AUTOMATED SAMPLING IN UPSTREAM PROCESS DEVELOPMENT FOR ACCELERATED ACCESS TO CRITICAL PROCESS PARAMETERS (CPPs) AND CRITICAL QUALITY ATTRIBUTES (CQAs)

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The biopharmaceutical market faces increasing pressure to develop and deliver affordable biologics to patients as quickly as possible without compromising quality and safety. To meet these market dynamics, biomanufacturers are focused on accelerating timelines while improving quality standards and reducing costs over the lifecycle of their products. Achieving these ambitious targets relies on a shift from processes with several independent and manual unit operations to a more automated facility with both digital and process connectivity. In parallel, automation of process analytics is becoming indispensable for faster decision making in the development phases and near real-time release of the final product while ensuring high standards for quality control and assurance. For this reason, innovations in process analytical technologies (PAT) have gained attention for providing integrated monitoring and control capabilities. PAT allows for measurement of critical process parameters (CPPs), which are essential to maintain within a specified range to ensure reproducible control of the process, and critical quality attributes (CQAs), which provide information about the resulting product quality. Historically, offline analytical technologies have required a significant manual burden in which operators obtain, process, and assess a sample of interest which can take days or weeks to complete. To address this challenge in upstream cell culture processes, new technology has emerged to enable automated, aseptic sampling. Automated sampling systems can take a sample from the bioreactor while maintaining its sterility and deliver the sample to a variety of analytical instruments for real-time analysis, without the need for human intervention. In perfusion cell culture modes where processes run continuously, this is especially important to ensure quality across the entire run duration and take corrective actions to prevent deviations. This poster will focus on the MAST® automated sampling system and its utilization in perfusion cell culture for accelerated upstream process development. We will demonstrate increased frequency of data acquisition for online CPP measurement and automation of a sample processing workflow to reduce the time to CQA measurement in both steady state and dynamic perfusion cultures. Additionally, we will discuss the value of combining automated sampling with Raman spectroscopy for increased sample frequency during chemometric model building, leading to more accurate inline and real-time measurement of CPPs and CQAs in the upstream bioprocess