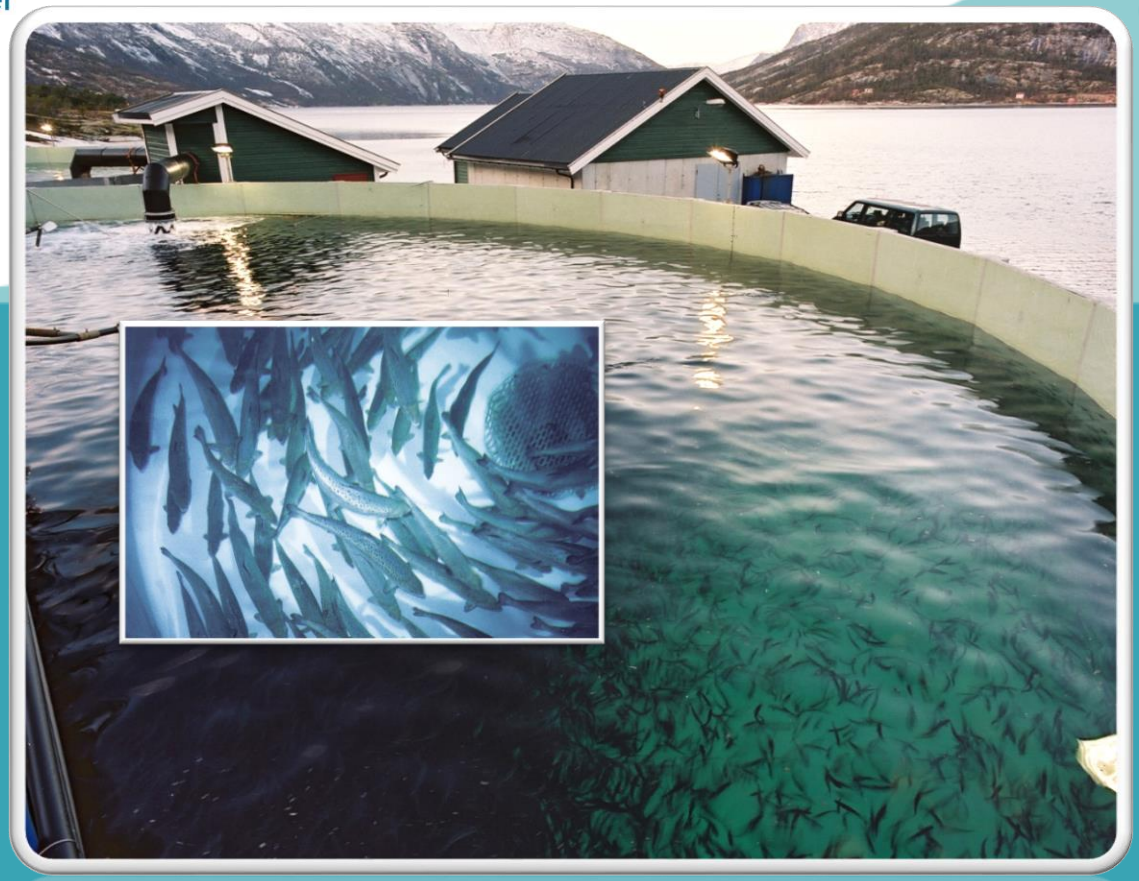
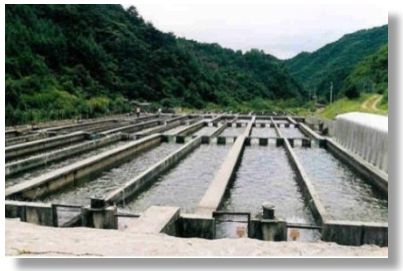
Ing. Federico Dallera



WEDECO Ozone for Aquaculture

Aquaculture production techniques

	Net pens / cages	Ponds	Flow-through (usually raceway)	Recirculating System (RAS)
				
	Increasingly sophisticated treatment & monitoring			
Description	• Fish kept in net pens or cages • Ocean or freshwater	• Typically fresh water fed by spring or surface water • Some brackish and salt	• Water contained in a channel; water flows through continuously • Usually fed by river	• Fish are kept in tanks, indoor or outside • Water is recirculated, monitored and treated
Treatment	○ None	◔ Aeration in larger and higher density ponds	◑ Varies significantly; most have settling ponds / tanks, many have mechanical filtration, and a few use aeration	● Extensive water treatment, including filtration (mechanical and biological), disinfection (UV & ozone), oxygenation, and waste / sludge treatment
Monitoring	◔ Limited; DO regularly, other intermittently. Environmental monitoring varies by country / site	◔ DO daily / continuously Other intermittent	◑ DO daily / continuous Other regularly	● Continuous monitoring of DO and other parameters Larger systems fully automated with SCADA

RAS are the most sophisticated form of aquaculture

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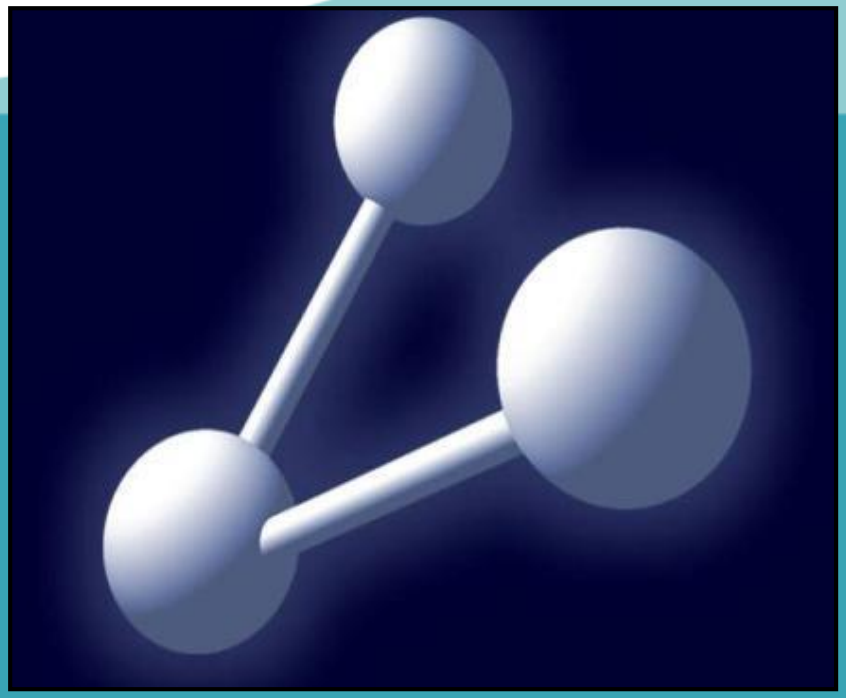
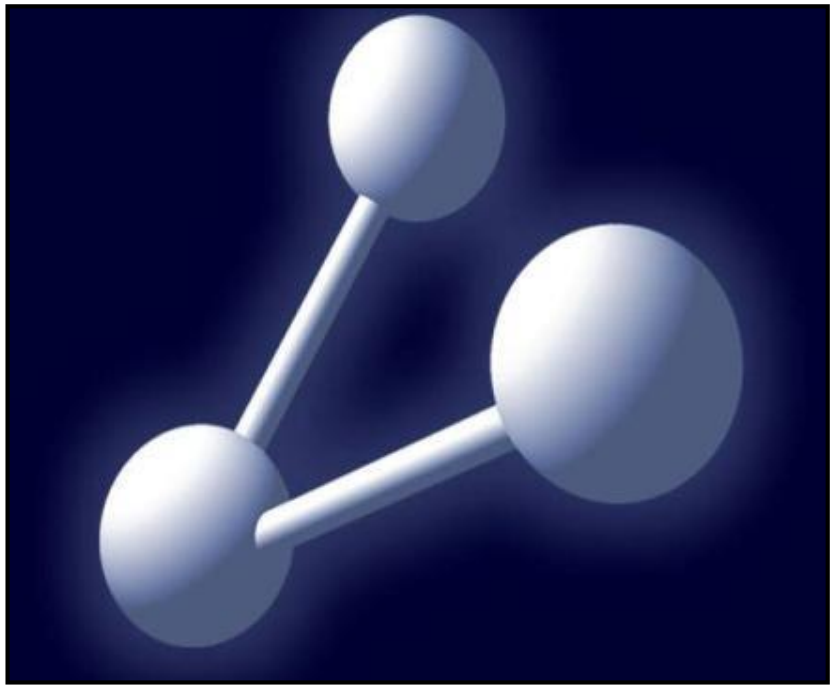


Basics Ozone

Ozone Basics

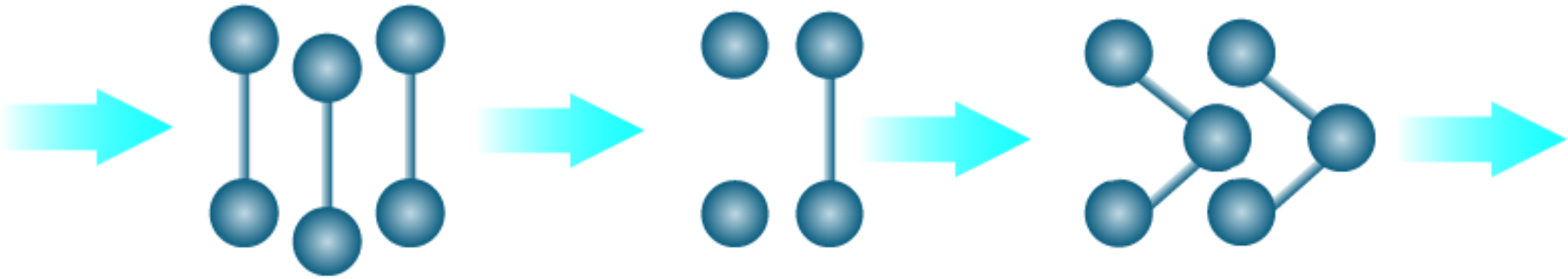
What Is Ozone?

- Tri-atomic form of Oxygen
- Colorless gas
- Very powerful oxidizing agent
- Relatively short half life (cannot be transported or stored – must be generated at point of use)
- Decomposition product of ozone is oxygen (O_2)
- Can be generated as well as found in nature



Ozone Basics

Ozone Formation



Oxygen molecules are split within an electric field

Oxygen atoms combine with oxygen molecules

Ozone molecule

How does Ozone work?

- Oxidation Potential of various chemical Oxidants = Measure of Oxidation Strength

Oxidant	Potential in V	Oxidant	Potential in V
Hydroxyl Radical	2.80	Sodium Hypochlorite	1.49
Ozone	2.07	Chlorine	1.36
Hydrogen Peroxide	1.08	Chlorine Dioxide	1.27
Potassium Permanganate	1.70	Oxygen	1.23

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How does Ozone Work?

- Ozone oxidation follows two pathways:
  - Direct - Ozone contacting microorganism of contaminant
  - Indirect - Ozone disintegrates into short living, stronger hydroxyl radicals
- Both reactions occur simultaneously
- Since Chlorine is still a widely used and known chemical for oxidation and disinfection, Ozone is often compared to Chlorine
- Ozone acts **3,000** times faster than chlorine as a bactericide

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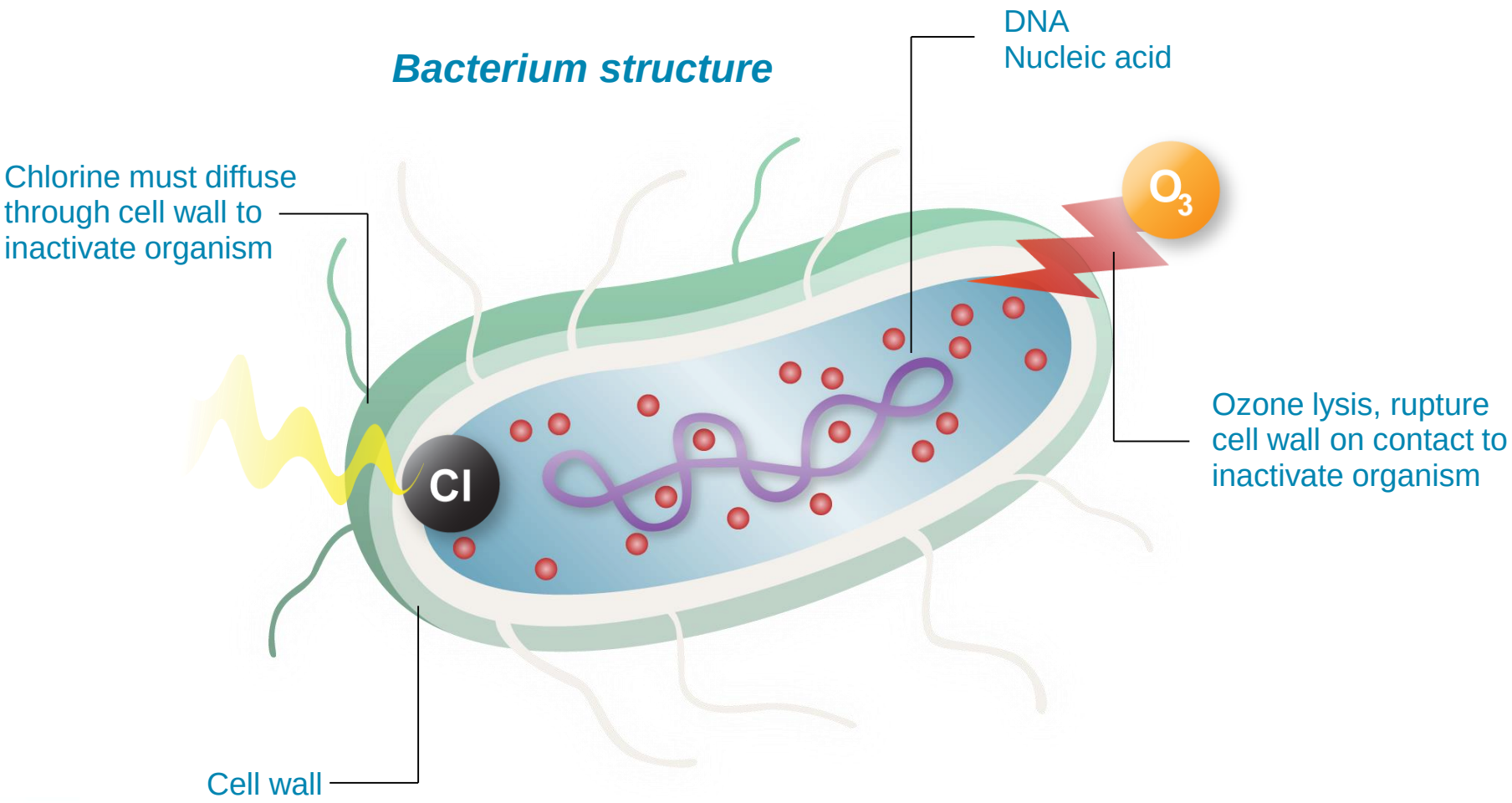
Disinfection Mechanism

Chlorine versus Ozone



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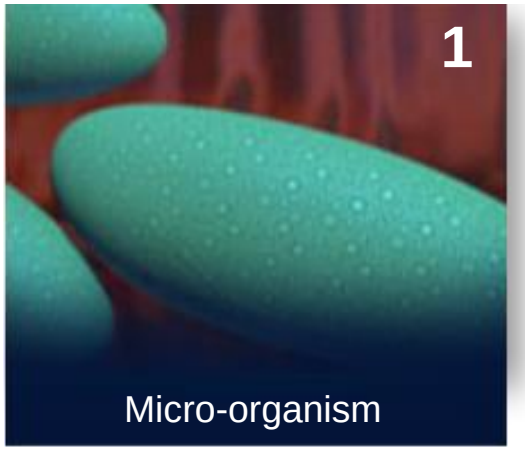
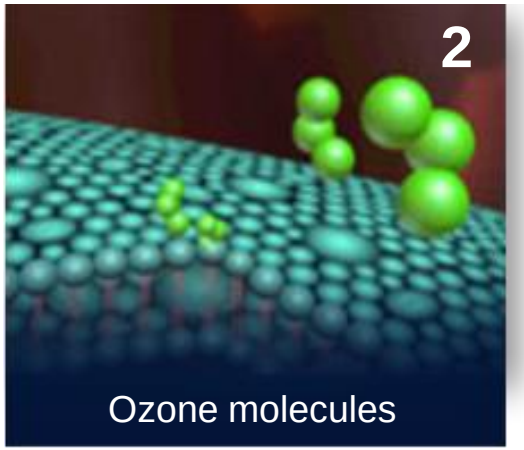
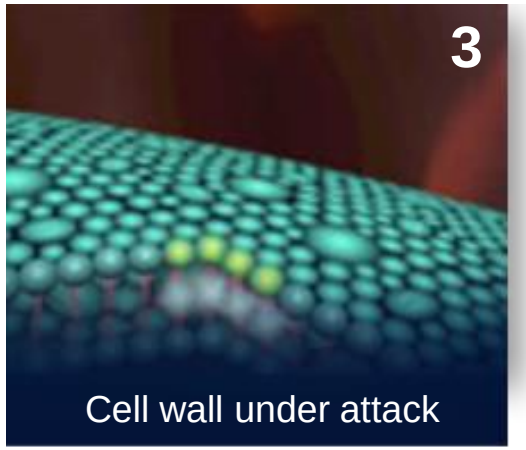
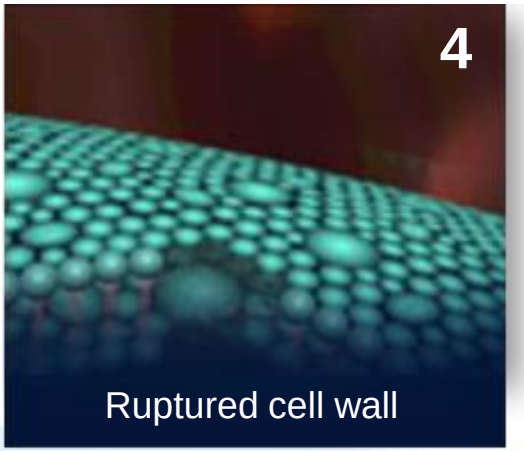
Example of Ozone Lysis









Wedeco‘s Portfolio for Ozone

Modular
0.2 – 8 g/h O3

GSO 10-30
3 – 100 g/h O3

GSO 40-50
200 – 400 g/h O3

SMO100-200
400 – 1.100 g/h O3

SMOevo 410-960
300 – 21.400 g/h O3

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Wedeco‘s Typical system for fish farm: O_3+UV

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Let's Solve Water

Ozone Applications in Aquaculture

1. Aquaculture
2. Fish hatcheries
3. Aquariums
4. Zoos

Ozone Disinfection & Oxidation

Intake water

if there is concern about water quality and pathogens from the water source

Recirculating water (RAS)

usually used before the biofiltration treatment, prior to return to fish tank

Effluent water

if concern of disease, quality or discharge limits

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Ozone Disinfection & Oxidation

- Bacterial and viral diseases are a significant threat to aquaculture operations
- In RAS systems concentrated organic matter, hormones, smell and taste are problematic for fish production
- Ozone is a proven technology to oxidize any kind of organic matter, also colour, smell, taste and others
- Ozone also damages and kills pathogen bacteria and virus
- Ozone systems are used in Aquaculture worldwide with increasing importance for protecting the fish production specially in RAS

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Ozone applications

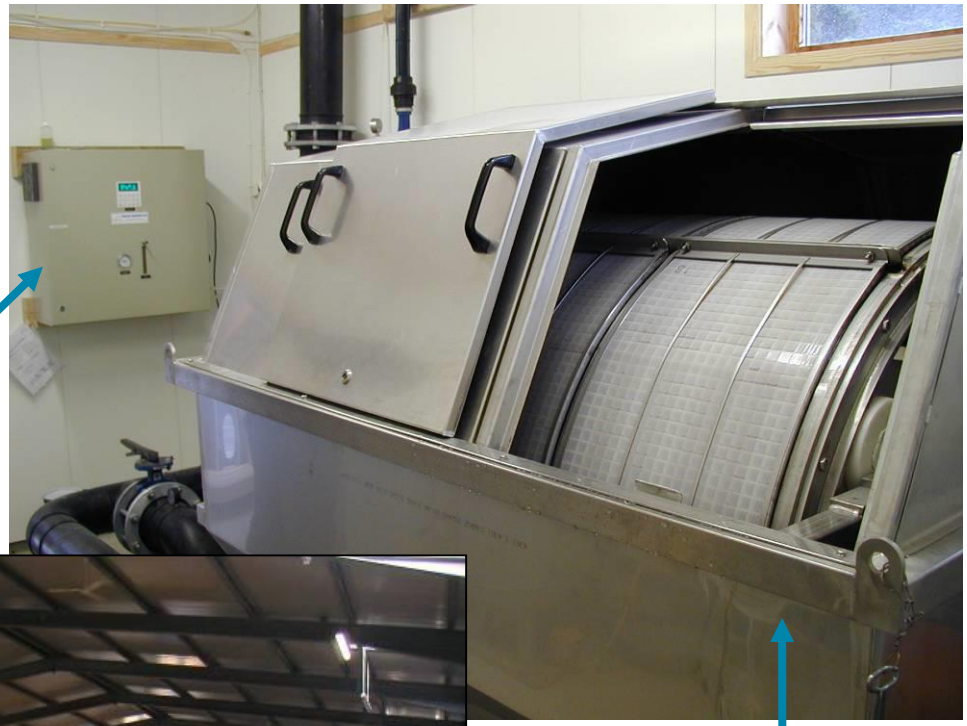
Benefits of ozone treatment

- Reduction of pathogenic bacteria
- Reduction of mortality
- Higher growth rate of fish with shorter breeding time
- Improvement of water quality:
  - Minimization of color, taste and odor
  - Prevention of accumulation of undesirable residual organic compounds
- Effective disinfectant and oxidant which decomposes into useful oxygen

Ozone applications - RAS

Fish farms / - hatcheries

Ozone injection into recycling loop, after filtration step.



Ozone generator type GSO 30

Drum filter

Ozone applications - Aquarium

Aquarium / Zoos

Ozone injection into protein skimmer / foam fractionator

Protein skimmer

The Conclusion

Advanced Water treatment without residual chemicals

Water for aquaculture: microbiologically safe, without harmful contaminants, healthy due to Ozone

- Safe disinfection
- Easy and reliable to apply
- No hazardous by products or residuals
- No undesirable substances
- No concentration, no sludges
- No hazardous chemicals
- No resistance as with chlorine and antibiotics

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Let's Solve Water

GRAZIE !

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