

## ABSTRACT

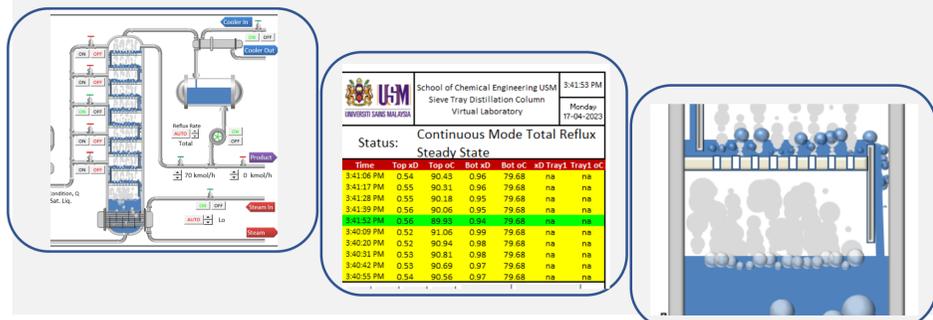
The developed virtual lab simulation is a sieve tray distillation column, designed to study the distillation of various binary mixtures. The simulation offers four operating modes, including total reflux batch mode, varying reflux ratio batch mode, total reflux continuous mode, and varying reflux ratio continuous mode. These modes enable students to learn about start-up and shutdown procedures, operating the column, and studying the material balance and vapor-liquid equilibria in the distillation process.

The simulation is an excellent tool for understanding distillation column operations in a safe and controlled environment, without the need for physical equipment. The virtual lab can be accessed remotely, which makes it convenient for students to study and experiment with the distillation process without being present in a physical laboratory. Overall, the simulation provides students with valuable hands-on experience and a deeper understanding of distillation column operations, essential in chemical engineering and other related fields.

## OBJECTIVES

The objectives of the sieve tray distillation column virtual lab are:

- To provide students with a safe and controlled environment to study the distillation of binary mixtures.
- To enable students to understand the start-up and shutdown procedures, operating the column, and studying the material balance and vapor-liquid equilibria in the distillation process.
- To enable students to experiment with the four operating modes available in the simulation, including total reflux batch mode, varying reflux ratio batch mode, total reflux continuous mode, and varying reflux ratio continuous mode.
- To provide students with hands-on experience and a deeper understanding of distillation column operations, essential in chemical engineering and other related fields.
- To make the simulation accessible remotely, allowing students to study and experiment with the distillation process from anywhere at any time.
- To help students develop critical thinking and problem-solving skills through the analysis and interpretation of simulation results.
- To provide a cost-effective and efficient alternative to physical laboratory experiments, reducing the need for expensive equipment and materials.



## ADDED VALUES

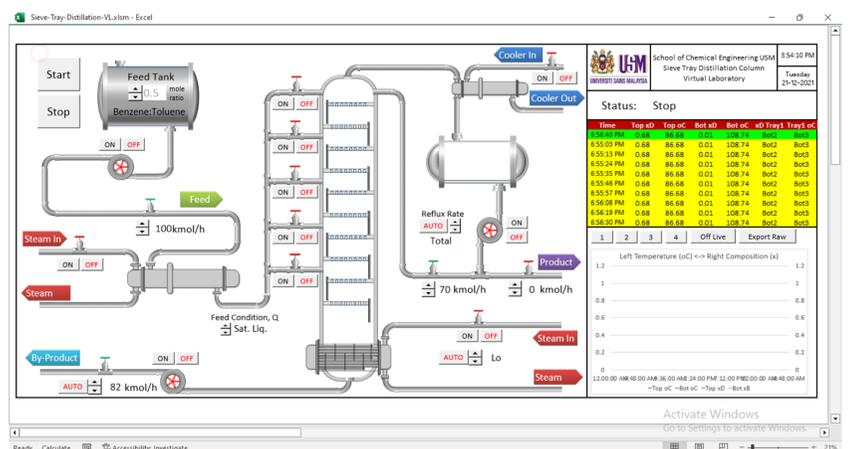
- 1) Preparing for industry: The virtual lab provides students with practical experience that can be applied to real-world situations in the chemical engineering industry.
- 2) Self-paced learning: The virtual lab allows students to learn at their own pace, enabling them to review complex concepts as many times as needed before moving on to the next topic.

## USEFULNESS

- 1) Flexibility: The virtual lab offers students the flexibility to experiment with the distillation process at any time and from anywhere, as long as they have access to an internet connection.
- 2) Safety: Since the experiment is conducted virtually, there are no safety hazards associated with handling chemicals and operating physical equipment, which makes it safer for students.
- 3) Cost-effective: Setting up a distillation column in a physical laboratory can be expensive. The virtual lab offers a cost-effective alternative that eliminates the need for expensive equipment and materials.
- 4) Accessibility: The virtual lab can be accessed remotely, making it more accessible to a broader range of students.
- 5) Realistic simulation: The virtual lab provides a realistic simulation of the distillation column process, enabling students to gain hands-on experience and a deeper understanding of the process.

## COMMERCIALIZATION POTENTIAL

Educational institutions could use the software as a tool for teaching and research purposes, while training and consulting companies could use it for employee and client training. Additionally, online education platforms could offer the virtual lab simulation as part of their online course offerings. With a broad range of potential customers across various industries, the project has significant commercialization potential.



## RECOGNITION

The reception of the sieve tray distillation column virtual lab project among users has been overwhelmingly positive. Users appreciate the opportunity to gain practical experience in distillation column operations and to experiment with different operating modes in a safe and controlled environment. They find the virtual lab intuitive and user-friendly, with clear instructions and immediate feedback on their performance.



Nor Irwin Basir  
School of Chem. Eng.



Prof. Dr. Ir. Zainal Ahmad  
School of Chem. Eng.



Assoc. Prof. Dr. Mohamad Zailani Abu Bakar  
School of Chem. Eng.



Assoc. Prof. Dr. Syamsul Rizal Abd Shukor  
School of Chem. Eng.