



Product Flexibility and Machine Throughput Optimization

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Abstract

For almost five (5) years a pharmaceutical manufacturing industry has been operating an automated manufacturing line with only two (2) full-time (8-hours) shifts; four (4) validated codes/products and left with 28% availability of run-time daily.

The main goal of this project was to manage and validate more products within this automated manufacturing line that could improve the equipment's material throughput and running time. It brought ideas such as product flexibility, process automation, and product family standardization, that took results in an increase in material logistics and material & production scheduling.

Based on Lean manufacturing practices and SIPOC methodology tools, the project took directions into rigorous results. The tested idea brought a 29% increase in material throughput and 11% in the machine's running time, ensuring a future manufacturing capacity within other manufacturing lines that could be used as an example for other internal sister sites and/or regular manufacturing entities. These results provided numerous future follow-up ideas that could help improve the idea of production optimization within the manufacturing scenarios.

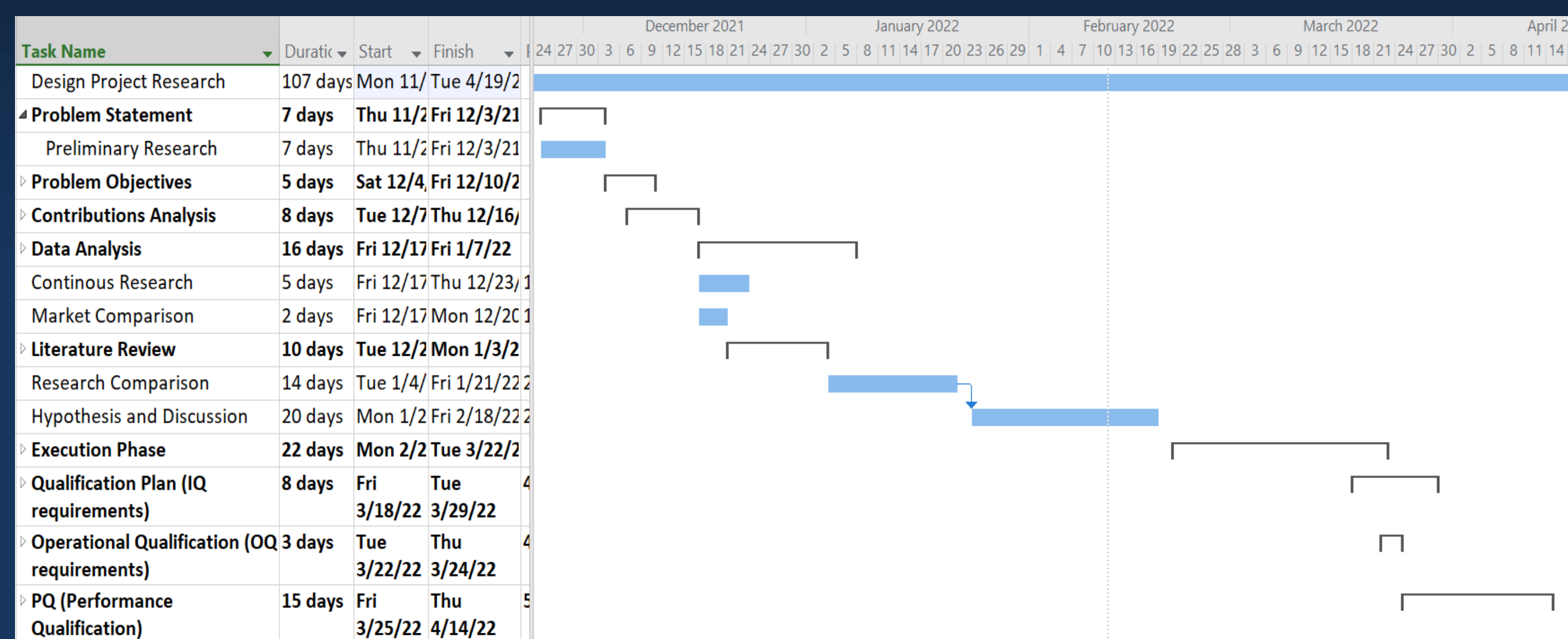
Introduction

A manufacturing industry has five (5) production lines, with a stable and positive outcome. There is one line that only is active during two (2) shifts – Shift A and Shift B, Shift C is downtime without producing. The reason is that there are only two (2) products that are validated to be manufactured in that respectful production line. This project is based on Process Optimization and required to develop a “perfect state” to know the limits of the machine and required a more robust understanding of the relationship between the machine's computer and the capabilities of the machine.

Objective

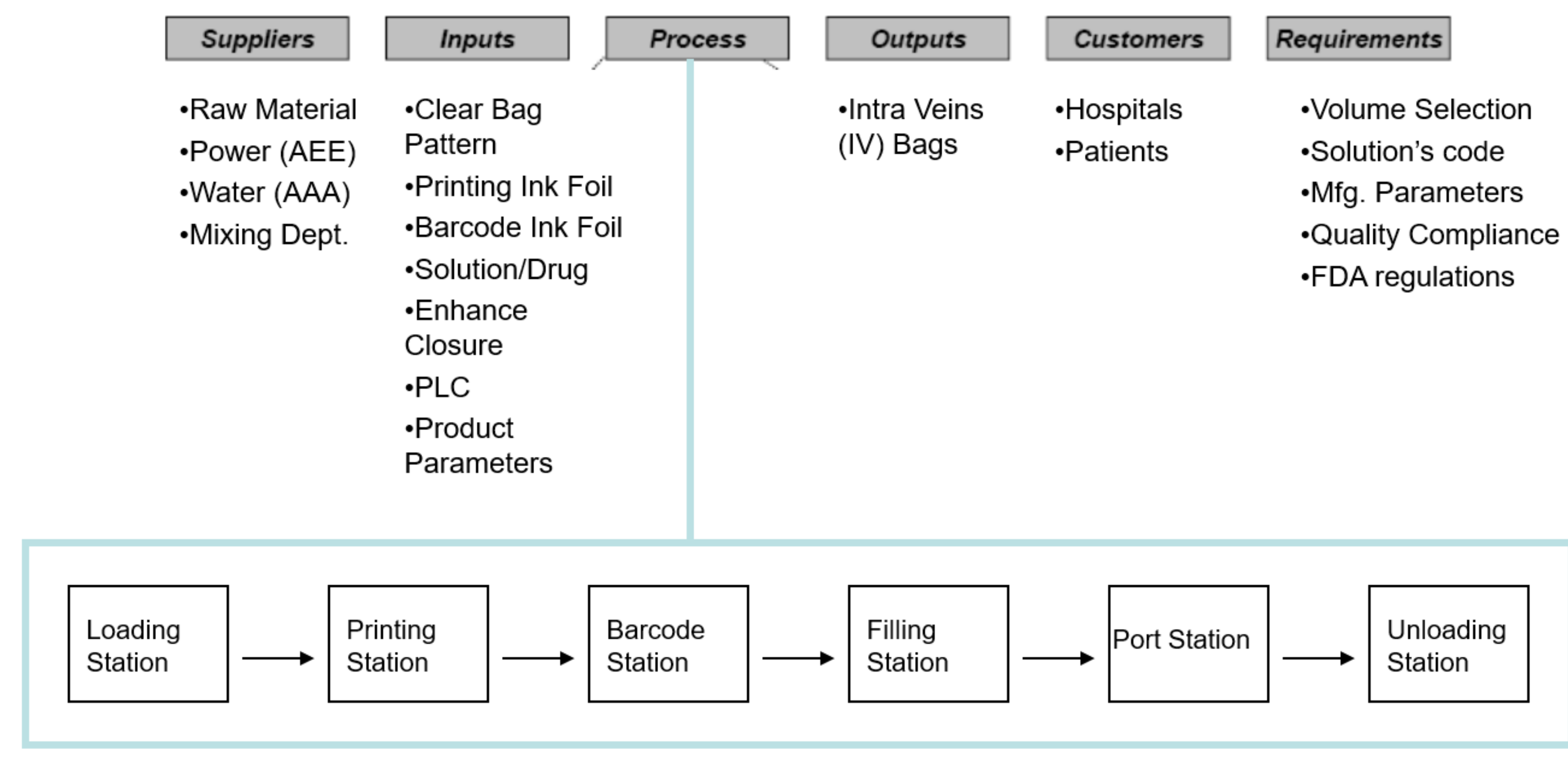
The objective of this project, will be to increase Line#5 Output Production by a 30%. There is a high possibility that this goal could be achieved by introducing new products within the Line #5, automated process that will require an additional shift to fulfil the new output numbers. By achieving that main objective, will increase the production at Line#5 and will reduce the quality turnback's caused by its regular process. This could also open a production line-capacity gap, creating some other goal achievements that will be supported along the way.

Project Plan



Key Process Identifiers for SIPOC methodology at LN5 (MPF).

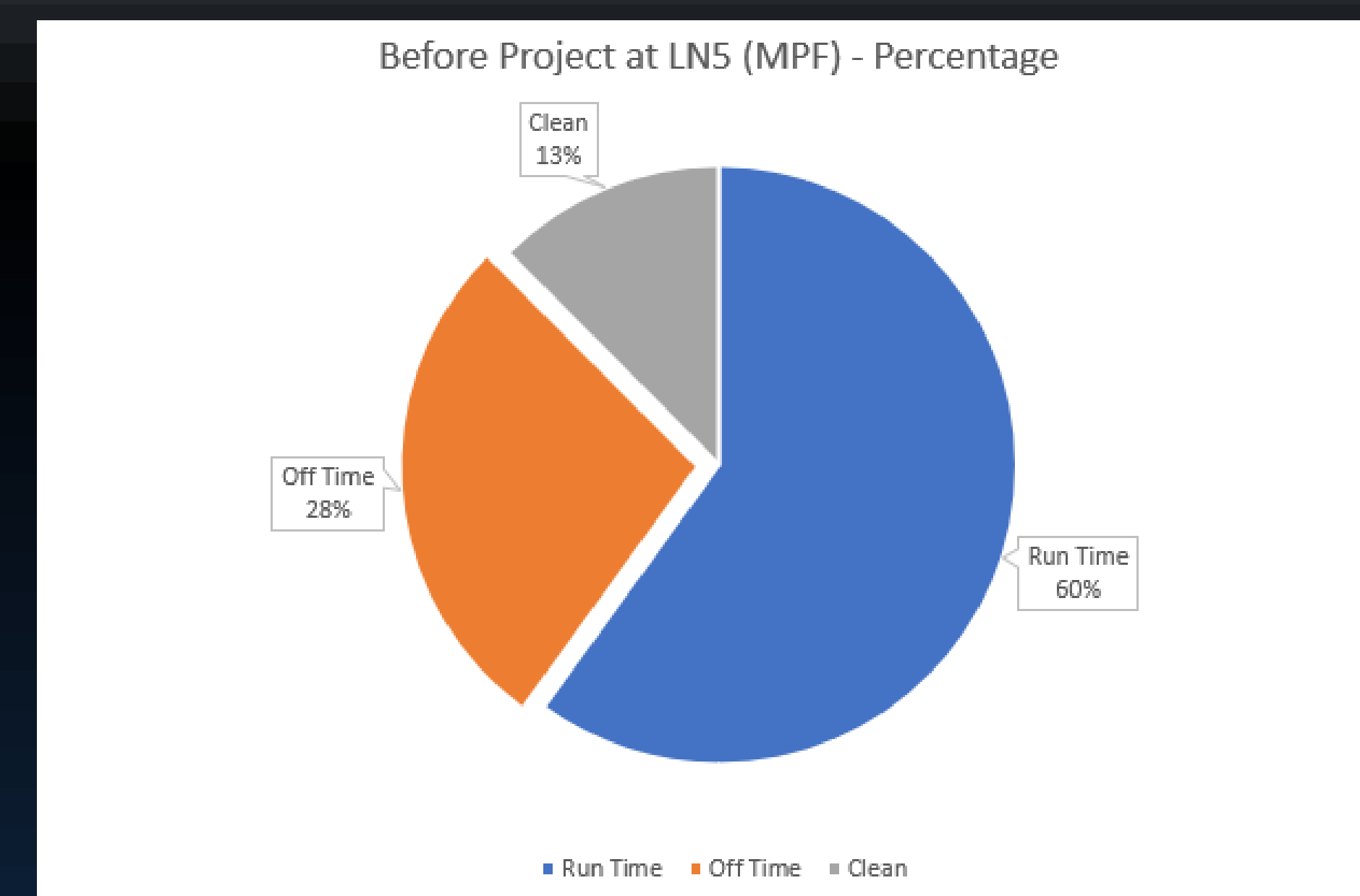
SIPOC Diagram -- Mfg. Line5 (MPF)



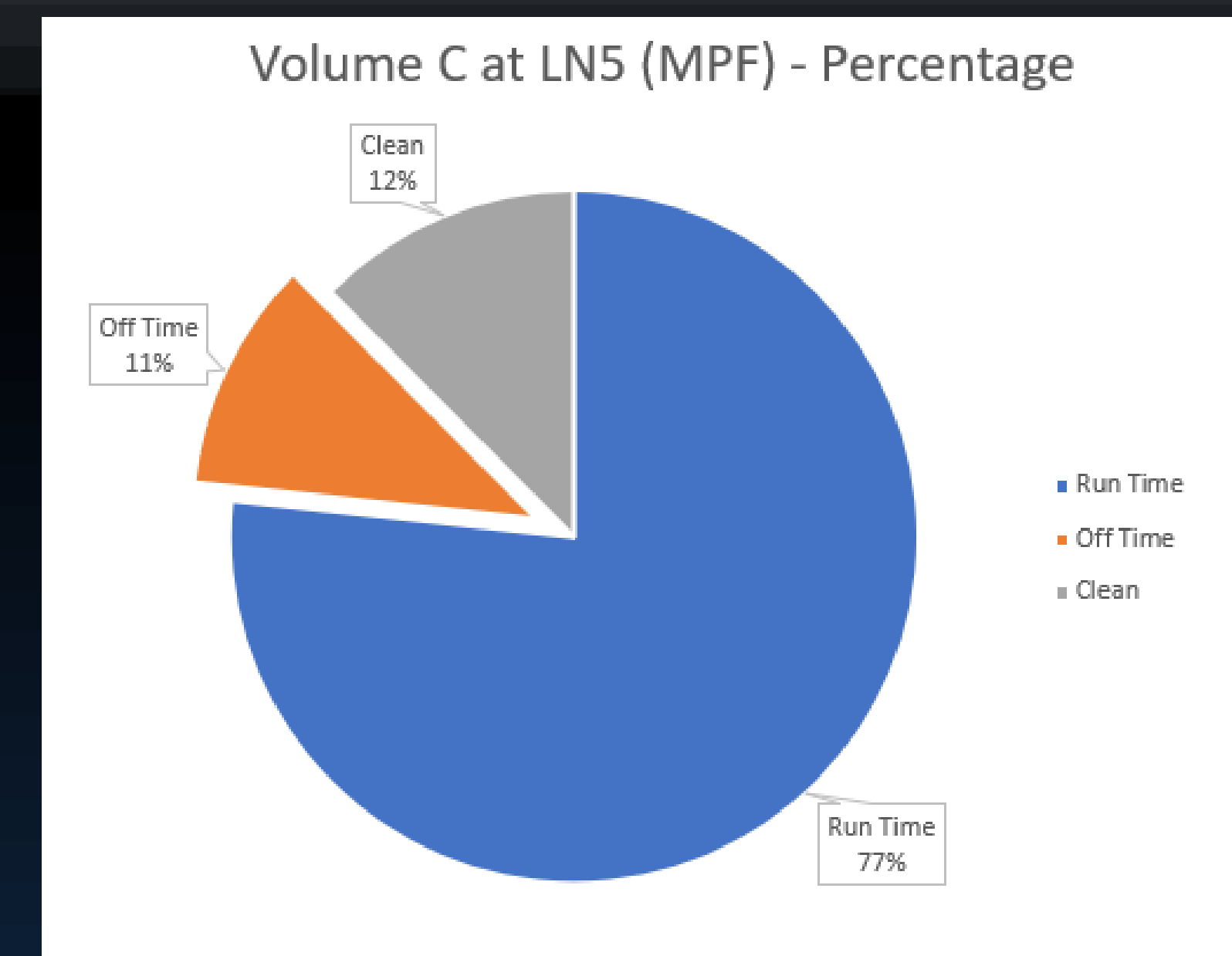
Headcount Comparative

| PROCESS/AREA | Line 2 | Line 5 |
|---------------------------|-----------|-----------|
| Printing | 6 | 2 |
| Filling | 9 | 0 |
| Inspection | 4 | 5 |
| Racking | 12 | 3 |
| Material Handler | 1 | 1 |
| Group Leader | 1 | 1 |
| TOTAL (Head Count) | 33 | 12 |

Before Project Implementation



After Project Implementation



Conclusion

This Project Design aimed to find a solution to increase the Run-Time of manufacturing Line5 by implementing product flexibility between manufacturing lines using various types of mindsets and practices providing more efficient and positive production process standards. These are called methodologies as Lean Manufacturing strategic thinking to reduce waste and bring more ideas for continuous changes and future investigations. The manufacturing Line5 (MPF) still showed to have areas of opportunity which once accounted for, will increase the mechanical's downtimes, and will improve the product quality. Just this “product flexibility” brought a lot to talk about since it did impact the manufacturing's operations across multiple departments that will continue to challenge new opportunities. The results indicated that by adding a new “special shift” to the MPF, it increased its available time by 11%, its effectiveness, and at the same its production throughput by 29%.

Recommendation

Further findings show numerous details on how to improve the logistics for scheduling across the manufacturing areas and triggered the automation department for new technologies to sharpen the process. Although while executing the Project Design, natural causes such as the pandemic we are living affected acquiring personnel and availability for machine set-up and raw material preparation, for this “over-time” personnel was required as part of the experimental project, looking forward to acquiring more headcount for this new “shift”.

Project Design Results

| Created Date | Batch | Area | Line | Shift | Machine | Prod Qty | Scrap | Good Units | Code |
|--------------------|----------|------|-------|-------|-------------------------|----------------|---------------|----------------|------|
| 4/4/2022 | P4285xx | MPF | Line5 | EXP | Fill-5 All Nozzles Prod | 33,904 | 1,695 | 32,209 | #11 |
| 4/5/2022 | P4262xx | | | | | 35,228 | 2,818 | 32,410 | #18 |
| 4/6/2022 | P4268xx | | | | | 35,800 | 1,832 | 33,968 | #18 |
| 4/7/2022 | P4276xx | | | | | 39,144 | 2,740 | 36,404 | #11 |
| 4/12/2022 | P4280xx | | | | | 35,213 | 2,183 | 33,030 | #11 |
| 4/18/2022 | P42820xx | | | | | 35,271 | 2,116 | 33,155 | #18 |
| Total (Qty) | | | | | | 214,560 | 13,384 | 201,176 | |

References

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