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EXPERIENCE IN MODERNIZING STEAM STERILIZERS FOR THE CREATION OF BUBBLE BIOREACTORS

DOROVSKIKH Viktor, https://orcid.org/0009-0009-1432-2573,
DOLZHYKOVA Irina*, https://orcid.org/009-002-8197-858X

Engineering and Technological Institute "Biotechnika" of NAAS,
Khlebodarskoye village, Odessa region, Ukraine,
**Corresponding e-mail*: *dolirina85@ukr.net*

Purpose: To develop a bubble bioreactor for the production of microbial plant protection agents based on the VK-75-01 steam sterilizer.

Object of study. Technological processes for the production of biological preparations, technological processes for the sterilization of culture media, and control systems of the modernized unit based on the state parameters of the VK-75-01 as the control object.

Research methods. Calculation methodologies for heat and mass transfer equipment, methods for accounting for the spatial distribution of culture media and fermentation media parameters within the working chamber volume, experimental methods for process research on physical models, methods of correlation and regression analysis for assessing the quality of biological products, and methods for synthesizing optimal automatic control systems for state parameters.

Research results. Technical solutions were adopted for the external piping of the VK-75-01 steam sterilizer with shut-off and control valves. This allows the apparatus to carry out the processes of culture media (CM) sterilization and fermentation in the specified sequence, with the ability to control air and water flow rates and implement the sterilization formula for CM and fermentation media (FM).

For the technological scheme of the existing bubble bioreactor (BB), the use of subsystems for the preparation of sterilized air and water has provided grounds to consider it an autonomous technical system for the production of biological preparations based on the BB.

The Bubble Bioreactor Control System (BBCS) has been developed. It provides information on parameters such as media temperatures (CM, FM), air flow rate, water flow rate, the status of actuators, the water level in the BB jacket, and media pressure in the sterilization chamber and the jacket. The system also monitors the

progress of technological processes, specifically the reference points defined by the sterilization formulas for CM and fermentation (FM). The latter is reflected by a light mnemonic diagram on the front panel of the control console.

Conclusions:

1) The technical system based on the BB is a specialized instrument for studying fermentation processes. It has the capability to produce both inoculum (of a specified titer) and biological preparations in a volume of 60 dm^3 per cycle.

2) The properties of the technical system based on the BB allow for its application as a universal sterilizer for fermentation complexes of medium capacity.

Keywords: Bioreactor, bubbling, system, modernization, control.

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