



Single-use capacity expansion

5 key considerations for successfully
creating cGMP single-use
biomanufacturing capacity



Collaboration drives success

The global pharmaceutical portfolio today reflects a greater prevalence of large molecule drugs, expansion in the number of personalized products, and a rise in orphan disease treatments. Over 1,000 biologics have been approved worldwide and more than 8,000 are in development to help address unmet healthcare needs.

To meet therapy production demands, the industry needs to have the right capacity, in the right locations. Increasingly, single-use technologies are being seen as the solution to flexibly and cost-effectively address many of the challenges around creating biologics manufacturing capacity. And it's the fastest way to bring capacity online.

If you, as a pharmaceutical company or contract manufacturing organization, are looking to produce biologics using single-use technologies, there are many ways to approach the challenge of creating cGMP biomanufacturing capacity.

Contract development and manufacturing organization Fujifilm Diosynth identified five key considerations to inform their biologics manufacturing capacity expansion plans. Having already successfully implemented GE Healthcare's BioProcess single-use platform at their site in North Carolina, USA, they decided to duplicate this capacity at their Billingham, UK, site.

Working in close partnership with GE Healthcare, Fujifilm Diosynth was able to bring online the UK's first cGMP single-use manufacturing facility in just 14 months. Details of how the options were assessed and the secrets to their success can be found in this eBook.



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Determining the right type of biomanufacturing capacity

Seven of the top ten drugs on the market are biologics. And, an explosion in the number in development pipelines means demand for manufacturing capacity is still increasing. As an industry, we have manufacturing capacity, but the question is whether it is the right capacity. The biologics in development today are typically high value, niche drugs. These require the production of larger numbers of smaller batches compared to the previous generation of blockbuster drugs, which are produced in lower numbers of much larger batches.

To meet the increased demand for biomanufacturing capacity, you can build in-house or outsource. In terms of the type of capacity, the options are stainless steel, single-use, or a hybrid solution that combines the two. Single-use systems are more suitable for smaller scale, more potent molecules, and also enable facilities to more easily adopt a multi-product approach.

It is essential to choose a manufacturing strategy with the flexibility to produce these products, supporting your needs today and into the future.

4 key considerations when determining the right type of biomanufacturing capacity

1) Understand the industry needs now and going forward

Whether keeping capacity in-house or outsourcing production, it is important to fully understand your needs, your customers' needs, or both. This will help identify all the criteria that can inform the type of manufacturing capacity you commission.

For example, you may want to serve additional or multiple markets globally, and therefore need to establish or access capacity that meets the corresponding local, regional, or international regulatory requirements. There are also the factors of speed and cost. With increasing budget constraints, how can you add capacity in the most cost-effective, efficient, and risk-mitigated way?

“Biologics comprise 7 of the top 10 drugs on the market today”



Parrish Galliher
Chief Technology Officer,
Upstream BioProcess
GE Healthcare Life Sciences

Fujifilm Diosynth is a contract development and manufacturing organization (CDMO) that was faced with this challenge. They were seeing considerable demand from their global customers for cGMP manufacturing based on mammalian cell culture technologies and needed to add additional capacity to support this. They spoke to customers to understand how they could best support them on their clinical journey.

“We had been early adopters of GE Healthcare’s BioProcess Xcellerex platform”



Nick Martin
Head of Operations
Fujifilm Diosynth Biotechnologies
Billingham, UK

These discussions informed the need for a practical solution that would allow Fujifilm Diosynth to quickly turn around larger numbers of smaller batches. They developed a short term objective of adding smart capacity for faster turnaround times and then, longer term, having the option to add the right additional capacity as their customers’ needs grew.

2) Analyze and build on your existing capacity

For any company with existing capacity, it is important to examine what is working well for your customers and your business.

This investigation might lead you to capitalize on what you already have, and expand or duplicate this capacity. In other cases, it might make more sense to develop complementary capacity to add value to your business’s offering.

At Fujifilm Diosynth, they wanted to expand their UK capabilities and were looking to develop the right capacity with an accelerated timeline. They also needed that capacity sooner rather than later. The typical multi-year timescales for stainless steel or hybrid options would have taken too long to bring online.

Fujifilm Diosynth was already a successful early adopter of single-use technologies at their site in Research Triangle Park, North Carolina, namely GE Healthcare’s BioProcess Xcellerex™ platform. They used the experience from that platform to inform an analysis of what would be the fastest solution to add capacity in the UK.

“Decision-making always needs to be supported by relevant data”

Nick Martin
Head of Operations
Fujifilm Diosynth Biotechnologies
Billingham, UK

One of the advantages of single-use technology is that when using the same technology platform, you can duplicate capacity at another site and this can be an exact copy. You can also use the learnings from one location to support another, to enable a smoother technology transfer process and a more rapid duplication of capacity.

3) Inform and validate your decision with the right data

When commissioning new biomanufacturing capacity, your decision should be informed by relevant data. Once you have identified the set of criteria that the new capacity must meet, it is important to compare different types of technology and platforms to see which best supports your business needs.

There are tools available to help you determine the right solution. Process design tools can map your biomanufacturing process workflow to determine the best choice of hardware, software, and layout.

You can also develop your process science database. This involves determining the science-based process information required to give you the confidence to design a robust process that can also be scalable. You can then move on to determine the right equipment for the process and a facility design that supports the process workflow.

In addition, you can run physical comparative studies with different equipment, assessing against your pre-determined set of criteria. This allows you to make a direct comparison not just of the production output and quality, but also costs, speed, volume capacity, and efficiency.

In undertaking this final option, Fujifilm Diosynth compared CHO mAb runs on a 110L stainless steel bioreactor with an Xcellerex 200L bioreactor. Using the data from those runs, they found that single-use was the fastest and most cost-effective solution for getting a capability online at their Billingham, UK, site, and to start delivering to customers.

4) Flexibility

In many cases, a company will require biomanufacturing capacity that is suitable for a diverse portfolio of multiple products. The new capacity will need to be flexible enough to support manufacturing needs today, and support the unknown needs of tomorrow, in a rapid and cost-effective manner.

Fujifilm Diosynth, a CDMO supporting many different biopharmaceutical organizations around the globe, wanted to quickly add duplicate capacity to support mammalian cell-based biomanufacturing.

Single-use has the flexibility to enable the rapid delivery of many small batches. Essentially, the reaction vessel is the bag, so time and money is not wasted in cleaning the equipment in between batches. In addition, you can easily and rapidly add bioreactors to the process workflow as biomanufacturing demands increase.

“The single-use option gave us the fastest and most cost-effective solution to adding additional capacity”

Nick Martin
Head of Operations
Fujifilm Diosynth Biotechnologies
Billingham, UK

Weighing up the options, Fujifilm Diosynth decided to replicate their North Carolina, USA, single-use capacity at their Billingham, UK, site because they found GE Healthcare’s BioProcess single-use platform gave them the flexibility to build on their existing processes. Working in collaboration with GE, they achieved rapid technology transfer and qualification of their UK single-use facility – and were able to implement the UK’s first cGMP single-use manufacturing facility in just 14 months.

Closing remark

In selecting the right biomanufacturing platform, you need to fully understand what the industry needs are and which parts of the drug development life cycle you intend to support with your new capacity. You need to have rigorous selection and assessment criteria, validated with relevant data, to select the single-use platform that has the flexibility to suit your biomanufacturing needs today and going forward.

“Flexibility is key”



Martin Meeson
President and COO
Fujifilm Diosynth Biotechnologies
USA

Expanding single-use biomanufacturing into new locations

As an industry, expanding biomanufacturing capacity to new locations is most often to support access to new markets. This could be as a contract manufacturer wanting to locate near a certain customer base or as a pharmaceutical or biotechnology company wanting to establish local in-house production.

Expanding to become an operation with multiple manufacturing sites also improves security of supply, offering the ability to manufacture the same product at more than one location, providing you have installed duplicate capacity.

Single-use technologies readily enable creation of duplicate biomanufacturing capacity, in addition to the benefits they bring by being both flexible and future-proofed.

When expanding single-use manufacturing into a new location, there are a number of key factors to ensure success.

5 key considerations when expanding single-use biomanufacturing into new locations

1) Work collaboratively to increase efficiency

Working in collaboration is critical. This goes beyond collaborating with your colleagues and encompasses working closely with your suppliers. By developing an open relationship with your technology supplier, you can ensure that they understand your requirements and support your business needs.

“The teams worked very collaboratively to deliver the project in 14 months”



Paul Found
Chief Operating Officer
Fujifilm Diosynth Biotechnologies
Billingham, UK

As a contract development and manufacturing organization (CDMO), Fujifilm Diosynth wanted to add duplicate capacity in the UK, largely to mirror the capacity found at their Research Triangle Park facility in North Carolina, USA.

Having successfully installed GE Healthcare's BioProcess single-use platform technology at the North Carolina facility, GE Healthcare was the obvious partner for Fujifilm Diosynth's UK expansion project.

Working collaboratively, the team was able to deliver the UK's first cGMP single-use manufacturing facility in just 14 months at Fujifilm Diosynth's UK manufacturing site in Billingham. Getting the facility up and running in such a short timeframe was achieved due to efficient qualification, and technology and knowledge transfer processes between the sites.

This success would not have been possible without having the right people in place to support the project. You need the right combination of people, with the right experience and expertise to make such projects a success. Ambitious goals require high performing teams working seamlessly together.

2) Understand the local operating environment

Having knowledge of the local operating environment allows you to anticipate and address potential challenges before they arise. This is particularly important for meeting regulatory requirements, where unforeseen hurdles could dramatically impact the qualification timeframe and project delivery date if they have not been taken into account from an early stage.

“The MHRA really engaged with us to help future-proof the facility”



Helen Bickley
Head of Quality Assurance
Fujifilm Diosynth Biotechnologies
Billingham, UK

If you are already operating in the country of your expansion project, you may be able to draw upon the expertise of your own local team. You could also benefit from the knowledge of external parties, such as suppliers, that have on-the-ground operating experience to support your project.

For Fujifilm Diosynth, they already had a manufacturing site in the UK and wanted to expand this to include a single-use facility for mammalian cell culture biologics. Having internal expertise with working knowledge of the UK operating environment helped the wider project team understand what was needed to build and validate a local manufacturing facility.

They proactively engaged and included feedback from the UK's regulatory agency, the MHRA, in the initial project planning phase. Having visibility of the design and operating philosophy, the MHRA was able to help future-proof the facility. Fujifilm Diosynth was also able to incorporate customer feedback, and insights from GE Healthcare, to ensure they were taking a comprehensive approach.

Consequently, Fujifilm Diosynth identified existing data that addressed local planning application requirements. This enabled them to speed up the qualification process and release valuable project resources that could then be allocated elsewhere. Overall, knowledge of the local operating environment meant a smoother implementation and qualification process.

3) Benefit from offline training

In order to bring a new manufacturing facility online quickly, your manufacturing operations personnel will need appropriate training. Ideally, they should be fully trained and ready to use the equipment as soon as it is installed. This can be achieved through offline training.

“Having the ability to train offline enabled us to bring the go-live ahead of schedule by three months”

Helen Bickley
Head of Quality Assurance
Fujifilm Diosynth Biotechnologies
Billingham, UK

Fujifilm Diosynth wanted to fully validate their single-use biomanufacturing facility and bring it online as quickly as possible. They were able to benefit from GE Healthcare's global network of Fast Trak training centers, which meant their staff were trained offsite, in parallel with the activities happening onsite during the build.

The operating team traveled to Marlborough, Massachusetts, USA, to learn from GE Healthcare's single-use experts. Not only could they familiarize themselves with the systems being installed at their facility, but they also had the opportunity to discuss potential challenges and ways to address them. The operators were able to write procedures that were concise but detailed enough to enable effective and efficient training.

As a result, when the equipment arrived in the UK, the operations team was ready to use it. Being able to benefit from a comprehensive offline training program allowed Fujifilm Diosynth to start operations at the facility three months ahead of schedule and ensured smooth execution of the first manufacturing batch.

4) *De-risk technology transfer*

Technology transfer is widely recognized as a complex process, particularly for manufacturing biologics. There are means to de-risk the process, both from a compliance and time perspective, depending on the type of manufacturing capacity that you choose.

One of the benefits of single-use technology is the ease of technology transfer between sites compared to stainless steel manufacturing. This is especially true when utilizing the same technology platform and supporting processes for your duplicate capacity.

“We built upon GE Healthcare’s experience in the design, commissioning, and qualification of single-use equipment to benefit our customers”

Paul Found
Chief Operating Officer
Fujifilm Diosynth Biotechnologies
Billingham, UK

For Fujifilm Diosynth, their single-use expert team worked in collaboration with GE Healthcare to duplicate their single-use capacity from North Carolina, USA, to Billingham, UK. They worked together to ensure coordination between the sites, and built upon the experience that GE Healthcare has in the design, commissioning, and qualification of that equipment. Strong team work enabled them to deliver the project quickly and efficiently.

5) *Ensure open communication*

The value of honest and open communication should not be underestimated, both in delivering a project and beyond. If you are a company that is in any way a service provider, open communication is vital in ensuring that any issues are resolved quickly and smoothly.

As service providers in their respective fields, Fujifilm Diosynth and GE Healthcare both have a culture of embracing new technologies, and working openly and collaboratively with partners in order to be successful.

“As service providers, we both value the importance of open communications”

Paul Found
Chief Operating Officer
Fujifilm Diosynth Biotechnologies
Billingham, UK

Right at the start of the project, the core single-use expansion project team agreed upon the importance of having an honest relationship and open dialogue so that they could tackle any potential issues head on.

When issues were encountered, the open communication and cultural fit between the companies enabled solutions to be rapidly developed and prevented any delays with getting the facility online.

Closing remark

In working collaboratively with your internal experts, single-use technology supplier, and local regulatory agency, you can efficiently create biomanufacturing capacity that meets all the necessary operating requirements. With a streamlined technology transfer and qualification process, strong coordination and communication between all parties, smart project planning, and parallel offline training, you too could be able to meet such ambitious project goals.

Choosing the right single-use bioreactor platform

When selecting a bioreactor, you can choose stainless steel or single-use technologies, depending on your biomanufacturing requirements. The bioreactor is a key component of your bioprocessing workflow and should be regarded as a strategic asset. It is important that this core technology is carefully chosen, specified, designed, and supported, both now and in the future.

Stainless steel bioreactors, at capacities of 10 000 to 20 000 liters or greater, are still the preferred option when producing large-scale products. But single-use bioreactors, typically 1000 or 2000 liters, are quickly becoming the preferred option for small-scale production.

When producing biologics, single-use can provide benefits such as lower capital investment, lower operating expenses, and lower environmental footprint. It also offers the flexibility to produce larger numbers of smaller batches, with faster turnaround times compared to traditional stainless steel.

Cell densities are predicted to continue to rise, as is the need to produce greater quantities of proteins, all in an environment of increasing regulatory requirements. If you decide to opt for single-use, it's important to select the bioreactor that meets not just your current needs but also is able to support the demands of future processes.



5 key considerations when choosing a single-use bioreactor platform

1) Process performance

When making your assessment, one of the key considerations should be process performance. You should look for single-use technology that is equal to or better than traditional stainless steel; in terms of consistency, reliability, reproducibility, robustness, and, most importantly, flexibility.

“Adoption of single-use technology has allowed us to continue to be flexible enough to meet all of our customers’ varied needs”



Sharyn Farnsworth
Associate Principal Scientist – Group Leader
Fujifilm Diosynth Biotechnologies
North Carolina, USA

Contract development and manufacturing organization (CDMO) Fujifilm Diosynth needed a single-use platform that outperformed stainless steel across all these parameters. In addition, the single-use bioreactor itself needed to have optimal mixing capabilities, optimal mass transfer, and flexible sparging options.

Fujifilm Diosynth needed to accommodate the demands of its proprietary Apollo™ expression platform and Saturn™ mAb platform, as well as a significant number of differing client platforms. Adoption of GE Healthcare’s BioProcess Xcellerex bioreactor platform allowed them the flexibility to meet all of the needs of such varied processes. Of particular note was the novel design that allows a 5:1 turndown for a wide range of output volumes.

2) Control system and automation

The choice of the automation and control systems are critical to the success of your project. Pairing the right control systems with sophisticated automation can deliver clear benefits. These range from remote control and remote monitoring, frequent sampling at predefined time intervals, and enhanced traceability of the manufacturing process, through to advantages

of standardization across a facility. Automation also reduces the amount of human interaction with the process and can limit the chance for human error.

Implementation of the right control systems leads to an overall improved level of quality assurance and compliance of the operating process, as well as increasing efficiency and reproducibility, which is especially important for cGMP manufacturing.

3) Ease of implementation and qualification

One of the key advantages of single-use is that the bag is the reactor, and therefore you can take the “family” approach. That means if you already have single-use technologies in place, previous qualification data can be leveraged for new bioreactors when the same type of bag is used, in terms of materials and design. This can dramatically simplify and speed up the qualification process.

Fujifilm Diosynth already had a fully qualified and operational Xcellerex XDR-2000 at their Research Triangle Park site in North Carolina, USA, that they were happy with, so it made sense to duplicate this capacity at their Billingham manufacturing site in the UK. Installing the same equipment enabled three months to be taken off the installation time.

In addition, the experience Fujifilm Diosynth had in North Carolina helped in the technology transfer and qualification stages of the single-use facilities at the Billingham site. This family approach also means that the amount of work to validate additional capacity in the future will also be reduced.

“The right pairing of automation and control systems leads to an overall improved level of quality assurance and compliance”



Parrish Galliher
Chief Technology Officer,
Upstream BioProcess
GE Healthcare Life Sciences

4) Flexible design – Choose a design that allows you to scale down

When manufacturing biologics, it is important to have a bioreactor, or bioreactors, in place that allow volume flexibility. Biologics are high value products so you want to be able to manufacture only what is needed

and minimize waste. You need to understand not only the maximum capacity of a run, but also the minimum operating volume before deciding on your bioreactor.

The turndown ratio of a bioreactor is the difference between maximum operating volume and the minimum operating volume. Having a larger turndown factor has a number of benefits, for example, the size of the inoculum train can be reduced, because the inoculum is much smaller for the starting volume and the production reactor. That reduces the number of vessels that you need to buy, the size of facility you need to build, and the number of bags consumed per batch. It also reduces the overall operating and capital cost expenditures for the facility.

“We can exploit the family approach in single-use manufacturing to reduce the amount of work to validate additional capacity as we expand our facility”

Parrish Galliher
Chief Technology Officer,
Upstream BioProcess
GE Healthcare Life Sciences

The innovative design of the GE Healthcare Xcellerex-XDR bioreactor allows for up to a 5:1 volume turndown. This gives biomanufacturers like Fujifilm Diosynth a large dynamic range of volumes, allowing their processes to be run in a vessel that is specific for output needs and beneficial in minimizing waste.

5) Flexible design – Choose a design that is future-proof

Bioreactors can be specifically designed to readily support production scale changes. For single-use, if the whole range has a common overlapping design space, then the output from a 50 L, 100 L, 500 L, 1000 L, or 2000 L bioreactor will be the same, as long as the control parameters are kept within the recommended ranges.

This not only provides a whole range to pick and choose from, but means bioreactors can be “bolted on” anywhere along the workflow to suit needs. And, it simplifies the validation process.

At their North Carolina site, Fujifilm Diosynth had a range of bioreactors up to 1000 L from GE Healthcare’s BioProcess Xcellerex platform and added an additional 2000 L bioreactor in 2014. They

decided to mirror this approach at their Billingham site, where Xcellerex bioreactors up to 1000 L were initially installed and then later, in 2015, a 2000 L bioreactor was added.

“A large turndown ratio is important because it not only allows us to have a lot of varied options for scale-down, but it also allows us to have options for scaling up”

Sharyn Farnsworth
Associate Principal Scientist – Group Leader
Fujifilm Diosynth Biotechnologies
North Carolina, USA

This future-proofing concept was factored into the additional facility design. By taking a phased approach, Fujifilm Diosynth were able to start meeting customers’ needs and then add additional capacity as demand increased.

By adding duplicate single-use capacity, Fujifilm Diosynth had the ability to build on the experience they had from North Carolina and also had the flexibility to move customers’ “projects” from one site to another as capacity became available. This gives them the ability to efficiently serve customers through the drug development lifecycle.

Closing remark

Whatever technology platform you choose, it should have the performance, reliability, flexibility, and robustness to meet the demands of your processes. Beyond process performance, it is important to consider how control systems and automation come into play, how easy it is to implement the platform, and if the design is flexible enough to support varying production volumes today and in the future.

“Having a bioreactor range from small scale through to large and then duplicating this capacity gave us the ability to serve customers through the drug development lifecycle”



Mark Douglas
Head of Strategic Business Development
Fujifilm Diosynth Biotechnologies
Billingham, UK

Choosing your single-use technology supplier

If you have decided to expand your biomanufacturing capacity with single-use technologies, it's important to develop a detailed set of criteria against which you can assess potential technology suppliers.

Choosing an existing supplier can have its advantages, such as simplifying procurement, but ultimately the decision will depend on a number of contributing factors.

These factors include the technology offering (equipment, systems, and consumables), company and technology reputation, initial capital expenditure, running costs, expected implementation time, availability of on-going service and support, and flexibility as the industry evolves over time.

In all cases, it is essential to find a single-use technology supplier with the potential to be a true partner, working alongside you to meet your objectives now and into the future.

5 key considerations when choosing a single-use technology supplier

1) Assess performance and flexibility

Clearly the technology itself is an important factor. As an industry, we tend to look for and trust sound scientifically proven solutions. This means finding the right balance between having a technology that pushes the boundaries in terms of performance and a proven track record.

To assess performance, first you should look at whether the single-use technology can deliver what it claims, ideally through extensive proof of concept studies. Then, as with any supplier selection, you should think about costs, delivery time, and ability to service.

“A truly strategic supplier thinks about how they can work with you to future-proof your process”



Morgan Norris
General Manager,
Upstream BioProcess
GE Healthcare Life Sciences



However, a truly strategic supplier is a company that is thinking about how they can work with you to future-proof your process. This means that they are investing in product manufacturing capacity to best fit your future needs, expanding and improving their product ranges, and having a deep understanding of the processes that you're running in order to be able to best support your needs going forward.

For contract development manufacturer Fujifilm Diosynth, being able to offer their customers a flexible solution is critical. They aim to support customers all the way from initial clinical trials through to commercial manufacture, and be able to scale-up or scale-out at every stage as needed.

Having already adopted GE Healthcare's BioProcess single-use platform at their site in Research Triangle Park, North Carolina, USA, Fujifilm Diosynth decided to expand their manufacturing site in Billingham, UK, by adding duplicate single-use biomanufacturing capacity to address rising customer needs. This brought flexibility of scale and, importantly, the ability to smoothly and efficiently transfer programs from site to site.

2) Review existing supplier relationships

Single-use technology providers offer unique solutions to support different industry demands. Your choice of supplier will depend on what your needs are and how a given supplier can potentially support your needs.

If you already have experience with single-use technologies in-house or through outsourcing, a logical step is to review these relationships, especially current suppliers, and any previously delivered projects to see what can be leveraged for future projects.

In terms of existing single-use suppliers, Fujifilm Diosynth had worked extensively with GE Healthcare to successfully establish a single-use platform at their North Carolina site. They installed

“We wanted to critically assess the existing supplier base we had to make sure we fully leveraged those relationships”



Nick Martin
Head of Operations
Fujifilm Diosynth Biotechnologies
Billingham, UK

a suite of Xcellerex XDR bioreactors, as well as other GE technologies to support process development and manufacturing.

By the end of that project, GE Healthcare became more than just a supplier to Fujifilm Diosynth. They established a close network of single-use experts from both companies, working in partnership. This positive experience certainly strengthened GE Healthcare's standing in the selection process for choosing a supplier for the Billingham expansion.

3) Understand ability to meet multiple needs

Facing increasing pressures to ensure that projects and processes are working efficiently and are as streamlined as possible is common across all aspects of the industry. As such, it can be beneficial to use suppliers that can meet multiple needs, which also simplifies procurement.

While selection of the right production-scale bioreactor may be the main end goal, it's important to see what other elements your supplier can offer to support across the complete drug life cycle. You might find that your potential single-use technology supplier is actually already a supplier supporting other elements of your business.

“GE brings to the table a wide range of technical documents and knowledge to support all the way from R&D through to manufacturing”



Mike Jones
Director of Manufacturing
Fujifilm Diosynth Biotechnologies
Texas, USA

Companies like GE Healthcare offer a broad range of tools, technology, and technical knowhow, spanning R&D, through to process development, and upstream and downstream bioprocessing.

For example, GE Healthcare's WAVE bioreactors can be used for seed trains and the ÄKTA™ ready chromatography system is designed for large-scale purification. These technologies are supported by UNICORN™ software, which is widely used and recognized as being comprehensive and easy-to-use and enables operators to control multiple equipment from a single operating system.

4) Determine facility design support capabilities

Before deciding which single-use technology platform and supplier to choose, it's important to consider how you are going to implement and integrate that technology into your operational footprint. Will this addition fit your existing bioprocess workflow or will you need to create a new workflow?

You should select a single-use technology supplier that has deep expertise across all aspects of biomanufacturing. Ideally, this expertise would span designing new manufacturing capacity to cGMP requirements through to deep operational knowledge across the bioprocessing workflow. In doing so, your potential supplier will be in a position to help you create a single-use facility design that maximises operational efficiency.

“You should select a single-use technology supplier that has deep expertise across all aspects of biomanufacturing”

Morgan Norris
General Manager,
Upstream BioProcess
GE Healthcare Life Sciences

For Fujifilm Diosynth, one of the key reasons they chose to continue to use GE Healthcare as their single-use technology supplier was because of extensive industry knowledge and technical expertise, and the ability to support their facility design.

This included maximizing the efficiency from a control room standpoint, which included proposing a central service area in the middle of the building, opting for relatively low classification rooms where possible, and advising on optimized material and people flow control. In addition, GE Healthcare had the knowledge and experience to be able to advise on how this could be done in accordance with regulatory requirements.

5) Evaluate training capabilities

In order to operate your new single-use facility, your manufacturing operations personnel will need the appropriate training. You, therefore, need to understand what your potential technology supplier offers by way of training.

“We developed a training program in conjunction with GE Healthcare that ran in parallel to the installation of the equipment”

Nick Martin,
Head of Operations
Fujifilm Diosynth Biotechnologies
Billingham, UK

Depending on your business goals and supporting staff, you might only need a generic, blanket training program. More often, you will need a training program that can be tailored to suit your personnel, their varied skill sets, and bioprocess challenges.

To ensure that Fujifilm Diosynth could start accessing their new biomanufacturing capacity as soon as it was validated, they developed an extensive training program, conducted by GE, which ran in parallel with the installation.

Fujifilm Diosynth was also able to access expert advice on the technology transfer process for moving to a single-use technology-based platform, and received dedicated technical support throughout installation and validation.

Closing remark

In summary, you should choose a supplier that has a track record of quality, a strong supply chain, an ability to deliver, and a deep understanding of your processes. If you can combine that with one that wants to work with you to implement and look for new solutions together, you will have a supplier that can support you going forward.

Future-proofing your single-use biomanufacturing capacity

The pharmaceutical and biotech industry makes life-changing and life-giving medicines for patients across the globe. To ensure that we can meet demand, and not endanger patient safety, it is essential to have a strong and secure supply chain with the right suppliers to support the complete drug development lifecycle.

Currently, seven of the top ten drugs in the industry are biologics, and they are forming an increasing share in drug development pipelines. These biologics are often high value, niche drugs that need to be produced in small volume batches, which are well-suited to be manufactured using single-use technologies.

If you, as a pharmaceutical company or contract manufacturing organization, are looking to produce biologics with single-use manufacturing technologies, you need to think about how you can modify your capacity to ensure it remains flexible enough to meet your needs today and into the future.

The plug-and-play nature of single-use enables you to incorporate new technologies and innovations into the process workflow as they become available. But beyond the flexibility of the single-use platform, you need to consider a range of other factors to ensure your capacity will meet your long-term needs. It is important to note that these factors are different from those associated with traditional stainless steel technologies.



5 key considerations to future-proof your single-use biomanufacturing capacity

1) Select a supplier who understands your needs

Making therapeutic drugs is a long-term commitment, so your suppliers must be able to support your manufacturing process now and for years to come. The security of supply of these drugs is clearly of vital importance to the patients, the regulators, and the drug companies themselves.

Drug companies and regulators look upstream into the supply chain to suppliers to ensure that they also have a robust security of supply and can continue to provide key ingredients and components that, in turn, result in the patients receiving the medicines they need.

“We’re partnering for life to advance tomorrow’s medicines”



Martin Meeson
President and COO
Fujifilm Diosynth Biotechnologies
USA

This means choosing suppliers that not only provide the raw materials, equipment, and consumables you need, but also work with you to understand your business needs, processes, and plans for the future. Choosing an established, committed, global company can help ensure long-term engagement and a solid supplier partnership.

When Fujifilm Diosynth was selecting a single-use technology provider, they were looking for a long-term committed partnership based on trust and a mutual understanding of needs. In GE Healthcare, they identified a partner with a strong heritage, commercial stability, and leadership position in many industrial fields. Their extensive bioprocessing portfolio, including innovative single-use technologies and proven chromatography purification platforms, gave Fujifilm Diosynth the confidence that they had found a long-term partner.

2) Determine credibility in single-use bioprocessing

When choosing a supplier to partner with, it is important to understand and assess the supplier’s relative credibility in terms of both the company itself, and its relevant technology offering. For contract development and manufacturing organizations (CDMOs), like Fujifilm Diosynth, who are trying to attract many different types of customers, it is especially important to have supporting technologies that are recognized in the industry.

“When you’re trying to attract many different types of customers, it’s very important to have some recognition with the technologies you have chosen”

Martin Meeson
President and COO
Fujifilm Diosynth Biotechnologies
USA

When Fujifilm Diosynth first decided to add single-use manufacturing capacity to their site in Research Triangle Park, North Carolina, USA, they were early adopters of the technology. Fujifilm Diosynth went through a rigorous selection process for potential single-use suppliers that evaluated the technologies they were looking to implement, as well as the companies themselves.

Technology performance and reputation were certainly key in Fujifilm Diosynth’s decision to choose GE Healthcare’s BioProcess Xcellerex platform, which they knew would resonate well with their customers.

3) Assess the security of supply program

Only if your supplier’s supply chain is robust, will yours be, too. While there are benefits to outsourcing certain raw materials from a wide supply base, it can also be beneficial to have more control over the supply chain by developing robust solutions with a single strategic partner.

For security in any supply chain, it is important to keep things as simple and robust as possible. There are underlying principles common to all security of supply programs, irrespective of industry or product. Notably, your business continuity and security of supply plans need to be developed based on the specific raw material or finished product and, wherever possible, comply to a recognized accredited standard.

“For security of supply in our supply chain, GE Life Sciences is striving to make things as simple and robust as we can”



Jan Makela
General Manager,
BioProcess
GE Healthcare Life Sciences

In making its selection, Fujifilm Diosynth established that GE Healthcare had a comprehensive security of supply program in place. This includes ISO 22301 accredited business continuity plans in addition to long-term strategic supply agreements with raw material suppliers, and strategic safety stocks.

This strategy enables GE Healthcare to be able to continue to supply their local and global customers with, for example, single-use components and cell culture media even in the event of any unforeseen supply disruptions affecting production at a given site, such as natural disasters.

Overall, it is important to have visibility throughout the supply chain, including change control programs that enable tracking and tracing of components. This will allow you to see how any issues might potentially impact the supply chain and predetermine contingency plans should these happen.

4) Fulfill regulatory requirements

The biopharmaceutical industry is highly regulated, and those regulations are constantly evolving to keep pace with the dynamic innovative changes being seen almost daily. It is vital to anticipate future regulatory requirements and select a supplier that has the foresight to provide you with “future-proofed” technologies to support your biomanufacturing needs now and going forward.

It is widely expected that regulators will increasingly demand more details and assessments of the impact of single-use technologies on the resulting biopharmaceutical end product.

In anticipation of predicted future regulatory demands, GE Healthcare is investing in broadening the understanding of the impact of extractables and leachables (E&L) and has created a dedicated E&L laboratory at their site in Uppsala, Sweden. Working in collaboration with VR Analytical, the intent is to share compound data, structures, and IDs to support the accurate and complete identification of E&L compounds.

We are also seeing both suppliers and users across the industry becoming active members of trade groups, like BPOG, who have dedicated sub-teams addressing key areas. One area that is receiving increasing interest, specifically from the FDA, is data integrity.

“E&L is clearly a big focus for the regulators, which we are also investing in”

Jan Makela
General Manager,
BioProcess
GE Healthcare Life Sciences

The industry is working together to assess the many data integrity requirements, and pharmaceutical companies often look to their suppliers to take an active role in supporting them. CDMOs like Fujifilm Diosynth and tools and technologies suppliers like GE Healthcare are working together to understand this, and to help their respective customers comply.

5) Ensure customer service and support

When therapeutics are manufactured, they need to be reliably delivered to ensure patient safety. It is crucial that your chosen supplier provides excellent customer support not just during installation, qualification and start-up of your process, but also throughout the life of your products.

Fujifilm Diosynth often runs operations around the clock and needed 24/7 support from a supplier to help rectify any issues. Supply chain robustness must encapsulate high quality service and support to deliver a comprehensive solution that meets the demands of the industry.

Closing remark

In summary, when commissioning new single-use manufacturing capacity, it's not enough to consider requirements at a single point in time. You have to consider how flexible that capacity is to both suit your needs now and how it can be tailored to suit future needs. You need to evaluate all aspects of the supplier, not just the technology offering to ensure your capacity is future-proofed. By evaluating the considerations discussed here, you should be able to choose a supplier that can give you the confidence that you can reliably deliver life-saving therapeutics to patients now and in the future.

“At Fujifilm Diosynth, we are making life-changing medicines so it is really important that our suppliers, like GE Healthcare, are robust and partner with us on that journey”

Martin Meeson
President and COO
Fujifilm Diosynth Biotechnologies
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