlight, UV has long been known as a natural source of disinfection. For over a century, scientists and researchers have built up a wealth of experience in the laboratory and in the field. Now UV is a well established method of wastewater treatment. To safeguard public health and protect wildlife in surface waters, effluent from treated wastewater must be disinfected before it is introduced into the environment.



No photorepair

### Mechanism of UV inactivation

The UV section of the electromagnetic spectrum is divided into three main wavelengths ranges (UV<sub>C</sub>, UV<sub>B</sub> and UV<sub>A</sub>), which have different effects on DNA, RNA and other molecules (such as enzymes) within the cell.

DNA and RNA have their main absorption at 265 nanometer (nm). UV also causes photochemical reactions in proteins, enzymes and other molecules, mainly between, 240 and 280 nm.

## Higher effectivity with bersonInLine<sup>+</sup>WW

### Permanent inactivation

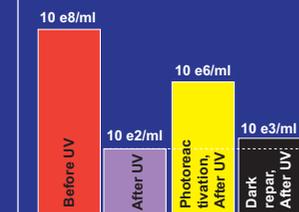
Research work by Oguma *et al* (2002) has confirmed that bersonMultiWave<sup>®</sup> medium-pressure lamps cause permanent irreversible inactivation at faecal bacteria like *Escherichia coli*. The results of the research work suggest bersonMultiWave<sup>®</sup> lamps offer better protection against photoreactivation than low-pressure UV lamps.

Zimmer *et al.* (2002) also reports permanent deactivation of pathogenic *E. coli* O157:H7 using medium-pressure lamp technology.

If there is any chance that UV-treated wastewater will be exposed to visible light or sunlight, even for short periods of time, it is best to use bersonMultiWave<sup>®</sup> rather than low-pressure UV lamps.

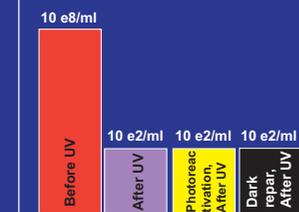
### Study of Zimmer et al. (2002)

Results of low pressure UV lamps @ 10 mJ/cm<sup>2</sup>



### Study of Zimmer et al. (2002)

Results of medium pressure UV lamps @ 10 mJ/cm<sup>2</sup>



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# UV

## Berson UV-techniek for wastewater treatment

### 'Closed-pipe' UV units

#### Open channel or 'closed-pipe'

Nowadays more wastewater treatment plants are designed using pipes instead of open channels to discharge treated effluent.

As chlorination of effluent is now limited due to environmental concerns, the need for chlorination contact tanks is no longer necessary. More and more wastewater treatment plants are also closing or covering their open channels to prevent algae growth due to sunlight.

As a lot of effluent is now re-used for irrigation, it is usually transported in-pipe to point-of-use.

If UV units are used to disinfect effluent it is necessary to cover up open channels to protect operators from UV light from the lamps. The alternative solution is very simple - install a pipe and fit a 'closed-pipe' UV unit.



Better protection using  
'closed-pipe' UV system

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#### Design of UV reactor

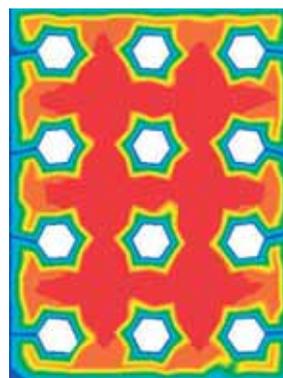
Berson UV-techniek has designed a 'next generation' unit, the bersonInLine<sup>+</sup>WW, based on more than 30 years' experience in wastewater treatment.

By using advanced CFD (computational fluid dynamics) software and performance verification of biological data, the bersonInLine<sup>+</sup>WW optimises unit performance efficiency for wastewater disinfection.

The advantage of the bersonInLine<sup>+</sup>WW over open channel UV units is the narrow and perpendicular position of the UV lamps, which force microorganisms to pass the 'high-intensity field'.

Open channel UV units have a virtually laminar flow due to the low velocity of the fluid. Microorganisms therefore pass through the area of lowest UV intensity without receiving sufficient UV exposure.

The CFD figure below shows the front view of an open channel unit. The highest velocity passes through the centre (red area), where the lowest UV intensity can be found. Microorganisms passing through the centre therefore receive the lowest (or no) UV dose.

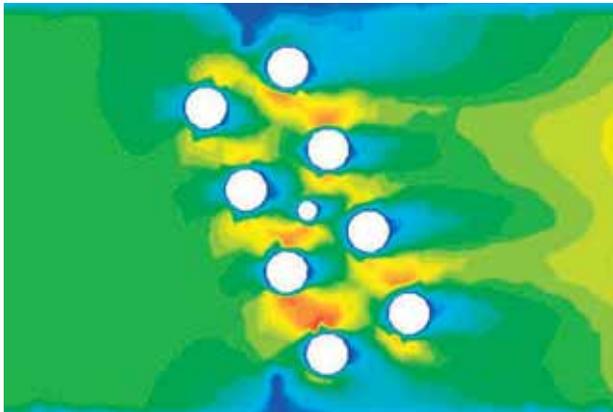


*Smallest footprint***Computational Fluid Dynamics (CFD)**

CFD is a computer generated prediction of the characteristics inside a UV reactor. It is used to predict and understand flow patterns, headloss, velocities, pressures, particle distribution and UV dose.

As all UV units are different in terms of flow, reactor design and geometry, fluid kinetics and process piping, CFD-modeling is needed to predict the required performance of a UV unit for wastewater.

CFD-modeling combined with microbial biosimetric validation tests optimises the design of UV reactors.



Berson UV-techniek's extensive field experience provides concrete proof of the accuracy of its CFD prediction modeling.

The new bersonInLine<sup>+</sup>WW is the first series of UV equipment based on CFD prediction modeling.

**Berson combines CFD with biosimetric tests**

**90% fewer lamps, ballasts, sleeves and wipers**

**Controls**

The controls of the bersonInLine<sup>+</sup>WW unit use the highest quality components from established suppliers.

Berson UV-techniek uses highly reliable longlife 'constant wattage transformers' made from steel and copper wires.

The distance between the UV units and the control panels can be up to 100 meters.

To control the bersonInLine<sup>+</sup>WW unit and its connection with an external PLC, Berson's enhanced UVtronic<sup>+</sup> intelligent control can be used.



# UV

## Berson UV-techniek for wastewater treatment

### *Reliable controls*

#### **UVtronic<sup>+</sup> control**

The new UVtronic<sup>+</sup> is an intelligent, flexible and adjustable control device which ensures required microbial performances. It continuously interprets all process parameters and reacts immediately to any changes by selecting the optimal program to run the UV units. UVtronic<sup>+</sup> guarantees minimal operational costs in all possible situations.

#### **UVector monitor**

The UVector is a very reliable UV monitor that provides accuracy and a long life between factory calibrations. The UVector is an important component of the bersonInLine<sup>+</sup>WW, ensuring better control and assessment of disinfection performance.

#### **Access hatch**

The access hatch on the berson-InLine<sup>+</sup>WW allows operators to inspect and maintain the internal components of the UV unit.

#### **UltraWipe cleaning**

The improved UltraWipe chemically assisted cleaning mechanism (optional) removes difficult deposits from the quartz sleeves and the UV sensor.

#### **Energy control**

Enhanced energy control technology makes it possible to adjust power input based on UV dose calculated by the UVtronic<sup>+</sup> control device. Depending on UV output, the energy is adjusted to the correct value needed to guarantee the required UV dose with the lowest energy input.

#### **Automatic cleaning**

The automatic cleaning mechanism prevents fouling of the quartz sleeves and the optics of UV monitor. Because the sleeves are positioned at the right angles to the flow, there is no increase in headloss during the wiping procedure.



Berson UV, for small and large wastewater plants

*bersonInLine<sup>+</sup>WW***UV reactor**

The UV reactor of the bersonInLine<sup>+</sup>WW is manufactured from high quality stainless steel.

**UV lamps**

All bersonInLine<sup>+</sup>WW units are equipped with bersonMultiWave<sup>®</sup> medium-pressure UV lamps. These lamps are very compact, have a stable UV output and are easy to replace.

**Quartz sleeves**

High quality quartz sleeves protect the UV lamps. All bersonInLine<sup>+</sup>WW units use quartz sleeves with special components to prevent fouling.

**Easy mechanical installation**

bersonInLine<sup>+</sup>WW UV units can easily be installed within new or existing gravity and/or pressurised flow systems.

**Easy electrical installation**

bersonInLine<sup>+</sup>WW UV chambers are certified to IP65 for outdoor installation. The control panels are ready to connect with local power supplies.

The best choice for your installation

# UV

## Berson UV-techniek for wastewater treatment

### Wastewater sites



Thousands of wastewater sites use Berson UV



Berson, masters in UV

2008e/wastewater/BUV



For more information :

Berson UV-techniek  
P.O. Box 90, 5670 AB Nuenen  
The Netherlands

Tel +31 40 290 7777  
Fax +31 40 283 5755  
info@bersonuv.com  
www.bersonuv.com

