Spring 5-10-2016

Advancement of cell culture process understanding and control through real-time multivariate process monitoring, use of statistical process modes and deployment of process analytical technologies

Patrick Gammell
Amgen, pgammell@amgen.com

Thomas Mistretta
Amgen

Cenk Undey
Amgen

Eric Kwei
Amgen

Tonny Wang
Amgen

See next page for additional authors

Authors
Patrick Gammell, Thomas Mistretta, Cenk Undey, Eric Kwei, Tonny Wang, and Greg Naugle

ADVANCEMENT OF CELL CULTURE PROCESS UNDERSTANDING AND CONTROL THROUGH REAL-TIME MULTIVARIATE PROCESS MONITORING, USE OF STATISTICAL PROCESS MODELS AND DEPLOYMENT OF PROCESS ANALYTICALTECHNOLOGIES

Patrick Gammell, Amgen, West Greenwich, RI
pgammell@amgen.com
Thomas Mistretta, Amgen, Cambridge, MA
Cenk Undey, Amgen, Thousand Oaks, CA
Eric Kwei, Amgen, Cambridge, MA
Tony Wang, Amgen, West Greenwich, RI
Greg Naugle, Amgen, West Greenwich, RI

Key Words: Process Monitoring, Multivariate Statistics, Continued Process Verification, Raman.

Commercial bioprocess manufacturing facilities generate considerable amounts of process data which are routinely used for process monitoring. Through the analysis of batch over batch trends it is possible to ensure that the process remains in a state of continuous statistical control. Real time process data can also be used to drive rapid root cause analysis and to enable timely interventions to prevent performance parameter excursions. Finally, these process data also provide significant opportunities to further understand the interaction between operating parameters, process equipment and raw materials to enable improved process control and optimization.

To use the available process data effectively, systems are required to store, aggregate, and visualize the data. These data can then be used for advanced analytics, such as development of process models or analysis of variance across similar product modalities. These advanced analytics allow for rapid identification of process excursions and identification of true special cause variation (e.g. raw material variability). These tools also enable continued process verification (CPV) as part of the lifecycle approach to process validation.

This presentation will describe the deployment of advanced process monitoring approaches, the development of predictive process models using multivariate process and product data and how to leverage these tools to drive process improvements. Finally, the application of newer technologies to understand and control process performance will be discussed including a case study describing the development of closed loop feeding strategies using Raman spectroscopy. These advances will be described in the context of continued process verification and as part of a future vision for portfolio-wide approaches to process monitoring, understanding and optimization.