Project I: The Manufacturing Facility

First Partial

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Once your model is done, your system must be able to answer:

* What is the final production of any given run after an execution of 5000 units of time?
* What is the occupancy rate of each workstation in every run?
* What is the downtime of every workstation by run?
* What is the occupancy of the supplier device by run?
* What is the average fixing time by run?
* What is the average delay of production because of bottleneck situations?
* What is the average rate of faulty products per run?

Producció	Ocupaciór	Ocupaciór	Ocupaciór	Ocupaciór	Ocupaciór	Ocupaciór	Inactivida	Inactivida	Inactivida	Inactivida	Inactivida	Inactivida	Tiempo in	Ocupaciór	Tiempo pr	Retraso pr	Tasa de pr
1118	0.974842	0.9629	0.959505	0.946206	0.942239	0.936451	125.7911	185.5006	202.4775	268.97	288.8038	317.7441	255.9505	0.116232	3.199381	2.039159	0.054562
1112	0.978329	0.962431	0.962709	0.948987	0.931285	0.949275	108.3571	187.8446	186.4549	255.0645	343.5738	253.6262	247.1157	0.113996	3.050811	2.014056	0.051259
1121	0.972807	0.963853	0.955522	0.941778	0.919031	0.941832	135.963	180.7351	222.389	291.1098	404.8452	290.8414	281.4743	0.113043	3.127492	1.990192	0.046387
1120	0.968957	0.968633	0.956851	0.941782	0.941653	0.936701	155.2169	156.8346	215.7434	291.0894	291.7352	316.4934	291.5311	0.116619	2.886447	2.082482	0.045536
1123	0.977226	0.966758	0.970109	0.952869	0.948431	0.938586	113.8679	166.2082	149.4547	235.6562	257.8463	307.0692	251.1833	0.113461	2.760256	1.990543	0.045414
1141	0.976943	0.973698	0.963846	0.959282	0.948348	0.953323	115.2855	131.511	180.7715	203.5902	258.2584	233.3843	228.9819	0.115041	2.631976	2.011202	0.038563
1127	0.974315	0.961291	0.95748	0.955445	0.947606	0.955381	128.423	193.5449	212.6	222.7762	261.9705	223.0944	205.3281	0.115167	2.415625	2.034752	0.054126
1121	0.97303	0.970781	0.95785	0.950015	0.942628	0.92891	134.849	146.0945	210.7493	249.9244	286.8575	355.4483	223.7524	0.112423	3.390187	1.972327	0.05174
1137	0.97514	0.970331	0.960705	0.949446	0.953936	0.94967	124.3004	148.3427	196.4768	252.7693	230.3187	251.6476	251.4689	0.116178	2.56601	2.016975	0.042216
1124	0.97401	0.955564	0.952774	0.939802	0.947788	0.944311	129.9521	222.1795	236.1288	300.9919	261.0575	278.4451	277.148	0.114686	3.079422	2.02625	0.045374
1130	0.97852	0.959092	0.957235	0.944515	0.944986	0.94501	107.3998	204.5405	213.8263	277.4241	275.0706	274.9494	259.5456	0.116936	3.127055	2.058727	0.043363
1129	0.97644	0.976403	0.961734	0.949552	0.946956	0.946209	117.7977	117.9834	191.3302	252.239	265.2206	268.9536	234.5976	0.113298	2.969589	1.98768	0.049601
1091	0.978244	0.967202	0.957451	0.955119	0.930098	0.930689	108.7808	163.9914	212.7456	224.4045	349.5075	346.5532	263.6973	0.111434	3.139253	1.975788	0.067828
1125	0.976662	0.969747	0.955963	0.944781	0.957305	0.944128	116.6921	151.2652	220.1832	276.096	213.4752	279.3611	288.4134	0.111509	2.80013	1.963185	0.045333
1124	0.978348	0.957924	0.953588	0.943846	0.946547	0.945408	108.2591	210.381	232.0578	280.7699	267.2636	272.9588	259.5089	0.112774	3.017546	1.978498	0.052491
1128	0.979911	0.961716	0.96453	0.951019	0.949586	0.939069	100.4467	191.4212	177.3502	244.9072	252.0718	304.6563	219.069	0.116021	3.085479	2.021272	0.047872
1135	0.976987	0.965519	0.960887	0.955599	0.947791	0.934912	115.0674	172.4043	195.5642	222.0056	261.0429	325.44	273.4621	0.115908	3.551456	2.033481	0.044053
1121	0.974741	0.974344	0.955478	0.949121	0.945795	0.936373	126.2972	128.282	222.6118	254.3951	271.0242	318.1373	279.3618	0.115049	3.10402	2.004342	0.053524
1116	0.975873	0.969688	0.964969	0.952027	0.956652	0.956595	120.635	151.5608	175.1554	239.8633	216.7401	217.0264	243.8625	0.117202	3.010648	2.041853	0.062724
1119	0.974924	0.969077	0.959655	0.948781	0.942957	0.95177	125.3785	154.6146	201.7247	256.0951	285.2152	241.1495	306.1665	0.114552	3.292113	2.009689	0.0563
1116	0.976882	0.973081	0.972166	0.94405	0.944737	0.94369	115.589	134.5927	139.1705	279.7496	276.3174	281.5502	238.8154	0.115344	2.985192	2.016501	0.057348
1117	0.976107	0.973441	0.965702	0.944238	0.940415	0.932561	119.4654	132.793	171.4893	278.8111	297.9256	337.196	258.5939	0.113425	2.750999	1.982954	0.051925
1120	0.97763	0.969002	0.962733	0.949909	0.939066	0.947192	111.8477	154.9903	186.3364	250.4571	304.6679	264.0405	246.6672	0.113235	2.596497	1.986587	0.05625
1106	0.974824	0.957296	0.965939	0.945074	0.948503	0.93581	125.8796	213.5197	170.307	274.6302	257.4871	320.9513	267.2261	0.111226	3.002541	1.972089	0.057866
1127	0.975513	0.963457	0.957406	0.943275	0.959812	0.940595	122.4334	182.7135	212.9718	283.6238	200.9413	297.0248	199.5743	0.113871	2.69695	1.99773	0.04614
1102	0.976423	0.969193	0.958862	0.944042	0.928386	0.935593	117.8865	154.034	205.6878	279.7892	358.0708	322.0366	279.6674	0.112902	3.290205	2.001804	0.055354
1105	0.973064	0.969911	0.951222	0.944415	0.939887	0.920605	134.6776	150.4437	243.889	277.926	300.5641	396.9757	258.1801	0.110309	2.933865	1.948921	0.056109
1122	0.977789	0.975355	0.965744	0.956088	0.949331	0.946555	111.0568	123.2228	171.28	219.5608	253.344	267.2243	265.0814	0.1119	3.155731	1.963152	0.052585
1110	0.974752	0.966627	0.961756	0.945729	0.928237	0.944358	126.2406	166.8657	191.2188	271.3566	358.8151	278.2111	269.0673	0.112711	3.494381	1.977386	0.053153
1095	0.979479	0.972803	0.949597	0.942109	0.922662	0.924528	102.605	135.985	252.0174	289.4539	386.691	377.3585	302.1451	0.110902	3.513315	1.980401	0.060274
1109	0.975722	0.963776	0.96035	0.945953	0.936244	0.951353	121.3888	181.122	198.2494	270.2374	318.7792	243.2336	207.3968	0.114695	2.625276	2.019271	0.064923

This report focuses on the efficiency and productivity of a manufacturing plant that operates using a system composed of six workstations. Throughout the development of this analysis, a simulation was carried out that was executed 100 times, aiming to adjust and analyze various critical parameters. These adjustments were made in order to identify areas for improvement whose implementation could maximize production levels and minimize unnecessary time in the operational process.

Each of the workstations is designed to contain 25 units of raw material at all times, allowing each station to work continuously for an extended period. In addition, there is a replenishment system composed of three automatic devices that facilitate the restocking of materials when the containers run out. However, it is important to mention that this replenishment process includes a delay, which has been considered in the simulation to reflect the real operational conditions of the plant.

Another fundamental aspect of the simulation is the consideration of different probabilities of error that may occur at each workstation. These probabilities were established variably, varying from one station to another, which allows us to analyze how these errors might interrupt production and affect overall efficiency. Likewise, a specific working time was defined for each station, as well as a repair time to resolve any errors that may arise.

In addition to the probabilities of error and working time, a rejection percentage for products was established, as well as a probability of production halting. These factors notably influence the final results of the simulation, providing a comprehensive view of how each variable interacts within the manufacturing system.

The results obtained from this simulation have been, in general terms, positive. The plant has shown efficient behavior, as very little time is spent compared to the time when work areas remain inactive. This implies that production operations are continuously functioning, which translates into an optimal utilization of the resources invested. Furthermore, the percentage of errors observed, as well as the number of rejected products, were considered acceptable according to industry standards and the expectations of the plant, suggesting that the quality levels are reasonably adequate.

Based on the data collected and analyzed, several proposals were developed in order to further improve the efficiency and productivity of the plant. The proposal that yielded the most outstanding results during the simulation was to reduce the average production time for each piece. Originally, the standard time established was 4 time units per piece, but by decreasing it to 3 time units, a significant increase in production was achieved, reaching an average of 300 additional pieces for every 5,000 time units. This increase not only highlights the importance of production times in operational efficiency but also underscores how relatively simple adjustments can have a considerable impact on the plant’s production capacity.

Another effective proposal was to increase the size of the raw material input at each workstation. By doing so, the frequency of replenishment was reduced, which contributed to an overall increase in production. However, the impact of this modification was not as noticeable as the reduction in production time per piece. Nevertheless, it is important to recognize that a larger quantity of raw material supply can still provide long-term benefits by improving the continuity of the process and avoiding interruptions due to more frequent restocks.

Finally, a third proposal was implemented to reduce the error percentage in machine number 4. This machine had demonstrated a significantly high error percentage, raising concerns about its operation and the quality of the final products. However, since the workload in production is divided between station 4 and station 5, this adjustment did not result in as drastic an improvement in overall production as expected. Still, it is essential to systematically address error issues, as although the improvement may not have been immediate, the equipment maintenance and long-term error reduction will continue to benefit the plant.

In conclusion, the simulation conducted on the manufacturing plant has provided valuable data regarding its current operation and has allowed for the identification of potential areas for improvement. The proposals to reduce production time and to increase the size of the raw material containers are concrete actions that can positively impact operational efficiency. Furthermore, consistent attention to production errors, especially those occurring at station 4, is essential for ensuring continuous improvement in the quality of manufactured products and the reduction of waste.

In addition to the previously mentioned measures, it is advisable to explore other adjustments and solutions that could be implemented in the future. For example, utilizing monitoring and automation technologies could help optimize operational processes even further. More advanced production management systems could also facilitate the early detection of problems and the informed decision-making necessary to enhance the supply chain.

Finally, the ongoing use of simulations to test and modify different parameters could be an effective strategy for ensuring that the plant maintains its competitiveness in the market. By conducting simulations periodically and adjusting the processes accordingly, the plant will not only adapt better to the changing demands of the market but also foster a culture of continuous improvement among employees, leading to a more efficient and productive work environment. In summary, the correct identification of the factors affecting efficiency and productivity, as well as the implementation of informed strategies, is key to the optimal functioning of the manufacturing plant in the long run.