

Embedding PAT in Bioprocesses: How Hardware Enables AI/ML, Advanced Automation and Process Intensification

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In the evolving landscape of biopharmaceutical development and manufacturing, Process Analytical Technology (PAT) is a cornerstone for realizing true process intensification and digital transformation. This contribution discusses how embedding PAT into bioprocesses, as part of an integrated strategy spanning automation, data analytics and AI/ML, can unlock more robust, efficient and scalable operations. A particular focus is placed on the role of smarter hardware as an enabler for high-quality data, soft sensors and advanced control concepts. By connecting equipment, PAT and analytics, bioprocesses can be steered more intelligently, supporting faster development cycles, improved process understanding and more consistent product quality. The talk will outline key building blocks, typical challenges at the interface of process science and data science, and conceptual approaches for making PAT and AI/ML practically usable on the shop floor. This sets the stage for discussing how hardware suppliers can evolve from component providers to enablers of connected, data-driven bioprocessing.



Winfried Geis is a Senior Upstream Process Intensification Development Specialist at Sartorius, based in Göttingen, Germany. He supports the EMEA sales organization in aligning upstream technologies with customer needs in process intensification. His work focuses on integrating technical expertise into strategic discussions around bioprocess efficiency.

Winfried holds a doctorate in applied mathematics from the University of Stuttgart, and a degree in physics. He has over 20 years of experience in simulation, data analytics, and digital solutions, including roles in process analytical technology, software automation, and modeling. Prior to joining Sartorius, he held technical and leadership positions at Comsol Multiphysics GmbH.