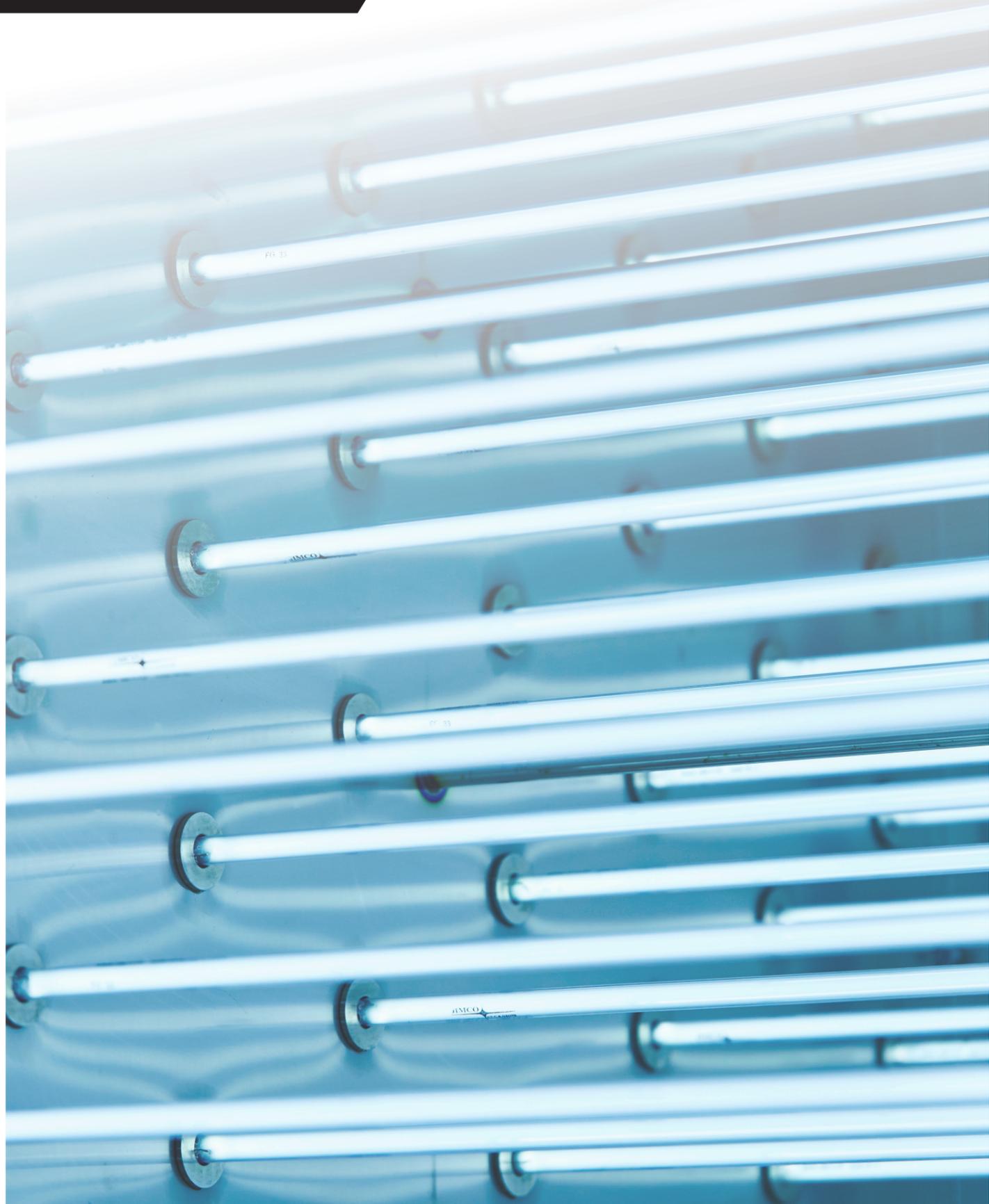




**JIMCO**<sup>®</sup>  
UV-C  
WWW.JIMCO.DK

ENVIRONMENTALLY FRIENDLY  
**DISINFECTION  
FLO-D<sup>®</sup> TECHNOLOGY**





## INNOVATION AND DRIVE

Technology for the future - designed and developed in Denmark

Jimco A/S is the company behind some of the world's most unique air and waste-water purification and sterilisation solutions.

Since designing its very first air-cleaning unit in 1993, Jimco A/S has not looked back. Today, the company supplies its products to a large number of industries and institutions worldwide. Its customer base comprising factories within the food industry, commercial kitchens, waste-water treatment plants, schools and nursing homes. In brief, Jimco A/S undertakes all types of projects – large and small.

Jimco A/S combines common sense with innovative thinking as the basis of the company's unique products. It is no coincidence that Jimco A/S supplies air-treatment units to some of the biggest chains in the world – including McDonald's, Scandic Hotels, McCain, Danish Crown etc.

## COMPLETE DISINFECTION OF SURFACES IN PRODUCTION FACILITIES

**Efficient disinfection – without manual procedures, chemicals or water.**

With the introduction of the UV-C-based disinfection of surfaces, we now add yet another field of application to our patented UV-C technology, which has been awarded the EU Environmental award and which since 1993 has been used in air cleaning – systems which i.a. are used for removing obnoxious smells, improving the indoor climate as well as reducing the danger of fire and infection.

The fact that it is now possible to disinfect surfaces, which would normally require a manual treatment, involves a large number of advantages for the operating economy, the environment as well as the work environment.



## WHY CHOOSE JIMCO DISINFECTION TECHNOLOGY?

- ✓ Avoid time consuming manual disinfection with water and chemicals.
- ✓ Save liters of water by the tons as well as energy for heating and drying.
- ✓ Disinfect more efficiently in corners, chinks and ventilation ducts, cooling coils and surfaces.
- ✓ Avoid strong chemicals, which have an impact on the environment and work environment.
- ✓ Avoid an environmentally harmful release of chlorinated wastewater.

## PRACTICAL USE



## SURFACE DISINFECTION AND ODOR REMOVAL

Food Industry – Refrigerated Containers – Limited Areas – Health Sector

### It can be expensive.

A food production factory can be exposed to bacteria and mould even if a high standard of hygiene is in place. Manual surface disinfection of work surfaces, machinery and freezers etc. can often allow an unusually high number of bacteria to remain.

Unpleasant odors can also cause inconvenience. In these cases, money may be lost through complaints, resulting in bad publicity, and spoiled products.

### It is easy to be at the front edge.

By simple use of the mobile FLO-D® air cleaners, you will quickly and effectively disinfect and remove unpleasant odors from the air in a confined production space.

The daily cleaning of production areas is the most important function, in order to maintain a high standard of hygiene and by using the FLO-D® you will also prevent mould, fungus or any other type of micro-organisms from forming on equipment, walls or ceilings.



## VERY POSITIVE RESULTS – OF TESTS AS WELL AS PRACTICAL USE

Prior to the introduction of our solutions for UV-C & Ozone-based disinfection, we have for some time conducted full-scale tests in various companies in cooperation with DTU (Technical University of Denmark) and The National Institute for Aquatic Resources. The results were impressive.

Furthermore, various tests carried out in cooperation with The South Danish University have shown that concentrations of for instance listeria and salmonella bacteria can be almost completely destroyed by means of our technology and within only two hours.

## SOME FACTS ON OZONE AND IT'S USE

1.

Ozone is a potent antimicrobial agent, which can effectively kill viruses, bacteria, fungi and parasites, including those causing food spoilage or human diseases.

2.

The efficiency of ozone depends on the target microorganism and the treatment condition.

3.

Ozone destroys microorganisms by reacting with particular oxidizable cellular components, the end reactions of which result in cell damage and death of microorganisms.

4.

Ozone as opposed to other chemical treatments destroys microorganisms instantly and effectively, without leaving harmful residues in treated food or surfaces, hence is safer and environmentally friendlier than most other antimicrobials.

5.

The production and use of ozone in food processing is safe, provided that its concentration is controlled and monitored. The permissible level of exposure to ozone is 0.1 ppm in workplace and food processing environments for 8 hours.

## FIND OUT HOW MUCH YOU CAN SAVE

It is easy to calculate the amount of savings that your company will be able to gain in terms of manpower, water, heat, electricity and chemicals, simply by shifting to an automatic, environmentally friendly disinfection.

Solutions for UV-C & Ozone-based disinfection can be rented at Jimco A/S.

## AUTOMATIC DISINFECTION OF COLD STORAGE

Disinfect effectively - without manual processes, chemicals or water

Production manager Morten Tønder from Danfrugt A/S. says: -The results demonstrate that UV-C produced ozone is beneficial to the production environment. In practice, this means that we can keep our exotic fruits fresh for two weeks longer. Danfrugt is one of Denmark's leading fruit growers and one of Jimco's customers, who has installed, tested and purchased Jimco's new technology.



### Mixing apples and pears

In addition to the minimization of mould and yeast growth, the system has other benefits. It also reduces ethylene in the air, normally secreted by apples. This enables the possibility of mixing different fruit types. Normally, apples cannot be stored in the same cold storage rooms as a number of other fruits. However, the concentration of ethylene, which causes e.g. pears to rot faster, is minimized with the FLO-D® technology. Thus, new opportunities are offered for storage of different fruits in the same cold storage rooms. It is an advantage, because we can then close down a few cold storage rooms and gather various fruits together in the same room when the high season is coming to an end, says Morten Tønder.

## HYGIENE ON A LEVEL BETTER THAN TRADITIONAL DISINFECTION

At the fish factory Vega Salmon A/S in Esbjerg, Jimco's system for UV-C & Ozone-based disinfection has been installed in the production. Tests from the factory show that the total bacterial concentration after a UV-C & Ozone-based disinfection is better/lower than after a traditional disinfection.

At the same time, the concentration of fungal spores is reduced. This goes to prove that saving tons of water and chemicals has no hygienic consequences.



# DISCOVER THE POWER OF FLO-D

FOR EFFECTIVE AND CHEMICAL-FREE DISINFECTION

FOR FOOD SAFETY, SHELF LIFE, AND REDUCED FOOD WASTE.

## Here are some of the benefits of having a FLO-D device:

- ✓ **Effective disinfection:** FLO-D utilizes a combination of UV-C technology and ozone to eliminate bacteria, viruses, mold, and other harmful microorganisms. This efficient disinfection ensures a cleaner and healthier environment.
  - ✓ **Environmentally friendly solution:** FLO-D's use of UV-C technology and ozone for disinfection eliminates the need for water or chemicals. This makes it an environmentally friendly solution as it doesn't leave wastewater or chemical waste.
  - ✓ **No chemical impact:** By avoiding the use of chemicals in the disinfection process, FLO-D eliminates the risk of chemical contamination of food, surfaces, or the environment. This is particularly important in the food industry where safety and quality are crucial.
  - ✓ **No residues or byproducts:** FLO-D's UV-C technology and ozone production ensure thorough disinfection without leaving residues or harmful by-products on surfaces or food. This helps maintain the natural purity and integrity of products.
  - ✓ **Safety and hygiene:** By avoiding the use of chemicals, FLO-D minimizes the risk of chemical exposure for staff and visitors. This promotes a safe and hygienic working and production environment.
  - ✓ **Economic savings:** Not having to purchase or store chemicals for disinfection leads to economic savings. FLO-D's efficient disinfection system also helps reduce costs associated with cleaning procedures and maintenance.
  - ✓ **Easy to use:** FLO-D devices are designed to be user-friendly. They are easy to operate and can be customized to specific needs and requirements. With a user-friendly touchscreen, you can easily set treatment parameters and monitor the device's operation.
  - ✓ **Versatile application:** FLO-D devices can be used in a wide range of applications and industries, including healthcare, food industry, public facilities, transportation, and more. They can be tailored to different room sizes and types, offering flexibility in the disinfection process.
  - ✓ **Improved hygiene:** With FLO-D, you can achieve a higher standard of hygiene. By reducing the amount of microorganisms on surfaces and in the air, you can create a cleaner and healthier environment for both staff and visitors.
  - ✓ **Time savings:** FLO-D's efficient disinfection process does not require time-consuming manual procedures or subsequent cleaning. This saves time and resources in cleaning routines.
  - ✓ **Food safety:** FLO-D's effective disinfection system is crucial for food safety. By eliminating harmful microorganisms on surfaces and in the air, it reduces the risk of foodborne illnesses and contamination of food.
  - ✓ **Extended shelf life:** By reducing the number of microorganisms on fruits, vegetables, and other food items, FLO-D extends their shelf life. This helps prevent deterioration, prolongs the lifespan of products, and reduces waste.
  - ✓ **Reduced food waste:** With FLO-D's ability to extend the shelf life of food, it contributes to reducing food waste. Fewer products will be wasted due to spoilage or contamination, resulting in economic savings and a more sustainable food system.
  - ✓ **Safety control:** FLO-D enables better control of food safety. By disinfecting surfaces and air in production facilities and storage areas, it helps maintain hygiene standards and comply with regulatory requirements.
  - ✓ **HACCP compatibility:** FLO-D is compatible with the Hazard Analysis and Critical Control Points (HACCP) system, which is a systematic approach to food safety. By integrating FLO-D into HACCP plans, you can ensure a comprehensive and effective disinfection strategy.
- These additional points highlight the importance of FLO-D in food safety, shelf life, and reduction of food waste. With FLO-D, you can achieve increased food safety, extended shelf life, and contribute to a more sustainable food system by reducing food waste.*

## TECHNICAL DESCRIPTION

### FLO-D®

UV-lamps: 30 pcs. 89 watt  
 Quartz sleeve: 30 pcs. (in cold storage)  
 Power supply EU: 3x400V + PE 50/60Hz, 16A  
 Power supply US: 3x480V + PE 50/60Hz, 16A  
 Consumption: 9 kW  
 Display: Siemens PLC, Proface color panel  
 Treatment capacity: Roomsize up to 1,500 m<sup>3</sup>

### Mesurements:

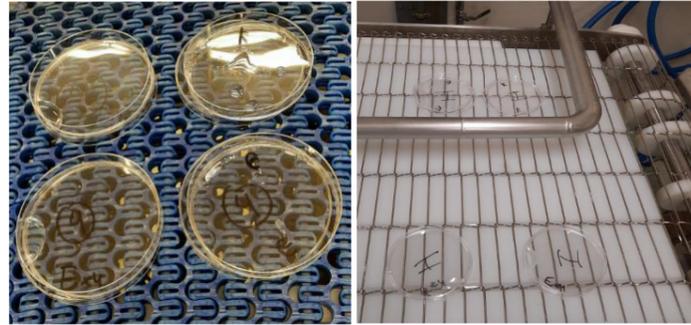
Height 2,100mm  
 Width: 1,200 mm  
 Depth: 1,200 mm  
 Weight: 175 Kg



FLO-D®

US Patent No. 14/436,318  
 PCT/EP 2012/070820

## EFFECTIVE UV-C OZONE TREATMENT REDUCES MICROORGANISMS AND IMPROVES HYGIENE IN FISH PRODUCTION

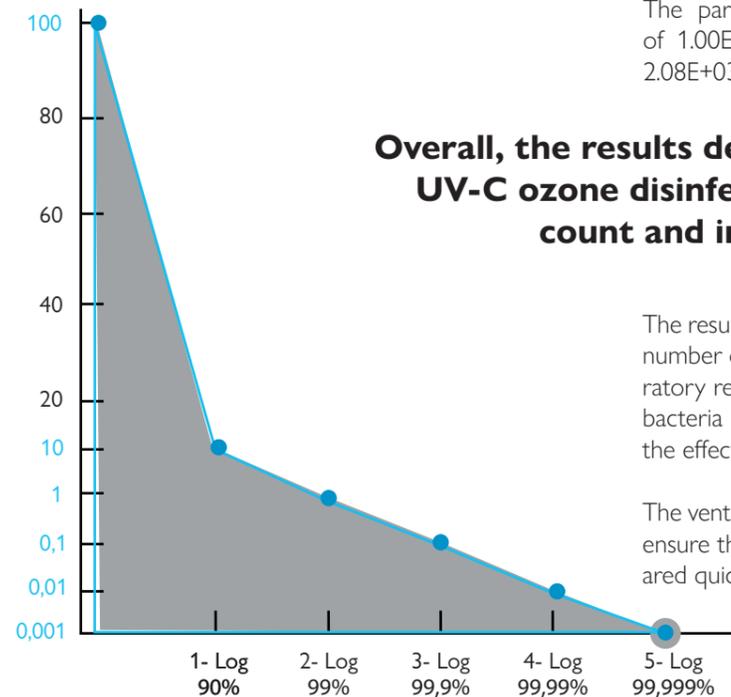


These results are conducted at a fish factory to demonstrate the effectiveness of a disinfection technique using UV-C ozone in reducing the number of total bacteria count and enterobacteria. This method involves the following steps:

1. The salmon fresh department is cleaned to remove any physical pollution inside the room.
2. Petri scales are placed on 20 spots inside the room.
3. The ozone generator is used to treat the room with a concentration of 10 parts per million (ppm) for 2-3 hours at night.
4. Petri dishes are collected from all 20 locations and sent to the laboratory for analysis.
5. The lab tests the petri scales for total count and entero bacteria.

The parameters for the suspension are a starting total count of  $1.00E+07$  cfu and a starting entero average measurement of  $2.08E+03$  cfu.

**Overall, the results demonstrates the effectiveness of the UV-C ozone disinfection technique in reducing bacteria count and improving hygiene in the fish-factory.**



The results confirm that the goal of reducing and eliminating the total number of bacteria and enterobacteria has been achieved. The laboratory results show a positive decrease in both the total number of bacteria and enterobacteria. Furthermore, the results demonstrate the effectiveness of the ozone treatment at all 20 locations.

The ventilation in the room was switched off during the treatment to ensure that no ozone could escape, and the residual ozone disappeared quickly when the ventilation was switched back on.

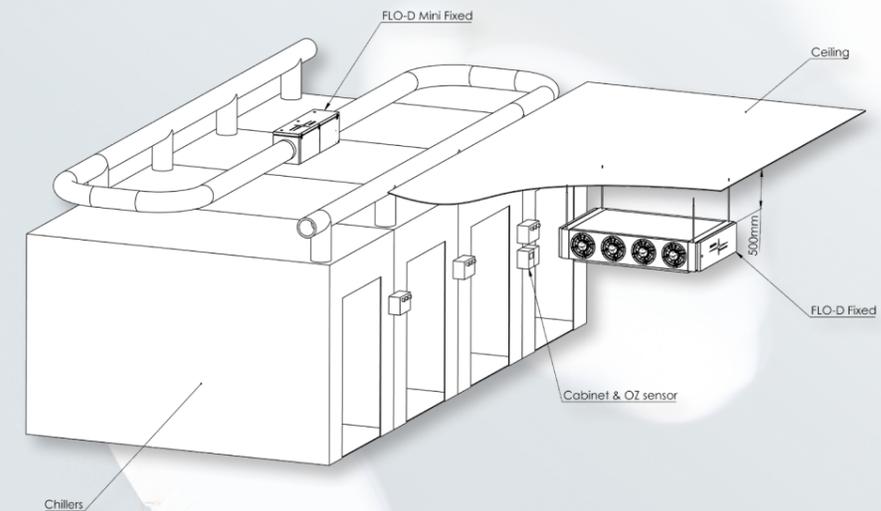
## FLO-D<sup>®</sup> FIXED

FLO-D Fixed, allows you to have any size of production area, no area is too big

FLO-D Fixed is a development used for installation where absolute no failure is allowed, and more than one person has the responsibility of the disinfection

FLO-D Fixed also allows you to install the system in a pipe installation. As an example you can use one unit for disinfection of more chillers, by use of dampers.

Contact Jimco for more information on FLO-D Fixed



# FLO-D<sup>®</sup> MINI

## TECHNICAL DESCRIPTION

### FLO-D<sup>®</sup> MINI - Mark 2

UV-lamps: 8 pcs. 70 watt  
 Quartz sleeve: 8 pcs. (in cold storage)  
 Power supply EU: 1x230V + PE 50/60Hz, 10A  
 Power supply US: 1x115V + PE 50/60Hz, 10A  
 Consumption EU: 640 watt  
 Consumption US: 685 watt  
 Display: Proface PLC, color panel  
 Room-volume: Disinfection: Up to 314 m<sup>3</sup>  
 Odor treatment: Up to 1.258 m<sup>3</sup>

Temperature and moisture sensor  
 Data logging for your surface disinfection

Mesurements:  
 Height: 1150 mm  
 Width: 560 mm  
 Depth: 890 mm  
 Weight: 59 Kg



## WHAT IS FLO-D MINI MARK 2?

### An environmentally friendly surface disinfection treatment

FLO-D Mini Mark 2 is an air purification and surface disinfection machine. It is automatic and gives you an environmentally friendly treatment. The machine is running with the JIMCO UV-C & Ozone technology which means that you do not have to use any kind of water or chemicals. The UV-C lamps and the ozone production from the machine will purify the air and the surfaces efficient with up to 99,99% within few hours.

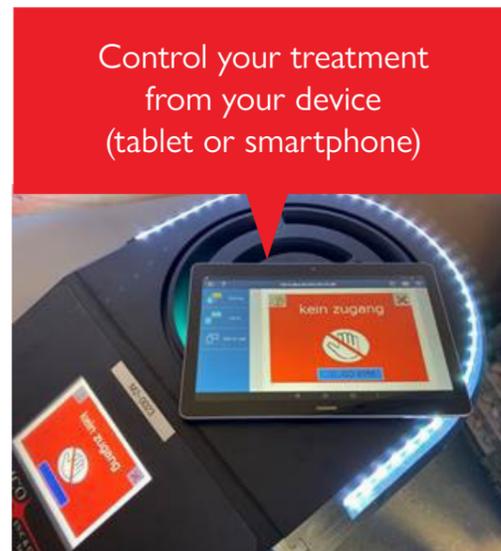
FLO-D Mini Mark 2 has been tested and documented, and customers all over the world are very positive with their results. FLO-D Mini Mark 2 is obvious at food factories, industries, hospitals etc. Surface disinfection is important for your health, the people around you, and for your surroundings. By disinfection you will make sure to guarantee a nice quality of your area and the air you breath.

### REMARKABLE DISINFECTION RATES

- Staphylococcus aureus: 99,973 %
- Enterococcus hirae: 99,149 %
- Pseudomonas aeruginosa: 99,898 %
- Candida albicans (yeasticidal): 98,741 %
- Escherichia coli: à 99,880 %



FLO-D Mini Mark 2 in a hatchery



Control your treatment from your device (tablet or smartphone)

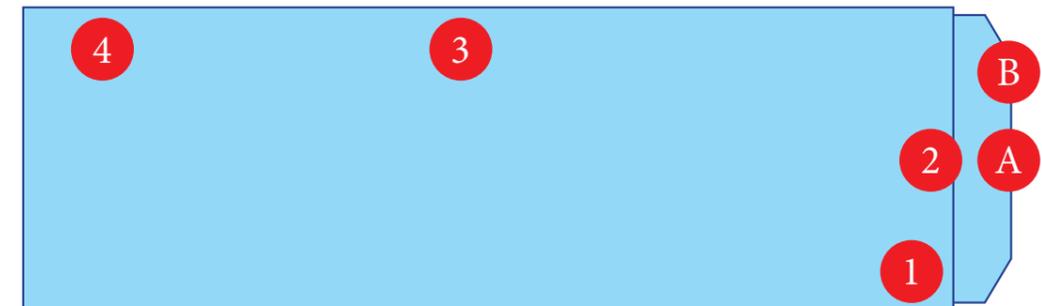
## COOLING TRAILER TEST

The FLO-D Mini produces Ozone by draining the air in the room through the system's UV-C chamber where oxygen O<sub>2</sub> contained in the air is converted to ozone O<sub>3</sub>. The ozone then blows out and spread into the room.

1. Ozone treatment in 3 hours with FLO-D Mini would reduce the amount of organic matter in which bacteria thrive and reproduce.

2. That, without other means, we get an ozone flow through evaporating the unit, so that there is also a reduction of organic matter.

3. Reduction or removal of odors.



Position	Start ATP	15 seconds ATP	60 seconds ATP	Remarks
1	2463	101	71	OK
2	2471	111	9	OK
3	2788	90	62	OK
4	1786	106	56	OK
A	1216	106	75	OK
B	1556	199	87	OK

There was a **SIGNIFICANT** reduction of fish smell after treatment, the trailer was left in the workshop overnight, which without ozone treatment usually means no one can keep the smell of fish out at the workshop and it is normal practice to pull chees / fishing trailers out at night.

**Test settings for the FLO-D Mini:**  
Blower speed 80%, Ozone measurement upper ozone limit 9 ppm lower limit 8 ppm - hours ON - 03 hours 00 minutes.

## KILL MOULD, YEAST AND ETHYLENE

- No need to use so many resources to effectively clean your cold store.
- Avoid premature wastage of your precious fruits.

JIMCO A/S has performed tests and analysis, depicting significantly lower concentration of both mould and yeast when using the FLO-D®.



## TREATMENT WITH & WITHOUT UV-C PRODUCED OZONE

With ozone



Grapes



Strawberries



Oranges



Tomatoes

Without ozone



## SAVE MONEY

The shelf life of food has always played an important role. For example, ethylene, mould and yeast shorten the time in which the food stays fresh. In the fruit industry, among other places, mould and yeast growth is a tough opponent affecting product lifespan. FLO-D® (photolysis oxidation disinfection) will help revolutionize the way fruit is stored.

The FLO-D® uses UV-C-Technology to kill the bacteria, mould and yeast in the cold storage, hence optimizing the lifespan of fruits.

### Cleans within a few hours

One FLO-D® unit is capable of cleaning a cold storage room of up to 1,500m<sup>3</sup> within a few hours.

# TEST OF JIMCO FLO-D® DISINFECTION EQUIPMENT BASED ON UV-C/OZONE



UNIVERSITY OF SOUTHERN DENMARK

## Aim of project

To investigate the bactericidal effect of UV-C produced ozone on chosen bacteria strains that are regarded as relevant contaminants in the food processing industry. Furthermore, it was desirable to determine a setting for the ozone concentration and the time of exposure, in achieving the desired effect.

## Experimental setup

The test was performed in a special designed ozone chamber, where the ozone concentration and the temperature were measured during the experiments. 10 µl of bacteria culture was applied on stainless steel plates and spread to an area of 1 cm<sup>2</sup>. The bacteria culture was diluted in sterile milliQ H<sub>2</sub>O to a concentration of 105-107 cells/ml. The steel plates were incubated at room temperature for one hour until the applied culture had dried out. The plates were then placed in the ozone chamber and exposed to various ozone concentrations for time point.

Bacteria survival was measured by washing the applied area on the steel plates with 2x50 µl 0.9 % NaCl, which was obtained and spread on agar plates for CFU determination by overnight incubation at 37 °C. As a reference, the CFU of bacteria applied on stainless steel that were not exposed to ozone, was also performed. The experiments were performed at room temperatures that did not exceed 23 °C during the experiments.

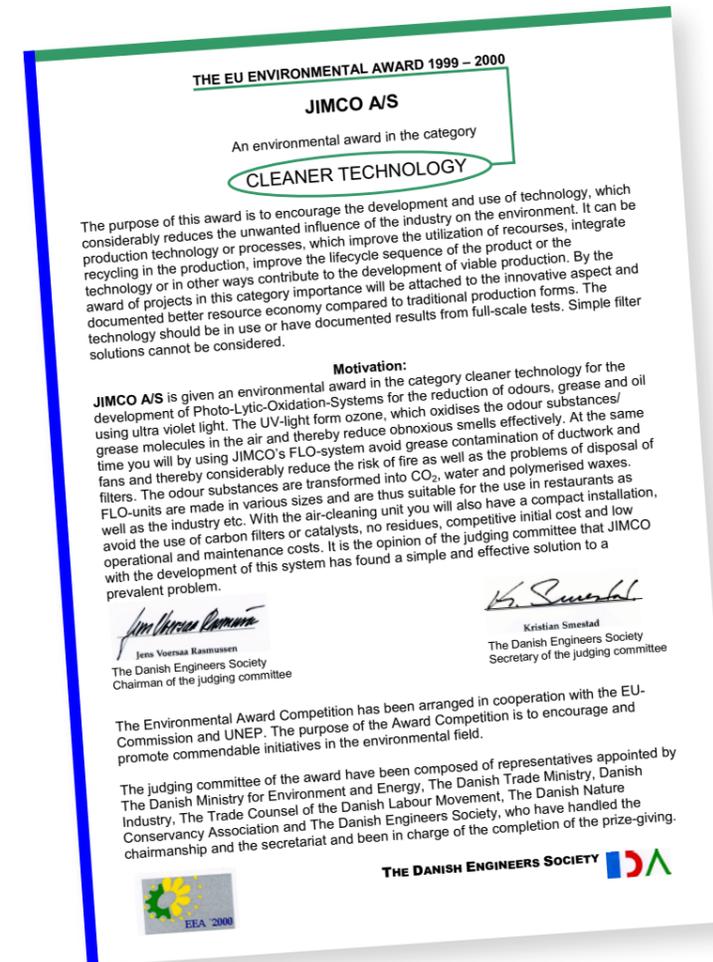
## Conclusion

In these experiments, the largest effect was observed after two hours of exposure at 10 ppm. When the time exposure was reduced to one hour, or the concentration of ozone was lowered to 5 ppm, the reduction of bacteria was distinctively decreased. Furthermore, the effect of ozone was limited by the amount of bacteria applied on the steel plates.

When the level of bacteria exceeded 105 bacteria per cm<sup>2</sup>, the effect of ozone also decreased after two hours of exposure at 10 ppm.

However, with a reduction that is within the accepted range. Also, this amount of bacteria exceeded the level of what would be representative of well-cleaned food production facilities, which is the premise for the application of the device.

Exposure time	Ozone concentration	Loaded	Control	Ozone	Reduction
		CFU/cm <sup>2</sup>	CFU/cm <sup>2</sup>	CFU/cm <sup>2</sup>	
2 hour	10 ppm	2.40E+03 (2400)	4,00E+00 (4)	0,00E+00 (0)	
		3.30E+03 (3300)	8,00E+00 (8)	0,00E+00 (0)	
		3.00E+03 (3000)	7,00E+00 (7)	0,00E+00 (0)	
			1,60E+01 (16)	0,00E+00 (0)	
	Average	2.90E+03 (2900)	8,75E+00 (8,75)	0,00E+00 (0)	100,00%
2 hour	10 ppm	2.00E+04 (20.000)	3,00E+00 (3)	0,00E+00 (0)	
		2.00E+04 (20.000)	1,40E+01 (14)	0,00E+00 (0)	
		2.00E+04 (20.000)	2,80E+01 (28)	0,00E+00 (0)	
	Average	2.00E+04 (20.000)	1,50E+01 (15)	0,00E+00 (0)	100,00%
2 hour	10 ppm	3.60E+04 (36.000)	3,00E+01 (30)	0,00E+00 (0)	
		2.20E+04 (22.000)	1,13E+02 (113)	0,00E+00 (0)	
		2.60E+04 (26.000)	3,40E+01 (34)	0,00E+00 (0)	
	Average	2.80E+04 (28.000)	5,90E+01 (59)	0,00E+00 (0)	100,00%
2 hour	10 ppm	3.60E+05 (360.000)	3,98E+02 (398)	0,00E+00 (0)	
		2.20E+05 (220.000)	2,85E+02 (285)	1,00E+00 (1)	
		2.60E+05 (260.000)	2,97E+02 (297)	0,00E+00 (0)	
	Average	2.80E+05 (280.000)	3,27E+02 (327)	3,33E-01 (0,33)	99,90%



The EU Environmental Award for Cleaner Technology.



Worldwide patents of Jimco Technology.

# AWARDS AND PATENTS



UV-C AND OZONE SOLUTIONS FOR THE FUTURE  
EUROPE · SOUTH AMERICA · NORTH AMERICA · AFRICA · ASIA · MIDDLE EAST

### JIMCO FLO-D TECHNOLOGY REFERENCES



WESTON FOODS



danfrugt

nature energy



Agropecuária Produza S.A.

