

LOGO	<b>BSA CONTROL</b> ENVIRONMENTAL BIOSECURITY – INSPECTION - CONTROL	<b>Report number</b> <b>File number</b> <b>Laboratory number</b>	<b>20-015581</b> <b>29-20-0230</b> <b>20-1882-84</b>
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Holder

## Malaga Transport Company EMT MÁLAGA

Location

Camino de San Rafael s/n  
29.006 – Málaga

Subject

Continuous disinfection system validation

Microbiologic control  
Environmental control  
Particle Control

Environmental technician

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Date: May -20  
Report number: 20-0015581  
File number: 29-20-0230  
Laboratory number: 20-1882-84

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## 2. Subject of the report

### 2.1 Subject

The main purpose of this report is the verification of the correct operation regarding the continuous disinfection system installed in an urban bus and the communication of the results obtained.

### 2.2 Purpose

The purpose of the report is to verify and evaluate the correct functioning of the installed continuous disinfection system, verifying the current environmental and microbiological state of the vehicle before and after a working day, making a contrast with another vehicle of the same characteristics and use, without disinfection system installed.

## 3. Prior Information - Background

### 3.1 Background Information

No historical and/or previous environmental and microbiological controls are available.

## 4. Description of the vehicles used in the sampling

Bus 696 –	With disinfection equipment. 212 Passengers - Line 1 Disinfected with Ox-Virin
Bus 697 -	Without disinfection equipment. 206 Passengers - Line 1 Disinfected with Ox-Virin



## 5. Description of the air conditioning system.

### 5.1 Air conditioning system

The air-conditioning system consists of a *Hispacold 12LS Roof top* unit.

Cooling power:	36.00 kW
Treated air flow rate:	6.000 m <sup>3</sup> /h
Filter type:	Textile filter. G4 Quality

### 5.2 Continuous disinfection system.

Two photocatalysis units have been installed:

1 Unit FC Unit 3" in the right plenum for treated air supply.

1 Unit FC Unit 3" in the left plenum for treated air supply.

## 6. Description of the photocatalysis system (\*)

Active sanitization module "*Dust Free FC Unit 3*", designed to be easily installed within ventilation systems.



The FC Unit 3 module creates an advanced photocatalytic oxidation process, capable of producing oxidant ions and hydroperoxides for disinfection.

The PCO technology of the FC Unit 3" modules exploits the combined action of the rays of the UV lamp with a catalytic structure that consisting of a penta-metal alloy with a honeycomb matrix, mainly composed of Titanium Dioxide (TiO<sub>2</sub>) and other noble metals to a lesser extent.

The air, loaded with humidity (H<sub>2</sub>O), passes through the FC Unit 3" module which, through a photochemical oxidation reaction, binds an extra molecule of oxygen to those of H<sub>2</sub>O; the Hydrogen Peroxide it generates (H<sub>2</sub>O<sub>2</sub>), diffused in the environment, allows a safe, effective and above all complete disinfection, since it is capable of destroying most of the polluting compounds such as bacteria, viruses, moulds, allergens and odours.

### 13. Summary of results

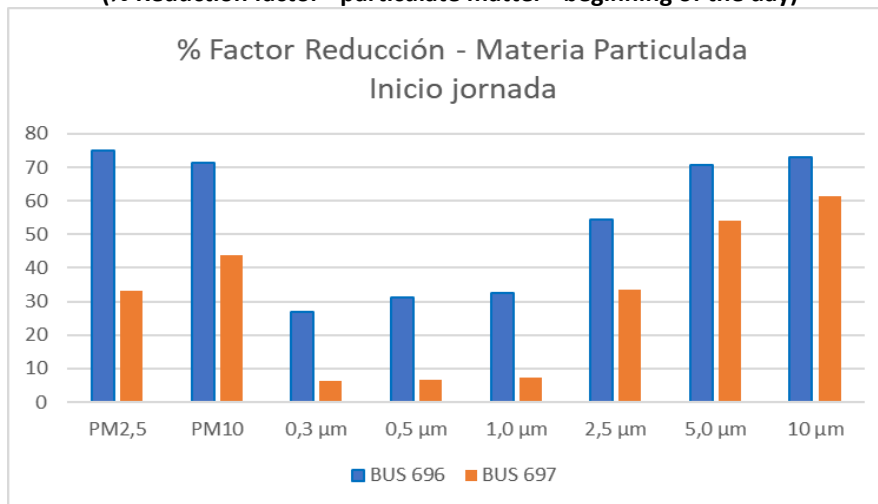
#### 13.1 Visual hygienic assessment of the system

The state of conservation and hygiene is correct.

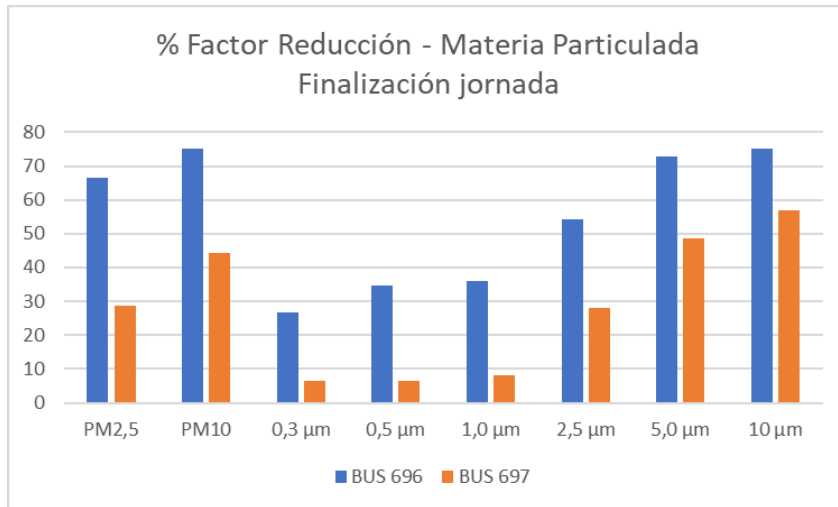
#### 13.2 Hygiene assessment - Particulate matter

The reduction factor of particulate matter in bus 696, equipped with a photocatalysis system, is appreciable, in comparison with the contrast bus (697), obtaining significant reduction results, both at the beginning and at the end of the day.

#### (% Reduction factor - particulate matter - beginning of the day)



#### (% Reduction factor - particulate matter – end of the day)



### 13.3 Hygienic - microbiological assessment on surfaces

The microbiological amplification factor is acceptable, obtaining a great difference with respect to the contrast bus.

Bacterial amplification factor - bus 696:	5.29
Bacterial amplification factor - bus 697:	15.96
Fungal amplification factor - bus 696	7.92
Fungal amplification factor - bus 697	39.79

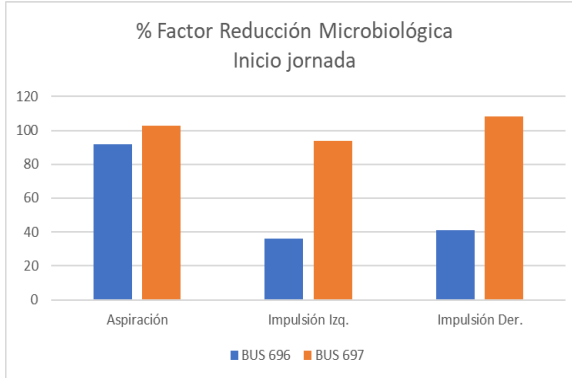
### 13.4 Environmental Assessment - Microbiological Parameters in the Environment

The microbiological reduction factor in the environment is very acceptable, obtaining a great difference with respect to the contrast bus.

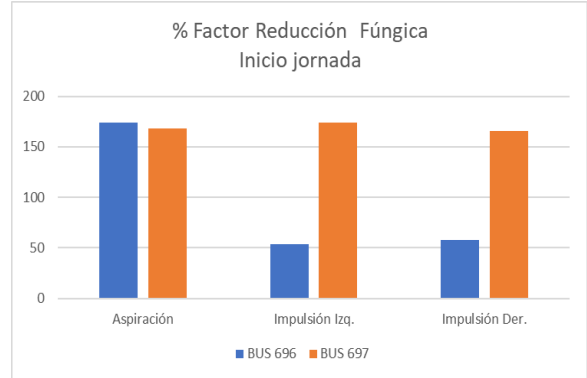
Average factor bacterial reduction - bus 696	- 57.19 %
Average factor bacterial reduction - bus 697	- 2.01 %
Average fungal reduction factor - bus 696:	- 67.53%

Average fungal reduction factor - bus 697: - 0.48 %

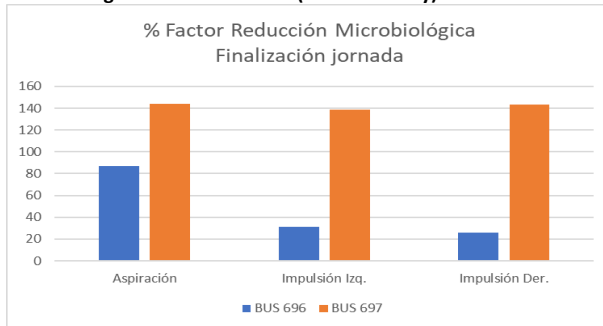
Microbiological reduction factor (beginning of the day)



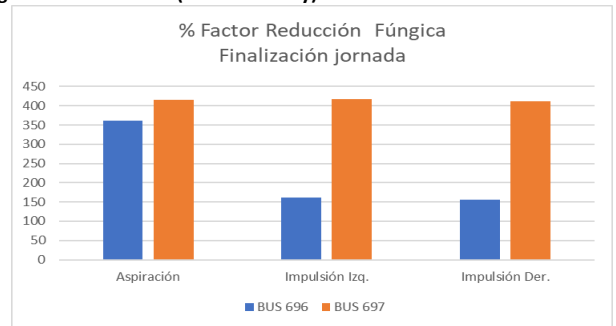
Fungal reduction factor (beginning of the day)



Microbiological reduction factor (end of the day)



Fungal reduction factor (end of the day)



### 13.5 Environmental assessment - Thermal parameters

The evaluation of the thermal and chemical environmental parameters is normal and should not influence the evaluation of the disinfection system.

### 13.6 Results: Photocatalysis Evaluation - Residual in environment

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No residual levels above the environmental limit values permitted by the INSST in its 2019 review have been detected.

Environmental limit values:

Hydrogen Peroxide (H <sub>2</sub> O <sub>2</sub> ):	1.0 ppm
Ozone (O <sub>3</sub> ):	0.10 ppm

Detected residual values:

Hydrogen Peroxide (H <sub>2</sub> O <sub>2</sub> ):	< 0.25 ppm
Ozone (O <sub>3</sub> ):	< 0.05 ppm

#### 14. Recommendations

Given the technical characteristics of the equipment evaluated, with a maximum capacity of treated air of approximately 800 m<sup>3</sup>/h (according to the manufacturer's data), and that the air-conditioning system has a flow rate of 6,000 m<sup>3</sup>/h, it would be advisable to increase the number of units installed.

It is recommended to lower the speed of the air treated in the photocatalysis system, installing a deflector or similar element for this purpose.

#### 15. Confidentiality

This report is confidential and therefore, unless expressly authorised in writing by BSA CONTROL, its diffusion is prohibited.

Matarò, 28 May 2020

(stamp)

(unreadable signature)

Signed: Juan J. Gonzalez  
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