

AquaCulture UV System

The Solutions to Pathogen Control
and Marine Biology Safety

AquaCulture

DESMI
Make life flow



Safeguarding your fish and your business

When you protect your fish stocks from disease, you keep your aquaculture operation flowing efficiently and profitably.

DESMI UV systems help you eliminate viruses and pathogens – and concerns about quarantine, trade restrictions, and financial losses. Our technology has been proven to reduce disease and mortality rates, creating a safe environment for your fish and for your business.

We have worked with the aquaculture industry for decades and can develop a solution that fits your requirements to the letter. Get an overview in this brochure and contact us to learn more.

Designed to address your challenges

Maintaining a healthy environment for your fish can be a challenge. You need a treatment solution that will eliminate viruses, bacteria, microorganisms, and pathogens reliably and efficiently, regardless of water temperature and salinity. And you need a solution that does not introduce new threats to your aquaculture operation – and does not break the bank.

DESMI UV systems help you address these challenges, giving you peace of mind. They deliver extremely high and documented UV doses for unrivalled safety in any water temperature and salinity. Relying on UV light and filtration, they are completely chemical-free, making them a risk-free solution for fish stocks. And they are made from highly reliable and efficient components, giving you uninterrupted operation and uptime plus predictable costs.

Our UV system offering includes two main products:

- ✓ The AquaShield system, which is specifically engineered for intake water, focusing on the water source where most pathogens and microorganisms are likely to enter the system
- ✓ The AquaDose system for recirculating water in fish farms which effectively eliminates harmful pathogens, bacteria, and viruses that may exist in the water

Increase fish production, protect valuable stocks, and create a safer environment for your fish



Proven Technology

AquaShield

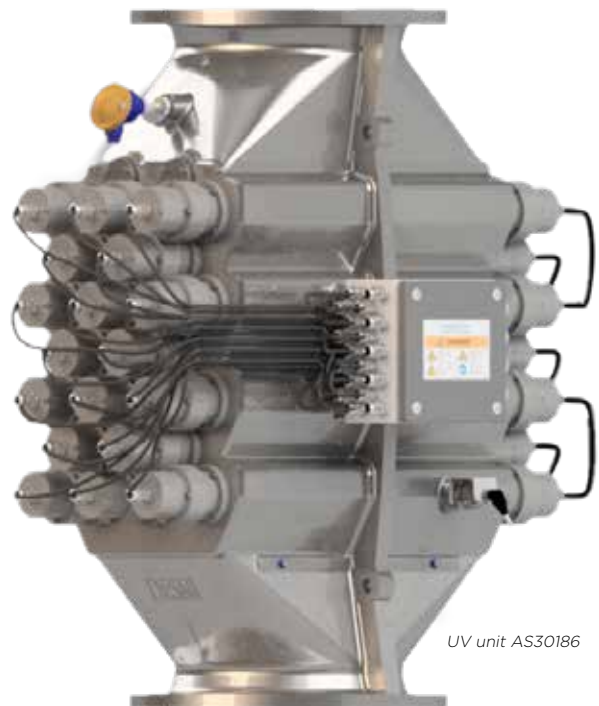
The Key to Inactivating Pathogens and Keeping Intake Water Safe for Fish

DESMI UV has no salinity or temperature limitations. Model selection ensures flow ranges down to 35 m³/h and up to 3,500 m³/h with a single unit. The different UV models are optimized for both high and record-breaking low UV transmission values!

Key benefits:

- ✓ Simple installation, operation, and maintenance
- ✓ Acts as a firewall for viruses in intake water
- ✓ Can be delivered skid mounted for super easy installation
- ✓ Can be bundled with Auto-filter and Auto-Cleaning
- ✓ No chemicals, only UV light
- ✓ Automatic dose control ensuring optimal safety and cost efficiency.
- ✓ Specialized plant engineering team available
- ✓ +10 years of UV experience
- ✓ More than 2,000 systems in operation around the world
- ✓ Wide range in flowrates from a single unit*
- ✓ Full IoT integration for remote performance monitoring and alarm notifications (SMS, email, etc..)

*Depending on UV-T and Target UV Dose.



UV unit AS30186



UV unit AS5064



Veterinærinstituttet
Norwegian Veterinary Institute

| AquaShield | AS10024 | AS15044 | AS15064 | AS20066 | AS20086 | AS25126 | AS30186 | AS35246 | AS40366 |
|--------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| UV lamps [pcs] | 2 | 4 | 6 | 6 | 8 | 12 | 18 | 24 | 36 |
| Lamp type [kW] | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 |
| Total lamp power [kW] | 8 | 16 | 24 | 36 | 48 | 72 | 108 | 144 | 216 |
| Flange size Dimensions [mm] | DN65 | DN100 | DN150 | DN200 | DN200 | DN250 | DN300 | DN350 | DN400 |
| Height | 525 | 570 | 772 | 776 | 900 | 850 | 984 | 1030 | 1101 |
| Width | 661 | 661 | 661 | 828 | 828 | 828 | 838 | 838 | 844 |
| Depth | 300 | 405 | 406 | 438 | 446 | 516 | 541 | 628 | 722 |

AquaDose: The Key To Controlling Recirculation

Investing in a compact and solid UV system, such as The AquaDose, is essential for fish farmers who want to ensure optimal recirculating water conditions for their fish. By using the AquaDose system, farmers can eliminate the risk of potential pathogens outbreaks that could lead to the loss of valuable fish.

The AquaDose effectively controls harmful pathogens, creating a clean and safe recirculating environment for the fish to grow. This ensures that the fish are not only protected but also healthier and happier, resulting in increased profits for the farm.

By providing a comprehensive pathogen control solution, the AquaDose ensures that the fish remain healthy and thrive. The peace of mind that comes with knowing that the fish are protected in optimal water conditions is priceless, making investing in a high-quality UV system like the AquaDose an obvious choice for any serious fish farm.



| AquaDose | AD20024 | AD25044 | AD35064 | AD45066 | AD50086 | AD60126 | AD60186 |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| UV lamps [pcs] | 2 | 4 | 6 | 6 | 8 | 12 | 18 |
| kW / lamp | 4 | 4 | 4 | 6 | 6 | 6 | 6 |
| Total lamp power [kW] | 8 | 16 | 24 | 36 | 48 | 72 | 108 |
| Flange size | DN200 | DN250 | DN350 | DN450 | DN500 | DN600 | DN600 |
| Dry Weight [kg] | 60 | 75 | 85 | 103 | 135 | 185 | 250 |



Proven Technology

Cleaning In Place

Keep your UV at its best...
CIP will do the trick

At DESMI we recommend Cleaning in Place (CIP) to ensure top performance of the UV system every day.

DESMI has its own brand of citric acid, which can be added to recirculate through the UV unit, when needed.

Citric acid is generally recognized as safe (GRAS) by the FDA and is widely used in food and beverage industries as a preservative, acidulant, and flavoring agent. Citric acid poses no harm to human health or aquatic life.



UV Dimming Saves Energy While Maintaining The Set Minimum Dose

The implementation of smart UV lamp dimming represents a significant advancement in energy management for water disinfection systems. By adjusting the intensity of UV lamps based on the required dosage, energy consumption is reduced without compromising the effectiveness of the disinfection process. This not only promotes conservation of resources and cost savings, but also ensures the continuation of safe and clean water supply.

For instance, considering a UV unit with a size of 48 kW, utilizing smart UV dimming technology for a 20% power reduction could save up to 84,096 kWh annually. Adopting this technology serves as a responsible and efficient means of achieving a sustainable water disinfection system. The benefits of smart UV lamp dimming extend beyond cost savings and environmental considerations.

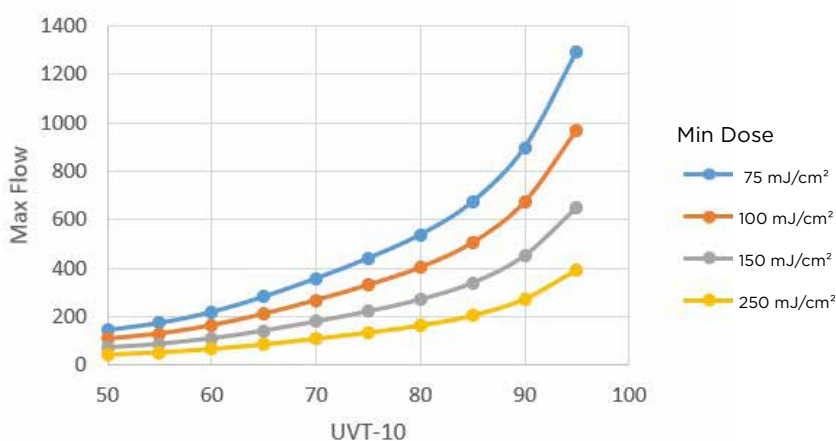
UV Systems That Can Survive High Humidity Environments

Aquaculture requires a dependable UV system to ensure the health and safety of the fish. Our UV systems are constructed from ultradurable Super Duplex material or Nickel-Alu-Bronze to withstand the challenging corrosive conditions. These materials are specifically designed to endure even the most extreme conditions and effectively disinfect the water.

DESMI's UV units are an invaluable resource to have when facing unpredictable climates and ensuring that your fish are kept safe from hazardous pathogens.

With a successful history of more than 2,000 installations and being type-approved for the harshest conditions, including vibration, humidity, temperature, and saltwater exposure, you can trust that this cutting-edge system will always effectively safeguard your fish and provide a secure environment

Max flow curves
V20086 - Minimum Dose



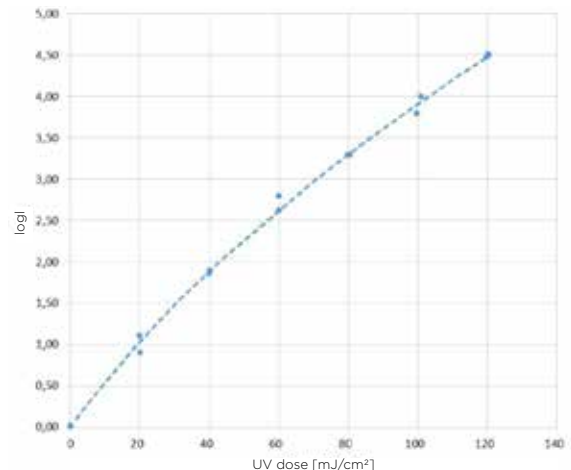
Enhanced Efficiency with CFD Optimized UV Systems

Our UV systems are optimized using biosimetry validated CFD (Computational Fluid Dynamics) technology.

DESMI UV system has been extensively tested and optimized to ensure maximum performance in aquaculture environments. The system has undergone rigorous biosimetry testing, with test results indicating high levels of efficiency and effectiveness.



Table 6 shows one of the comparisons between the measured data and CFD simulation results of the system.



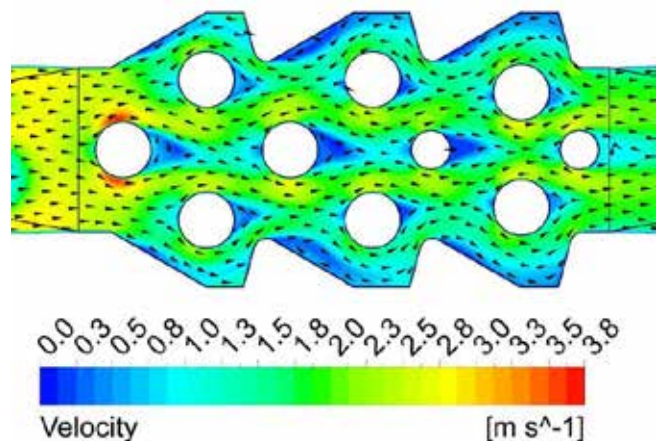
FDA 1000 badge
UV Dose [J/m²] Plot of simulated log inactivation vs. UV-dose for MS2 microbe with exponential approximation (dotted line) and actual dosimetry data points.

Table 6: Comparison of measured data and CFD simulation.

| | ID | UVT [%] | Flow [m³/h] | LogI [-] | RED [J/m²] |
|--------------|-------|---------|-------------|----------|------------|
| Test Results | MS2-1 | 64.7 | 340 | 4.15 | 1080 |
| | MS2-2 | 59.8 | 288 | 4.14 | 1078 |
| | MS2-3 | 55.3 | 216 | 4.25 | 1118 |
| | MS2-4 | 44.4 | 122 | 4.51 | 1210 |
| | MS2-5 | 40.6 | 91 | 4.71 | 1284 |
| CFD Results | MS2-1 | 64.7 | 340 | 4.15 | 1083 |
| | MS2-5 | 40.6 | 91 | 4.99 | 1392 |

MS2-1 results

At test point MS2-1, there was a near-perfect match between the measured and simulated results, with a RED (dose of UV radiation) of 1080 and 1083 J/m², respectively. Test point MS2-5 showed a slight deviation between the two results, but overall, the CFD results were well within the confidence level. The UVT, flow, and log data for each test point also show the system's ability to perform in a variety of conditions. With DESMI UV system, you can trust that your aquaculture disinfection needs will be met with the highest levels of performance and reliability.



Section plot from CFD simulation.

Minimum vs. RED UV Dosage.

What is the difference?

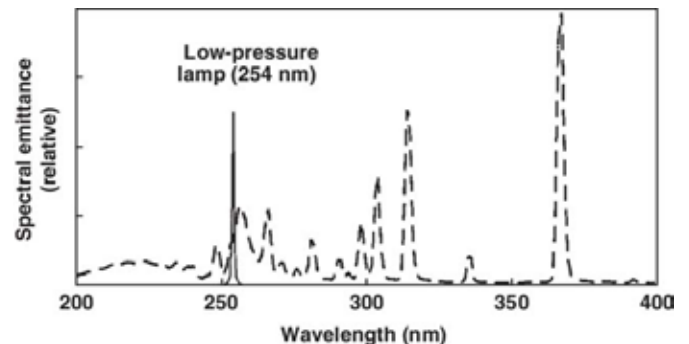
Minimum dose, average dose, and reduction equivalent dose (RED), are essential for evaluating UV-system performance and predicting log reduction.

Minimum dose represents the least amount of UV light energy received by the microorganisms as they pass through the UV system. This is a crucial parameter because the system's overall effectiveness depends on the lowest dose received by the most shielded organisms. The minimum dose is typically used to ensure that all microorganisms receive a sufficient dose of UV light to achieve the desired level of inactivation or kill rate.

Average dose is the mean UV energy received, accounting for variations in intensity, flow, and exposure time. While the average dose can provide a general understanding of the system's performance, it may not fully represent the actual inactivation level, as some microorganisms may receive lower or higher doses than the average.

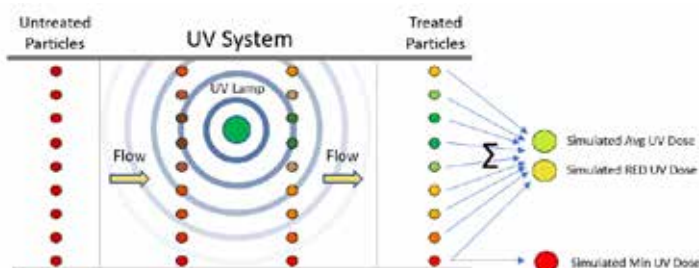
RED considers the target microorganism's UV sensitivity, expressing the UV dose needed for a specific log reduction. It's useful for comparing UV systems or treatment conditions. The RED is especially useful for comparing the effectiveness of different UV disinfection systems or treatment conditions, as it provides a common benchmark for evaluating performance based on the specific target organism's sensitivity.

Please note that real-life bio-dosimetry tests and obtaining the RED values are crucial for accurate UV system simulations. These tests offer empirical data on system performance, considering water quality, flow rate, and UV intensity variations. The RED value accounts for the target microorganism's UV sensitivity, ensuring simulations accurately represent inactivation effectiveness. Without bio-dosimetry tests and RED values, simulations may depend on theoretical assumptions, potentially resulting in inaccuracies in predicting system performance and pathogen reduction.

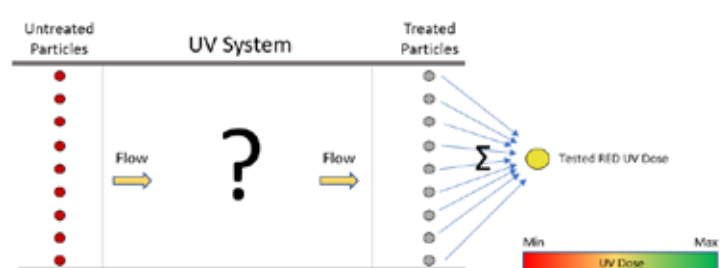


As a result of the broader spectrum of light, compared to lowpressure UV-systems, the reduction of specific organisms will respond positively to the treatment delivered by DESMI's mediumpressure UV light. Comparing medium and low-pressure UV systems by only assessing the 254nm UV-Dose is therefore not sufficient.

Simulated



Bio Dosimetry Testing



Danish Salmon

...says YES to the DESMI AquaShield



The implementation of the AquaShield UV system in Danish Salmon's RAS operations serves as a prime example of the efficacy of this technology in intake water treatment. They have reported that the system works smoothly and is easy to operate and maintain. Danish Salmon is currently expanding the fish farm significantly and due to that - the new AquaShield system is installed at a temporary location. This

is easily accommodated with the SKID-based solution where the system is prefabricated at DESMI's factory. When Danish Salmon is ready for the permanent placement - this is done in less than a day. Finally, Danish Salmon reports that the extensive IoT monitoring platform gives great insight into the performance of the system.

Call the
DESMI Service Hotline
round the clock
at +45 96 32 81 10

After-sales and service

from DESMI Service



Call us anytime and let us know what you need: Our global after-sales and service department DESMI Service offers parts and services that keep your aquaculture operation running.

Our spare part kits cover several pumps and contain the parts you need for overhauls, for example shaft seals, bearings, and O-rings. You can also order individual spare parts as needed, and for some parts or products, we ship within 48 hours.

Our highly experienced and factory trained service teams provide a long list of onsite services, from installation and commissioning to service, repair, upgrades, and maintenance, plus training and technical support – whatever it takes to optimize your critical flow processes.



Overhaul
Videos



We exist to keep your business flowing

DESMI works closely with aquaculture engineers, designers, and owners to keep critical production processes flowing reliably and efficiently on fish farms on land and at sea, anywhere on the planet. Our pumps, UV treatment systems, IoT offerings, and after-sales service are trusted worldwide for dependability and the lowest total cost of ownership.

At DESMI, our focus has never been on discovering what we can do – it's about pushing the boundaries of what we can do for you, no matter which type of facility and what species you work with. We help you ensure optimal production environments that keep fish stocks healthy and safe and keep your business profitable.

Founded in Denmark in 1834, we have provided the expertise, solutions, and aftermarket support our customers need for nearly two centuries. We help you operate more efficiently and reliably, enabling your ambitions for performance, food safety, and growth whilst helping you reduce your climate impact.

Together, we can make a difference, whatever the future holds. Because we, like you, are here to **make life flow**.

For more information, visit **desmi.com**

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