



Lonza Biologics Expansion Singapore (LBXS1 and LBXS2), Singapore

CLIENT:

Lonza Biologics

PROJECT VALUE:

\$290 million and \$330 million

PROJECT DURATION:

July 2006 – September 2008 and February 2008 – September 2009

SERVICES PROVIDED:

Front-end engineering design and transfer
Modeling study
Process design
3-D process model development
Process procurement
Process detail design and associated support, including onsite construction support in Singapore



Lonza Biologics is the world's leading supplier of active chemical ingredients, intermediates, and biotechnology solutions for the pharmaceutical and agrochemical industries. Lonza is also the leading contract manufacturer of therapeutic monoclonal antibodies and recombinant proteins from mammalian cell cultures. To address its expanding markets, Lonza initially selected Parsons in 2000 as its program manager for an engineering, procurement, and construction management project that expanded Lonza's East Coast facility in Portsmouth, NH. Because of our shared success on this state-of-the-art facility—the new production plant was completed in late 2003 and began product manufacturing in May 2004—we have worked in tandem with Lonza to improve its efficiency and effectiveness by providing operational support to its major expansions at other facilities, in addition to receiving more than \$50 million in supplemental projects at its Portsmouth facility.

However, to continue strengthening its leading position as a global custom manufacturer of biopharmaceuticals, Lonza required increased large-scale contract manufacturing capacity. In 2006, Lonza selected Parsons to provide procurement management and process engineering design for the Lonza Biologics Expansion Singapore (LBXS1), its new large-scale mammalian biopharmaceutical production plant in Singapore. Mechanically completed in September 2008, this 270,000-ft² stand-alone facility—the largest and the first of its kind in the region—provides space



LBXS1 construction site

for manufacturing, quality control laboratories, offices, and office/facility support (workshops, storage, shipping, receiving, etc.). Lonza has contracted 100% of LBXS1's capacity to Genentech, and Genentech has an option to purchase the facility.

Parsons managed the process design and procurement of more than \$60 million of process equipment and systems for this 80,000-liter, large-scale mammalian biopharmaceutical production plant. The process equipment was fabricated, tested, and disassembled in the United States and then shipped to Singapore for reassembly onsite. Our front-end engineering design study for this fast-track project prepared Lonza for the localized design effort in Singapore because this effort was based on our experience with the Lonza Biologics plant in Portsmouth. We also managed the coordination and development of a 3-D model between the design teams in the United States and Singapore and the super-skid vendors supporting the coordinated onsite installation in Singapore of high-purity process and mechanical systems.

Parsons' U.S.-based engineering team effort supported the following major activities:

- Process P&ID development
- 3-D process model generation
- Design, procurement, fabrication, and testing of process equipment and modular/super-skid systems
- Shipment to Singapore of disassembled equipment and systems



Workers reassemble process equipment in LBXS1 fermentation suite

Process utilities design included water for injection generation and distribution, clean steam generation and distribution, clean-in-place bulk chemical distribution (A & B), and bulk caustic dilution and distribution. Process engineering and procurement support continued through September 2008 and finished with the successful mechanical completion of reassembling and installing the modular bioreactor system in Singapore.

Parsons also worked with Lonza's users to develop a concept that allowed the flexibility to share open laboratory and support space between/among user groups. In addition, we provided ongoing site support for process design coordination, process procurement receipt, and installation coordination during the construction execution phase.



LBXS1 fermentation suite containing 20,000-liter bioreactor with operators commissioning the system

Based on its strategy to expand operations in Singapore, Lonza decided to build a second facility—Lonza Biologics Expansion Singapore Phase 2 (LBXS2)—under the name of Lonza Biologics Tuas, located in Singapore's Tuas Biomedical Park. The Tuas facility has four mammalian cell bioreactor trains, each with a flexible capacity of 1,000 to 20,000 liters—inclusive of the respective purification systems. This second facility is scheduled for mechanical completion in June 2010.

Parsons is serving as process design and process equipment procurement contractor to Lonza Biologics Tuas for the LBXS2 project. Parsons' services range from process design and process design procurement, through factory acceptance testing, to shipment to Singapore. The LBXS2 facility is a replica of LBXS1, with adjustments in process design to allow for high-titer capability at 5,000 liters (versus 20,000 liters) at each of four bioreactors.



Lonza Singapore employee at LBXS1 chromatography skid in purification suite

Parsons is also responsible for the following deliverables:

- Procurement – Key activities focus on placing orders for the long-lead equipment (vessels and modules/super-skids) to support the construction schedule. Other key activities include:
 - ▶ Develop and finalize bid strategy in terms of modular versus stick-built.
 - ▶ Establish strategy for U.S. versus overseas vendors.
 - ▶ Confirm vessel buyout strategy.
 - ▶ Bid/confirm process of the project's price agreements.

- Process Engineering – The following tasks are aligned to support the procurement of long-lead process equipment:
 - ▶ Issue P&IDs, specifications, and data sheets for bioreactors and multiple vessel orders (small and large).
 - ▶ Identify design changes with regard to high-titer cell culture processes, changes required by potential clients (who will manufacture high-titer biologics) for whom Lonza is building its LBXS2, and field-coordinated changes.
- Instrumentation and Controls
 - ▶ Revise basis of design documents to establish instrumentation and valve standards, cabinet specifications, and standards for instrument, pneumatic, and wiring labeling.
 - ▶ Develop and administer web-based controls library for vendor access.
 - ▶ Develop and administer web-based CAD library for shared global access.
- Modeling
 - ▶ Begin design layouts/studies of areas that change from the original LBXS1 design to expedite module RFP and assess impact to existing LBXS1 model. These study areas include fermentation, purification, and ethanol/flammable dispensary.
 - ▶ Identify model areas where there are no design changes from the original LBXS1 and input those areas into the LBXS2 model.

Since teaming together in 2000, Parsons and Lonza have developed an excellent working relationship that has led to Lonza's awarding Parsons more than \$450 million in combined projects.



Top of a product-holding tank in LBXS1 purification suite



LBXS2 construction site