

Ultra Violet Disinfection



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Applications

Overview

Ultraviolet (UV) disinfection is used to treat three billion litres of water every day around the world as it is a highly effective treatment method for killing virtually all micro-organisms within a system. UV works by disabling reproductive DNA.

A tried and tested technology, UV is effective in a wide range of applications which include general disinfection as well as specialist applications such as grey water recycling and the treatment of ultra pure water in a pharmaceutical production process.

Installation Guidelines

UV disinfection is a very effective method of killing bacteria, protozoa and viruses. Installers should however be aware that the treated water does not carry a residual effect which means it will not be effective against any contaminants already established in pipework. It is therefore recommended that distribution systems are drained and cleaned before the UV system is placed in service.

In an ideal situation the UV should be installed after any possible source of contamination, however in many cases it is acceptable to install the equipment on the incoming supply to a property.

Typical UV applications include spring supplies, borehole supplies and where there are risks of contamination by Legionella or pseudomonas. Grey water can also be treated using UV.

Boreholes

Most borehole supplies are governed by legislation which sets the limit for microbiological contamination as zero. Although testing is based on indicator organisms such as coliforms or streptococci, the real concerns relate to *Cryptosporidium*, *Giardia* and *E.coli*0157.

UV is a tried and tested method of disinfecting a borehole supply without altering the taste or odour of the water.

Spring Supplies

Spring supplies are often contaminated by surface waters that contain pathogens. This means some form of microbiological protection is needed. UV is the system of choice on many of these supplies as it does not alter the taste of the water nor does ultraviolet light create the potentially harmful by-products associated with chlorine dosing.

Legionella

HSE Approved Code of Practice and Guidance, L8 covers the control of Legionella. The legislation places the onus of responsibility on the owners of a property to protect the health of users.

The rate of growth of Legionella greatly increases in the temperature range of 20° to 50°C which is the a typical temperature range of a hot water system. This means that large buildings with extensive distribution systems are at risk.

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The traditional method of heating water to high temperatures and using mixer valves to cool the water has many drawbacks. In areas where the water is hard this increase in temperature also increases the potential for scaling and the creation of an environment which can harbour Legionella.

The obvious inefficiency in heating water to high temperatures only to cool it again by mixing with cold water at the point of use, has strengthened the case for low temperature water systems. UV disinfection can effectively protect against Legionella contamination in such situations.

Rainwater Harvesting

Cost in both financial and environmental terms has led to an increase in the use of grey water and rainwater recycling systems. These systems include a disinfection stage which is an ideal application for UV equipment.

Both rainwater and grey water can be filtered and delivered to a storage tank where UV can be used to treat the water prior to recycling for non-potable purposes.

Pseudomonas

Contamination of Pseudomonas in water systems is on the increase. The bacterium forms a bio-film that builds up on the inside walls of distribution pipework and fittings. The Pseudomonas sludge can lead to corrosion and blockages.

Accelerated growth occurs in situations where the water is oxidised and/or where the water temperature is within a range of 20° to 40°C. Growth can occur outside this range where the water is between pH 7 and 8.5.

The risk of Pseudomonas contamination can be reduced significantly by taking the following precautions.

- Adding biocides whenever the system is tested or during the initial filling stage;
- Only using properly chlorinated hoses and equipment when filling or maintaining the system;
- Testing the water for Pseudomonas as it enters the building and during filling or maintenance;
- End-capping open pipework to avoid contamination by debris and stagnant water;
- Designing the distribution system so that the entire system can be effectively flushed;
- Installing an appropriately sized UV system with a 10 micron pre filter.
- Regularly maintaining the UV and filter according to manufacturer's instructions.

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Specifications and kill rate

Type	Flow Rate* M ³ /h (lpm)			Flange Connection	Power Consumption (Watts)	Dimensions W x H x D (mm)	UV chamber Weight(kg)
	25 mj/cm ²	30 mj/cm ²	40 mj/cm ²				
Blue Boss 1	1.08 (18)	0.92 (16)	0.69 (12)	1/2"	35	470 x 90x 70	1,7
Blue Boss 2	2.70 (45)	2.25 (38)	1.69 (29)	3/4"	55	670 x 95 x 70	2,4
Blue Boss 4	4.65 (78)	3.87 (65)	2.90 (49)	3/4"	55	675x 129 x 102	3,2
Blue Boss 7	8.78 (147)	7.33 (123)	5.50 (92)	1"	95	1035 x 132 x 102	5,0
Blue Boss 10	13.17 (220)	10.97 (183)	8.23 (138)	1 1/2"	95	1040 x 180 x 140	9,0

40 mj/cm² = 99.99% (4-log) kill; 30 mj/cm² = 99.9% (3-log) kill; 25 mj/cm² = 99% (2-log) kill
 Sizing: For a 99.99% (4-log) kill of *E.coli.*, the Blue Boss 4 (@ 40 mj/cm²) will give a flow rate of 49 lpm.
 * The UV transmission at the end of lamp life (1 year) is 98%.

The dose and kill relationship as defined by the industry standard D₁₀ value is logarithmic, that is each logarithm is a power of 10. Using the table below, a 4-log (99.99%) *E.coli.* "kill" requires a UV "dose" of 21mj/cm². Assuming the required flow is 2.9m³ per hr, then using the specifying sheet (Rating), insert the following alongside maximum flow rate; **40 mj/cm² @ a flow of 2.9 m³ p/h.**

UV dosages for 4-log inactivation

Bacteria:	dose required (mj/cm ²) for a 4-log (99.99%) kill
Legionella pneumophila	8
Escherichia coli (<i>E.coli</i>)	21
Salmonella typhi	30
Vibrio cholera	1
Pseudomonas aeruginosa	22
Salmonella enteritidis	30
Streptococcus viridians	8
Staphylococcus aureus	10
Protozoa:	
<i>Giardia lamblia</i> cysts	10
Cryptosporidium parvum oocysts	10
Viruses:	
Hepatitis A	16
Poliovirus	30
Rotavirus – SA11	40

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Specifying Blue Boss UV

Water Disinfection

For the disinfection of the water system an ultraviolet disinfection unit shall be installed on the incoming mains or prior to the relevant equipment.

The unit shall provide effective microbiological protection and comprise a polished stainless steel chamber containing a high intensity long life UV lamp and quartz sleeve.

The flow of water to the Blue Boss shall be filtered to 10 micron using an appropriately sized filter and housing. The aim is to prevent particulate shadowing or clumping of micro-organisms as they pass through the chamber.

The unit shall connect to the mains via a moulded control unit and operate from a 230 / 240, single phase, 50Hz fused power supply.

The unit shall be a Blue Boss as detailed in the adjacent technical data table.

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Item	Rating
Feed water quality	Less than 300µg/l Fe Less than 50µg/l Mn Less than 120mg/l Hardness Less than 5 NTU turbidity
Pre filtration	10 micron
Lamp Life	1 year continuous use
Lamp type	Low pressure mercury
maximum flow rate (lpm)	___m ³ /cm ² @ a flow of ___lpm
Power consumption	___ Watts
Maximum operating pressure	8 BAR

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Warranty

The warranty for the components of the Blue Boss UV unit is 12 months parts and labour.

The warranty starts 6 months from the date of delivery or from the date of commissioning, whichever occurs first.

The warranty for UV bulbs is 8,000 hours.

The warranty does not cover any damages resulting from misuse, incorrect installation or application.

Goods should be checked when delivered and any breakages or missing parts reported immediately to Springhill, in writing.

The warranty will be invalid if the equipment is not serviced according to manufacturer's service intervals or is not carried out by a Springhill Water Services approved engineer.

This warranty forms part of Springhill's general terms and conditions and does not affect statutory rights. For a full copy visit the legal section of our web site, or telephone the main office to request a copy.