

PUSHING THE CLOSED AND CONTINUOUS BOUNDARY: END-TO-END ICB AT THE PILOT SCALE

Kevin Brower, Sanofi Biologics Development, Purification Development US
Kevin.brower@sanofi.com
Michael Coolbaugh, Sanofi
Tarl Vetter, Sanofi
Chad Varner, Sanofi
Emily Davenport, Sanofi
Brad Bouchard, Sanofi
Marcus Fiadeiro, Sanofi
Nihal Tugcu, Sanofi

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Encouragingly, the biomanufacturing field continues to move towards GMP implementation of integrated and continuous processes. To our knowledge, all implemented ICB processes – including those at Sanofi – do not extend the ICB boundary to drug substance. In fact, questions remain not just as to whether fully continuous is necessary but whether the required process and engineering technologies yet exist to enable fully continuous at a commercially relevant scale. At Sanofi, we have built on our experience developing and implementing ICB technology to achieve an industry-first demonstration of a fully continuous process, including all typical downstream purification steps, to produce kilograms of drug substance. We will present our vision for end-to-end integrated and continuous biomanufacturing including design goals related to closed processing, automation, and continuous unit operations (not fast batch). Operation at the pilot scale, integrated to an intensified 100L perfusion bioreactor, required creative solutions in many aspects of the run design and execution while allowing for identification of true failure modes and, therefore, identification of areas for future development. Overall, we believe that currently available technology may allow for the realization of an end-to-end closed continuous commercial process. Moreover, our results suggest investment in pushing the continuous boundary may inspire disruptive innovation across bioprocessing to meet long-held aspirations for a truly disruptive facility of the future.