A Biotechnological Device for Disinfection of Air of Production Apartments
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Abstract – The disinfecting action of ultraviolet is considered. The biotechnical device for disinfection of air is created and tested.

Keywords – disinfection, ultraviolet, the biotechnical device, light reflection tape.

I. INTRODUCTION
At all stages of technological process of milk production the disinfection of air, brines, surfaces, dry products of vegetable fabrication from microbes, bacteria, viruses is needed. An effective way for this purpose is the usage of ultraviolet.

II. CREATION OF BIOTECHNICAL DEVICE
The efficiency of sterilization by an ultraviolet depends on the sort of the destroyed microorganisms, on character of their distribution in the air, on its humidity, on the size of apartment which is sterilized, on the type and power of radiant and duration of its work. One of basic indexes, related to the action of ultraviolet radiation, is a dose [1] which is determined as work of radiation-exposed (W/cm²) in a time of irradiation (sec). It is necessary to take into account that different kinds of bacteria are sensitive to the ultraviolet radiation in a different degree. The percent of the destroyed bacteria grows with the increase of dose, so there is the probabilistic dependence of bacteria removal from the size of irradiation dose [2]. Experimental dependence of the destroyed bacteria possibility from the dose is approximated and shown as an analytical curve Eq. (1):

\[ P = 1.06 \left[ 1 - \exp\left( -\alpha \left( D - 0.22 \right) \right) \right] \quad \text{if} \quad 0.22 \leq D \leq 3.5 \quad (1) \]

where \( D \) – dose size, mW/cm²; constant \( \alpha = 0.9 \ \text{cm}^2/\text{mW·sec} \) [3].

In the research the developed biotechnical device for disinfection of air in production apartments of cheese fabrication on the basis of the usage of ultraviolet is described.

An ultraviolet engulfs a range from 100 to 400 nm of optical spectrum of the electromagnetic field. A bactericidal action of the ultraviolet covers the range of waves length of 205-315 nm. The bactericidal lamp Philips TUV30 with power 30 W has been used. The biotechnical device contains a cylinder case and the ventilators for inflation / deflation of the air which are located in the butt ends of it. The ventilators are used for creation the forced convection stream; they have automatic control for the synchronous rotation of blades, that is adjusting circulation of air. The bactericidal lamp TUV30 is placed in the case on its wasp and powered by start regulation system, connected with a timer. The device is powered from the electric system of alternating current (220 V; 50 Hertz; 40 W); it has overall size 1140×120 mm, mass of 3 kg and provides the productivity of 60 m³/h.

The feature of biotechnical device is the coverage of the internal surface of the cylinder pipe by light reflection tape that allows souping the power stream of the bactericidal lamp up Eq. (2):

\[ B_0 = \frac{B}{1 - \eta \left( 1 - \frac{R}{L} \right)} \quad (2) \]

where \( B \) is a nominal power of radiation stream of the lamp; \( \eta \) is a reflectivity index of the tape; \( R \) is a radius and \( L \) is the length of the cylinder pipe.

The developed biotechnical device has passed the production tests on the air disinfection in the areas of ripening and finish packing of cheeses at the joint-stock company «Pyryatynsky Syrzavod», which is a leader among of 500s enterprises of milk industry of Ukraine.

III. CONCLUSION
The developed biotechnical device has allowed increasing the productivity of bactericidal irradiator-recirculators of air disinfection by 7-8 times.

REFERENCE

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