



# Expert report

## **Salus Automatic Air & Surface Disinfector Model 210 air purifier and surface disinfectant efficiency study**

**Client: Valdo Technic Industrial Solutions Ltd.**

**2737 Ceglédbercel, Iskola str. 58.**

Mórahalom, March 09, 2022

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## 1. Introduction

Valdo Technic Industrial Solutions Ltd. (Hereinafter: the Client) assigned the the Food Safety Laboratory of **SeqOmics Biotechnology Ltd. Foodsafety Laboratory** (hereinafter: the Laboratory) with testing the efficiency of the air purification and surface disinfection device manufactured by the Client.

## 2. Device introduction

The Salus is a special purification and surface disinfection device with ability of killing pathogenic and non-pathogenic microorganisms (bacteria, fungi) in the air. The efficiency of the device is ensured by the HEPA filter, UV-C luminaires and chlorine dioxide. One of the main advantage of the device is the “Dry-Mist” system: ability of disinfection of not only airborne particles but also surfaces.

The device can be used in three modes.

In **HEPA & UVC mode**, the air is disinfected by the HEPA filter and the UV-C lamps after the air has been drawn into the device.

In **Continuous operation**, in addition to the air disinfection by the HEPA filter and UV-C lamps, the device also releases low concentrations of chlorine dioxide into the air, which enables faster and thus even more efficient air disinfection.

In the Intensive mode, similar to the Continuous mode, in addition to the air disinfection by the HEPA filter and UV-C lamps, the device also releases chlorine dioxide into the air. In this mode, however, the concentration of chlorine dioxide is higher than in the Continuous mode, which, in addition to disinfecting the air, also enables efficient surface disinfection of the equipment in the room.

## 3. Objective

The aim of the tests was to investigate the air and surface disinfection efficiency of the Salus device.

During the inspections, the Client wanted to test the air and surface disinfection efficiency of the device at sites with different exposure to infection. The venues included a device assembly workshop, a nursing home, and a school.

The Client also asked the Laboratory to test the device into the laboratory rooms.

#### **4. Device tests by the customer**

The three modes of the disinfection efficiency was investigated by monitoring the number of all colony-forming microorganisms (Colony Forming Units) present in the air and on the surfaces.

##### Sampling and sample processing

Sampling for external on-site air and surface testing was performed by the Client. The equipment required for sampling was provided by the Laboratory to the Client.

Air sampling: the airspace of the sites was examined by placing petri dishes containing 90 mm diameter PCA medium (Plate Count Agar). The petri dishes were placed by the Client in the given airspace at a different distance from the manufacturers before the operation of the device and for 2 hours after the operation of the device. The sampling devices were delivered to the Laboratory by the Client immediately after sampling (between 0-4°C). The Laboratory incubated the PCA plates at 37 °C for 72 hours.

Surface sampling: The surface sampling of the equipment at the sites was performed by the Client in accordance with the requirements of the MSZ ISO 18593: 2008 standard, with swabs before and immediately after the operation of the device. The Client transported swabs to the Laboratory after sampling (between 0-4°C). The Laboratory tested all colony-forming microorganisms on the surface hygiene samples according to the MSZ EN ISO 4833-1: 2014 standard and incubated at 37 oC for 72 hours (in the same way as PCA plates used for air sampling).

#### **5. Device tests by the Laboratory**

At the request of the Client, the Laboratory studied the efficiency of the three operating modes of the device in its laboratory rooms.

##### Sampling and sample processing

Air Sampling: the Laboratory has studied the HEPA & UVC and Continuous mode of the Salus instrument by testing the air disinfection efficiency of the instrument as a function of time, monitoring all colony-forming microorganisms in the air and the number of molds. The laboratory room airspace was sampled by placement of 90 mm diameter PCA and CG media for 2 hours. To determine the total number of colony-forming microorganisms, the Laboratory incubated PCA plates according to the MSZ EN ISO 4833-1: 2014 at 37 °C for 72

hours. The chloramphenicol-containing glucose media (CG plates) used for the determination of molds were incubated according to the MSZ ISO 7954: 1999 ( withdrawn standard) for 120 hours at 25 °C.

Surface sampling: the Laboratory has studied the Intensive mode of the device by examining the surface disinfectant effectiveness of the device. During the study, a PCA (Plate Count Agar) plate was inoculated with  $3.0 \times 10^2$  cells with *Bacillus subtilis*, for which the required cell number was determined by Bürker chamber counting. After inoculation, the plate was placed in the vicinity of the Salus device and the Salus device started operating in Intensive mode. Following operation, the Laboratory tested the *Bacillus subtilis* cell count of the plate after 1 day of incubation at 37 °C.

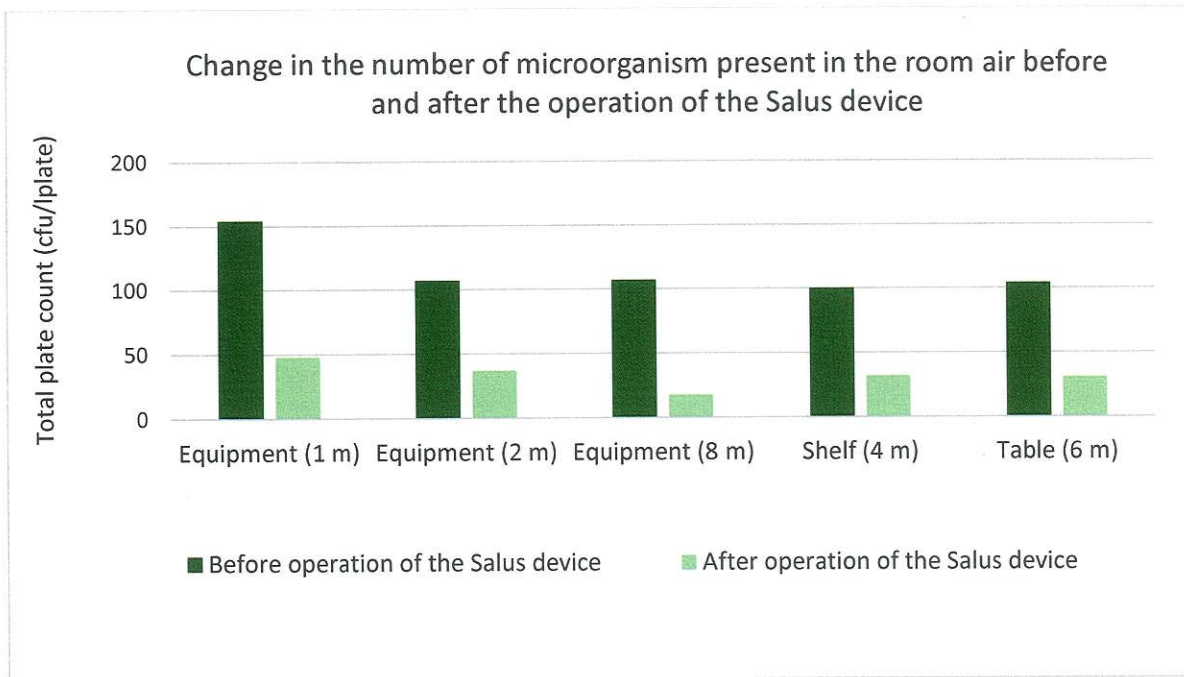
Control samples were also started by placing a PCA medium inoculated with *Bacillus subtilis* with same cell count ( $3.0 \times 10^2$ ) in a room without the Salus device. The plate has been open for the same time. After 24 hours of incubation at 37 °C, the cell number of the control sample was also checked.

## 6. Test results and conclusions

### 6.1. Evaluation of external on - site inspections by the client

#### 6.1.1. Evaluation of the air disinfection efficiency of the HEPA & UVC mode

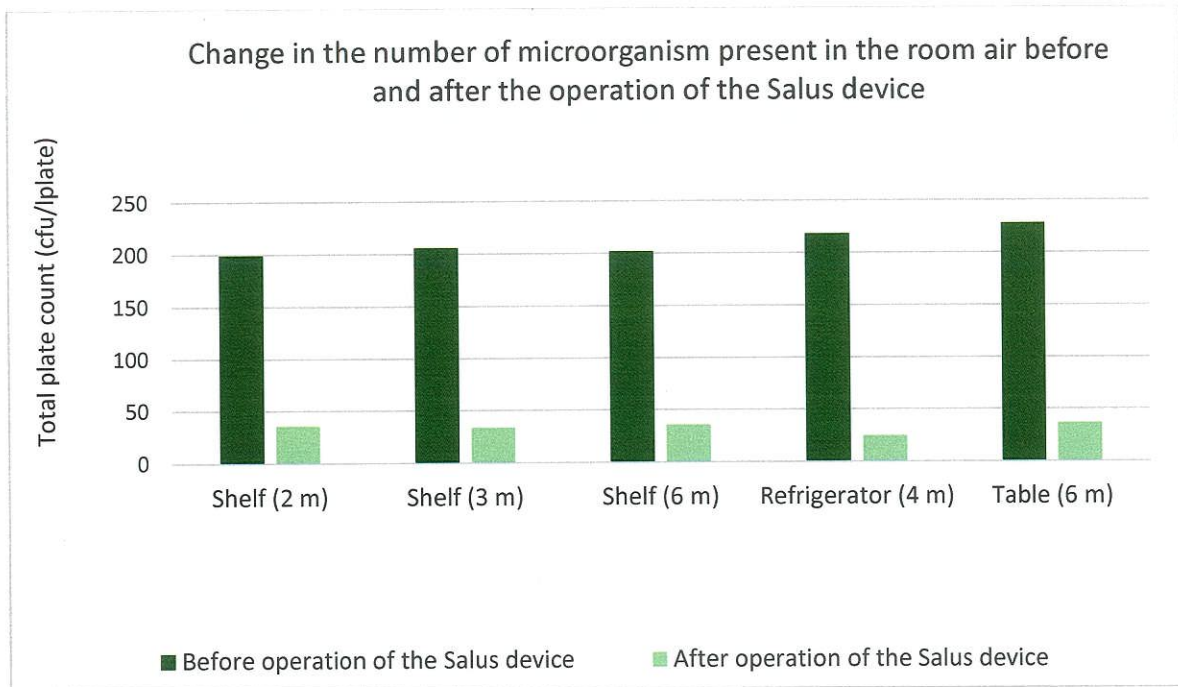
The air disinfection efficiency of the **HEPA & UVC mode** of the device was tested at the assembly workshop of Valdo Cafe System Ltd. The volume of the airspace of the room: 240 m<sup>3</sup>.



The operation of the Salus device in **HEPA & UVC mode** significantly reduced the microbial count of all colony-forming microorganisms in the room air by 70% on average. The distance from the device and the initial microbial count of the microorganisms did not affect the efficiency of the disinfection.

### 6.1.2. Evaluating the effectiveness of continuous air disinfection

The air disinfection efficiency of the continuous operation of the device was tested in the Day Care Home for the Elderly in Ceglédbercel. Volume of the air space of the room: 231 m<sup>3</sup>.

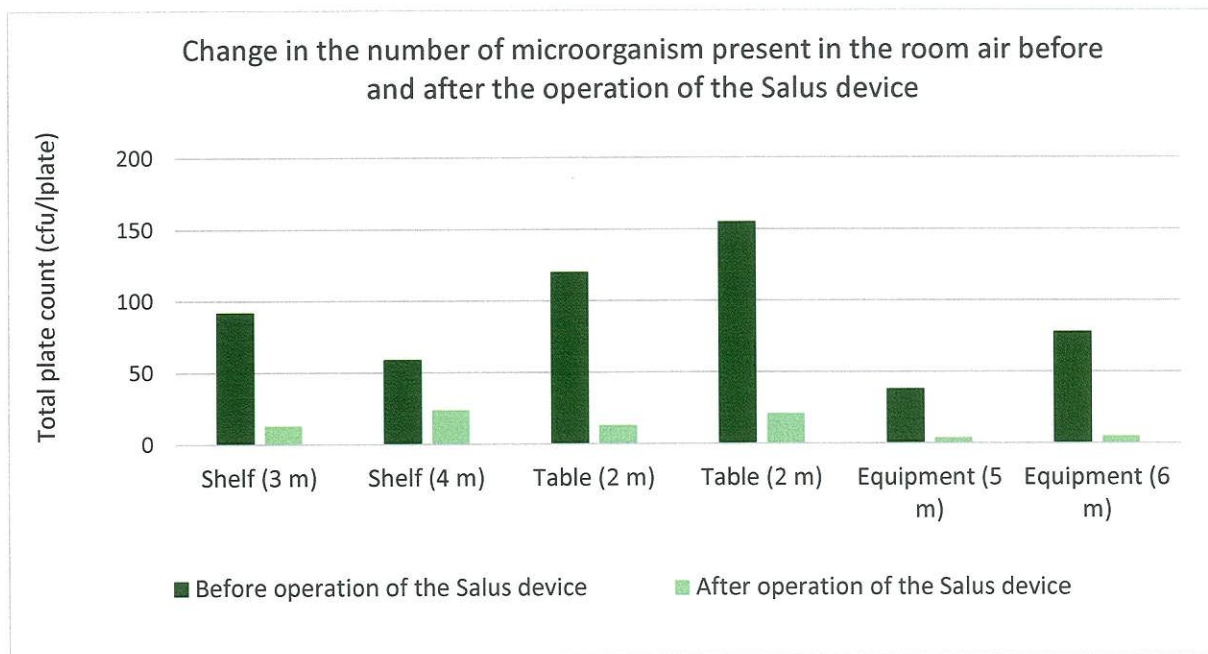


The Salus device has reduced the number of microorganisms in the air by almost 85% in Continuous mode. Compared to the HEPA & UVC mode, the disinfection almost 15% more efficient, even with a higher initial microbial count. The distance from the device did not reduce the air disinfection efficiency of the device in this mode either.

### 6.1.3. Evaluation of the air and surface disinfection efficiency of the Intensive mode

The air and surface disinfection efficiency of the Intensive mode of the device was tested at two different locations.

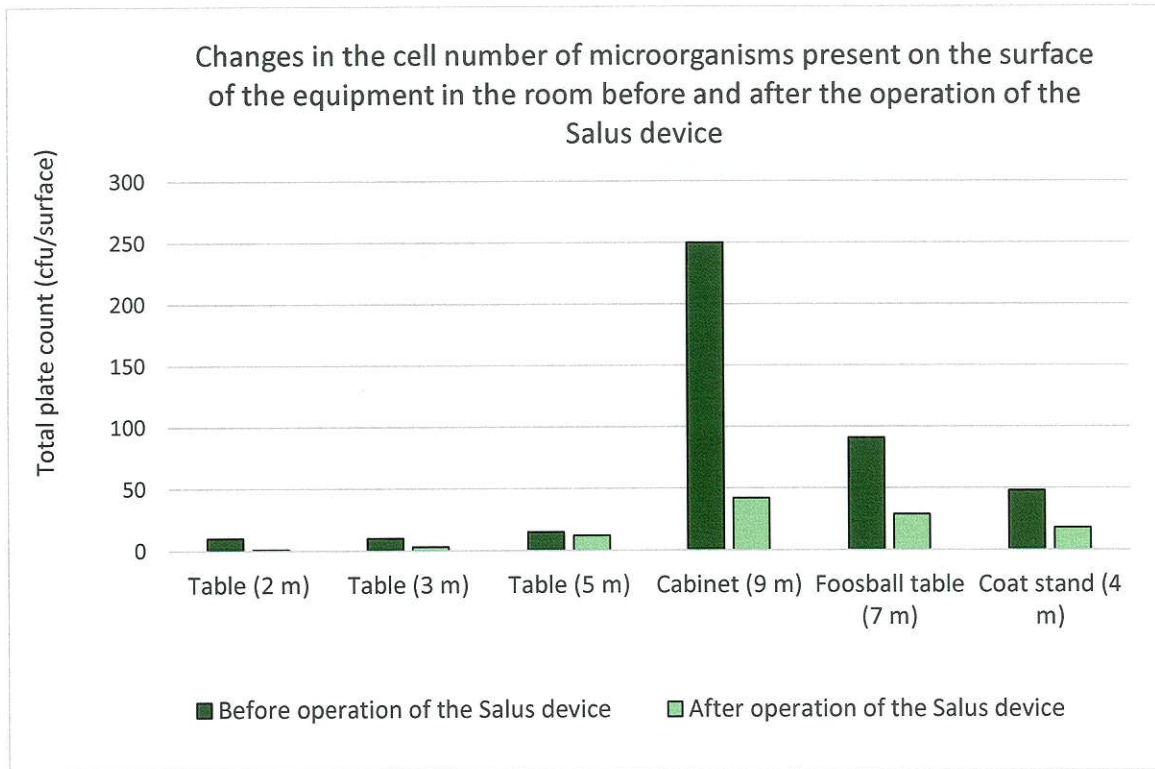
Evaluation of air disinfection: the efficiency of air disinfection was tested at the Valdo Cafe System assembly assembly workshop. Volume of the air space of the room: 240 m<sup>3</sup>.



The Salus device reduced the number of microorganisms present in the airspace by 85-95%, except for one sampling point (Shelf, 4 m). Compared to Continuous mode, the disinfection efficiency is on average almost 5% higher.



Evaluation of surface disinfection: the efficiency of surface disinfection was examined in classroom 11 of the József Eötvös Ethnic Primary School and Primary School of Art in Ceglédbercel. Volume of the air space of the room: 308 m<sup>3</sup>.

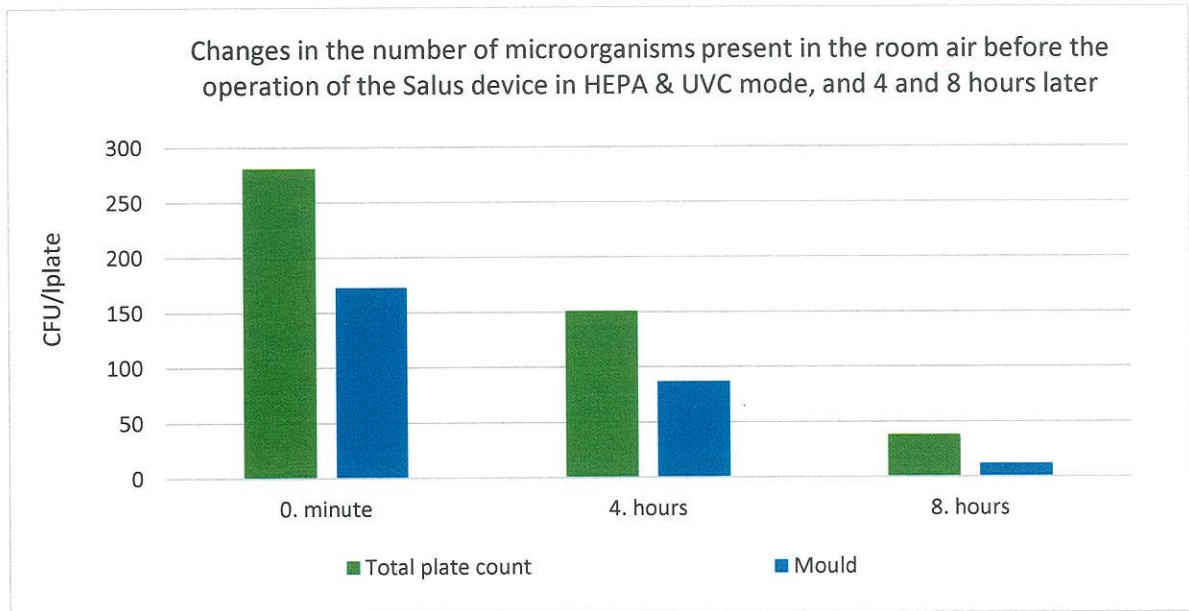


The Salus device has reduced the number of microorganisms present on surfaces in **Intensive mode**. At three sampling points (Table) there was no significant change due to the initial low microbial count. The efficiency of the device increases as a function of distance, at the farthest sampling point, 9 meters from the device, the number of all colony-forming microorganisms is reduced by 83%. At the sampling point closest to the instrument (4 meters from the instrument), the reduction in microbial count was nearly 40%. This is presumably due to the fact that the chlorine dioxide feeder of the device has transported the chlorine dioxide away with greater efficiency due to the strength of the pressure. The intensity of the exhaust fan can be adjusted according to the volume of the room in the speed control menu item of the device, thus ensuring an even distribution of chlorine dioxide in the air space of the room.

## 6.2. Evaluation of Laboratory tests

### 6.2.1. Evaluation of the air disinfection efficiency of HEPA & UVC mode

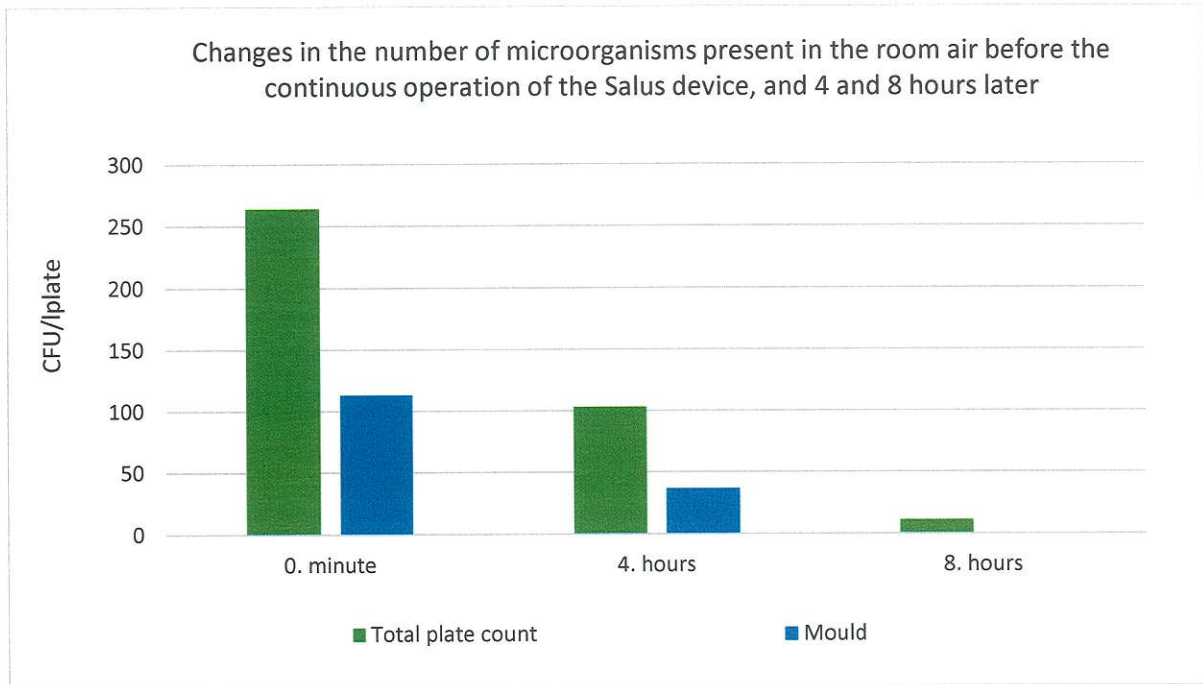
The time dependence of the air disinfection efficiency of the HEPA & UVC mode of the Salus device was investigated by the Laboratory in the Waste Disposal Room No. 33. Room air volume: 36 m<sup>3</sup>.



In HEPA & UVC mode, the Salus has significantly reduced the number of bacteria and molds even after 4 hours of operation. After 8 hours of operation, the all microorganisms present in the airspace decreased by 86%, while the count of molds decreased by 93%.

### 6.2.2. Evaluating the effectiveness of continuous air disinfection

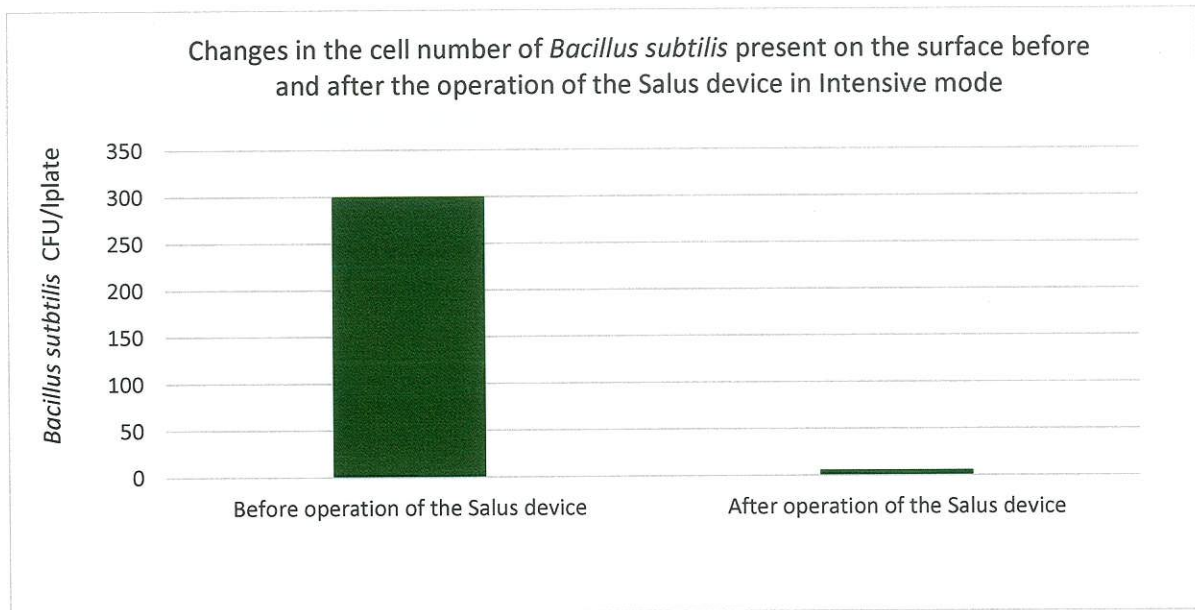
The time dependence of the air disinfection efficiency of the Continuous operation of the Salus device was investigated by the Laboratory in Warehouse No. 34. Room air volume: 36 m<sup>3</sup>.



The Salus device in Continuous operation reduced the total number of microorganisms present in the room air by 61% and the number of molds by 68% after 4 hours of operation. After 8 hours of Continuous operation, the number of total colony-forming microorganisms was reduced by 96%. Molds by the end of the 8th hour were not detectable in the room air.

### 6.2.3. Evaluation of Intensive mode Surface Disinfectant Effectiveness

The efficiency of the Intensive Mode of the device was tested by the Laboratory with an artificially infected surface with *Bacillus subtilis*.



The number of cells in control samples inoculated with *Bacillus subtilis* but not exposed to the device showed nearly equal to the starting cell number (300 cfu / plate) (291 cfu / plate) at the end of the assay (data not shown).

The Intensive mode of the Salus device enabled efficient surface disinfection. The number of cells in the surface infected with *Bacillus subtilis* was reduced by 99% after Intensive operation of the device.

## 7. Summary

Based on the tests performed by the Client and the Laboratory, It can be stated that **the Salus Automatic Air & Surface Disinfector Model 210** effectively reduces the number of total colony-forming microorganisms present in the air and on the surface of the equipment in the room.

Based on the results of tests, it can be concluded that the device can be effectively used for indoor air and surface disinfection.

The three operating modes of the device allow a wide range of applications in terms of application sites.

Mórahalom, March 09, 2022

A handwritten signature in blue ink, appearing to read "Zsíros", positioned above a horizontal dotted line.

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