Lab 1: WITNESS Control Post

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1 Introduction

In industrial systems, the optimization of processes and resource allocation is critical to ensuring efficiency and minimizing downtime. This report focuses on the simulation and analysis of a control post operation, performed using the WITNESS simulation software.

The control post is designed to inspect parts supplied at regular intervals of 10 minutes. These parts are classified into four types (A, B, C, and D), each requiring a specific amount of time for inspection: 1, 2, 3, and 4 minutes, respectively. Operator OP1 is responsible for performing the inspection tasks using a control machine equipped with three distinct tools, each dedicated to a particular type of operation.

Through the WITNESS simulation, we aim to gain insights into system bottlenecks, the utilization of the operator and tools, and the overall efficiency of the control process. This report presents the methodology, results, and recommendations derived from the analysis.

2 Final Model

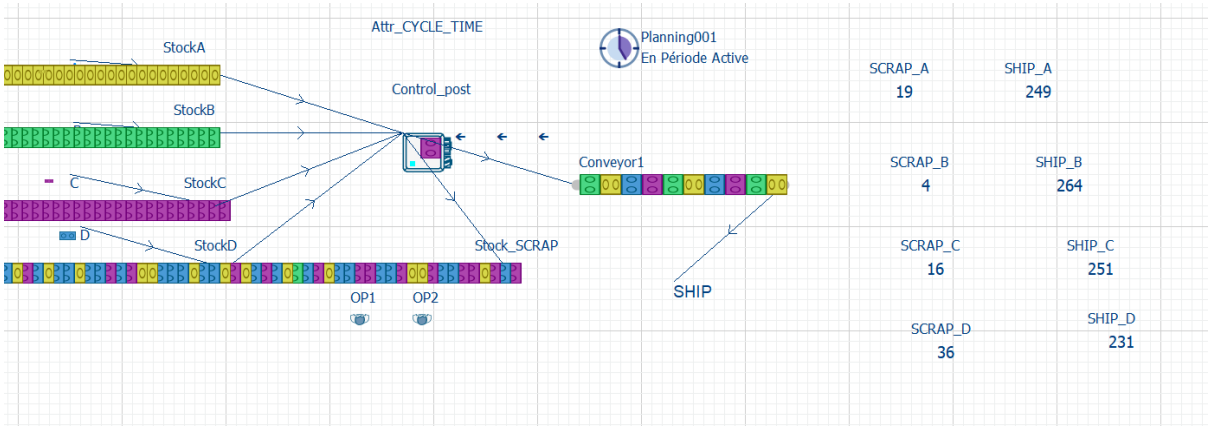

Figure 1: Final Model

Nom	Total entré	Total sorti	Taille actuelle	Taille maximum	Taille minimum	Taille moyenne	Tps moyen	Nombre moyen après séj...	Temps moyen après séj...	Temps minimum	Temps maximum
StockA	481	268	213	213	0	106.030	1058.094			0.000	9.000
StockB	481	268	213	213	0	106.295	1060.744			0.000	9.000
StockC	481	268	213	213	0	106.448	1062.266			0.000	9.000
StockD	481	267	214	214	0	106.804	1065.821			0.000	9.000
Stock_SCRAP	75	0	75	75	0	36.543	2338.733			0.000	0.000

Figure 2: Stock Elements at the End of Simulation

3 Task Resolution

Task 1.1: Number of Parts Waiting for Control

From Figure 2, the number of waiting parts is the sum of stock levels for StockA to StockD in the column "Taille actuelle." The total number of waiting parts at the end of the simulation is calculated as:

$$\text{StockTotal} = 853.$$

Task 1.2: Actual Activity Rate of the Controller

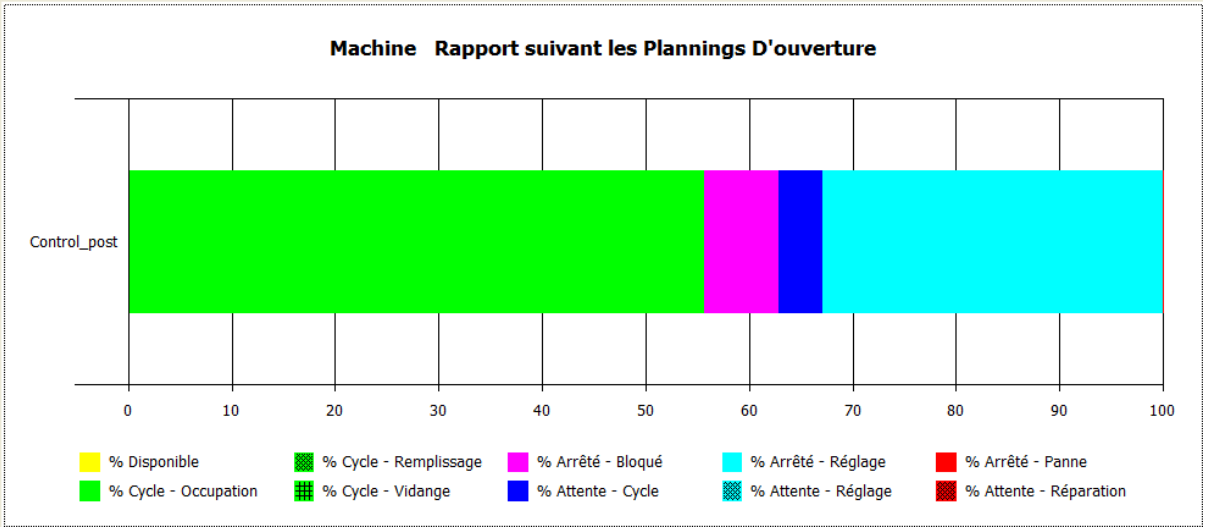

Figure 3: Controller Activity Rate

Figure 3 shows that the controller is actively working approximately 55% of the time, while being in breakdown 32% of the time. The remaining time is split between waiting (5%) and other activities. To improve efficiency, reducing breakdowns or optimizing repair times should be prioritized.

Task 1.3: Duration of Parts in the Control Post

As observed in Figures 4 and 5, the duration of parts in the control post is relatively uniform across different articles. This behavior arises due to the interaction of processing times, stock levels, and model dynamics.

Nom	Quantité Entré	Quantité Expédié	Quantité Rebuté	Quantité Assemblé	Quantité Rejeté	Encours	Encours moyen	Durée de séjour moyen	Indicateur Sigma
A	481	246.000	0.000	0.000	0.000	235.000	116.829	1165.859	6.000
B	481	261.000	0.000	0.000	0.000	220.000	109.240	1090.129	6.000
C	481	249.000	0.000	0.000	0.000	232.000	118.989	1187.420	6.000
D	481	229.000	0.000	0.000	0.000	252.000	124.143	1238.846	6.000

Figure 4: Articles Data

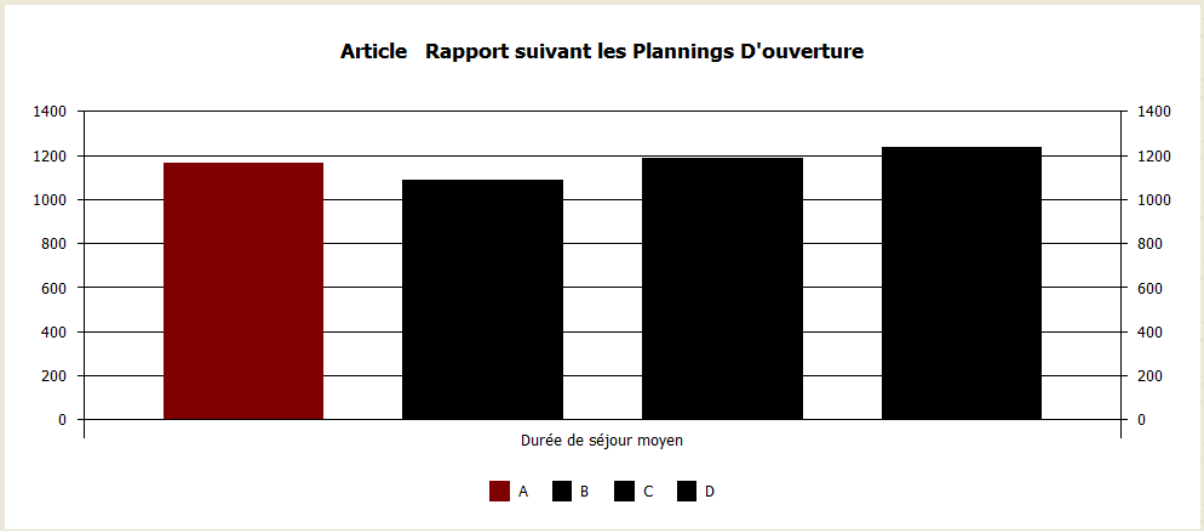

Figure 5: Duration of Parts in the Process

Task 1.4: Number of Poor-Quality Parts

Nom	Indices	<-------
SCRAP_A		19
SHIP_A		249
SCRAP_B		4
SHIP_B		264
SCRAP_C		16
SHIP_C		251
SCRAP_D		36
SHIP_D		231

Figure 6: Variables Values

Two variables were created to count the number of articles shipped and scrapped. This allows for evaluating the model and analyzing the impact of future decisions.

As shown in Figures 6 and 7, the total number of poor-quality parts is 75. The percentages of shipped and scrapped parts align consistently with the initial parameters.

NAME	VALUE	RATIO
SCRAP_A	19	7,631%
SHIP_A	249	
SCRAP_B	4	1,515%
SHIP_B	264	
SCRAP_C	16	6,375%
SHIP_C	251	
SCRAP_D	36	15,584%
SHIP_D	231	

Figure 7: Shipped and Scrapped Parts at the End of the Simulation

4 Conclusion

The simulation of the control post operation using WITNESS provided valuable insights into the system's performance. The key findings include:

- The total number of waiting parts at the end of the simulation was 853, indicating a potential bottleneck in the inspection process.
- The controller's activity rate highlights that breakdowns significantly impact system efficiency, consuming 32% of the total time.
- The uniformity in part duration at the control post suggests that stock levels and processing time synchronization influence system dynamics.
- The total number of poor-quality parts produced was 75, with shipped and scrapped parts percentages consistent with the initial simulation setup.

  To improve system efficiency, reducing breakdown time, optimizing repair processes, and re-evaluating stock flow could help address current bottlenecks and enhance overall performance.