

Improvement of the Daily Manufacturing Operations Productivity of the Injection Molding Department by at Least 5%

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Abstract — *Productivity is the most significant factor in manufacturing industries. Low productivity of workers can have a great impact in the finances of an organization. In this project paper, the focus is to improve the manufacturing productivity of Company X, particularly the Injection Molding Department of a Medical Devices Company. Data from daily operations was collected and analyzed finding that the low productivity was caused by rework performed on stock number x due to embedded particle matter caused by the mold manifold. After implementation and validation of a new mold manifold, embedded particle matter was eliminated, and the productivity was increased by 12.2%. During this project, rework was found as the cause and is one of the factors that affects productivity greatly, but other areas were identified as well that can be improved to increase even more the value of productivity obtained.*

KeyTerms—*Injection Molding, Manufacturing Operations, Productivity Management, Productivity Improvement.*

INTRODUCTION

Productivity is an area of manufacturing that requires attention as this is related to the cost associated to work. If this is not carefully monitored, it can have great impact in the finances of an organization. In manufacturing there is always the need to improve productivity, in the Injection Molding Department of Company X there is a need to increase the productivity as currently it is low, and it is impacting the organization financially.

The objective of this paper is to report the results of the improvement in the productivity of the Injection Molding Department of Company X after the root cause has been determined.

LITERATURE REVIEW

One of the important areas for the economic stability and development in the manufacturing industry is leaning to manage productivity. As the productivity is increased, the cost that is associated to work is reduced and another way of increasing productivity is by increasing the output of the units that are produced [1].

There are several studies that have been conducted over the years on manufacturing productivity focusing on different areas that can be improved. One of the studies conducted at Dewa's Gear Manufacturing which dedicates to axels and gears, used a software to study the design of production lines [2]. During this study it was identified that there was no adequate control in the manufacturing process due to difficulties with the tools and handling of the equipment.

On the other hand, a study conducted at Toprak Energy Glass Factory, worked on improving efficiency by measuring the times of the work cycles [3]. It was determined that by reducing the steps required for the preparations of the molds improved the productivity.

Another company dedicated to assembling air compressors, worked to reduce the high cycle time of the bottleneck stations by listing the activities and measuring times to perform them [4]. It was found that the distances that the operators had to travel impacted the production times.

In addition to the studies mentioned, another study was conducted on a tractor parts manufacturing company where the goal was to increase productivity by reducing the time to deliver complex shaped components [5]. It was determined in the study, that the reject components decreased by grouping some of the operations that were necessary

to manufacture the component in a single configuration on a CNC machine.

Lastly, a study performed by a small scale manufacturing company that makes brushes used the Lean Manufacturing to improve the process, finding that after implementing a new cellular design with a breakthrough machine, they were able to reduce inventory, reduce machines and time to perform the operations as well as reduce personnel which resulted in an increased productivity [6].

According to the literature review, the productivity is an area that can be improved by applying the methods mentioned before.

APPROACH AND ANALYSIS

For this project, the approach for analyzing the productivity of Company X Injection Molding Department involved measuring the data sent by the Finance Department which is the Operations Management Review. This data sent by the Finance Department includes all the information regarding manufacturing such as actual earned labor hours, direct labor hours, efficiency, down time, rework, and productivity. The scope of the project involves the analysis of productivity measured in the operations review of Company X, finding the root cause for this low productivity, and finding ways to improve it.

For the analysis of the current state and root cause, the method or approach used for analyzing the data was the time series plot to measure current productivity state and the hypothetical new productivity. By analyzing the current state, it sets the baseline of the current productivity and with the theoretical new productivity a difference in the comparison between the two helps to determine the root cause.

Figures 1 and 2 show the actual productivity and the theoretical new productivity indicating that if rework is eliminated, the productivity increases more than 5%. From this analysis, it was determined that the root cause for the decreased productivity was the rework performed on stock number x.

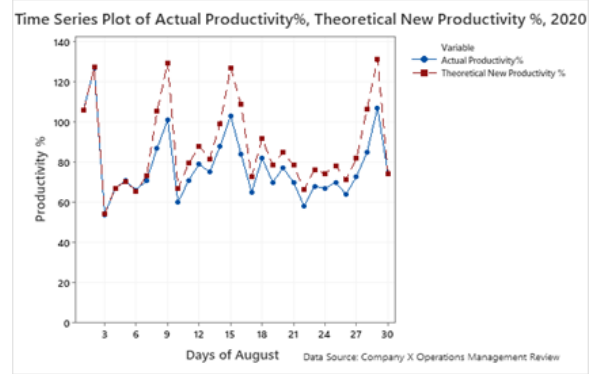


Figure 1
Time Series Plot of Actual Productivity % and Theoretical New Productivity %

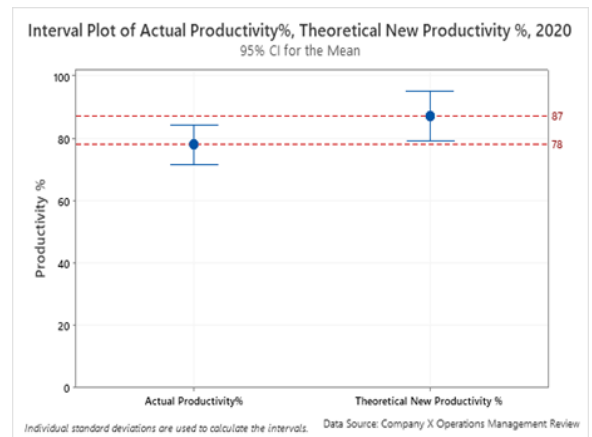


Figure 2
Interval Plot of Actual Productivity % and Theoretical New Productivity %

After the validation of the new mold manifold, rework of stock number x was eliminated, and the new data obtained was analyzed using the time series plot and the interval plot for the new data. From Figures 3 and 4 after the implementation of the new mold manifold, the personnel used for rework was eliminated and the productivity was increased by 12.2%.

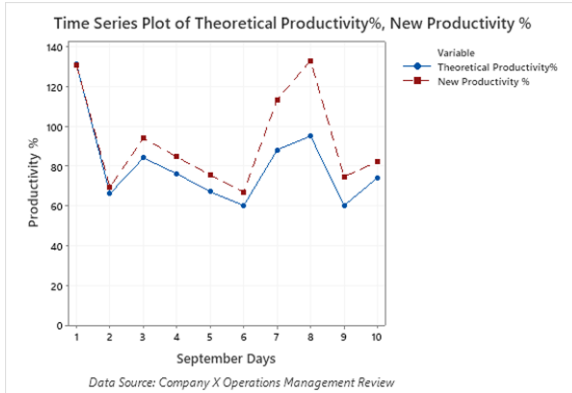


Figure 3
Time Series Plot of Theoretical Productivity % vs. New Productivity %

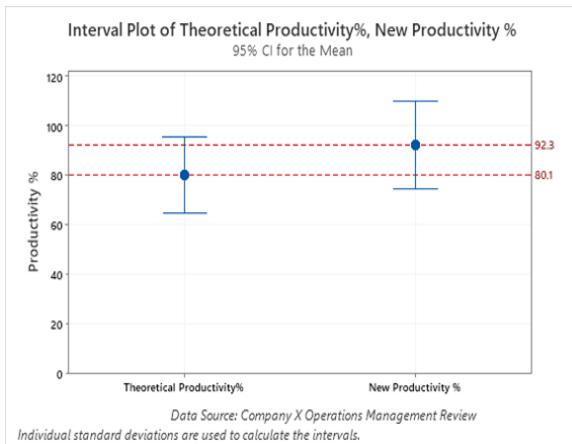


Figure 4
Interval Plot of Theoretical Productivity % vs. New Productivity %

RESULTS ANALYSIS

The analysis for the current state and root cause indicated by the data observed shows that for the current state it was found that the productivity mean was at 78% for the month of August, as indicated in Figure 2. Analyzing the data for the month of August and using the plot in Figure 1, it was found that the root cause was related to the re-work of stock number x.

The results after the new mold manifold implementation which helped eliminate the need for rework, the data indicates that an increase in productivity of 12.2% was achieved as seen in Figure 4 for the month of September.

CONCLUSION

The objective of this paper was to report the results of the improvement of the Company X Injection Molding Department which was increased by more than 5% using the approach of analyzing the data of the operations management report and finding the root cause. After the root cause was identified, an implementation of a new mold manifold eliminated the need of rework resulting in an increase of the productivity by 12.2%, which is greater than the 5% initially established.

Besides just improving the productivity by eliminating the rework, it was also identified other areas of opportunity that can be addressed such as down time, direct labor hours and cycle times. If these other variables are improved, the productivity will increase even more than just the 12.2% obtained in this project.

The implications of the findings of this paper are such that sustain the literature review and can add or sustain the current studies found for the improvement of productivity by adding to the current knowledge through this investigation.

Some additional future work needed in productivity is the evaluation of the calculation of the manufacturing standards performed and what to consider when standards are being developed or calculated.

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