

PLANNING THE PLACEMENT OF TEMPERATURE MONITORING AND CONTROL DEVICES IN THE PRODUCTION PROCESS OF GENTAMICIN SULFATE

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Micromonospora purpurea – gram-positive actinomycetes that serve as the primary industrial producer of gentamicin sulfate, an important broad-spectrum aminoglycoside antibiotic [1]. The production of this antibiotic requires precise control of temperature parameters, as they directly affect enzyme activity, culture growth rate, and biosynthesis productivity. Optimal planning of temperature sensor placement in fermentation systems is a critical factor for ensuring maximum gentamicin yield and process energy efficiency.

In industrial bioreactors for gentamicin sulfate production, various types of temperature sensors (resistance thermometers, thermocouples, infrared sensors) are used to enable continuous temperature monitoring and regulation [2]. The most effective approach is a multi-level control system involving sensor placement in different bioreactor zones: in the upper layer for gas phase temperature control, in the middle layer for culture liquid temperature monitoring, near the walls to prevent local overheating, and in the cooling zone for heat exchange efficiency control. Automated Control Systems (ACS) based on Programmable Logic Controllers (PLCs) allow dynamic temperature regulation by adjusting cooling or heating intensity according to current readings [3]. Such systems employ machine learning algorithms to predict temperature field dynamics and automatically adjust heat exchange regimes.

An important design consideration is the placement of backup temperature sensors and emergency cooling systems. The implementation of computer-integrated monitoring systems with remote control functionality significantly enhances process reliability and efficiency. Research has shown that optimal temperature control device placement combined with modern ACS can increase gentamicin sulfate yield by 18 – 22 % while reducing energy consumption by 12 – 15 %. Further development of these technologies, particularly through artificial intelligence applications for temperature dynamics prediction, opens new prospects for optimizing aminoglycoside antibiotic bioproduction.

References:

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