Beerlicious Brewery: Simulation Modeling

The objective of the case study is to perform a thorough analysis of the operations and the performance of the current production line of *Beerlicious Brewery*. The following report will showcase the simulation-based evaluation for *Beerlicious Brewery.* The visual representation of the system with the current configuration was constructed in '*AnyLogic 8.5.2*' by using the analogy of the **'DEGREE problem-solving methodology'** *(Rosetti, 2016)*. The main agenda of the project is to examine the potential bottlenecks in the current system with the help of and improve the system performance by eliminating those bottlenecks. Besides, the possible solutions have also been recommended in this report for the future expansion of the production line, where the evaluation is based on achievable variation in the operational performance of the system.

Simulation-Model overview:

The simulation has been performed to develop the results of the production line within the current configuration based on the provided data and basic assumptions *(Appendix).* A conceptual diagram & flow chart has been built to implement the simulation model *(Appendix).* The data of the beer schedule is in the form of different beer batches with the arrival from 15-06-2020 and entering throughout for processing. In the model, the stochastic input is being provided for each resource to attain results. Based on the assumption *(Appendix)* repairing and periodic cleaning also been considered as part of the operation. In the simulation, the batch of beer is specified to be Agent moving throughout the service blocks. To develop attainable outcomes, several replications were performed on the basis of random seed, producing further nominal values for the 100 replicates count. Steady-state has been achieved with the help of these 100 replications to define the behavior of the system *(Appendix: Output analysis)*. In addition, several random assumptions were made to attain analysis to underline the current structure to validate and prediction made for 2025. Furthermore, Key Performance Indicators (KPIs) were calculated and validated to get insight into the various alternatives in the simulation.

Simulation-Model results:

After performing simulation runs the significant problem with the production line was the beer batch was not able to process according to the desired speed of arrival of the batch. In the system analysis, it observed that the batch completes the processing approximately 24 hours after its arrival. In the operation until filtering the batch it can be observed that the utilization of fermentation and both cooling resources are high, however, we can see that with the current configurations fast cooler utilization is more among the resources.

On the other hand in the packaging process, considering the current configuration Small bottles & can are with higher demand hence utilization is more in comparison with the larger bottle. From the graph below we can conclude that the main bottleneck is the fermenter, along with the coolers and packaging of Small bottles and can.

In the following figure of resource utilization, the illustration is made on the basis of 100 random replication considering the current configuration and the future prediction, where future prediction is made on the basis of the assumption that the quantity of batch is to eventually go higher by 5% every year which makes the data for average utilization with the future demand on the present model. The processing time for cleaning the machine for every new batch arrival plays a crucial role in the delay of the process. The chart also showcases that the increase in demand for beer will be responsible for the higher utilization of the resources.

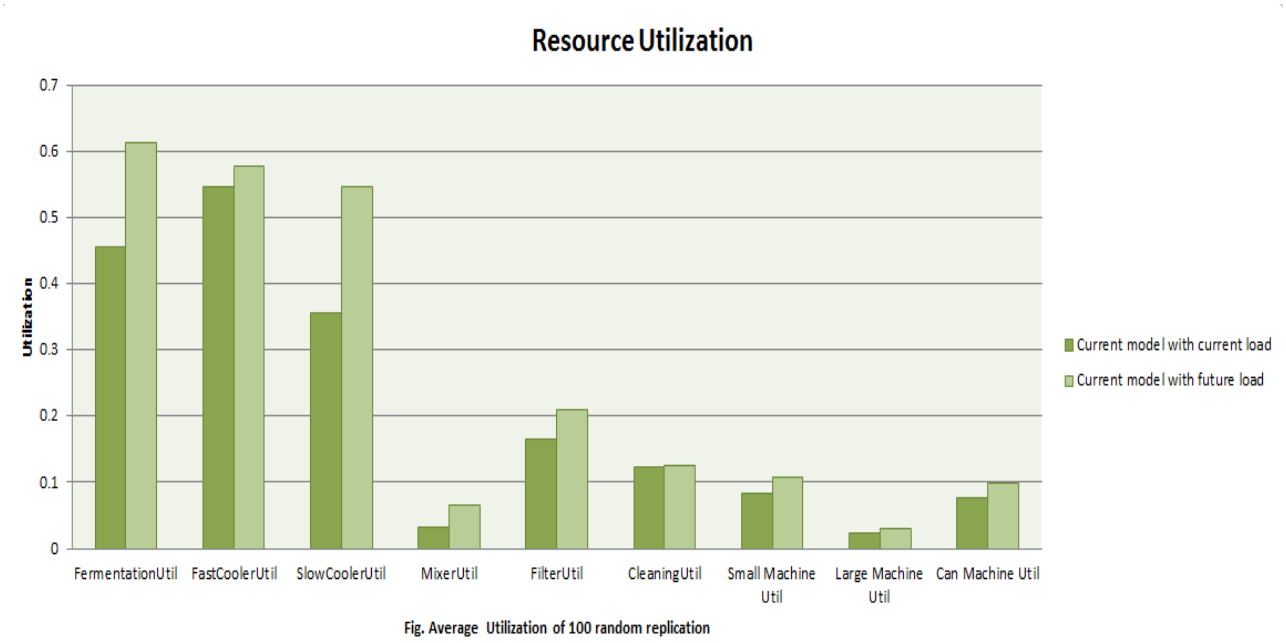

Fig. Average Utilization of 100 random replication

Recommendation:

Based on the system's operational performance of beer production line with the current data and the future data on the resources with the present capacity, it is recommended to run a parallel resource unit by adding a new fermentation tank and a Fast cooler by replacing it with the old cooler. It is also suggested to run the batch with the same type by changing the schedule of the batch arrival, which will save time in the cleaning process and also optimize the following system. If the cumulative average of the total processing time of the cleaning block is calculated, it might result in higher productivity with lesser usage. After the case study analysis, it is recommended to start and construct the production expansion a year in advance as the upgrading of the new plant takes approx 1 year.

Conclusion:

It could be concluded that there could be possible updates to this very basic model. An end-to-end analysis needs to be done taking the budget of the improvements into account. It is already stated in the appendix and the report in the above section that no budget constraints were taken into account while showcasing the outputs. Potential maintenance charges could be as well another factor to look after apart from the budget constraints if the proposal is accepted. The further deep study is required to analyze and perform the experiments based on accurate assumptions, market analysis & market forecasting.