



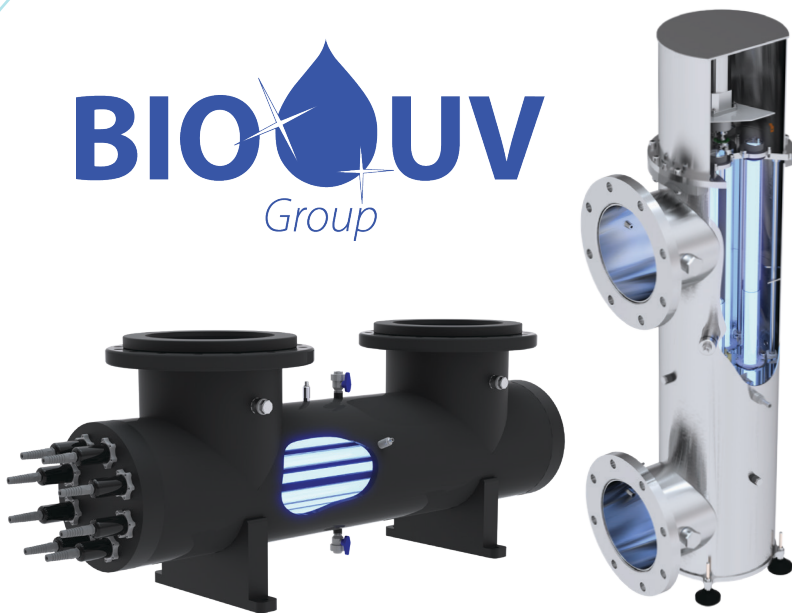
THE ULTIMATE STARTER'S GUIDE TO UV SYSTEMS

Everything you need to know for selecting
the ideal water treatment system for your facility.



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An Intro to UV Systems

Maintaining proper water quality is crucial to growing healthy fish. To do so, land-based farms need effective disinfection tools that can quickly and effectively remove unwanted microorganisms, ideally without chemicals. Excess chemical use can lead to pathogen resistance, alter water quality and even harm the fish directly.

Today, sites are turning to **UV (ultraviolet) disinfection systems as a chemical-free alternative**. These systems use a series of lamps to disinfect water without altering its physio-chemical characteristics, producing toxic by-products, or harming the fish.

Furthermore, UV has proven to be a versatile option, capable of treating a wide range of environments, from fresh to seawater.

In this buyer's guide, we'll explore the different types of UV systems, the best way to determine the right UV size and dosage, and when you should pair UV with ozone for additional treatment.

While this guide provides a solid starting point for understanding your options, choosing the right treatment setup requires carefully considering many factors. For personalized guidance and expert recommendations, [contact the Innovasea team](#).

At Innovasea, we've partnered with **Bio-UV** to deliver a comprehensive selection of advanced UV and ozone disinfection tools. When comparing the capabilities of different models, we'll be referencing Innovasea's current offering.

How UV Systems Work

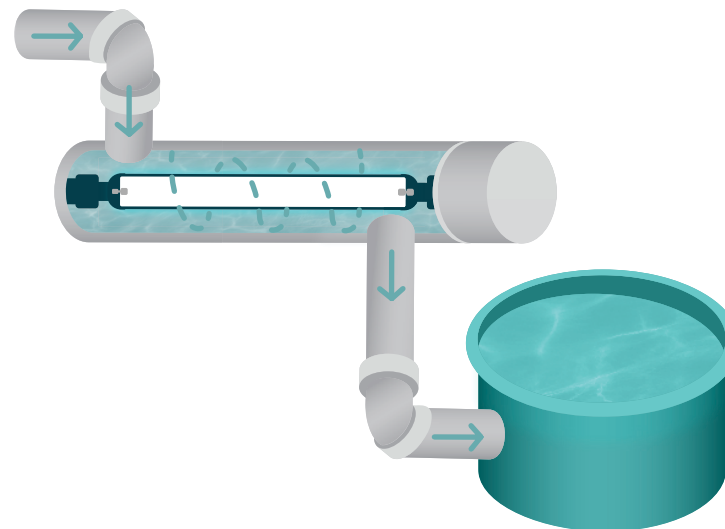
In a land-based fish farm, UV sterilizers are typically positioned downstream of mechanical filtration, such as drum and disc filters. This placement ensures the water is free of larger particles, allowing the UV sterilizers to effectively target and neutralize remaining pathogens.

Filtered water flows through the UV chamber, where it is exposed to a series of specialized UV lamps. While there are different types of lamps, depending on the size and system you select, they all have the same end goal: eliminating unwanted pathogens in a safe and chemical-free way.

UV systems achieve this by emitting UV light (measured in dosage) that can penetrate the cells of microorganisms and alter their DNA, rendering them harmless and unable to reproduce. A wavelength of 254 nanometers is considered the standard for effective dosage, but many factors can influence the required intensity (**outlined on p. 10**).

UV systems are not one size fits all, and before selecting an option, it's important to work with an expert who will take the time to thoroughly understand your farm's requirements and offer an effective, efficient solution.

Before exploring the factors that will help you determine the right UV sizing and dosage, it's important to first understand the key differences between the systems.



Want to learn more about drum and disc filters?

Download Innovasea's Ultimate Starter Guide to Drum and Disc Filters >



Low vs. Medium Pressure

In aquaculture, the two primary types of UV systems are low-pressure and medium-pressure systems, with “low” and “medium” indicating the power of the lamps used in each.



Lamp life is an important element to consider when comparing costs. Generally, the more powerful the lamp, the shorter its lifespan.

LOW PRESSURE SYSTEM

Low pressure systems are found in most fish farms due to their cost-effectiveness, longevity, and efficiency. Low pressure systems can have one of two lamps: high-output low-pressure UV lamps (HO) or amalgam lamps (AM) depending on the power of the lamp and the water temperature being treated.

Benefits of a low pressure system include:

- HO lamps are ideal for water temperatures between 10°C to 35°C
- AM lamps are ideal for water temperatures between 3°C to 60°C

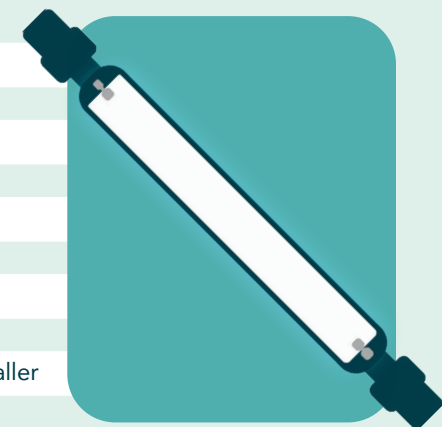


< 1,000 W	Power	200 – 50,000 W
HO: Fixed, AM Adjustable	Output	Adjustable
253.4 nm	Spectrum Range	200 – 600 nm
A few seconds	UVC Exposure Time	< 1 second
Higher power = longer	Lamp Length	Compact lamp = smaller

MEDIUM PRESSURE SYSTEM

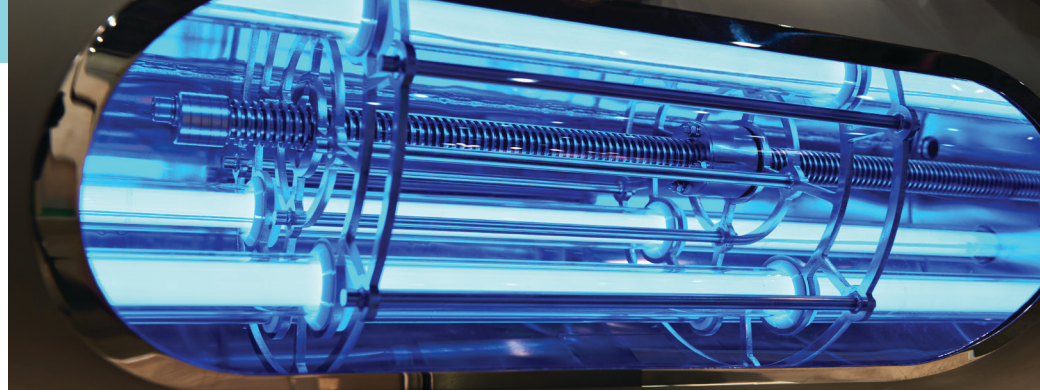
Medium pressure systems can emit a broader and more powerful spectrum of UV light than low pressure systems. This allows them to handle a higher volume of water, making them the preferred choice for farms that need to treat higher flow rates or when space is limited. Their compact design also makes them a popular choice for aquaculture well-boats.

While medium pressure systems are more powerful, they are also less energy-efficient, and their lamps have a shorter lifespan than those found in low pressure systems.



Inline vs. Open Channel

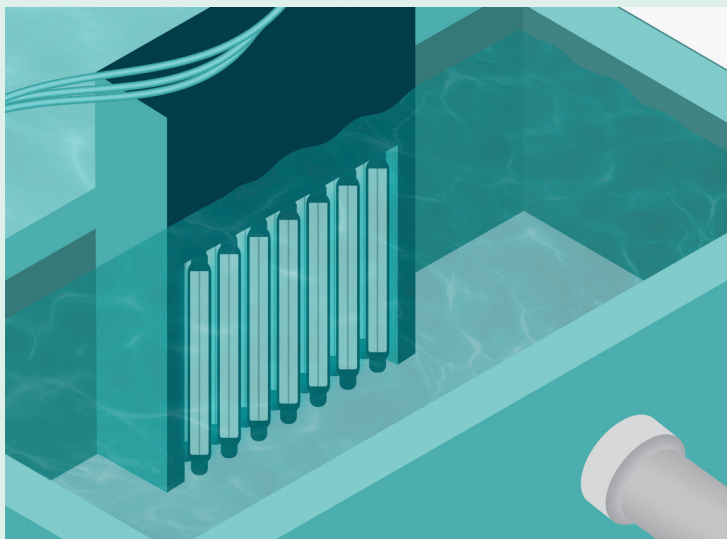
There are two types of UV systems found in aquaculture: inline and open channel. We'll explore the differences below.



OPEN CHANNEL UV

Open channel systems are typically found in high-flow applications and are exclusively compatible with low pressure UV lamps.

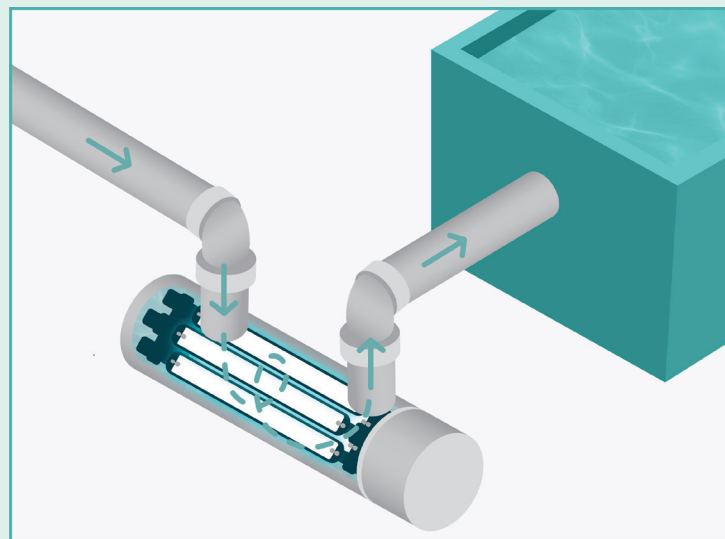
In an open channel system, water flows continuously through a channel, raceway or sump, using the gravitational flow to pass around the UV lamps placed in the water.



INLINE UV

Inline UV systems are widely used in RAS and are compatible with both low pressure and medium pressure lamps.

In this setup, water is driven through the chamber and flows directly around the UV lamps, eliminating the need for a separate water treatment tank. Farms can install one or multiple inline UV units, which can be mounted horizontally or vertically, providing a compact, versatile solution.



Selecting the Right UV Model

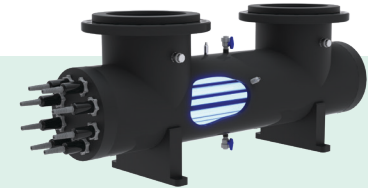
Now that we've covered the different factors that go into selecting a UV system, let's explore the different models available.

FRESHWATER UV SYSTEMS



Bio-UV IAM TS	BIO-UV FW
UVT: 70–98% UVT	UVT: 70–98% UVT
Maximum flow rate: 2000 m3/h	Maximum flow rate: 55 m3/h
Water temp: 3°C to 60°C	Water temp: Up to 35°C
Lamps: Up to 8 UV lamps x 800 W	Lamps: Up to 6 UV lamps X 87 W
Lamp life: 13,000–16,000 hours*	Lamp life: 13,000 hours*

SEA WATER UV SYSTEMS



UV TTPE AM TS	UV TTPE HO
UVT: 70–98% UVT	UVT: 70–98% UVT
Maximum flow rate: 2,000 m3/h	Maximum flow rate: 55 m3/h
Water temp: Up to 60°C	Water temp: Up to 35°C
Lamps: Up to 12 lamps X 800 W	Lamps: Up to 6 UV lamps X 87 W
Lamp life: 13,000–16,000 hours*	Lamp life: 12,000–13,000 hours*

**Minimum amount of time UV dosage is guaranteed.*

Control Panel

Your UV system will then be paired with a compatible control panel to monitor and optimize its performance.



TYPE 1: SIMPLE MONITORING WITH NO UV SENSOR

- TTPE HO
- TTPE AM

TYPE 2: UV SENSOR WITH PRO 3 MONITORING

- TTPE HO UV
- FW
- Can also be used for TTPE AM

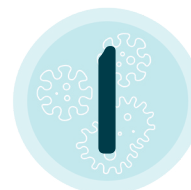


UV SENSOR WITH TOUCH SCREEN MONITORING

- TTPE AM TS

How to Choose Your UV Solution

Several factors must be considered when selecting the correct UV system, such as dosage, size, and type. Due to the complexity and importance of water treatment, it is recommended that you consult an expert who can explain the following considerations.



**IDENTIFY
TARGETED
PATHOGENS**



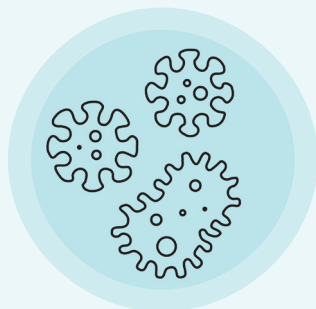
**CONFIRM
REQUIRED UV
DOSAGE**



**CONSIDER
WATER
CONDITIONS**



**CHOOSE YOUR
UNIT MATERIAL
AND SIZE**



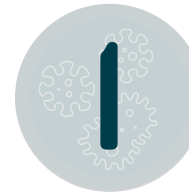
IDENTIFY TARGETED PATHOGENS

When choosing a UV system, the first step is to identify the pathogen(s) (algae, bacteria, viruses, fungus, etc.) you need to destroy. Different pathogens are eradicated at different UV dosages, making it essential to know what you're targeting.

The pathogens present vary by fish species, water conditions, and system type.



How to Choose Your UV Solution



1
IDENTIFY
TARGETED
PATHOGENS



2
CONFIRM
REQUIRED UV
DOSAGE



3
CONSIDER
WATER
CONDITIONS



4
CHOOSE YOUR
UNIT MATERIAL
AND SIZE

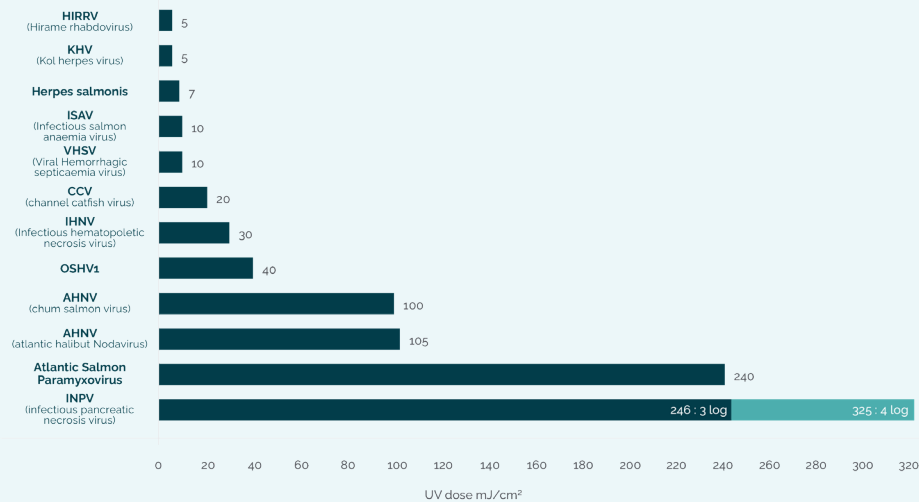


2 CONFIRM REQUIRED UV DOSAGE

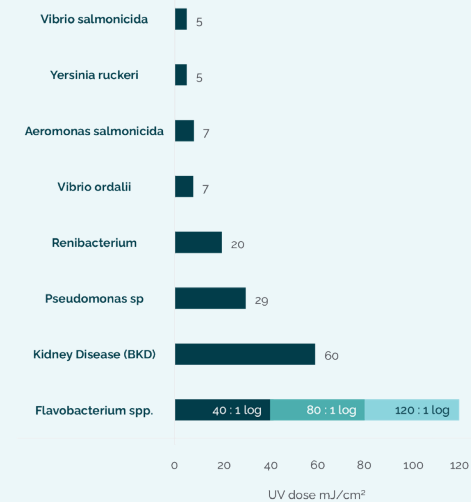
After identifying the target pathogen(s), you will need to determine the required UV dosage to eliminate the harmful microorganisms in the water.

The table below outlines the required UV dosage for several types of bacteria. [Click here for a more extensive list of harmful microorganisms.](#)

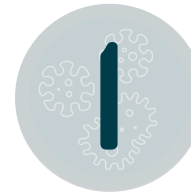
Eradicated Virus



Eradicated Bacteria



How to Choose Your UV Solution



IDENTIFY
TARGETED
PATHOGENS



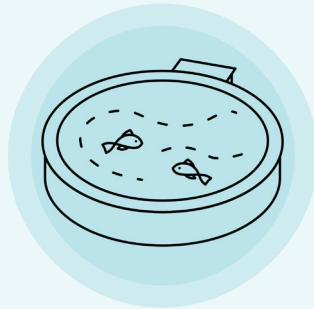
CONFIRM
REQUIRED UV
DOSAGE



CONSIDER
WATER
CONDITIONS



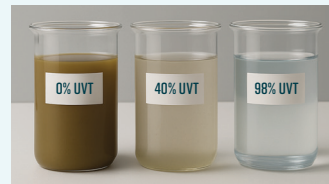
CHOOSE YOUR
UNIT MATERIAL
AND SIZE



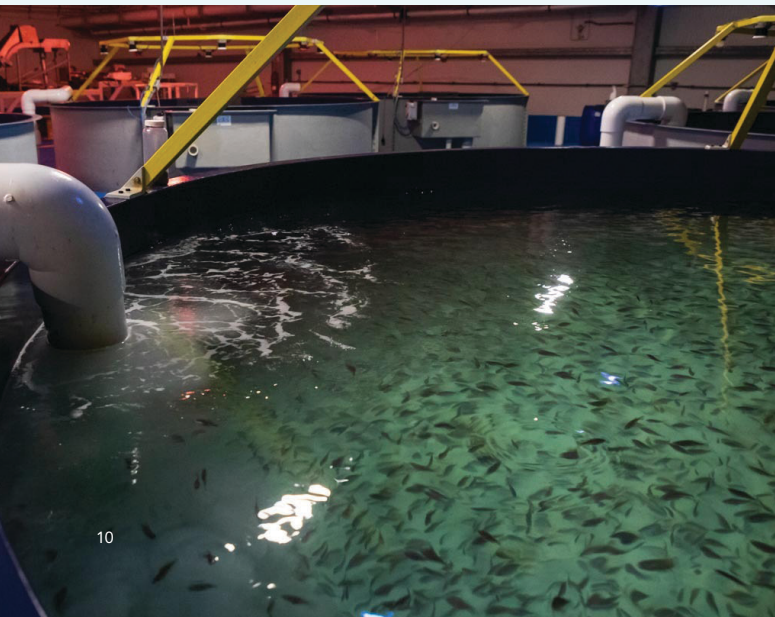
3 CONSIDER WATER CONDITIONS

While the chart on the previous page shows the required dosage to effectively eliminate specific pathogens, a system will typically require a higher dosage than advertised based on its unique water conditions. Thus, before finalizing the required dosage to eradicate pathogens, it's essential to evaluate the following aspects of your system:

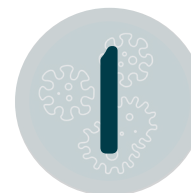
- **Ultraviolet transmittance (UVT):** UVT is the percentage of light that passes through a water sample at 254 nanometers – the optimal wavelength to inactivate microorganisms. UVT is impacted by multiple factors including turbidity, water clarity and mineral count; specifically iron levels. To measure UVT, the site's water should be tested during its worst time of the year. The lower the UVT, the more powerful the UV system needs to be.



- **Flow rate:** Faster water flow may decrease UV exposure time, impacting treatment efficiency. To maximize UV efficiency, the system must be capable of a single-pass treatment. This requires balancing UV dosage and flow rate to treat 100% of the water in a single pass through the system.
- **Salinity and temperature:** Salinity and temperature impact both the type of pathogens present and how effective the UV is at penetrating the water.



How to Choose Your UV Solution



1
IDENTIFY
TARGETED
PATHOGENS



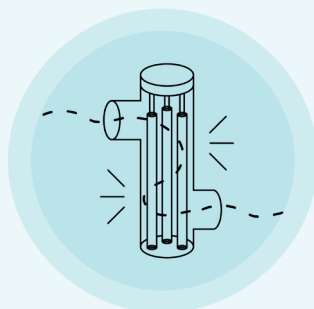
2
CONFIRM
REQUIRED UV
DOSAGE



3
CONSIDER
WATER
CONDITIONS



4
CHOOSE YOUR
UNIT MATERIAL
AND SIZE



4 CHOOSE YOUR UNIT MATERIAL AND SIZE

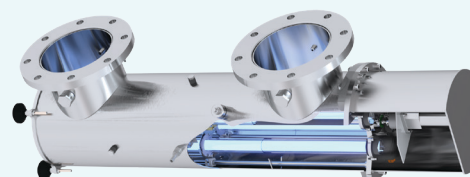
The final consideration is unit material and size. You'll want to ensure you have an effective system that can hold up to your farm's water conditions. For sizing, you can find additional information on [p. 7](#), but remember, it's best to work with an expert to find the ideal solution.

You have two options for material composition: high-density polyethylene (HDPE) and stainless steel.



HDPE

HDPE is extremely corrosion-resistant with a high strength-to-density ratio making it ideal for saltwater sites.



STAINLESS STEEL

Stainless steel is typically used in freshwater sites, especially those that incorporate ozone.

When to Pair UV with Ozone

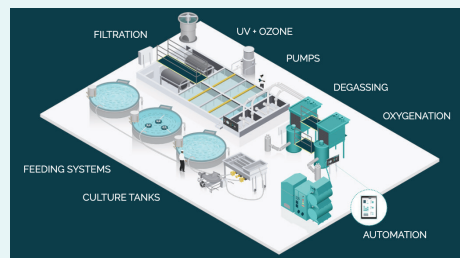
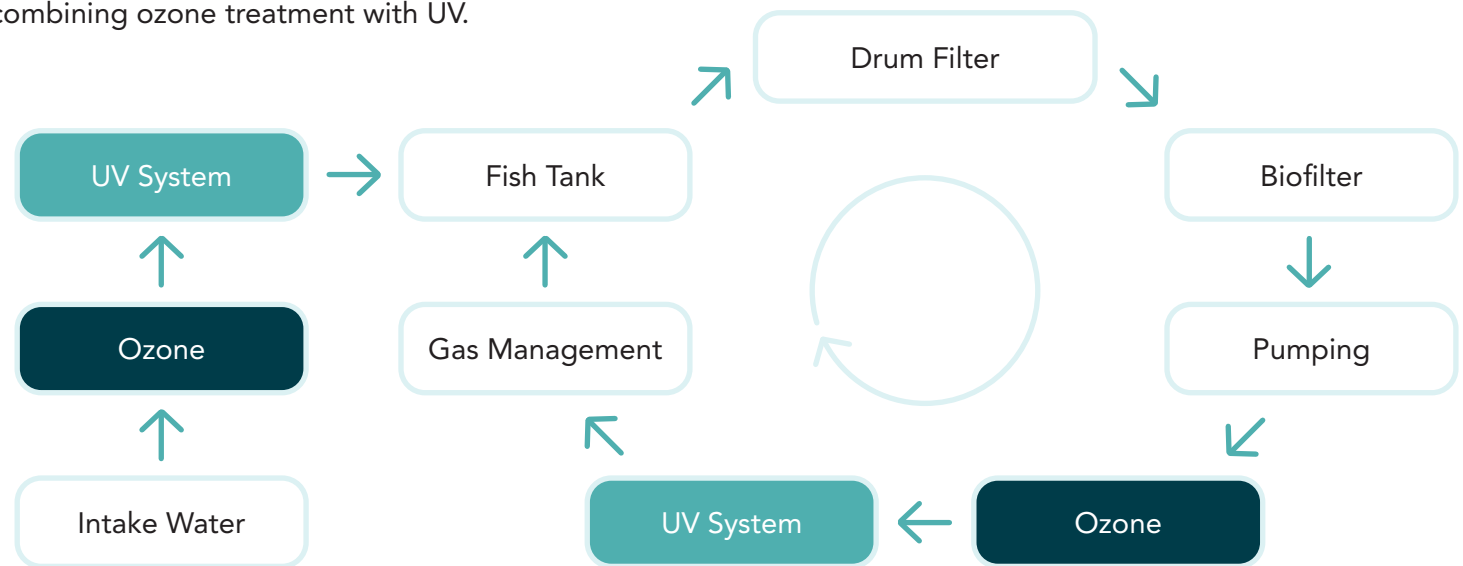
Ozone (O³) is a powerful oxidant that directly attacks material in the membranes of various pathogens. By targeting the membrane, ozone weakens the cell wall, causing it to rupture and die. This chemical-free treatment allows farms to significantly improve water clarity and reduce the risk of waterborne diseases.

However, residual ozone or ozone byproducts in saltwater can harm fish. While these residuals will naturally degrade over time, the process is accelerated by combining ozone treatment with UV.

By pairing these two elements, operators can more confidently destroy pathogens while simultaneously neutralizing potential residual ozone, ensuring a safer environment for your fish.

Potential placement of UV and Ozone systems in a RAS facility.

Configurations may vary depending on specific facility designs and requirements.



Worried about adding ozone?

Innovasea can help. Innovasea experts will work with you to safely integrate this highly effective element into your system.

[Get started >](#)



WHY INNOVASEA

At Innovasea, we have the expertise, experience, and technology to create the ideal conditions for raising fish in any environment. As world leaders in land-based aquaculture and RAS solutions, we understand the importance of reliable, high-performance systems. Regardless of which UV system you select, you can trust in the highest quality standards and innovative solutions that fit your needs.

To start designing your water treatment system, or to learn how we can help with all aspects of your aquaculture project, speak with a member of the Innovasea team today.

[Click here to talk to an Innovasea team member >](#)

Low vs. Medium Pressure

In aquaculture, the two primary types of UV systems are low-pressure and medium-pressure systems, with “low” and “medium” indicating the intensity of the lamps used in each.



Lamp life is an important element to consider when comparing costs. Generally, the more powerful the lamp, the shorter its lifespan.

LOW PRESSURE SYSTEM



< 1,000 W

Power

Fixed

Output

253.4 nm and 183 nm

Spectrum Range

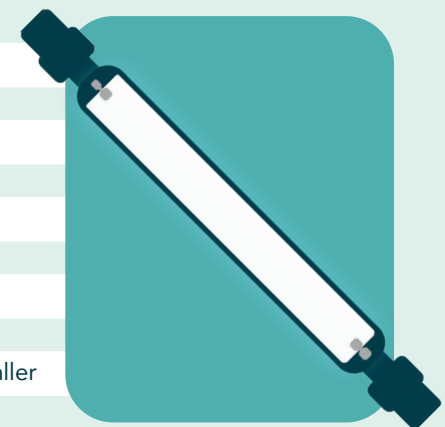
A few seconds

UVC Exposure Time

Higher power = longer

Lamp Length

MEDIUM PRESSURE SYSTEM



200 – 50,000 W

Adjustable

200 – 600 nm

< 1 second

Compact lamp = smaller