PLANNING THE PLACEMENT OF PRESSURE MONITORING AND CONTROL DEVICES IN THE PRODUCTION PROCESS OF DOXORUBICIN HYDROCHLORIDE USING STREPTOMYCES PEUCETIUS

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Streptomyces peucetius – gram-positive bacteria that are key producers of doxorubicin hydrochloride, a potent anthracycline antibiotic with antitumor activity [1]. The production of this drug requires careful control of physicochemical parameters, particularly pressure, as its fluctuations can affect aeration, oxygen dissolution, and the stability of biosynthetic processes. Optimal planning of pressure control device placement in fermentation systems is critically important for ensuring high doxorubicin yield and reducing energy consumption.

In industrial bioreactors for doxorubicin production, various types of pressure sensors (piezoelectric, capacitive, strain gauge) are used to monitor and regulate pressure in real time [2]. The most effective approach is the combined use of sensors at different sections of the bioreactor: in the upper part – for gas phase monitoring, in the liquid phase – for hydrostatic pressure analysis, and in outlet pipelines – to prevent excessive pressure buildup during product extraction. Automated control systems (ACS) based on programmable logic controllers (PLCs) enable dynamic adjustment of fermentation parameters by modulating gas supply or agitation speed depending on pressure readings [1]. One of the key challenges in doxorubicin production is pressure instability during aeration, which may decrease *S. peucetius* activity due to either insufficient oxygen saturation or oxidative stress. To mitigate these risks, situational control systems (SCS) are recommended. These systems integrate data from pressure, pH, temperature, and dissolved oxygen sensors [2]. Such systems employ neural network algorithms to predict optimal pressure values at different fermentation stages and automatically implement adjustments. An important planning consideration is the placement of backup sensors and pressure relief valves to prevent emergencies. Implementing computer-integrated monitoring systems with remote control capability significantly enhances process safety and efficiency. Research findings confirm that optimal pressure control device placement combined with modern ACS can increase doxorubicin hydrochloride yield by 15 –20 % while reducing energy consumption. Further development of these technologies, particularly through AI-based pressure dynamics prediction, opens new prospects for improving anticancer drug bioproduction.

References:

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