

NORMEX
AQUACULTUR

For clean water and healthy fish

Eco-friendly and effective water treatment

 **NORMEX**
Making a clean difference™

About NORMEX™

▶ Normex has been developing innovative disinfection and water treatment solutions for over 16 years. Since our establishment in 2003, we have delivered more than 300 facilities to companies in aquaculture, maritime and onshore fish processing industries worldwide. Normex's eco-friendly technology provides clean water, better fish health, greater biosecurity and disinfection without the use of chemical substances. We deliver complete solutions and engage in the entire process from initial design and project engineering to start-up, user training and after-sales service.

Because we define our overarching goal as "Making a clean difference", Normex has a strong focus on sustainable and eco-friendly solutions, in line with several of the UN's Sustainable Development Goals.



Ozone plays a vital role in our solutions. Ozone (O_3) is made from oxygen (O_2) by means of an electrical discharge in an ozone generator. Ozone is an extremely powerful and effective oxidiser, and eliminates microorganisms and pathogens from water. Once the ozone has reacted with the water-borne microorganisms, it returns to its original form – oxygen.

BENEFITS



Clean water
Clarification of water



Eco-friendly



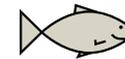
Chemical-free
disinfection



Increased biosecurity



Saves time
and money



Better fish welfare



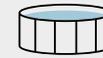


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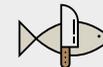
Hatcheries

Ozone-treatment of water for hatcheries, disinfection of tanks and pipes.



Onshore aquaculture

Ozone-treatment of raw intake and recycled water. Removal of microparticles using ozone and skimmer solutions. Disinfection of tanks and pipes, treatment of wastewater / effluent.



Fish harvesting and processing

Disinfection of tanks, pipes, machines and equipment. Treatment of wastewater / effluent.



Fishing boats and service vessels

Disinfection of tanks, RSW and pipes by means of ozone.

- Wellboats
- Delousing barges
- Harvesting vessels
- Fishing boats
- Purse seiners / factory ships

Our solutions

- ▶ **Since our establishment in 2003, we have built up extensive expertise in the disinfection and purification of raw water, process water and wastewater. Together with our international network of industrial partners and public research institutions, we have developed a portfolio of innovative solutions.**

The key to onshore aquaculture is good water quality. Eliminating microorganisms, such as bacteria, viruses, fungi and parasites, reduces the risk of infection and improves biosecurity. Removing microparticles and discolouration from the water enhances the fishes' welfare. The end result is higher quality and lower mortality. For the fish farmer, this means a higher yield and a more eco-friendly image among customers who are increasingly concerned about their carbon footprint and demanding sustainable solutions.

RAZONE™

Optimal water purification for onshore aquaculture increases biosecurity and improves fish welfare.

NORMEX RAZONE™ is a unique solution for cleaning water in onshore aquaculture facilities. The system significantly improves water quality.

The organic load in RAS facilities is often high. There is a significant risk of both the spread of infection and the build-up of harmful microorganisms, microparticles, micropollutants and unfortunate hydrogen sulphide (H₂S) issues. Normex has developed NORMEX RAZONE™ to resolve these problems by effectively eliminating microorganisms and removing microparticles and pollutants.

The NORMEX RAZONE™ skimmer works as effectively with freshwater as with seawater. It is compact, easy to operate and inexpensive to run. Our control system manages and regulates ozone concentrations depending on the quality of the water concerned, and can be connected to the farm's overall control system.

ADOXPOL™

Eco-friendly, effective and compact system for treating wastewater (effluent).

NORMEX ADOXPOL™ has been developed to remove particles and fatty substances from wastewater.

One of the system's primary objectives is to eliminate the handling and use of hazardous chemicals that are harmful to the environment.

Our solution rests on a combination of methods, such as filtration, flotation and oxidation. This combination enables particles to be constantly and effectively separated out. Microbubbles transport particles, fats and other pollutants to the surface, where they form a layer that is scraped off and channelled into a sludge tank.

Normex ADOXPOL™ is a fully automatic, compact system, with an integrated sludge tank. The system can handle an extremely high flow of liquid in a relatively small area and volume.

Typical areas of application are the fishing industry, fish harvesting and food processing plants, as well as wastewater / sewage treatment plants.



Salmon



Trout



Cleaner fish



Halibut

Effective cleaning and disinfection of tanks and closed-loop pipe systems, machines and equipment.

NORMEX DESINFECTA™ is an automated and highly effective system for cleaning and disinfecting tanks and closed-loop pipe systems, without the use of harmful chemicals.

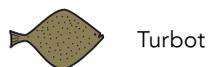
Food production facilities are subject to strict hygiene standards, which require them to wash and disinfect their equipment on a daily basis. This is often time consuming, and the chemicals employed necessitate the use of protective equipment, are expensive and have a negative impact on the environment.

NORMEX DESINFECTA™ has been approved as a method of disinfection in food production by the Norwegian Medicines Agency and the Norwegian Food Safety Authority. Flexibility in use and efficient routines simplify the process day to day, while the system significantly reduces water consumption.

NORMEX DESINFECTA™ is also used on vessels, where tanks, RSW and pipes are disinfected between fishing trips, cargo transport and destinations. NORMEX DESINFECTA™ is precisely tailored to each facility's size and is inexpensive to run.

APPROVALS

- ✓ Norwegian Food Safety Authority
- ✓ Norwegian Medicines Agency



Turbot



Tilapia



Shrimp



Other species



“At Mowi Rensefisk Vanylven, we’ve been using ozone for years to treat our intake water and guard against unwanted opportunistic bacteria, parasites, fungi and viruses.

In our view, the use of ozone is the best way to protect fish health and safeguard our assets.

Normex has supplied ozone systems not only to treat our intake water but also our wastewater. This means we can reduce the amount of chemicals we use and enhance our plant’s environmental profile.”

Leon Stranden
Technical Coordinator



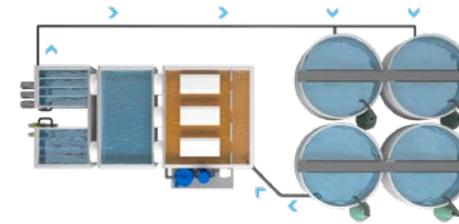
Recirculating aquaculture systems (RAS)

- ▶ Normex supplies solutions for RAS facilities, which help improve biosecurity, water quality and fish welfare. This ensures healthy fish, with strong growth and low mortality. For fish farmers, these are important drivers for increased yield, earnings and a good reputation.

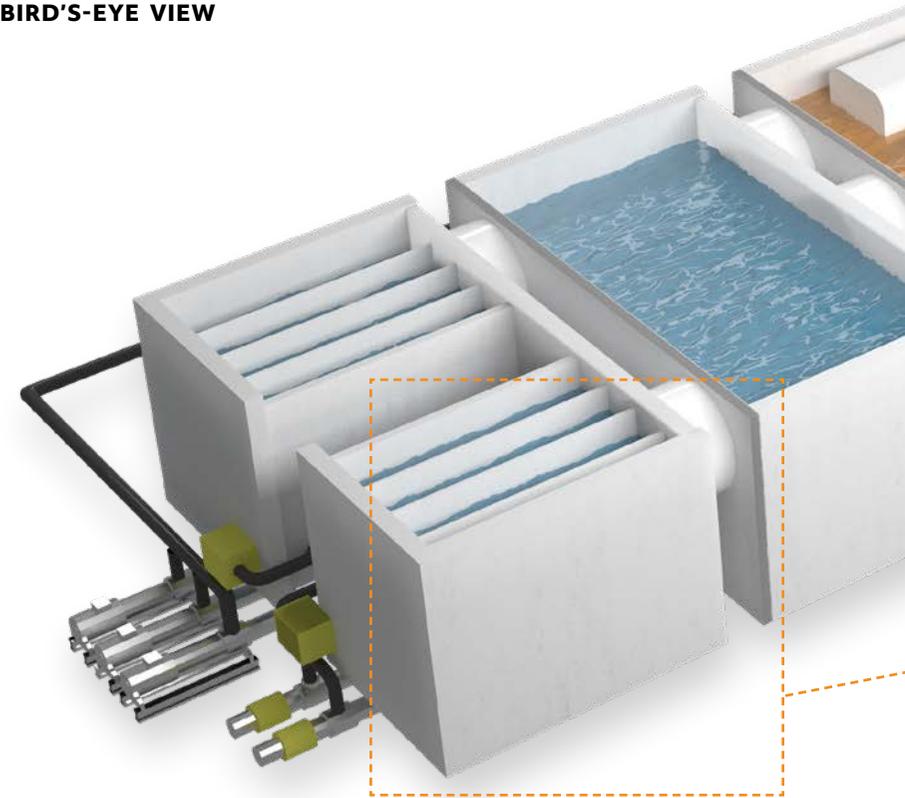
To remove microparticles, Normex has developed NORMEX RAZONE™. This system can be placed either before or after a biofilter, and treats the recycled water in a side stream. NORMEX RAZONE™ can also improve the quality of the wastewater, before it enters the sludge treatment plant.

BENEFITS

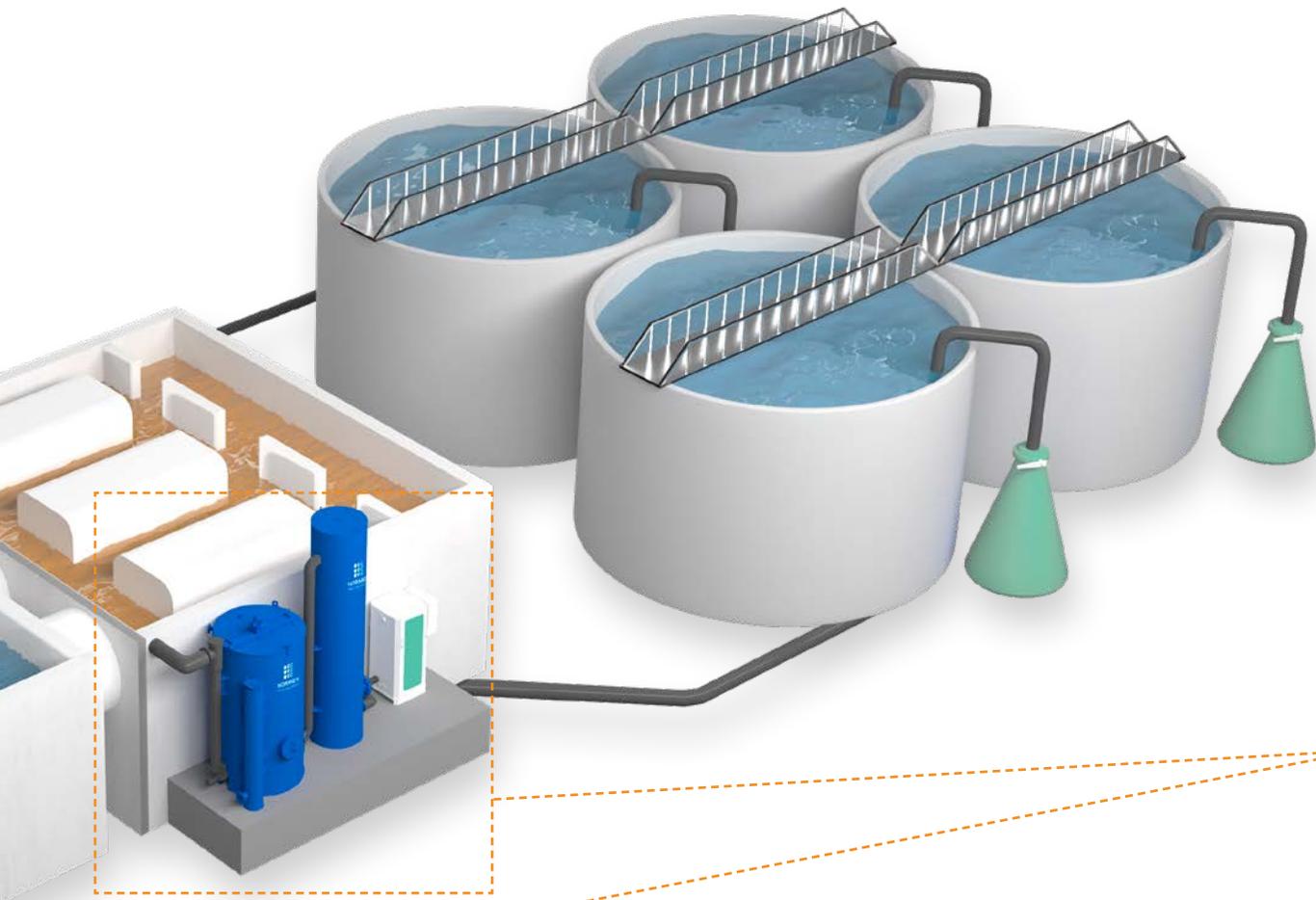
- ⊕ Increased biosecurity
- ⊕ Better fish welfare
- ⊕ Water clarification
- ⊕ Better feed utilisation
- ⊕ Higher growth rates
- ⊕ Better fish health
- ⊕ Reduced risk of hydrogen sulphide formation (H₂S)



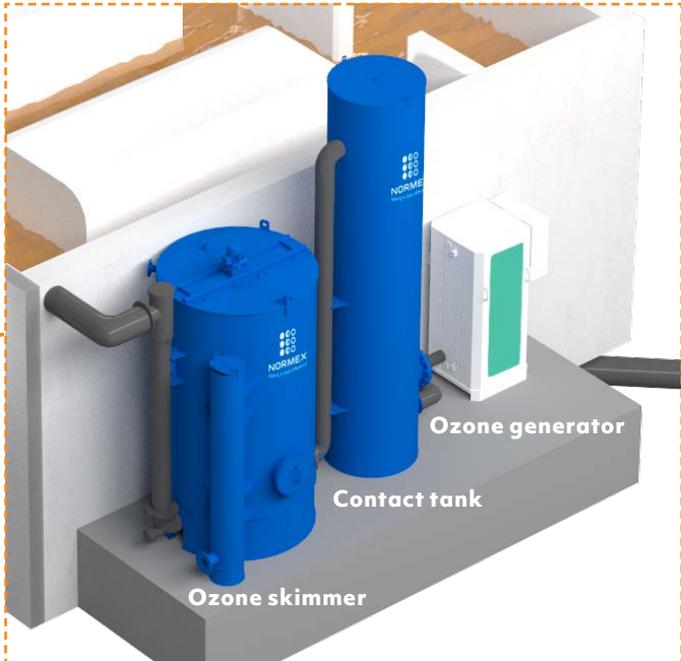
BIRD'S-EYE VIEW



Alternative positioning



NORMEX RAZONE™ ozone skimmer works just as well with freshwater as with seawater



NORMEX RAZONE™ system

Raw water from the facility is diverted via a side stream to the contact tank, where ozone is injected. The water is then fed into the ozone skimmer.

NORMEX RAZONE™

- ▶ **The removal of microparticles, microorganisms and micropollutants optimises water quality, which improves fish health, biosecurity and fish welfare.**

NORMEX RAZONE™ ozone skimmer effectively eliminates microparticles that are not removed by existing solutions. The water is diverted into a side stream and treated in a two-phase skimming process. In Phase 1, ozone is injected into the water and microfloculates are formed. In Phase 2, the waste material floats to the surface and is skimmed off.

NORMEX RAZONE™ ozone skimmer works just as well with freshwater as with seawater.

Ozon

Ozone plays a key role in our solutions. Ozone (O_3) reacts with oxidisable materials of all kinds, both organic and inorganic, and renders bacteria, viruses and fungi harmless far more effectively than chlorine. Since the reaction time for ozone is extremely short, it works much faster than other chemical substances. Ozone is also an effective way of removing discolouration and clarifying water.



Raw/recycled water from the facility ready for treatment.

Fase 1

MICROFLOCCULATION



Recycled water (RAS) or intake water from a flow-through system is fed into the NORMEX RAZONE™ contact tank.

The purification process begins:

- Ozone is injected
- Oxidisation takes place
- Clarification and decolouration
- Formation of microfloculates

Fase 2

REMOVAL OF MICROPOLLUTION



Tiny microbubbles are pumped in and the flocculated particles are forced to the surface, where they form a layer of sludge comprising:

- Microparticles
- Algae
- Dissolved metals
- Ammonium and nitrites
- Feed residues and faecal matter

The layer of sludge is removed from the surface and transferred to a sludge tank. The clean water exits through a pipe at the base of the ozone skimmer.



Ozone-replete water is channelled into the ozone skimmer for further treatment.



The treated and clarified water is fed back into the system.

Flow-through facilities with recycling

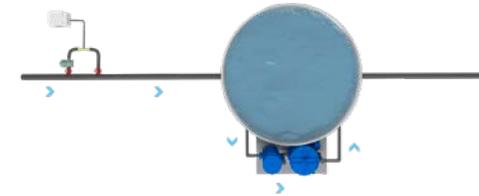
- ▶ **NORMEX™ supplies solutions for flow-through facilities, with or without water recycling. Clean water is a key factor irrespective of the type of facility.**

For pure flow-through facilities, we supply intake-water ozone treatment systems. The removal of discolouration and the oxidation of microorganisms, such as bacteria, viruses, fungi and parasites, ensures safer and cleaner water coming in.

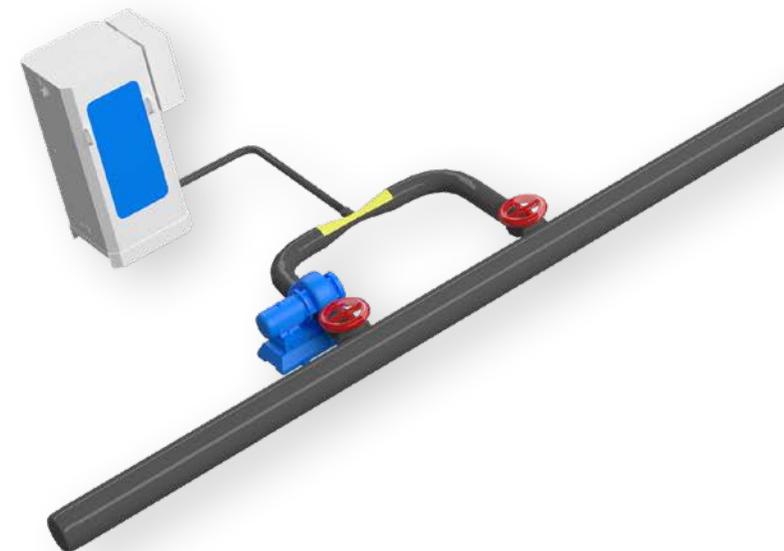
The system can also be used to disinfect tanks, pipework, tubs and equipment in connection with periodic cleaning. NORMEX DESINFECTA™ automates the disinfection of tanks, tubs and closed-loop pipe systems. It simplifies and speeds up an otherwise time-consuming process.

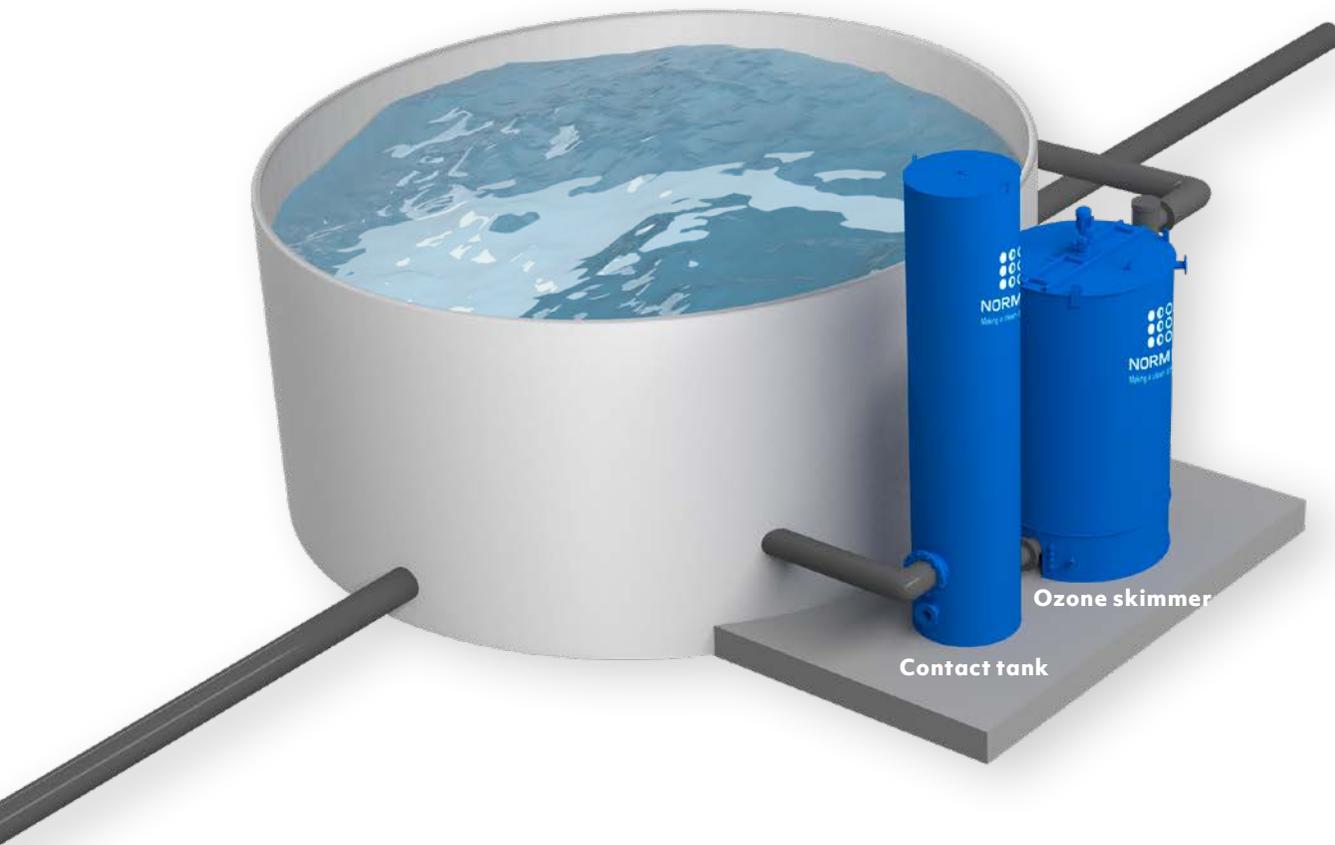
BENEFITS

- ⊕ Increased biosecurity
- ⊕ Eliminates bacteria/viruses/fungi/algae
- ⊕ Water clarification/decolouration
- ⊕ Better fish welfare
- ⊕ Better feed utilisation
- ⊕ Higher growth and lower mortality



BIRD'S-EYE VIEW





Eco-friendly removal of bacteria,
viruses, fungi and microorganisms

Ozone treatment of intake water with recycling.

The raw intake water is treated with ozone before it is fed into the plant. Water that is to be recycled is diverted via a side stream to the NORMEX RAZONE™ contact tank, where ozone is injected. The water is then pumped into the ozone skimmer for further treatment. The clean, treated water is then fed back into the plant.

Disinfection of tubs and pipework

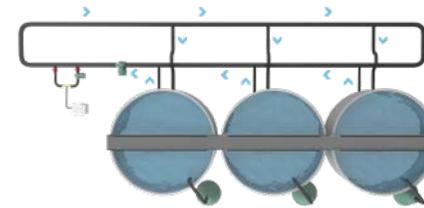
- ▶ **NORMEX DESINFECTA™** has been developed to disinfect tanks, tubs, equipment and pipework effectively and without harming the environment. The system has been approved by the Norwegian Food Safety Authority and the Norwegian Medicines Agency as a method of disinfection in the aquaculture sector.

For fish farmers, keeping the tanks and pipes used in the production process clean and free from contaminants is a high priority.

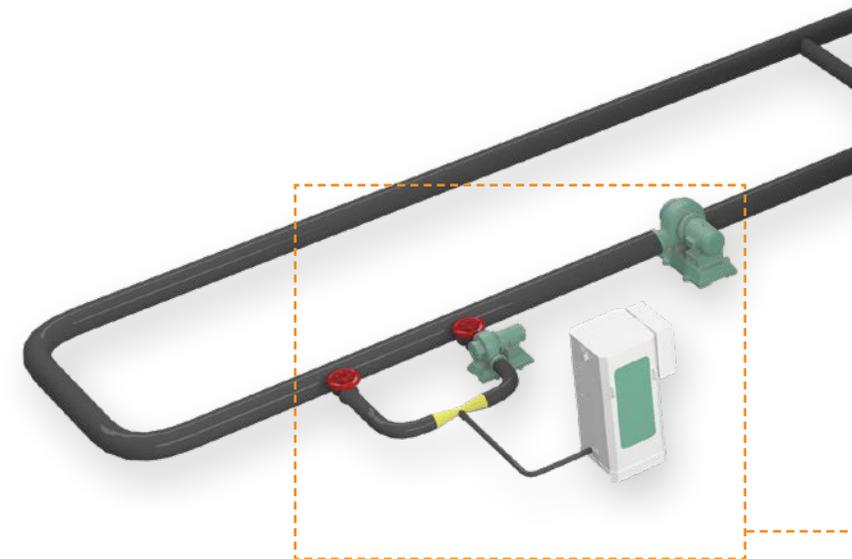
To achieve the best possible biosecurity at the farm, it is important to keep microorganisms at bay. However, their capacity to develop resistance to chemical biocides is well-known. Against ozone, they have no defence. Ozone is an eco-friendly, time-saving and cost-effective method of disinfection. The ozone is produced on-site, when you need it, which avoids logistical complications relating to purchase, storage and waste handling. Ozone is injected into the water stream and goes to work wherever the water penetrates. This ensures that hidden sources of contamination are effectively eliminated.

FORDELER

- ⊕ Simple and effective method
- ⊕ Eliminates hidden sources of contamination
- ⊕ Flexible in use
- ⊕ Cost-effective
- ⊕ Avoids chemicals and environmental damage
- ⊕ No harmful by-products, just pure oxygen
- ⊕ No build-up of resistance

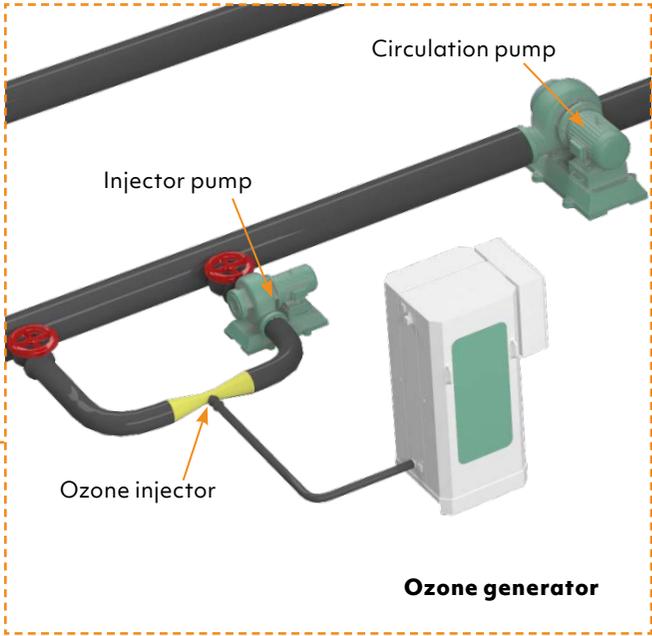


BIRD'S-EYE VIEW





Microorganisms cannot develop ozone resistance



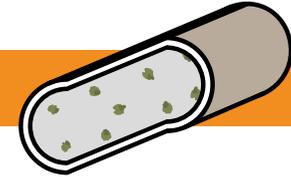
- APPROVALS**
- ✓ Norwegian Food Safety Authority
 - ✓ Norwegian Medicines Agency

NORMEX DESINFECTA™
 When the facility needs disinfecting, ozone is produced on-site and is injected into the water stream. It then eliminates contamination wherever the water penetrates.

Supplementary products and services

- ▶ **NORMEX's primary focus is to develop sustainable, eco-friendly and cost-effective solutions that benefit our customers. We also supply a range of supplementary products and services to ensure optimal operation, management and control of our solutions.**

NORMEX BIOFOUL™

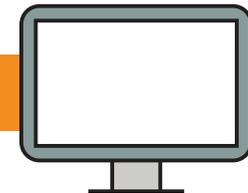


Effective removal and prevention of biological growth

NORMEX BIOFOUL™ removes and prevents biological growth in heat exchangers, pipework and seawater intake pipes – without the use of environmentally harmful chemicals.

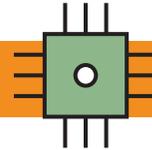
NORMEX BIOFOUL™ injects exactly the right amount of ozone into the intake pipe. The solution's highly effective and patented ozone infusion system means that treatment is effective at extremely low ozone concentrations.

CONTROL SYSTEM



Solutions supplied by NORMEX™ are regulated and monitored by a dedicated control system. Dosage and ozone concentrations are adjusted automatically to the desired levels, depending on the water quality. The HMI panel offers a user-friendly and intuitive interface, where all necessary parameters and values are displayed and logged. All data can be transmitted to the plant's overall control system.

SENSORS/DETECTORS



Our solutions also include a variety of sensors and detectors, both hard-wired and hand-held. For optimal safety, the ozone concentration in the water that goes to the fish and the air in any machine rooms is continuously monitored. Should any leaks from the equipment be detected, ozone production is shut down automatically.

SERVICE 24/7

NORMEX™ offers a high level of after-sales support, because we know how important it is that nothing interrupts our customers' day-to-day operations. For added peace of mind, we offer service agreements for all our solutions.

OXYGEN



Oxygen is an important parameter for fishes' ability to tackle stress factors, such as different treatments and transport. Water with a stable oxygen level is crucial for good fish welfare.

NORMEX™ supplies complete oxygen systems, and can help you choose the right design and scale to ensure the correct infusion of oxygen for:

- Fish farms
- Wellboats
- Fishing boats
- Other vessels
- Other applications

Making a clean difference™

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