From pressure to progress

The strategic case for process intensification in modern biomanufacturing

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Why Process Intensification Is Reshaping Antibody Manufacturing

Across the global pharmaceutical landscape, the pressure to deliver safe, effective, and affordable medicines continues to grow. For companies navigating this complex environment, process intensification offers a smarter, more efficient approach to biomanufacturing.

By enabling more product from the same materials, more doses from smaller facilities, and faster, data-driven decision making, process intensification can unlock new levels of efficiency. These gains support cost optimisation and sustainability throughout the biomanufacturing lifecycle.

While these principles can be applied to many biologic modalities, antibody manufacturing is ideally suited to intensification, with well-defined platform processes and significant gains available across both upstream and downstream operations.

What is process intensification?

At its core, process intensification reimagines how biologic products are made. Instead of relying on large, resource-intensive batch processes, intensified approaches combine innovative technologies, continuous operations, and advanced control strategies to increase throughput, enhance product quality, and reduce the overall manufacturing footprint.

In antibody manufacturing, this means rethinking conventional fed-batch cell culture and chromatography platforms to deliver higher titres, more consistent quality, and greater flexibility across multiple molecules and scales. Intensified approaches allow manufacturers to adapt established antibody platforms without compromising on regulatory expectations or product quality.

In practice, this can involve the use of perfusion bioreactors to achieve steady-state production, multi-column chromatography to optimise resin use, or in-line buffer exchange and concentration to streamline downstream operations.

Process intensification enables manufacturers to generate greater product volumes from the same raw materials while reducing facility footprint and capital expenditure. By shifting from traditional fed-batch processes to intensified or continuous operations, manufacturers can achieve up to two- to three-fold higher productivity from the same bioreactor volume. More efficient use of space and resources can reduce manufacturing costs by around 30% and decrease facility footprint by as much as 50–70%. These improvements support more agile facilities that require lower capital investment, with additional sustainability benefits.

Four pressures facing the pharmaceutical industry – and how process intensification can help

High cost of goods and competitive pricing

With both new biologics and biosimilars under significant pricing pressure, reducing the cost of goods (COGS) is essential. Process intensification increases yields and reduces facility requirements, contributing to a lower cost per dose and more competitive commercial positioning.

Tight capital and investor expectations

In a capital-conscious environment, investors expect evidence of value and risk reduction before supporting large-scale manufacturing projects. Process intensification provides a faster route to confident decision making. CPI's process intensification feasibility pathway helps companies validate concepts, test technologies, and generate robust data to strengthen internal business cases before committing major capital or platform decisions.

Sustainability and net zero goals

Sustainability is a growing priority across healthcare. With the NHS aiming for net zero by 2045, pharmaceutical supply chains face increasing pressure to reduce emissions and resource use. Intensified processes support ESG goals by lowering energy consumption, reducing water usage, minimising waste, and enabling smaller, more efficient facilities.

Regulatory evolution and technical readiness

Regulators are increasingly encouraging innovation in manufacturing. The publication of ICH Q13 signals a global shift toward continuous and intensified processing. CPI's experience in continuous biomanufacturing, process analytical technology (PAT), and model-based control provides companies with confidence that intensification strategies can align with evolving regulatory frameworks.

Where innovation meets implementation

For companies exploring process intensification, CPI provides a bridge between concept and commercial reality. CPI supports organisations to develop, test, and scale intensified biomanufacturing processes in a safe, non-competitive environment. CPI's facilities include flexible pilot lines, GMP-aligned environments, and advanced automation systems designed to evaluate and de-risk process changes before they are prepared for scale-up.

CPI's BioIntensify approach offers a clear, structured pathway. Our process intensification support begins with a **feasibility sprint**, providing rapid early insight using your existing data. CPI models key process parameters and compares intensification options to identify potential benefits and trade-offs. This is followed by a short **Integration Pathway**, during which small-scale perfusion trials are used to define the experimental space for your specific cell line. Bioprocess modelling is then applied to forecast performance at larger scales. Finally, our **Advanced Development** phase offers a tailored programme designed to mature and de-risk your intensified process.

CPI operates as a non-profit and vendor-neutral organisation, enabling companies to explore new technologies and process designs freely while retaining full ownership of intellectual property.

Intensification builds agility and resilience in biomanufacturing

In a landscape defined by rapid scientific progress and global uncertainty, biologics manufacturers must become more agile, adaptable, and resilient. From the rapid scale-up of mRNA vaccines to rising expectations around sustainable, localised manufacturing, flexibility is now a critical differentiator.

Process intensification addresses this challenge directly. By redesigning manufacturing systems for higher productivity, better digital control, and modular deployment, companies can react faster to market shifts, reduce technical and commercial risk, and accelerate the delivery of new biologics to patients.

Technology in action

At CPI's state-of-the-art facilities, process intensification is already a proven reality. CPI's integrated, end-to-end biomanufacturing test bed brings together upstream perfusion bioreactors, multi-column chromatography, single-pass tangential flow filtration, and in-line diafiltration. Advanced data systems, capacitance monitoring, and cloud-based data historians support predictive control, automated optimisation, and enhanced data visibility across every stage of production.

This capability allows CPI to identify performance sweet spots, strengthen process stability, and assess sustainability impacts under real-world conditions. The result is a validated, scalable process design that reduces technical risk, supports confident decision making, and accelerates time to market.

A partner for progress

Process intensification is no longer just about making manufacturing smaller or more cost-effective. It is about making it smarter and more resilient. The real transformation lies in the way that data, automation, and analytics are integrated into intensified systems.

For an industry facing pressure to deliver new biologics faster and more sustainably, this agility is invaluable. As biologics continue to diversify and expand, companies implementing digitally enabled intensification are not only optimising current processes but also preparing for next-generation therapies and technologies.

If your organisation is exploring new ways to reduce costs, accelerate scale-up, or improve sustainability, CPI can help you validate and implement intensified processes quickly and safely.

Get in touch

To arrange a complimentary 1-hour process intensification workshop with CPI's experts, contact CPI at www.uk-cpi.com/contact.

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