CASE STUDY: EXPANDING PRODUCTION CAPACITY FOR HIGH PRODUCING MAB PROCESSES

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SITUATION

A large, well-established biotech company with an expanding pipeline needed to expand its manufacturing capacity.

A project team was assembled, and they developed a set of designs and recommendations to build a facility that would produce one ton per year of antibody product.

ABOUT

Parrish has over 30 years of experience in bioprocessing, during which time he has helped build development, manufacturing and CMC teams who developed scalable bioprocesses, built biomanufacturing facilities, and achieved commercial licensure.

In this case study, Parrish shares his experience of developing new facilities and switching to primarily single-use technologies. Expect a visit to the drawing board along the way…

CHALLENGES

After about five years of evaluating different design options, the project team presented a final version to executive management. However, the executive management team had been recently made aware of advances in innovation in biomanufacturing and insisted the new facility needed a major reduction in capital and operating costs compared to a traditional stainless-steel facility.

The project team returned to the drawing board to evaluate the entire process, taking a holistic view of the way the drug is produced. This also involved a review of the facility and how it was designed for operations; getting materials in and out, getting media and buffers prepared and managing the product through the process train.

SOLUTIONS

AA new design was presented to management based on the new objective to significantly reduce both capital and manufacturing costs, and it was approved. It was decided that to meet the requirements of reducing capital and operating costs a very large percentage of the operations should be handled by single-use technology. Consequently, the next step was to build this facility and to do that the project team had to line up several single-use equipment vendors.

Single-use technologies were implemented from media prep right through to buffer prep, to seed train and bioreactor and through the downstream train, including the surge volumes between chromatography steps, right through to the virus filtration step at the end of the process. Various options were tested over several years by the process development team and there was a lot of work done with real drugs to verify the validity and performance of those different options. That data was reviewed by the executive management team to ensure the project stayed on track.

The build was completed and while there were some start-up challenges, the application of single-use technology was successful across all the unit operations right to bulk fill. Once the facility was up and running and had been through validation, it was decided to license the facility, which required inspections from the FDA, EMA and the Japanese authority.

In addition, the productivity of the processes continued to improve as they were scaled up and it was possible to tweak the process to improve yields both upstream and downstream. In the downstream, a connected process was deployed, rather than a continuous process. The connected process had no gaps in between the chromatography steps i.e., the product is batched in the first chromatography step, held in a surge bag and then loaded right onto the second column and run down the line to the end of the process. Media and buffer prep operations were also automated so media and buffer powders arrive at the facility in bags and are automatically loaded into solution containers to make the media and buffers.

Outcomes

The executive team wanted to know what the bottom line of the facility was. Here's a summary:

-75% reduction in the footprint of the facility
-75% reduction in capital costs
-30% reduction in manufacturing labour because they went to an open facility design which removed the need for separate cleanrooms for up and downstream
-80% reduction in energy and water consumption due to the single-use technology
-80% reduction in waste and discharge

The energy reduction was mainly because the need to use cleaning steam and cleaning fluid for the stainless steel equipment had been eradicated. There was also a concern about the amount of solid waste from the single-use materials, but it turns out this was offset by the elimination of the number of barrels of detergents, acids and alkalis normally used for clean-in-place operations.

Overall manufacturing costs were reduced by 60%.

In summary, the benefits of the single-use technology and the open architecture facility converted into a very dramatic reduction in operating costs and the facility passed all three inspections with regulatory agencies and is now a commercial facility.

The executive management team were very pleased with the outcome.

LESSONS

Do your homework in terms of process development and evaluating different single use vendors. There are many of them and there are supply chain shortages that can threaten schedules, so it's advisable to get your process development team to evaluate different vendors so you can go out for competitive bids when sourcing single-use components for your facility.

This case study was presented at a recent virtual event 'Pharma Shifts to Biologics', which included six in depth case studies and networking sessions.

Details of future events can be found here.

You can watch Parish's case study in full and on demand here

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