

## DEVELOPING NEW PERFUSION CAPABILITIES FOR AMBR® MICRO AND MINI BIOREACTORS

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Key Words: automated, high throughput, single-use, perfusion, bioreactor

In recent years a strong trend towards intensified and continuous biopharmaceutical processing has gathered momentum, enabled by key cell culture technologies such as ATF and TFF. However, small-scale application has been limited to traditional benchtop bioreactor formats that are manually intensive, relatively low throughput and costly to operate. Automated high throughput single-use bioreactor systems have transformed fed-batch cell culture bioprocess development over the last decade and new capabilities to support perfusion culture in these micro and mini bioreactor formats could facilitate and accelerate an industry wide transition to intensified and continuous perfusion cell culture processes.

Working in close collaboration with biopharm industry development partners, the design of the 'ambr 250 high throughput' bioreactor system has been modified to include hardware, software and single use components required to operate up to 24 parallel bioreactors with ATF or TFF cell retention modes. Iterative prototype testing with development partners has resulted in a novel ambr 250 system design capable of operating for extended culture durations and supporting high cell densities. In addition, a new Generation 2 ambr 15 cell culture system has been developed and demonstrated with technical capabilities facilitating perfusion mimic applications. Case studies will be presented on the utility of new ambr 15 system features for perfusion mimic (20-40M cell/ml) via cell settling and centrifugation methods, together with a range of industry case studies and novel performance data for the new 'ambr 250 perfusion' system (24 parallel perfusion cultures; >30d; >100M cell/ml; 0.25 vs. 5L; fully automated VCD control).

As previously established with ambr systems for fed-batch processes, the new Generation 2 ambr 15 and ambr 250 perfusion systems together have the potential to provide the biopharm industry with a step change in perfusion process development capacity, enabling high throughput bioreactor screening and DoE optimization approaches for accelerated perfusion process development.