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KL/1 1/1 Lodz, 21-09-2020

Certificate of analysis No K/336/01/2020

Subject of analysis: **UV dual-function lamp LBPD-4W PIR equipped with Philips radiators**

Customer: **ELFO Jan Tulikowski**
ul. Zgierska 231D,
91-495 Łódź

The device for testing deliverd by the Customer: 04-09-2020
The tests began: 07-09-2020
The tests finished: 13-09-2020

Type of analysis	Method	Results		
Microbial parameters				
Antimicrobial efficacy against:	Own methodology Instruction I-85	Percent reduction in the number of microorganisms		
		R_{5min}	R_{10min}	R_{15min}
Staphylococcus aureus ATCC 25923 (bacteria)		99.00%	100.00%	100.00%
Aspergillus brasiliensis (*A. niger*) (molds) ATCC 16404		98.45%	99.45%	99.78%

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Evaluation of the antimicrobial effectiveness of UV dual-function lamp LBPD-4W PIR equipped with Philips radiators

Aim and scope of the study

The aim of the study was to determine the antimicrobial effectiveness of UV dual-function lamp LBPD-4W PIR equipped with Philips radiators (Certificate of analysis No K/336/01/2020), against microorganisms: *Staphylococcus aureus* ATCC25923 (bakterie), *Aspergillus brasiliensis* (*A. niger*) ATCC 16404 (pleśnie).

Experimental procedure

The tests were carried out in accordance with own methodology developed in Laboratory (Instruction No. I-86), item 6.4 "Checking the effectiveness of UV lamps".

A suspension of the test strain (density 1 on the McFarland scale) was prepared, followed by a series of ten-fold dilutions. 0.1 mL suspension was taken from the appropriate dilution and spread on 90 mm diameter plates with appropriate agar medium (TSA, TSYEA YGC) to grow to 300 cfu (colony forming units). Control plates (without UV- disinfection) were placed in an incubator at the appropriate temperature for the given microorganism (37° C, 25° C) and incubated for 48 hours to 5 days. The second open test plate was placed inside the device and UV-disinfected for 5 10 and 15 minutes. The plates after disinfection were incubated in an incubator at the appropriate temperature for the given microorganism (37 ° C, 25 ° C) for a specified time (from 48 hours to 5 days). After incubation, the grown colonies were counted on control and test plates (disinfected with UV rays). The test was carried out three times for each microorganism, and then the percentage decrease in the number of microorganisms was calculated according to formula (1).

(1) R = 100-(b x 100/k)

where:

R- percent reduction in the number of microoorganisms

b- average number of microorganisms after UV disinfection [cfu /ml],

k- average number of microorganisms on control plates (without UV disinfection) [cfu /ml],

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Results

Table 1. Antimicrobial effectiveness of UV dual-function lamp LBPD-4W PIR equipped with Philips radiators

Results for control and tested samples											
Number of microorganisms											
Strain	On control plates without UV disinfection [cfu / ml]		After 5 minutes of UV disinfection [cfu /ml]			After 10 minutes of UV disinfection [cfu /ml]			After 15 minutes of UV disinfection [cfu /ml]		
		k		b	R[%]		b	R[%]		b	R[%]
Staphylococcus aureus ATCC 25923	914	908	10	9	99.00	0	0	100.00	0	0	100.00
	899		8			0			0		
	910		9			0			0		
		k		b	R[%]		b	R[%]		b	R[%]
Aspergillus brasiliensis (*A. niger*) ATCC 16404	900	901	19	14	98.45	8	5	99.45	2	2	99.78
	896		10			2			1		
	906		12			4			0		

Conclusion

After 5 minutes of UV disinfection with UV dual-function lamp LBPD-4W PIR equipped with Philips radiators, operating from a distance of 2 m the reduction in the number of *Staphylococcus aureus* (bacteria) was 99%. The extension of the UV disinfection time to 10 and 15 minutes led to the 100% reduction in the number of bacteria. In the case of *Aspergillus brasiliensis*, the reduction in the number of molds after 5, 10 and 15 minutes of the UV disinfection was respectively 98.45%, 99.45% and 99.78%.

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KL/I 1/1 Lodz, 21-09-2020

Certificate of analysis No K/336/02/2020

Subject of analysis: **UV dual-function lamp LBPD-4W PIR equipped with Philips radiators**

Customer: **ELFO Jan Tulikowski**
ul. Zgierska 231D,
91-495 Łódź

The device for testing deliverd by the Customer: 04-09-2020
The tests began: 11-09-2020
The tests finished: 16-09-2020

Type of analysis	Method	Results	
Microbial parameters			
Testing of the level of air pollution during the operation of the lamp in a room of 25 m^2	Own methodology using a microbiological air sampler MAS-100 ECO™ Manual MAS-100 Eco™	*[cfu/1 m^3]	Reduction level of microorganisms
- total viable count of microorganisms at time 0		**117**	-
- total viable count of microorganisms after 2 hours		**62**	R_{2h} = 47.0%
- total viable count of microorganism after 6 hours		**35**	R_{6h} = 70.1 %
- total viable count microorganisms after 20 hours		**19**	R_{20h} = 83.8%
- number of yeasts and molds at time 0		**28**	-
- number of yeasts and molds after 2 hours		**17**	R_{2h} = 39.3%
- number of yeasts and molds after 6 hours		**7**	R_{6h} = 75.0 %
- number of yeasts and molds after 20 hours		**4**	R_{20h} = 85.7 %

* The results are the average number of microorganisms from two measurements

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Assessment of air disinfection efficacy by UV dual-function lamp LBPD-4W PIR equipped with Philips radiators

The aim and scope of the research

The aim of the study was to determine the effectiveness of air disinfection by **UV dual-function lamp LBPD-4W PIR equipped with Philips radiator (**Certificate of Analysis No K/336/02/2020) on the basis of the total viable count of microorganisms and number of molds and yeasts examination using aspiration method after 2, 6 and 20 hours flow UVC lamp working in a room with an area of 25 m^2 .

Test procedure

The studies were conducted in accordance with its methodology developed at the Laboratory and the manufacturer's manual MAS-100 ECO™ (Microbiological Air Sampler) in a room with an area of 30 m^2. Before turning on the lamp, the total viable count of microorganisms and the number of mold and yeast in the room air were examined (at 0 time). The flow UVC lamp was placed in the center of the room and the air pollution was measured 2 meters from the device after 2, 6 and 20 hours of operation. The tests were carried out using the aspiration method using the microbiological air sampler MAS-100 ECO™. Each time the device took 1000 liters of air through a perforated plate (suction time about 9 minutes). The air stream containing particles was directed to the PCA or YGC agar surface in a standard Petri dish. After completing the air sampling cycle, the Petri dishes were incubated at 30°C for 72h or 25°C for 5 days, then the colonies grown were counted and the number of microorganisms in 1 m^3 of air was determined, taking into account the correction of the Feller's statistical correction table.

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