

OZONE EXPOSURE TESTS WITH VARIOUS ELECTRIC DEVICES



Picture 1. The tested devices, a pocket calculator, a telecommunication modem and a laptop computer

ABSTRACT

The test items were selected randomly. All the devices were common consumer electronics intended to be used in the normal indoor conditions without waterproof/airproof construction etc. resembling the type of electronics that can be also found onboard a well equipped boat in the form of entertainment electronics, computers etc. Due to their construction the test items were exposed to ozone gas inside out. The tested devices were used, but fully functional. The aim was to find out, if it is possible to clean a boat cabin by using an Elozo G150 ozone generator without causing damage to boat's electronic equipment that is not water-/airproof.

1. TEST ARRANGEMENTS

Location	The tests were conducted at Elozo Ltd's premises in Loukontie 8, 66440 Tervajoki, Finland.
Date	The tests were conducted from 27 th April to 19 th of May.
Testing time	18 hours
Test machine	D400 Ozone Cleaning System
Test settings	Duration 4 (2 hours) Power 4 (maximum ozone concentration, over 30ppm ozone gas)
Tested devices	Pocket calculator Telecommunication modem, Buffalo Inc. Model WZR-AGL300Nh Laptop Computer Fujitsu Siemens Amilo



Devices placement

The laptop computer was placed on 50 cm high platform on the floor of the cabinet. The telecommunication modem was hanging from the rod above the laptop computer. The pocket calculator was placed on the floor of the cabinet so that the calculator's display lid was open all the time. It was confirmed that the air-ozone mixture reached as freely as possible the laptop computer, telecommunication modem and the calculator. Electrical outlets were installed inside the cabinet enabling the power to be kept on during the ozone exposure stress tests.

2. TEST RUN

The two hour test was run nine times with a total duration of 18 hours. The functionality of all devices was verified in between the tests. As mentioned before, the devices were running (the power was on and the devices were working) during the test.

3. TEST RESULTS

All the devices remained fully operational after the test sequence. Also, no discoloration to the materials of the test items was observed. It is to be noted that the applied ozone concentrations in these tests were many times stronger than what would be the levels in an actual situation when Elozo product is applied inside a boat cabin.



Picture 2. The placement of the tested devices inside an Elozo D400 Ozone Cleaning System

4. CONCLUSIONS

If a boat cabin is embedded with unpleasant odours, it can be treated with the help of Elozo G150 ozone generator. With one-time treatment the risk of damage to boat's electrical devices is low. However, if a boat cabinet contains sensitive materials (e.g. natural rubber, uncoated metals), such materials/items should be protected for example with adhesive tape. If there is any suspicion that potentially highly ozone sensitive electronics are present in the treated area, Elozo recommends removing them from inside the cabin, where ozone treatment is to be done.

5. DISCLAIMER

The manufacturer, Elozo Oy provides only recommendations and basic directions about how to apply Elozo products in various environments. Elozo accepts no liability for any damage to onboard electronics and instruments as well as surface materials in a situation in which Elozo products have been applied inside a boat. Elozo recommends covering or removing any electric devices, instruments and other items which may be sensitive and prone to damage when exposed to ozone.



6. SIGNATURES

Markus Parkkali
Name and signature of testing officer

01.06.2015
Date (dd.mm.yyyy)

Jari Matilainen
Name and signature of assistant
officer

01.06.2015
Date (dd.mm.yyyy)

CE

Seija Pihlajaviita

6.6.2018

Report of ozone treatment on items used at slaughterhouse

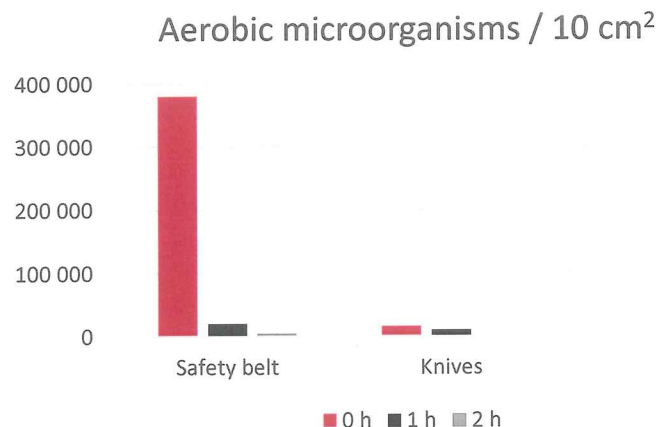
Atria Finland Ltd has tested the microbiological and physical effect of ozone to shoes, knives, safety belts at bovine slaughterhouse.

The tested system: Elozo D800 Cleaning System with oxone as an affecting compound. Time of ozone treatment varied from 25 min to 3 hours.

Results of the tests

The effect of ozone treatment was tested with safety belts used at the slaughterhouse and dirty knives. The sample was taken by swabbing and the aerobic microorganisms were determined before, after 1 hour and 2 hours of one treatment. The number of aerobic microorganisms was decreased with 1-2 log.

Ozone treatment	Safety belt cfu/10 cm ²	Knives cfu/10cm ²
0 h	380 000	15 300
1 h	20 000	10 000
2 h	4 400	1 500



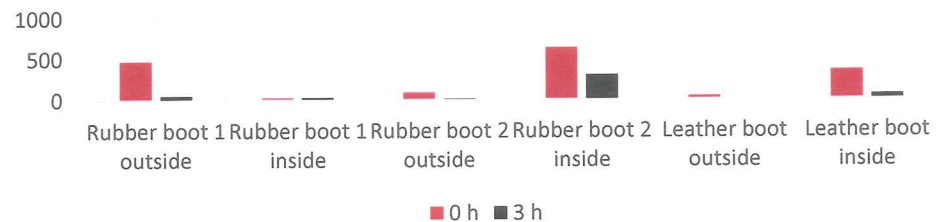
Seija Pihlajaviita

6.6.2018

The effect of the ozone treatment was also tested with rubber and leather boots used at the slaughterhouse. There was c. 0,5 - 1 log reduction in the number of aerobic microorganisms.

	Rubber boot 1 outside	Rubber boot 1 inside	Rubber boot 2 outside	Rubber boot 2 inside	Leather boot outside	Leather boot inside
0 h	470	24	87	630	35	350
3 h	52	27	11	300	6	61

Aerobic microorganisms cfu/cm²

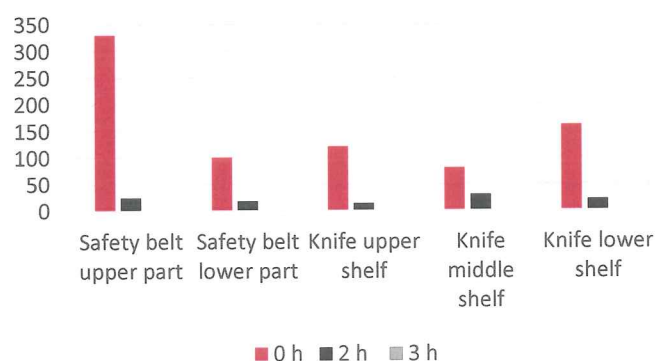


The efficiency of ozone treatment was also tested in different parts of the Elozo 800 Cleaning system. With this data it wasn't possible to determine, whether the efficiency varies in different parts. The goal was mainly to test, whether the efficiency is good enough in different parts. C. 1 log reduction could be reached in the number of microbes.

Especially with the longer time treatment some changes in metal parts safety belts could be seen. The metal parts were not stainless steel.

Ozone treatment	Safety belt upper part	Safety belt lower part	Knife upper shelf	Knife middle shelf	Knife lower shelf
0 h	330	100	120	80	160
2 h	25	18	14	30	21
3 h	0	0	0	0	0

Aerobic microorganisms cfu/cm²



Seija Pihlajaviita

6.6.2018

The effect was also tested with by using Bacillus subtilis BGA -strain spore - plates. The spore plates were on different shelves of the Elozo 800 Cleaning system.

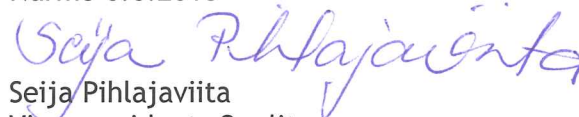
- = No growth
- + = Strongly reduced growth
- ++ = Reduced growth
- +++ = Strong growth

Shelf	Time	Date	Growth
1. shelf	25 min	4.4.2016	+++
2. shelf	25 min	4.4.2016	++
3. shelf	25 min	4.4.2016	+++
1. shelf	1 h	4.4.2016	+
2.shelf	1 h	4.4.2016	-
2.shelf	1 h	4.4.2016	-
3. shelf	1 h	4.4.2016	+++
0. shelf	2 h	4.4.2016	-
0. shelf	2 h	4.4.2016	-
1. shelf	2 h	4.4.2016	-
1. shelf	2 h	4.4.2016	-
2. shelf	2 h	4.4.2016	-
2. shelf	2 h	4.4.2016	-
3. shelf	2 h	4.4.2016	+

Conclusions

A 1-2 log reduction in number of aerobic microorganism could be reached in the tests. The ozone treatment is an easy and effective disinfection method to many materials. The time and concentration should be validated for the use and the sustainability of materials to the treatment is useful to test, if there is not earlier information of these topics. We also tested and are now using the Cleaning system for drying and disinfecting shoes in the area of high hygiene. The feedback from workers was positive: dry and fresh smelling shoes.

Nurmo 6.6.2018



Seija Pihlajaviita
Vice president, Quality

Elozo Oy
Loukontie 8
66440 TERVAJOKI

FINAS
Finnish Accreditation Service
T016 (EN ISO/IEC 17025)

Specimen:	Surface hygiene testing of equipment	Order no.	-
Specimen no.:	2017-03743-005	Arrival date:	1 st Feb 2017, at
Date of taking the specimen:	1 st Feb 2017, at	Date when testing began:	1 st Feb 2017
Place where specimen taken:	Seinäjoki Food and Environment Laboratory	Last day of use:	
Person taking the specimen:			
Reason for testing:	Commissioned study		
Additional information:			

Samples of aerobic plate count were done by a contact plate method.
Samples for Salmonella analysis were taken by swapping the surface of the shelves.
Samples (3) were taken separately from each shelf.

Testing for	Result	Measurement uncertainty	Unit	Test method
Total bacteria concentration 30°C 48h	No growth		cfu/10cm ²	NMKL 67/2010 mod.
Samonella bacteria 41.5±1°C 24±3h	No growth		*	ISO 65 79:2008

*) Items marked with the asterisk are included in the scope of accreditation. Accreditation does not apply to the report.

[cfu=colony forming unit. Translator's note.]

(signature)

Leena Ahvenainen, Laboratory Engineer

For your information.

(logo) Seilab, Vaasantie 1, 60100 SEINÄJOKI

Soil specimens (06) 422 5707, Other specimens, specimen reception (06) 425 5705, Other specimens, office (06) 425 5701

I hereby certify that the above one-page English translation of the original one-page Finnish document (attached) is true and correct.

Espoo, Finland, 10th May 2017

Pertti Felin, Authorized Translator (English-Finnish-English)

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 Laboratorio on FINAS-akkreditointipalvelun akkreditoima
 (FINAS akkreditointi T 106, EN ISO/IEC 17025)

Asiakirjan osittainen kopioiminen kielletty. Testaustulos koskee vain tutkittua näytettä.

Elozo Oy

 Loukontie 8
 66440 TERVAJOKI


Näyte: Puhtausnäyte laite
Näyttenumero: 2017-03743-005
Näytteenottopvm: 01.02.2017 klo:
Näytteenottoaika: Seinäjoen elint.- ja ymp. lab
Näytteenottaja:
Tutkimuksen syy: Tilaustutkimus
Lisätiedot:

Tilausnumero: -
Saapumispvm: 01.02.2017 klo:
Tutk.aloittamispvm: 01.02.2017
VKP:

Kokonaisbakteerinäytteet otettiin kontaktimalja- ja salmonellanäytteet pyyhintämenetelmällä.

Näytteet (3 kpl) otettiin erikseen laitteen jokaiselta hyllyltä.

Tutkimus	Tulos	Epäv.	Yksikkö	Menetelmä
Kokonaisbakteerimäärä 30°C 48 h	Ei kasvua		pmy/26 cm2	NMKL 5/1987
Salmonellabakteerit 41,5±1°C 24±3 h	Ei kasvua			* ISO 65 79:2008

*) Merkityt menetelmät sisältyvät akkreditoinnin pätevyysalueeseen. Akkreditointi ei koske lausuntoa.

Leena Ahvenainen, laboratorioinsinööri

Tiedoksi

 I hereby certify that the above one-page English translation of the original one-page Finnish document
 (attached) is true and correct.

 Espoo, Finland, 16th May 2017

Pertti Felin, Authorized Translator (English-Finnish-English)

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