Smarter, smaller, stronger: How process intensification reduces cost and footprint in biologics manufacturing

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Process Intensification as a Competitive Advantage in Biologics

In the competitive world of biologics manufacturing, capital and space are two of the most valuable and often limiting resources. From early-stage biotech companies to established pharmaceutical manufacturers striving to meet sustainability and productivity targets, the industry faces a common challenge: how to do more with less.

This is particularly relevant for companies developing monoclonal antibody (mAb) biosimilars who are often are under pressure to intensify their processes, as the end of patent exclusivity forces them to compete on both speed and cost. Process intensification offers a clear route forward: by re-engineering biomanufacturing operations to deliver higher productivity from smaller, more efficient systems, it directly tackles the twin pressures of cost of goods (COGs) and facility footprint. At CPI, this proven approach enables companies to accelerate innovation while conserving resources, capital and space.

Why footprint and cost matter now more than ever

Traditional biologics facilities are large, complex and expensive to build and operate. For emerging manufacturers, infrastructure burden can become a barrier to market entry. For established players, under-utilised or inflexible space constrains their ability to scale or adapt to new products.

How process intensification increases productivity and reduces facility footprint

Process intensification brings together advances in cell culture, downstream processing, and digital control to achieve equal or greater output from a smaller, more efficient system. A recent review indicated that end-to-end continuous bioprocessing could reduce the cost of goods by around 30% while also minimising facility footprint.

CPI has demonstrated this approach via its end-to-end intensified biomanufacturing platform, which integrates perfusion bioreactors, multi-column chromatography and single-pass filtration technologies under advanced process control. These technologies collectively:

- Increase productivity per unit volume, reducing the need for very large bioreactors.
- Minimise the number of unit operations and buffer volumes, cutting overall facility size.
- Reduce consumables and media costs while improving yield.
- Enable smaller, modular layouts that can be reconfigured for different products or scales.

The result is a leaner, more efficient manufacturing process that delivers a lower cost of goods and reduces environmental impact.

Why intensified bioprocessing benefits SMEs

For small and medium-sized biotechs, access to advanced manufacturing infrastructure can be a make-or-break factor in bringing a product to market. The capital required to purchase equipment or secure large-leased space is often beyond the reach of early-stage companies.

CPI removes this barrier. SMEs can use CPI's facilities, automation systems and expertise to evaluate, validate, and pilot intensified bioprocesses without major infrastructure investment. This approach provides:

- **Capital efficiency:** Instead of tying up funds in stainless-steel infrastructure or large leases, companies can focus on their core science and product pipeline.
- **De-risked scale-up:** As an independent organisation, CPI provides a controlled, vendor-neutral environment for testing high-density perfusion and continuous chromatography and other intensified methods, before committing to commercial deployment.
- **Flexibility for growth:** By optimising productivity per square metre, SMEs can operate effectively from smaller premises, freeing financial and physical capacity for future expansion.

As Simon Hawdon, CPI's Chief Technologist in Biologics, states: "Our goal is to help organisations unlock efficiency and innovation in biologics production, achieving industrial impact without industrial-scale overheads."

How larger manufacturers can transform legacy assets with intensification

Process intensification isn't only valuable for agile start-ups. Large pharmaceutical manufacturers also benefit by applying the same principles across their global networks. By redesigning unit operations for higher productivity and lower footprint, established organisations can:

- Maximise existing space, enabling multiple product lines within the same facility.
- Avoid costly site expansions, choosing to reconfigure within current real estate.
- Plan for more efficient site development, reducing CAPEX while increasing sustainability and resilience.

Modular, intensified systems also support more flexible production capacity without the long lead times associated with traditional plant construction. This improves asset utilisation and enhances resilience to supply-chain disruption.

How digital tools enable intensified and continuous bioprocessing

Reducing the cost of goods and shrinking a facility's footprint are not just operational wins; they are also environmental ones. Smaller systems use less energy, water and raw materials. Fewer clean-in-place cycles and shorter process times mean lower emissions and less waste.

With CPI's techno-economic (TEA) and life cycle (LCA) analyses, companies can quantify the economic and environmental impact of intensified processes before implementation. This data-driven approach helps both SMEs and multinationals build a business case that satisfies investors, regulators and sustainability goals simultaneously.

Process intensification doesn't just mean smaller tanks, fewer unit operations and lower footprint; it is also about smarter, digitalised manufacturing. At CPI, we see firsthand how digital tools, automated platforms and integrated analytics enable intensification at scale.

CPI's integrated intensified biomanufacturing system is a modular, continuous biomanufacturing system explicitly designed to integrate process analytical technologies, real-time monitoring, and advanced control software. This digital capability can reduce analysis time from hours to minutes, optimise resource use and enable real-time release of biologics.

On the upstream side, tools such as the Ambr 250 perfusion system enable parallel perfusion experimentation – up to 24 vessels simultaneously – generating high volumes of data to optimise culture conditions for high cell densities, high yields, and scalable performance.

Building a more efficient and resilient biomanufacturing process

CPI's BioIntensify programme is designed to help companies quickly validate intensification opportunities, identify high-impact unit operations, and provide a scale-ready roadmap for implementation. In just a few months, companies can progress from concept to data-driven recommendations for an intensified process without committing to new infrastructure.

For smaller innovators, this presents an opportunity to compete at scale without the capital burden of a large facility. For global manufacturers, it's an opportunity to modernise legacy assets, reduce costs, and make meaningful progress toward ESG targets.

In a sector where innovation often outpaces infrastructure, process intensification gives biologics manufacturers the freedom to grow sustainably and competitively. By adopting digitally enabled intensified processes and leveraging CPI's expertise and facilities, companies can reduce the cost of goods, decrease their operational footprint, and build capacity for the future, all while maintaining quality, compliance, and reliability.

To explore how intensified and continuous bioprocessing can reduce costs and shrink facility footprint, contact CPI. Let's innovate together.

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