

Lab 2: WITNESS Model

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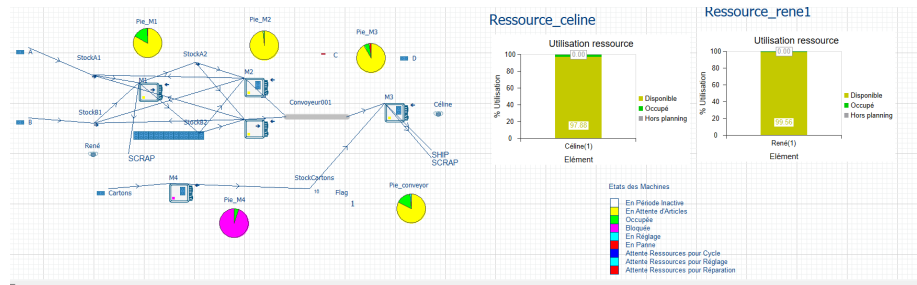
1 Introduction

In modern production systems, optimizing material flow and resource utilization is essential for achieving operational efficiency and meeting demand requirements. The given model represents a simulation of a manufacturing and assembly process involving multiple operations, storage facilities, and transportation stages. The system handles three main types of components—Articles A, B, and Cartons—which undergo various operations and are ultimately assembled into a final product for shipment.

This simulation examines the behavior of the production line under specific parameters, such as inter-arrival times, stock capacities, and machine cycle times. Key elements include FIFO-based storage systems, a conveyor for transferring components, and parallel assembly machines designed to process components efficiently. By analyzing the model, this study aims to identify bottlenecks, evaluate system performance, and propose improvements to enhance throughput and reduce lead times.

2 Final Model

After thoroughly understanding the process and implementing the necessary steps, the final model was developed in WITNESS:



This is the result after running the simulation for 5,000 minutes to evaluate the behavior of the various elements in the system.

3 Task Resolution

3.1 Bottleneck of the System

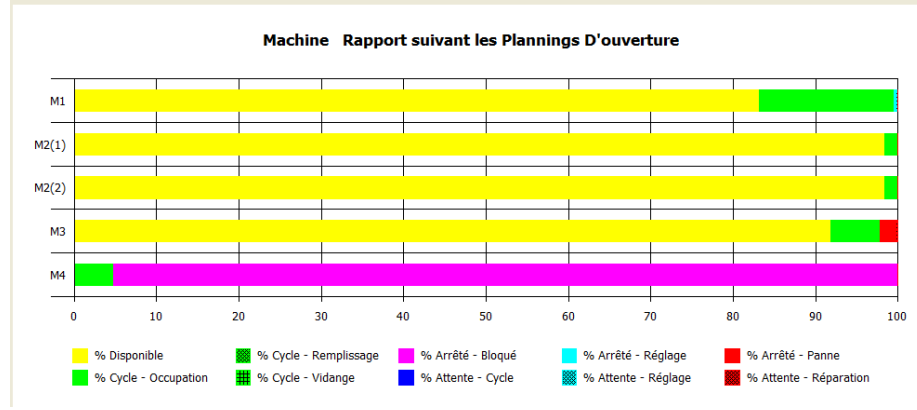


Figure 2: Machine Utilization Rates

From Figure 2, it is evident that the bottleneck of the system is Machine M1, as it has the highest utilization percentage. However, it is important to note that the primary limitation in this simulation is the restricted number of items entering the system, which is relatively low compared to the total simulation time. This constraint impacts the overall performance analysis.

4 Conclusion

The WITNESS simulation provided valuable insights into the performance and limitations of the production system. Key findings include:

- Machine M1 is the bottleneck of the system, as it exhibits the highest utilization, which suggests that its capacity is critical to the overall production flow.
- The restricted input of items into the system, relative to the simulation time, limits the ability to fully evaluate the long-term behavior and potential improvements of the model.
- FIFO-based stock management and the use of parallel assembly machines contribute to a balanced workflow but are still constrained by upstream bottlenecks.

To improve system performance, addressing the bottleneck at Machine M1 should be prioritized. Potential solutions include increasing the capacity of M1, optimizing its cycle time, or redistributing workloads across other resources. Future simulations could include adjustments to input parameters, such as increased item flow, to better reflect real-world operational conditions.