



## INDUSTRY VISIT 2 : BIOCON SDN BHD

# *Integrating Biotechnology and Computing Systems*

### Introduction

On 23 December 2025, students from Computer Network and Security and Bioinformatics programs, under the supervision of Dr. Azurah for Technology and Information System course, attended an industrial visit at Biocon Sdn. Bhd. in Iskandar Puteri, Johor. The objective of industrial visit is to indicate students the real-life applications of theoretical concepts and enhance their understanding of industrial practices highlighted on biotechnology operations. Furthermore, provided students with an opportunity to understand computer-assisted manufacturing processes, observe the lab-to-market workflow and gain exposure to the integration of computing, networking, and biology. This visit started with a simple ice-breaking session about how the innovative technology has an impact on health sector, following with the introduction of company's background and achievements. A key highlight of the visit was the opportunity to visit different departments within the industry such as Drug Substance, Research and Development also Drug Product.



### Company Overview

Biocon is a biopharmaceutical company that based in India since 1978 and has grown into one of the main suppliers in active pharmaceutical ingredients ( API ) for approximately 120 countries worldwide. This company entered Malaysia in 2010, currently recognized as Asia's largest supplier of biopharma insulin and manufacturing specialize in the production of human insulins and insulin analogs. Biocon's facility in Iskandar Puteri, Johor, Malaysia has became the first and only biopharmaceutical sterile injectables facility to receive U.S Food and Drug Administration ( FDA ) and European Medicines Agency ( EMA ) approvals across Malaysia.



## Key Observations

Under the Regulatory Science Department, lab research is translated into commercial products via a structured digital process involving application submission, screening, evaluation, and final approval or rejection. They ensured that every product made is valid through lab test before selling it. They save the data from the product tested every time and document it for them to trace the difference and helps to make the adjustment.

Computing systems support these processes through automated manufacturing, quality control, and data management. A dedicated IT department ensures smooth integration of computing and biology by handling system issues and performing regular data backups to secure private servers. It means in a large-scale manufacturing networking and data flow ensures that every information is backed up to prevent misinterpretation.

## Role of Computing and Information Systems

In upstream processing, BIOCON uses computer-based monitoring systems to control key bioprocess parameters such as temperature, pH, agitation speed, and dissolved oxygen. These automated systems improve process accuracy, consistency, and efficiency while reducing human error. They also help identify equipment issues early, minimizing production losses and discarded products. BIOCON applies Enterprise Resource Planning (ERP) systems to manage raw materials, inventory, production scheduling, procurement, and distribution. This ensures efficient resource utilization, material traceability, and compliance with regulatory documentation requirements. The company also uses computerized Quality Management Systems (QMS) to record laboratory test results, manage deviations and corrective actions (CAPA), and maintain data integrity. These systems support compliance with FDA, EMA, and other international regulatory standards. In production facilities, real-time machine monitoring and predictive maintenance systems are used to track equipment performance and prevent unexpected breakdowns, reducing downtime and ensuring continuous production. Additionally, BIOCON maintains centralized databases, sensors, and automation systems to collect and store real-time production and quality data securely. Automation reduces manual intervention, limits human-related contamination, improves process reliability, and supports data-driven decision-making in insulin production.

## Biotechnology Operations Observed

At BIOCON, insulin production involves both upstream and downstream processing. In upstream operations, genetically engineered microorganisms are cultivated in fermenters for about three days, with fresh media added during the process to promote cell growth and insulin formation. Approximately 70% of the product is sent to laboratories for quality analysis, while waste materials are carefully treated to prevent environmental pollution. In downstream processing, the fermentation product is transferred to a cell cage, where the supernatant moves on to the purification stage. Purification is carried out in graded cleanroom areas (Grades A-D) based on particle control, with Grade A being the highest standard. Strict microbial control is applied, especially in Grade B and C areas, to minimize contamination. The purified insulin is then sent to a freeze dryer for 80 hours. Throughout the process, in-process quality checks are conducted to ensure purity levels of 98% to 99.9%. BIOCON places strong emphasis on Good Manufacturing Practices (GMP), strict hygiene, cleanroom protocols, and Standard Operating Procedures (SOPs). The use of Personal Protective Equipment (PPE) and regular safety training ensures product safety, quality, and compliance with international standards.





## Learning Outcomes

The visit to Biocon Sdn. Bhd. was an eye opening experience that humanized the technical challenges of the biotech industry. It demonstrated that while automation and innovative software drive efficiency the human element through manual oversight and strategic decision making remains vital. Seeing the intersection of secure networking and life saving medicine has provided us with a new perspective on our career paths. We left the facility with a deeper appreciation for how our studies in computing can directly contribute to global healthcare.

## Conclusions

By connecting our studies to the real world, this trip showed how Computer Network & Security and Bioinformatics are key to making medicine. We saw the step by step process of making a product including how computers and software control things like temperature to keep everything exact. We also learned how important it is to keep data safe using private servers and following strict safety rules. Overall, we saw that mixing smart technology with human care is what makes life saving medicine, like insulin safe for everyone.



## Reflections

### 1. NORALYAA WAFAA BINTI MOHD NAWAWI (A25CS0297)

Through this visit, I have gained new perspectives on the significance and contribution of modern technologies into the medical field. Furthermore, I learned that despite innovations that allowing automated processing, occasional manual assistance is still crucial to achieve the expected outcomes. In Biocon, the insulin production is fully conducted through computer system to maintain the accuracy in each process.

### 3. LIM LEE XIANG (A25CS0083)

During the visit, I have learnt that how the impact of technology could help the communication across globe to run smoothly and they have explained in various knowledge point which is a whole new experience and professional. I also learned that the key point of innovation is to help us on our works and solve daily life problem. For example, in BIOCON they use computer to monitor the machine to prevent malfunctioning and prevent loss which also ease the quality of their works.

### 2. MUHAMMAD ALIFF SAFFUWAN BIN MOHD AZMI (A25CS0263)

The visit gave me a new perspective on how computer networking and security are implemented in the medical manufacturing sector. We learned the step by step process of insulin production, from R&D to the final market release. I was particularly interested to see that Biocon uses an offline networking system with a local server for their logging, this security focused approach makes me very interested in pursuing a career there.

### 4. ELSEYAH OMAR MOH A (A25CS0380)

The trip to Biocon gave me a lot of insight into the application of technology in the medical and biotech field. I was able to learn more about computing ideas such as secure networking and system integration and their relevance in a working environment. I was able to make connections between my academics and practical applications as well as generate further interest in a career in biotech and computing. The trip to Biocon gave me a chance to learn about a field that I could further pursue with a lot of interest.