



UV Disinfection Systems K Series

Clean and Healthy Drinking Water
with Ultraviolet Disinfection

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Certified UV systems

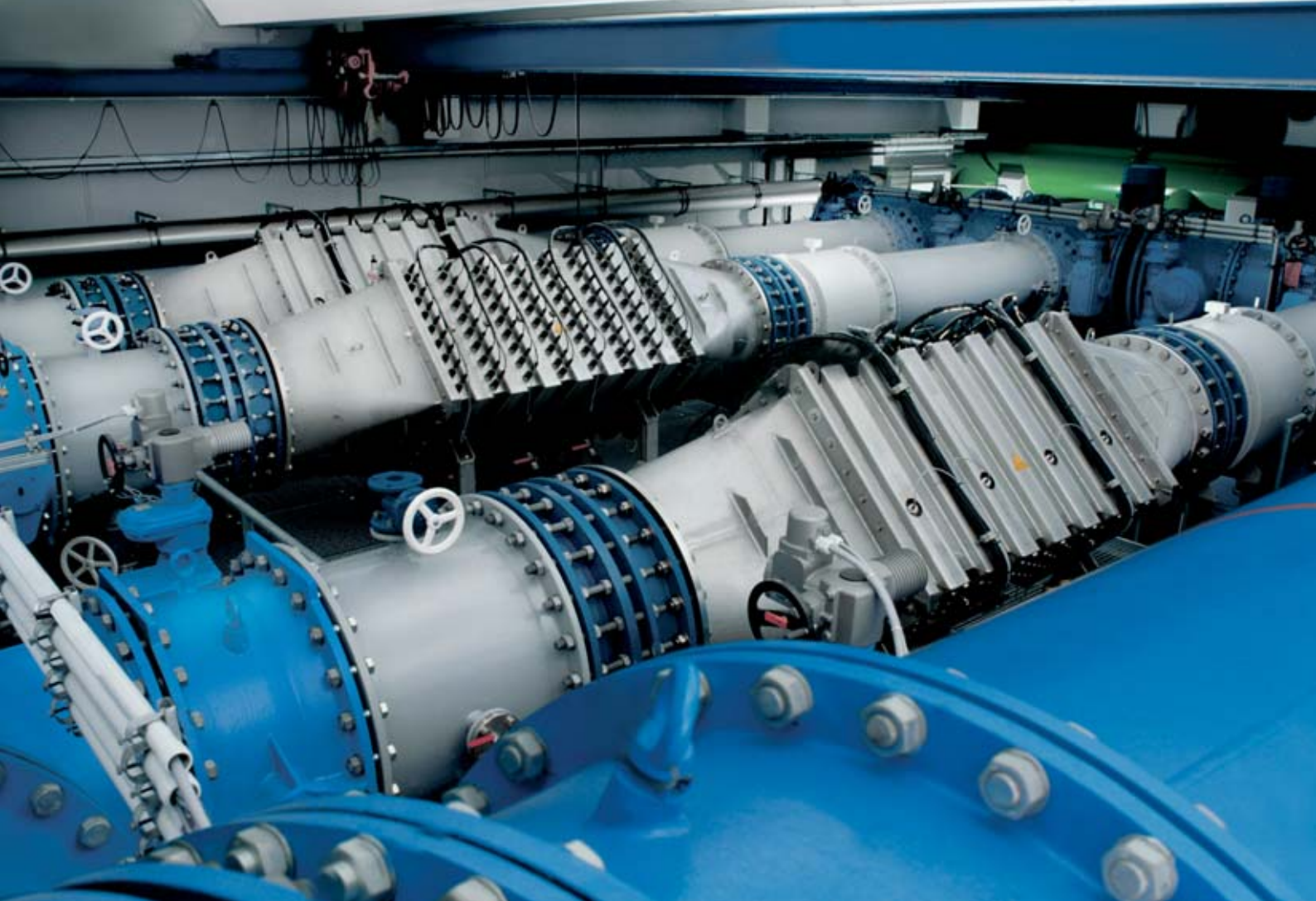
In 1993, a research project promoted by the Federal Republic of Germany demonstrated the effectiveness of UV disinfection with low pressure UV lamps. Following this, a certified method and quality standard has been developed, as described in the German DVGW guideline W 294 and the Austrian ÖNORM M5873-1, which specify the minimum requirements for a UV disinfection system. In a costly test procedure, UV disinfection systems must achieve a biosimetrically verified UV dose of at least 400 J/m² (at 254 nm) to obtain the DVGW, ÖVGW and SVGW (switzerland) certificates. According to the latest scientific knowledge, the number of hygiene-relevant

bacteria in water is reduced by a factor of 10⁶ by this UV dosage and the number of hygiene-relevant viruses and parasites is reduced by a factor of 10⁴ (Source: ÖNORM M5873-1). These certificates are now also recognized in Norway, Canada and the USA. WEDECO's product series can handle water flow rates ranging from 1 m³/h to several thousand m³/h with certified systems.

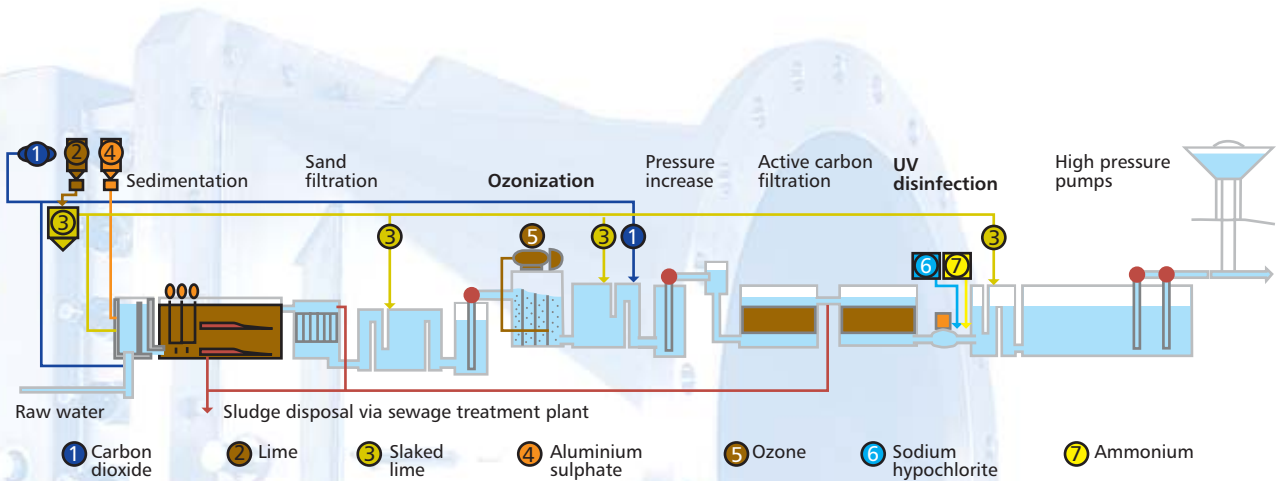
WEDECO offers the most technically advanced and economically effective solution, with the competence gained in 50 years of experience in drinking water disinfection with more than 50,000 installed large drinking water systems.



Worldwide distribution of WEDECO systems

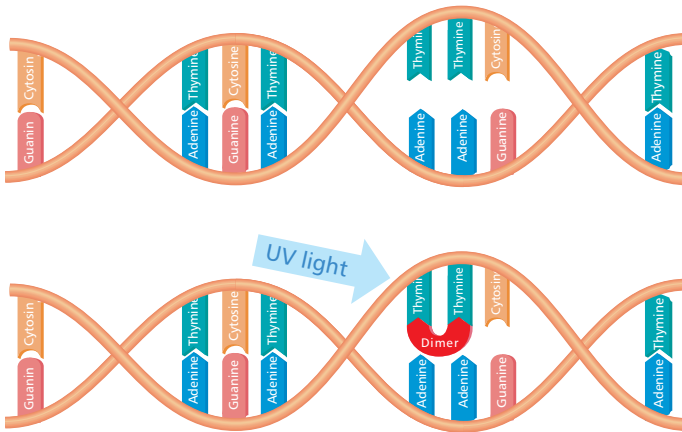


WEDECO UV potable water disinfection system (Wahnbachtalsperre, Germany)



Multistage process of drinking water treatment (Wasserwerk Pitkääkoski / Helsinki, Finland)

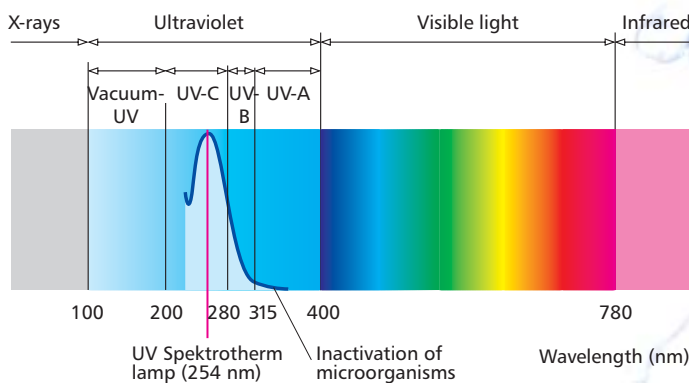
No chance for harmful microorganisms



UV light inactivates microorganisms by changing the genetic information in their DNA and RNA and thus preventing essential biochemical processes from taking place.

Reliable disinfection at 254 nm

UV is now used worldwide to disinfect potable water. Countless water utilities and big cities already rely on UV to disinfect their drinking water. Pathogenic bacteria, viruses and parasites such as *Cryptosporidium* and *Giardia*, are effectively inactivated by UV light. Disinfection with UV does not lead to the increased resistance associated with the use of antibiotics and, increasingly, chlorination. UV disinfection is being used successfully for groundwater, spring water, well water and surface water.



UV is energy-rich light with a wavelength of 100 – 400 nm. The UV-C range from 200 – 280 nm embraces the most effective wavelengths for disinfection (e. g. 254 nm).

Inactivation of parasites

As extensive tests in Germany and the USA have proven, UV disinfection is now the most effective method of inactivating dangerous parasites (*Cryptosporidia*, *Giardia*) in drinking water.

Comparison of the UV and chlorine disinfection methods

Type	Pathogenic bacteria	Total micro-organisms count	Viruses	Cryptosporidia Giardia	Possible harmful by-products
UV disinfection with low pressure	++	+	+	++	none
Chlorination	+	+	+	-	THM, AOX, chlorite

++ = very effective + = effective - = scarcely effective

No harmful by-products

Health authorities now recommend the use of technologies such as UV disinfection, which generate no harmful by-products. UV disinfection with low pressure Spektrotherm UV lamps (primary emission at 254 nm) impairs neither the taste nor the odour of potable water. It retains its natural quality. No harmful by-

products are formed, such as those associated with chlorination (THM) and medium pressure lamps (e.g. nitrite formation, the generation of assimilable organic carbon [AOC] and the formation of genotoxic substances). Nor does UV disinfection with Spektrotherm lamps increase the probability of recontamination.



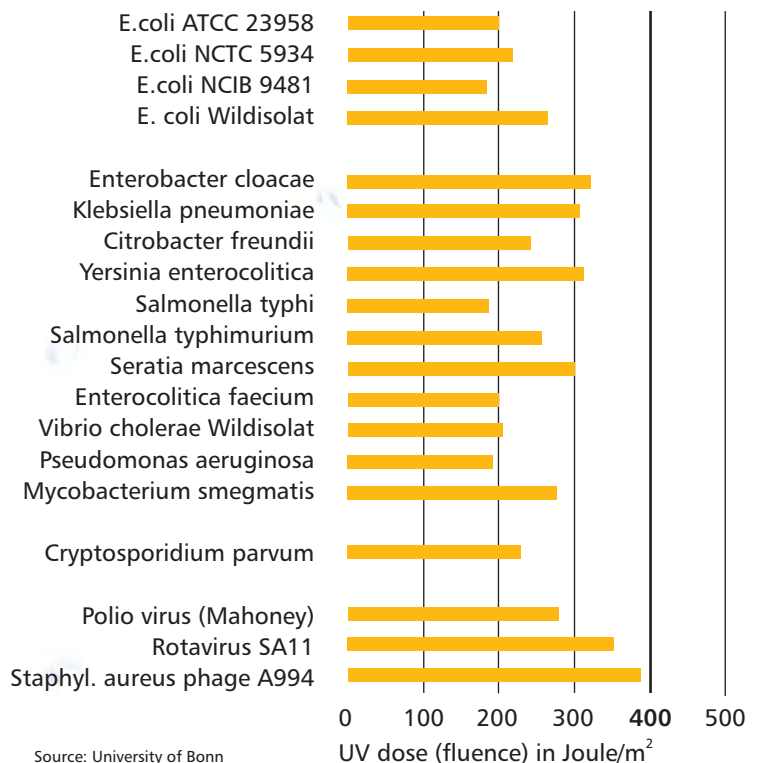
UV radiation is a part of natural sunlight

ADVANTAGES

UV disinfection is guaranteed with WEDECO Spektrotherm® lamps

- Reliable inactivation of bacteria, viruses and parasites (e.g. Cryptosporidia and Giardia)
- No harmful by-products
- No danger from chemicals
- No accumulation of dangerous microorganisms
- Cost effective
- Simple installation and operation

UV radiation dose for inactivation by a factor of 10⁴ (99.99%)



Photoreactivation is prevented by a UV dose (fluence) of 400 Joule/m²

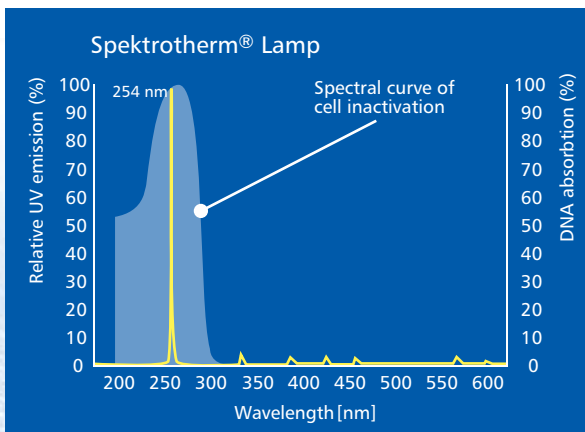
WEDECO Spektrotherm® lamps – market leaders in efficiency and reliability

In use for 15 years, during which it has been continuously improved, WEDECO's Spektrotherm® low pressure UV lamp is the benchmark for UV output and cost-efficiency. The special doping of the Spektrotherm® lamps (amalgam) and the specially developed electronic ballasts are responsible for the excellent operating properties of WEDECO's UV systems.

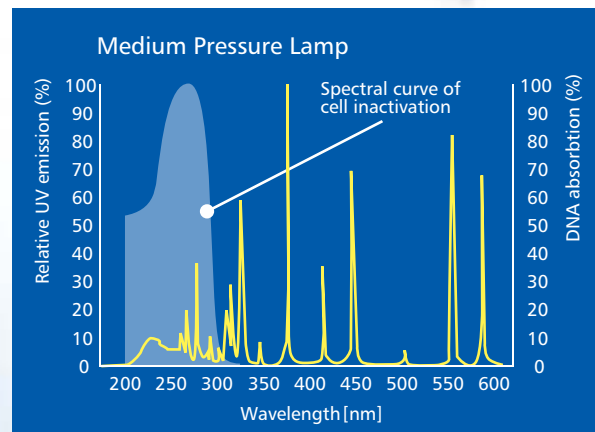
ADVANTAGES
• 5 times higher UV-C output than conventional low pressure lamps
• 3 times more energy efficient than medium pressure lamps
• Stable UV-C output at water temperatures from 0°C to 60°C
• Up to 3 times longer lamp life than medium pressure lamps



Emission spectra



The monochromatic Spektrotherm® lamp emits at a wavelength of 254 nm, which is in the maximum of the effective disinfection range of the spectrum.



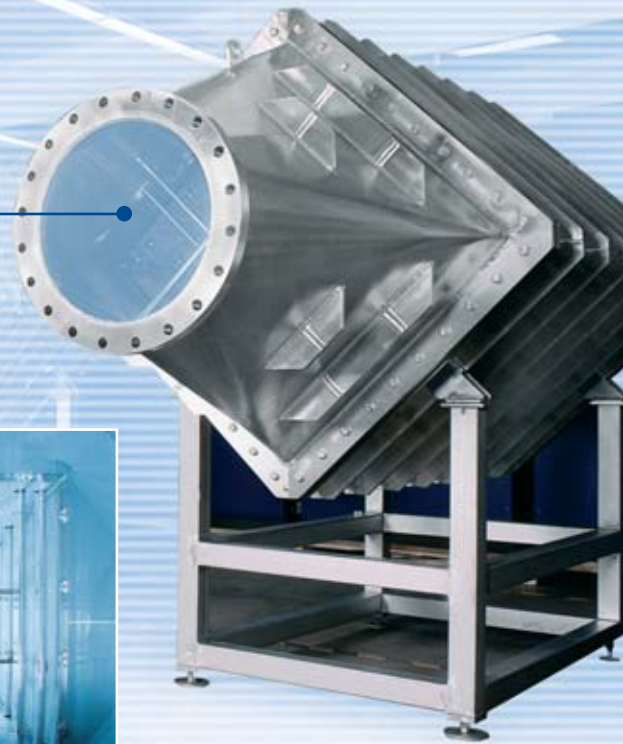
Medium pressure lamps emit a wide-band spectrum, most of which is outside the part of the spectrum that is relevant for disinfection. In addition, the formation of by-products cannot be excluded.



Electronic ballasts ensure that the Spekthrotherm® UV lamps operate cost-effectively and reliably



WEDECO stainless steel reactor with Spekthrotherm® UV lamps arranged perpendicular to the flow



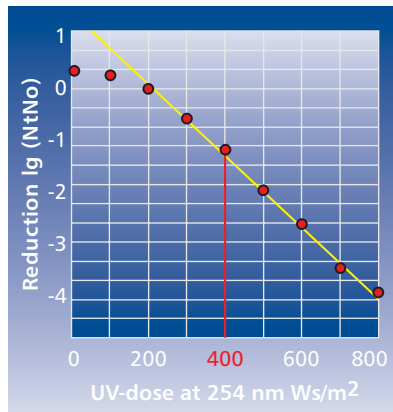
WEDECO Spekthrotherm® lamps – the most advantageous solution in comparison with medium pressure lamps

PROPERTIES	ADVANTAGES
<p>Much more efficient in the UV-C range Spekthrotherm® lamps: ~ 40% Medium pressure lamps: 12- 15%</p>	<ul style="list-style-type: none"> • Lower electricity and operating costs • Fewer lamps
<p>Longer guaranteed operating life than medium pressure lamps Lower lamp operating temperature: Spekthrotherm® lamps: 100 °C Medium pressure lamps: ~ 800 °C</p>	<ul style="list-style-type: none"> • Less ageing of the lamp and longer service life reduce operating costs • Simpler handling • Less susceptible to coating formation on the quartz sleeves • Immediate restart is possible – medium pressure lamps must first cool for 10 minutes • Medium pressure lamps have to be cooled during zero flow conditions (recirculation)
<p>Emission primarily at 254 nm – no emissions of short-wave UV light below 250 nm</p>	<ul style="list-style-type: none"> • In contrast to medium pressure lamps, no formation of harmful by-products • No expensive filters are needed to suppress short-wave UV light
<p>Amount of liquid mercury: Spekthrotherm® lamp: 0 mg Medium pressure lamp: up to 300 mg</p>	<ul style="list-style-type: none"> • Environmentally friendly • Spekthrotherm® lamps are recycled free of charge by WEDECO

Biodosimetrically verified UV dose of 400 J/m²

Certified to German DVGW W294 and Austrian ÖNORM M5873-1 standards

This unique quality standard for UV systems is a global benchmark. Mathematical methods of calculating the UV dose are usually imprecise, as insufficiently irradiated parts of the UV system are not sufficiently recognized.

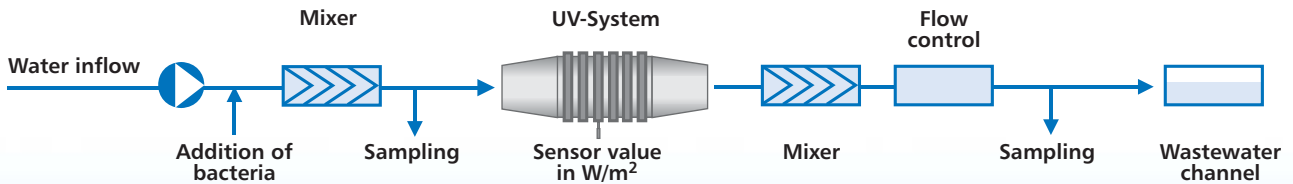


Inactivation diagram of B. subtilis spores with a laboratory radiation instrument

1 Radiation test in the laboratory

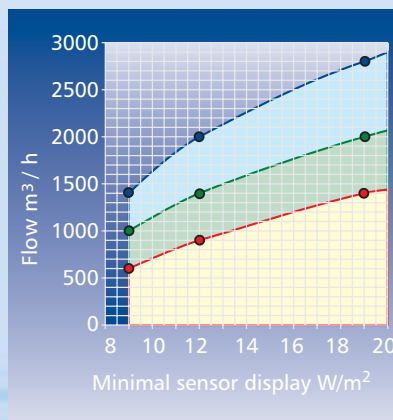
The UV system is subjected to a full-scale test to determine the real UV dose. The UV sensitivity of the bacterial strain is initially tested at 400 J/m² in a radiation test in the laboratory.

2 Full Scale Test

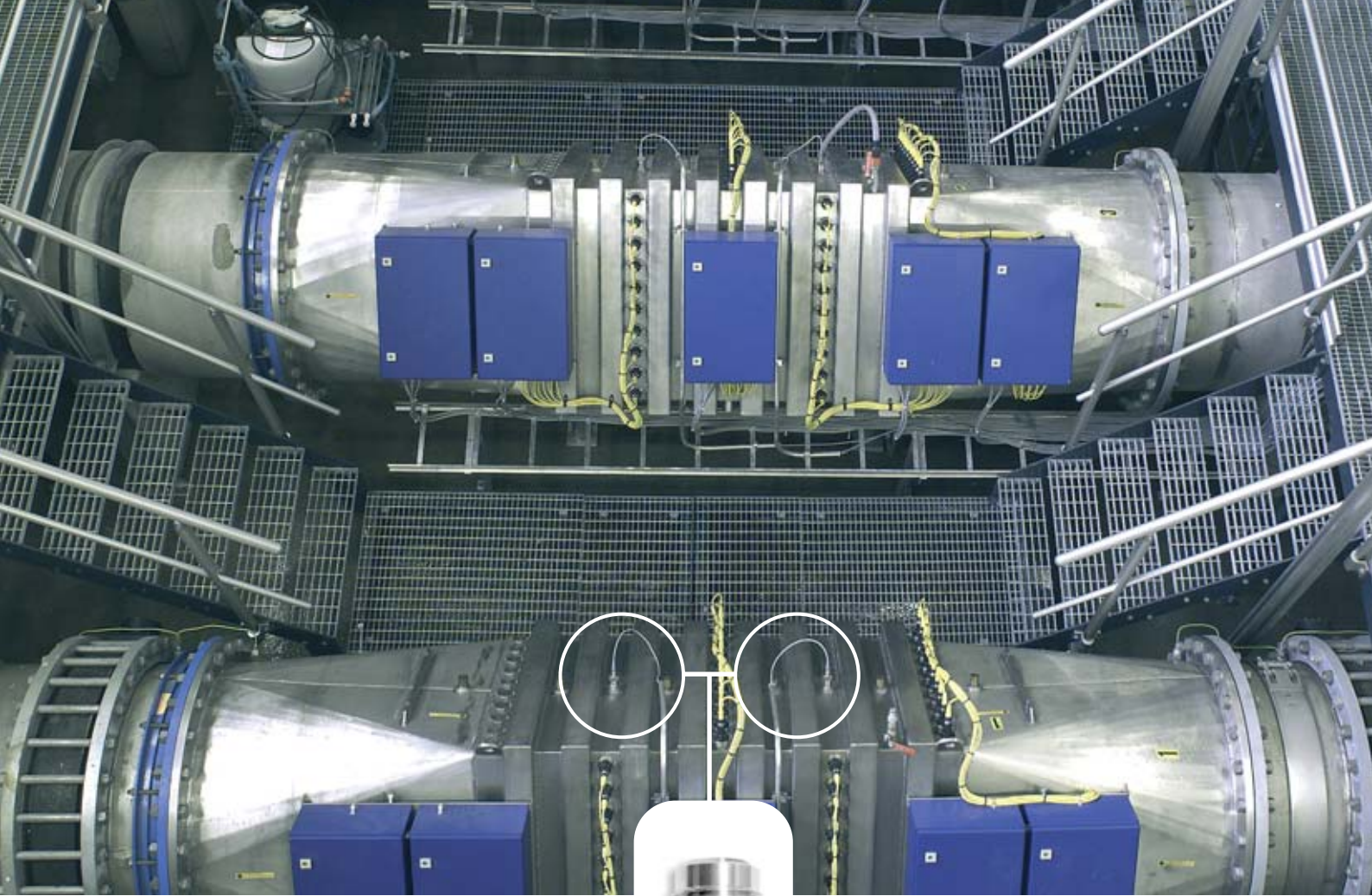


The UV system is then tested at full flow with injected bacteria. If the UV system achieves the same level of bacterial reduction as was measured in the laboratory test, the UV system has passed the test successfully.

3 Certified operating diagram



The result of this extensive test is the certified operating diagram with approved flow and minimum UV sensor value.



WEDECO UV disinfection system for potable water in Helsinki, Finland

Mounting sleeve



Sensor



UV monitoring device with sensor for determining the microbicidal radiation intensity

WEDECO is the first manufacturer in the world to have its whole range of drinking water products biologically certified. The K-type systems have also been intensively tested. Operators therefore know that they are getting the highest level of reliability.

ADVANTAGES

The decisive advantages for waterworks operators:

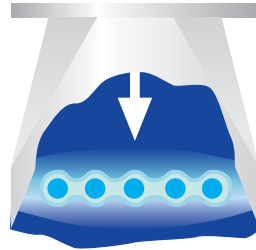
- Verification of the real UV dose of 400 J/m²
- Exactly dimensioned UV system on the basis of certified figures
- Standardized online UV intensity sensor
- Certified minimum UV intensity sensor value for verification of disinfection performance

UV dose control with the WEDECO variable system

ADVANTAGES

The WEDECO variable system offers

- constant UV dose irrespective of changes in water quality or flow
- continuous output regulation of the Spektrotherm® lamp
- fully automatic PLC control and visualization with bus or SCADA connection
- maximum disinfection reliability
- optimization of energy costs
- longer lamp life
- easy operation and monitoring



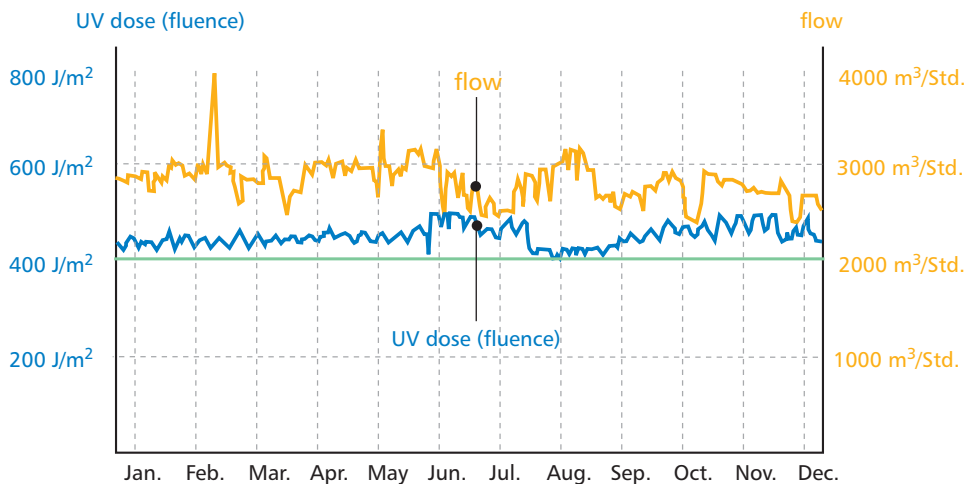
Low flow rate + good water quality = less intense UV radiation



High flow rate + poor water quality = more intense UV radiation

The WEDECO K systems can be optionally equipped with a fully automatic dose control. This unique feature of the WEDECO technology enables the output to be exactly adjusted to the water quality and flow. The output of the Spektrotherm® lamps is continuously controlled and rows of lamps can be switched on or off as necessary, e.g. during periods of low consumption.

The radiation intensity is determined at a representative point within the UV reactor and serves, together with the flow signal, to regulate UV output.



UV dose in practice: Constant UV dose even when the flow fluctuates.

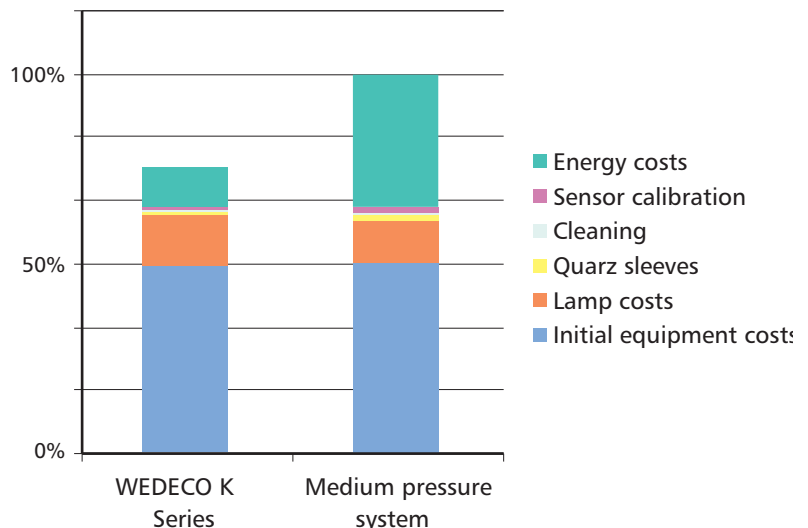


WEDECO UV disinfection system for Clayton County, Georgia, USA

ADVANTAGES
• Very low electricity costs
• Long lamp life
• Low cleaning costs
• Long service life of quartz sleeves
• Minimal pressure loss

Low lifetime costs – the decisive advantage of the K series

In addition to the listed technical highlights, the WEDECO K series also offers the solution with the lowest operating and lifetime costs. With low power consumption, a long lamp service life, variable control and low investment costs, the K series sets new standards of cost effectiveness. Coating formation on the quartz sleeves is also more manageable due to the low lamp temperature, so quartz sleeves rarely need to be cleaned. No expensive and maintenance-intensive wiper systems are needed.



Lifetime costs analysis based on 20 years, verified UV dose (fluence) with typical figures from public invitations to tender

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