

# UV WEDECO

## Aquaculture

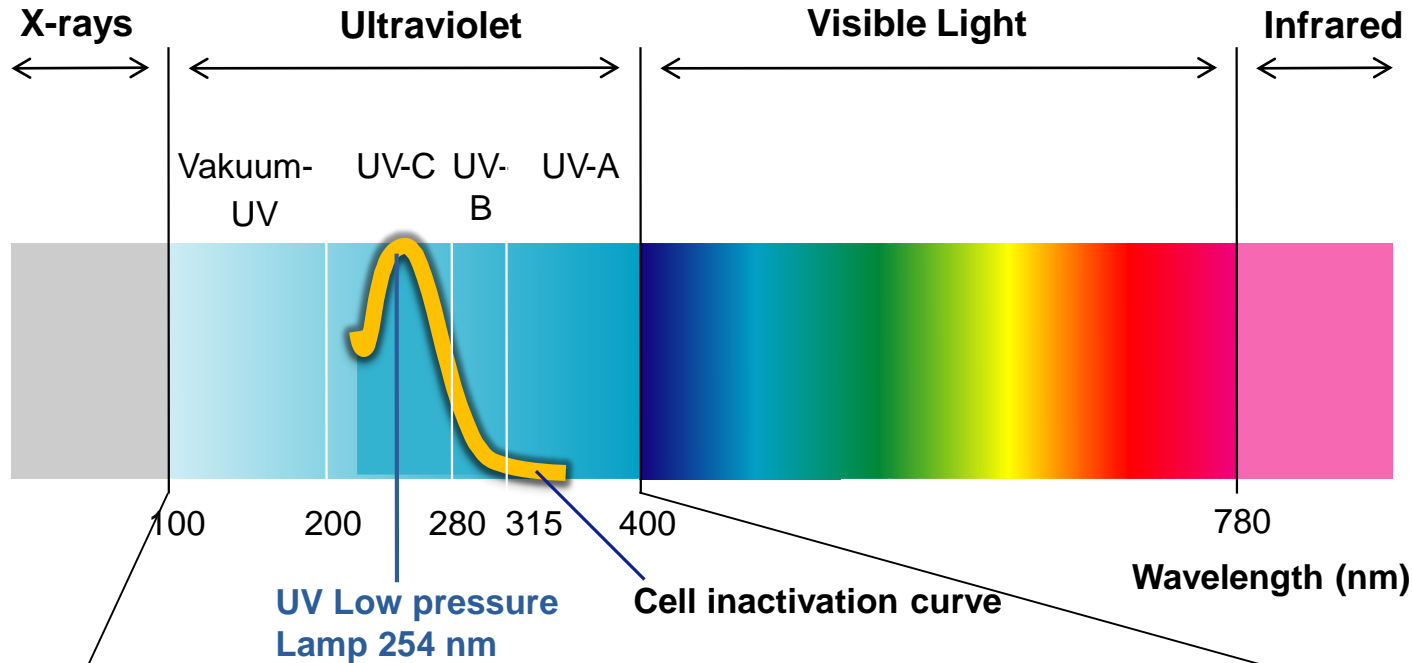
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# Agenda

- **Basic UV Disinfection**
  - The Mechanism
- **UV Applications in Aquaculture**
  - UV Dose requirements
  - Product overview
  - Installation references
- **Conclusion**

# UV Disinfection

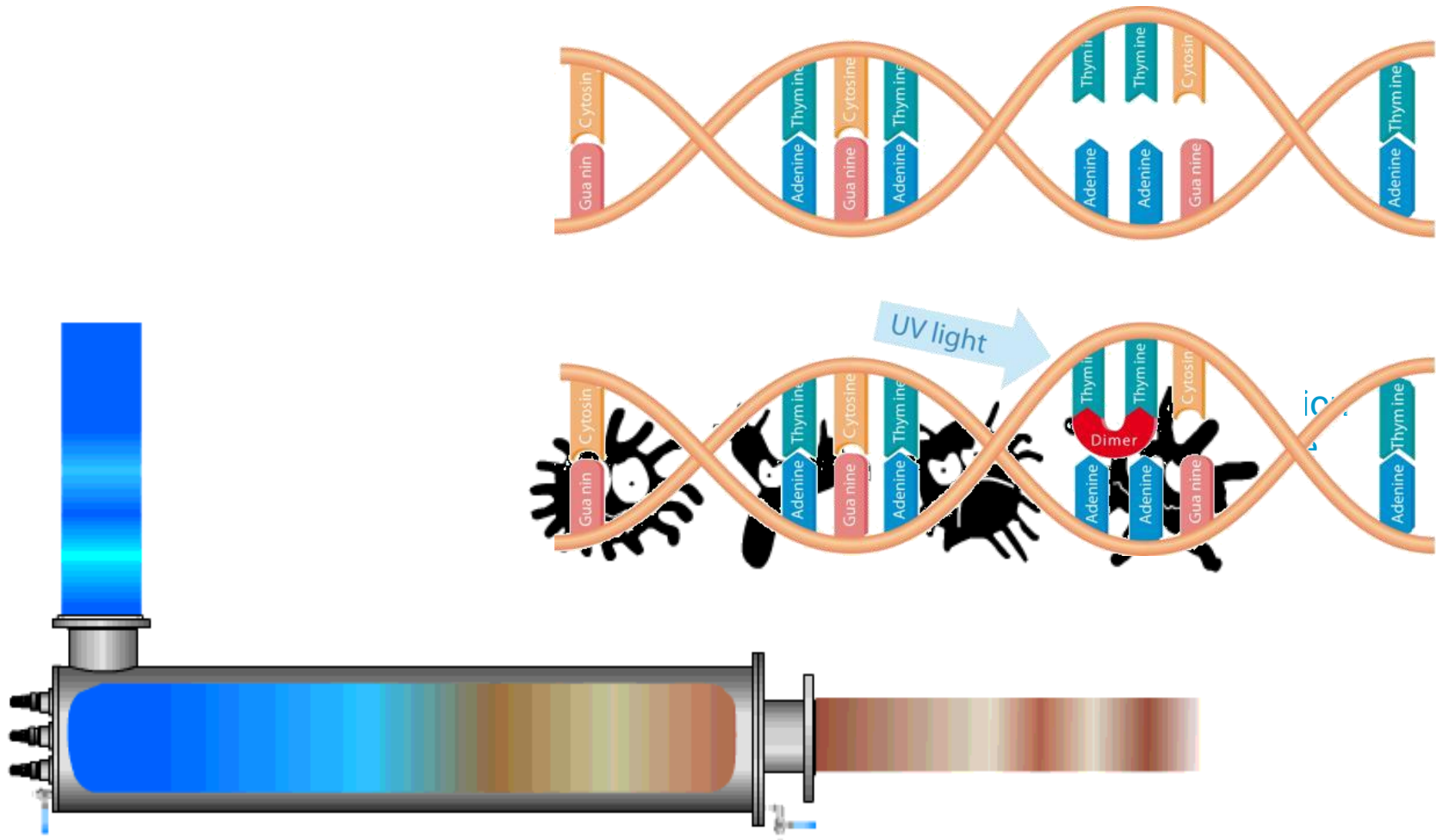
Inactivation of pathogenic microorganisms via photo-oxidation of DNA



UV Range	Wavelengths [nm]	Applications
UVA	315-400	Sunburn, Blacklight
UVB	280-315	Sunburn, Germicidal
<b>UVC</b>	<b>200-280</b>	<b>Germicidal Photochemistry</b>
Vacuum UV	100-200	High-energy Applications

# The Mechanism

## Effects of UV irradiation on DNA



# Disinfection - UV

Bacterial and viral diseases are a significant threat to aquaculture operations (e.g. Chile or Norway in 1980's)

UVC irradiation damages and kills pathogens and is used in Aquaculture for:

- 1. Disinfection:** most common application
  - a) **Intake water** if there is concern about infections from the water source
  - b) **Recirculating water;** most common and usually done after water treatment, prior to return to tank
  - c) **Effluent** if concern of disease or discharge limits
- 2. Removing ozone** residual in recirculating water

# Decision table for Aquaculture

What UV-dosage should I take for design if the customer...

	Intake / Fresh water	Recirculating water	Effluent / Waste water
... want a design according to Norwegian standards:	3-log reduction for ISAV or Aeromonas salmonicida <b>15 mJ/cm<sup>2</sup> validated dose</b>		
...has a pathogen specified:	Dosage from <b>university research</b>		
... has a pathogen specified but I cannot find it in this file:	Tell us the name of requested pathogen and required log-reduction, <b>Xylem Expertise R&amp;D</b>		
... has nothing specified only flow ... ...just an idea of...	Use Norwegian standards	Growth control of possible fish pathogen: <b>250 J/m<sup>2</sup></b> Growth control of heterotrophs <b>400 J/m<sup>2</sup></b>	Use Norwegian standards

# UV and ozone sensitivity of some fish pathogenic agents

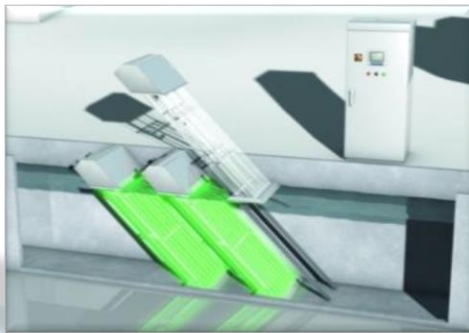
Fish pathogenic agent	UV sensitivity (CBD) [mJ/cm <sup>2</sup> per log reduction ]	RED for 3 log reduction [mJ/cm <sup>2</sup> ]
ISA virus	2.5	7.5
IPN virus	82	246
VHS virus	~1	3
IHN virus	~1	3
Nodavirus	35	105
Aeromonas salmonicida	3.7	11.1
Yersinia ruckeri	2.8	8.4
Vibrio anguillarum	4.5	13.5
Moritella viscosa	0.3	0.9

# WEDECO UV Products for Aquaculture

## Overview

### Duron

- up to several 10,000 m<sup>3</sup>/h
- Highly efficient
- High flow rate variation
- Automatic wiper
- Variable dose output
- Easy installation



### BX/LBX Series

- max. 2,120 m<sup>3</sup>/h
- Highly efficient Spektrotherm / ECORAY® lamps
- Automatic wiper
- Variable dose output
- Calibrated UV sensor



### TAK 55 Series

- up to several 10,000 m<sup>3</sup>/h
- Highly efficient ECORAY® lamps
- Automatic wiper
- Variable dose output
- Calibrated UV sensor



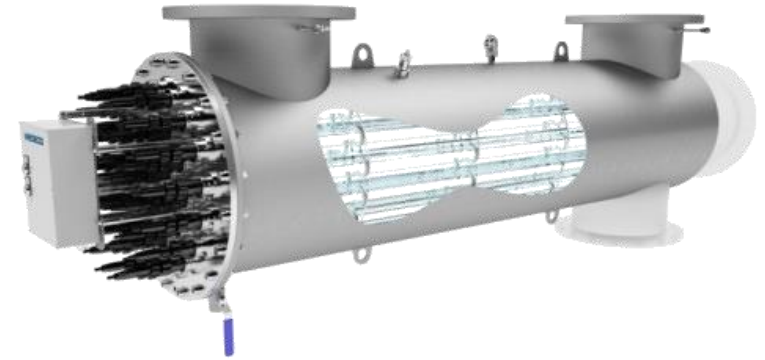
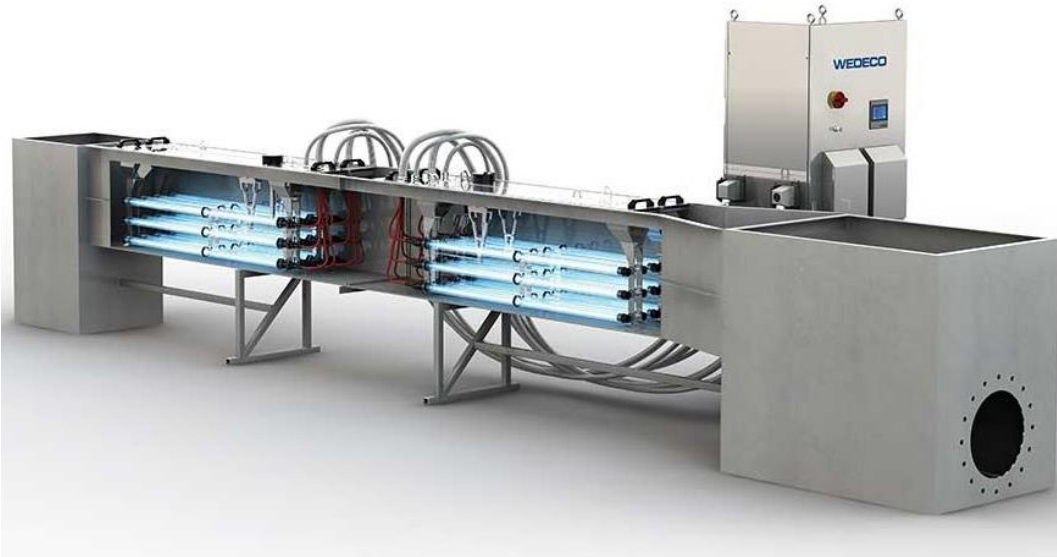
### TAK 55 Smart

- 50 -380 m<sup>3</sup>/h
- Highly efficient ECORAY® lamps
- Automatic wiper
- Variable dose output
- Calibrated UV sensor
- PE channel available





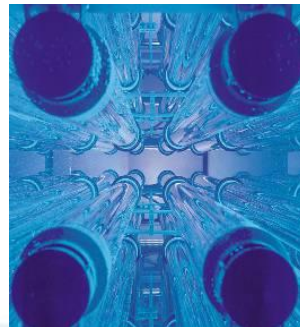
# Main components



Lamps



Quarz sleeve



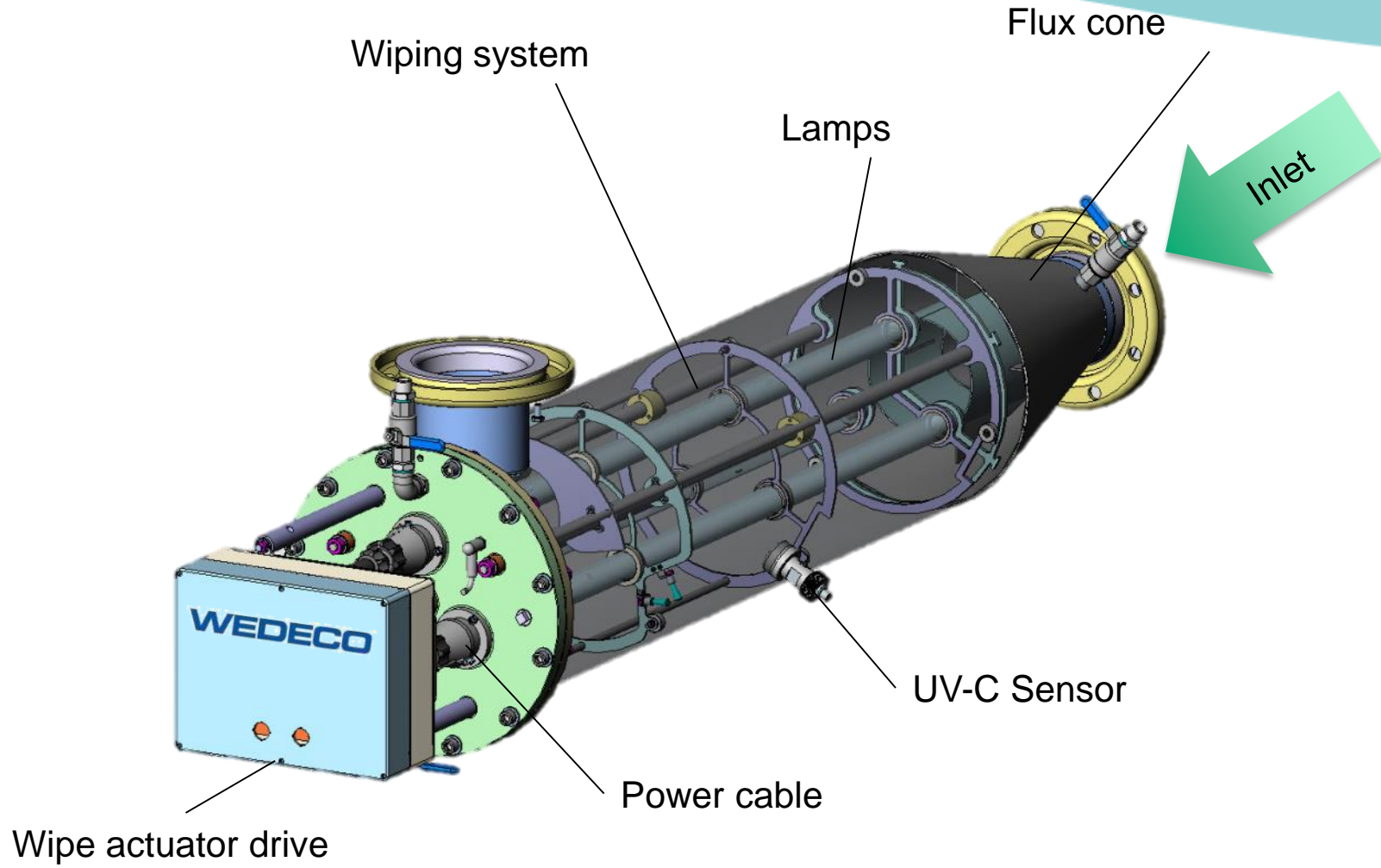
Ballast board

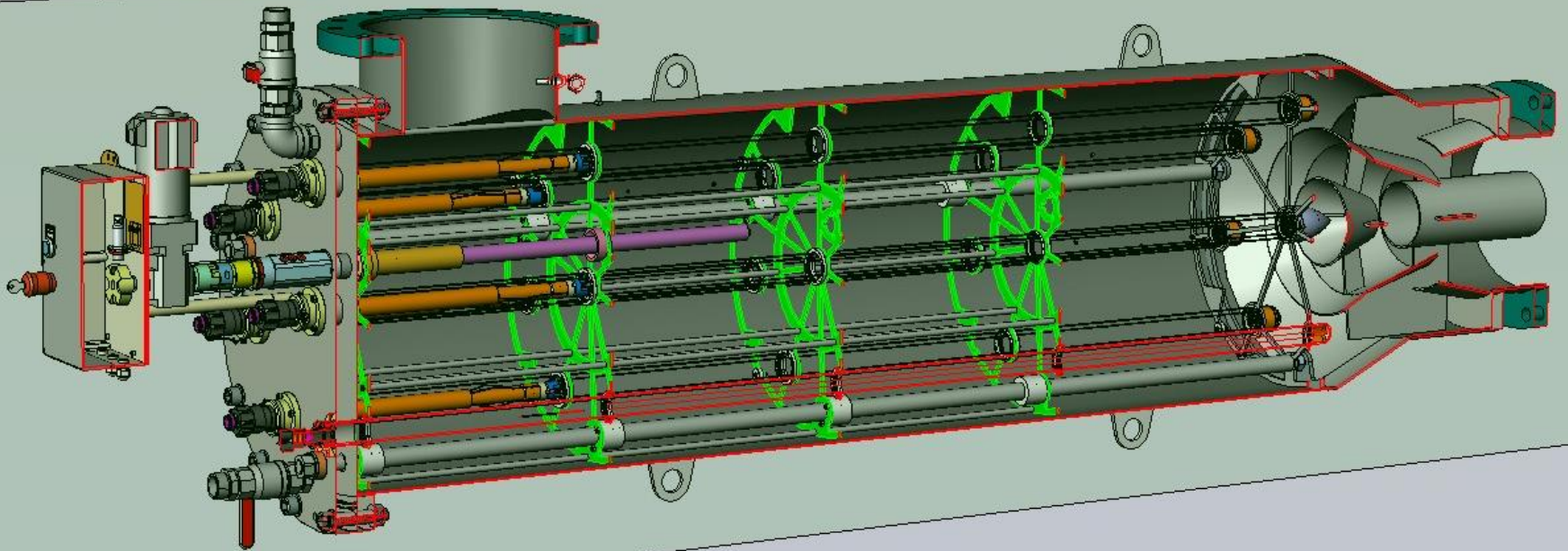
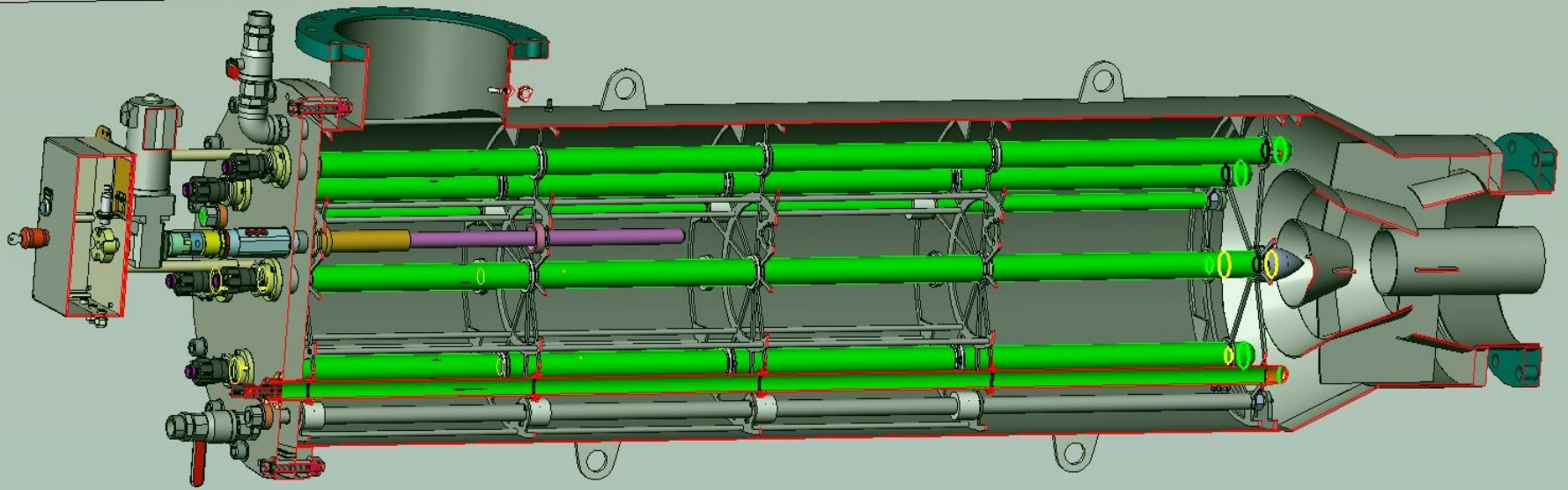


UV-Sensor



# What's inside?







# WEDECO BX Reference Site

## Eidane Smolt (NORWAY)

- Flow rate: 2 x 1,357 m<sup>3</sup>/h
- SS 316 reactor chamber
- 2 x BX 1800
- Automatic wiping system
- Year of Installation: 2008



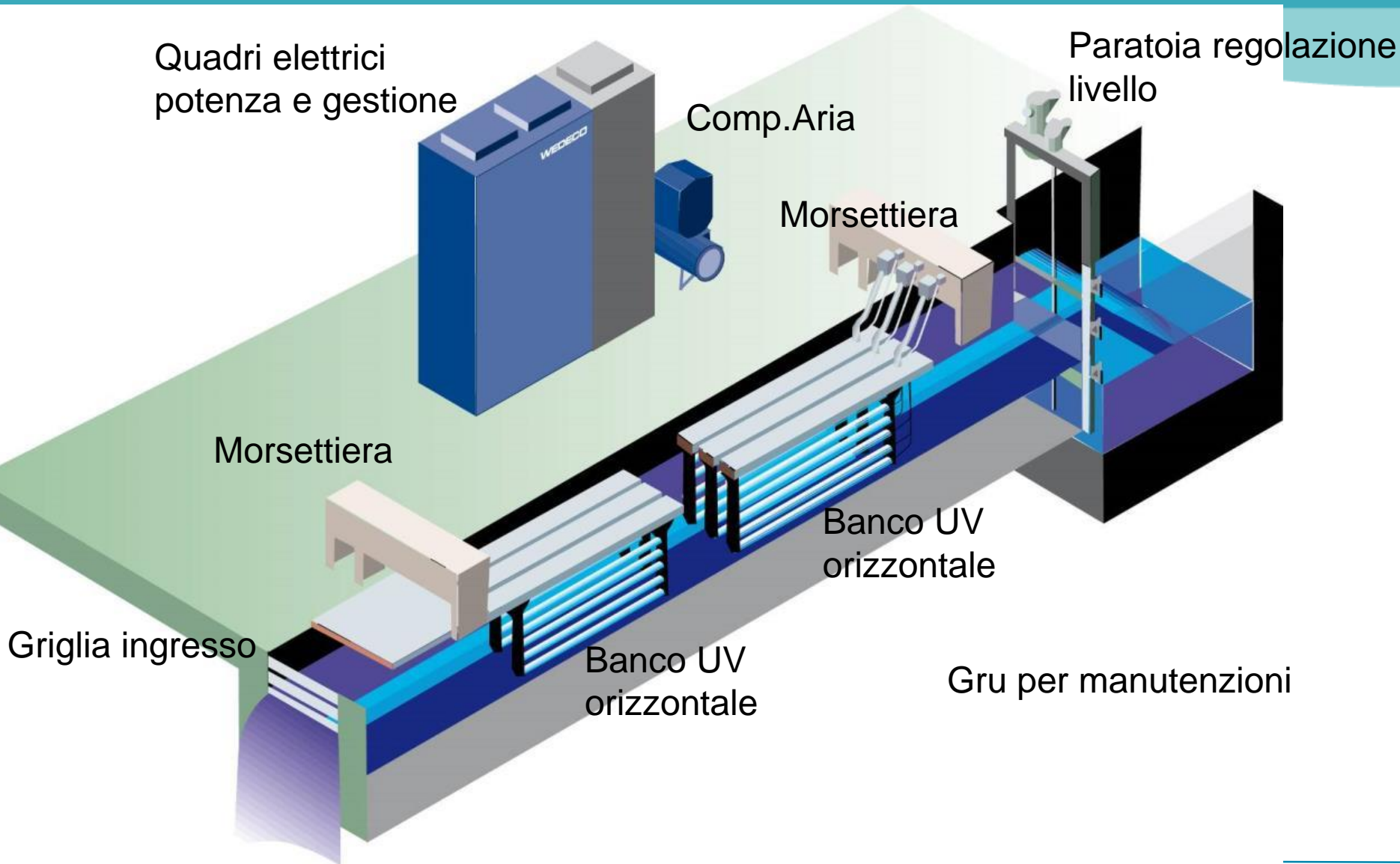
# WEDECO LBX / TAK Reference Site

## Fjon Bruk (Norway)

- Inlet water – fresh water (river)
- Flow rate: 95 l/min
- UVT: 70 %
- 4 x TAK, extended by 4 x LBX1000

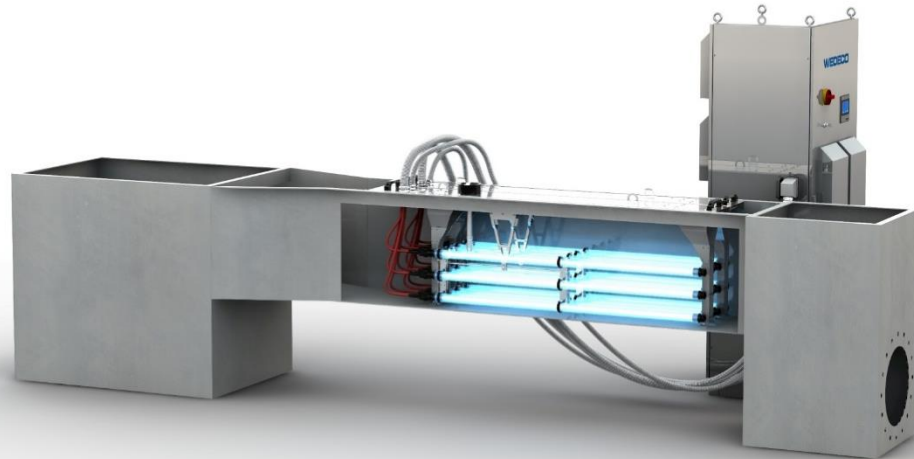
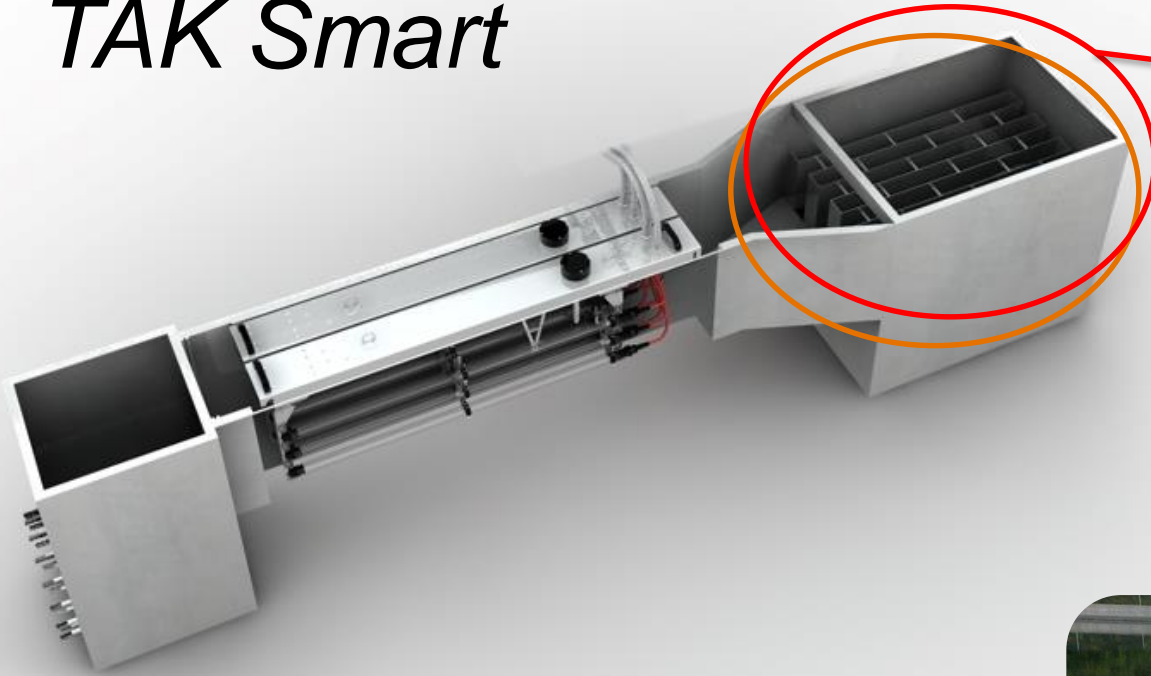


# Componenti principali TAK sistema in canale aperto con lampade orizzontali





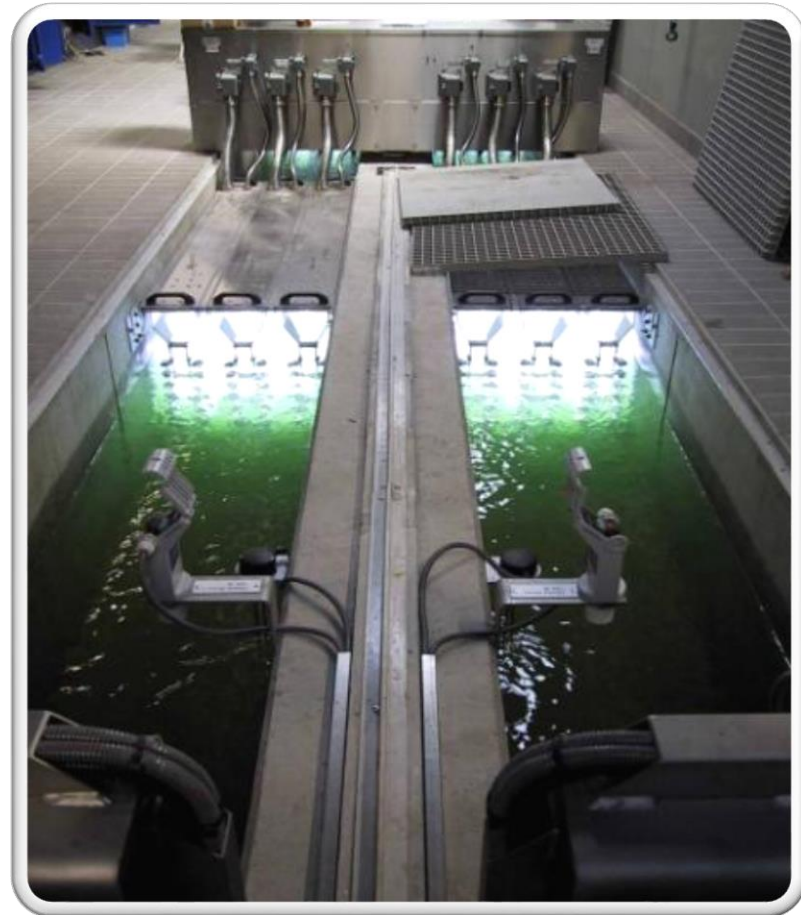
# TAK Smart



# WEDECO TAK Reference Site

## Pesquera los fiordos (CHILE)

- Flow rate: 1,000 m<sup>3</sup>/h
- UV-T: 92%
- Lamps: 72
- UV dose: 140 mJ/cm<sup>2</sup>
- Year of installation: 2003





# WEDECO TAK Reference Site

## Acuidoro Fishfarm (Spain)

- Flow rate: 10.800 m<sup>3</sup>/ h
  - Main stream disinfection
- UV Transmittance: 85 %
- Suspended solids: absence
- UV Dose: 50 mJ/ cm<sup>2</sup> (PSS)
- Lamps: 306



# Product Overview

## *WEDECO's waste water products – DURON Series - References*

### **DURON 72i3-2x1**

72 UV lamps

Flow 7,000m<sup>3</sup>/h

UVT 90%

25 mJ/cm<sup>2</sup> min PSS





# Benefits of UV Disinfection

UV Very effective against fish pathogens

Easy operation & maintenance

Power On / Off

Can't be overdosed

Long lamp life >1year

No chemicals

No harmful  
by-products to fish

No effect on odour

No effect on water  
chemistry

No chemical risk for  
operators

Reduced vaccination needs

Higher growth rates – less mortality

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<https://www.xylem.com/en-us/industries-applications/aquaculture/>

# ABSTRACT:

Aquaculture biosecurity using UV disinfection of inlet and outlet water.

Norway was the first country to institute biosecurity measures in the aquaculture industry by establishing disinfection requirements at both the intake and outflow of aquaculture facilities to help prevent the spread of pathogenic bacteria, fungi, and viruses. Following very costly ISA virus outbreaks in New Brunswick, Scotland, Shetland, and Chile, other countries have adopted similar aquaculture biosecurity measures to check infections before they become epidemics.

The presentation will describe how fishfarms can benefit in custom-designing UV disinfection systems that work as efficient disease protection. It will also highlight critical elements to be considered during the design phase and for efficient monitoring and control of the UV system. Furthermore, examples from the field will be discussed to illustrate how simple today's open channel UV systems, which are capable of disinfecting more than thousand cubic meters per hour, are to be operated and maintained.