Configuration of Manufacturing Line using Cell Operating System on a Patch and Serter Installation System

Bryan Cruz Ramos
Graduate Program in Engineering Management
Héctor J. Cruzado, PhD, PE
Graduate School
Polytechnic University of Puerto Rico

Abstract *— The objective of this project was to implement a new product to the manufacturing assembly line at medical devices company. The product is categorized at a high inventory level. The manufacturing line was moving from a manual assembly process in some processes to a semi-automatic assembly process. The medical devices company was able to use the Cell Operating System (COS), increasing the capacity of the installation system. This Lean Manufacturing method was applied to increase the capacity of the installation system and aiming to move products through the assembly line one piece at a time. All equipment's of the assembly line was modified to stop and signal when a process is complete or if a problem occurs. The lean manufacturing method was also applied to reduce defects that result from processing and product changeovers.*

Key Terms *— Capacity, COS, Lean Manufacturing, Process Flow*

INTRODUCTION

Medical devices companies maintain continuous development of new products to obtain long-term contracts with their clients and receive new clients. To be competitive, they always use methods that reduce manufacturing costs and improve the capabilities of the manufacturing line to comply with the demand. Therefore, the medical devices industries obtain for use the different methodology to achieve the desired results.

A medical devices company has a manufacturing assembly line that implemented a new product. This new product is categorized as high inventory level for the demand. The manufacturing line that processes the product has a high-cycle time which impacts the manufacturing output line. By moving from a manual assembly process to a semi-automatic assembly process, the medical devices company was able to use the Lean Manufacturing method, reduce the cycle time and increase the capacity of the installation system process. This Lean Manufacturing method helps to increase the capacity of the installation system process.

The objectives of this project were to increase the capacity of the assembly manufacturing line, reduce the cycle time of the installation system process, and improve the manufacturing line to produce more products per hour without compromising the quality of the product.

This project will contribute to the medical device company increasing its manufacturing capacity. The research contributes to reducing the time associated with the manufacturing process of the product. From the client's perspective, the client will receive a product of high quality. The medical device company will increase its capacity to meet the customer demand for the product.

LITERATURE REVIEW

Cellular Manufacturing, better known as COS (Cell Operation System), is a manufacturing process where production equipment and workstations are organized in a sequence that allows a uniform flow of materials and components throughout the manufacturing process [1]. The implementation of this method represents the first change in production activity and is the key factor in achieving greater production speed and flexibility, as well as reducing production costs.

One of the main purposes of cellular manufacturing is to achieve and maintain efficient continuous flow. Cellular manufacturing is configured to have greater speed and minimal

material handling. Some of the configurations used in cellular manufacturing are as follows:

- Linear Type Cell is a straight line which this model decreases the probability of having a multifaceted operator and makes it difficult to adjust a defined layout.
- Serpentine Type Cell is a cell that improves communication and obtains good flexibility and has a regular arrangement of the layout.
- Type U cell in one of the most well-known models. It is named for its shape similar to the letter alluding to its name. This configuration is flexible for staff to regroup on different workstations, good communication is obtained, and operators are multifunctional. With this configuration, you can create a continuous flow where assembly time is reduced [2].

Cellular manufacturing can also give companies the flexibility to vary product type or production line characteristics to specific customer demands. The approach seeks to minimize the time it takes for a single product to flow through the entire production process [3].

This one-part flow method includes specific analytical techniques to evaluate current operations and design a new cell-based manufacturing design that will shorten cycle times and change times [4].

ANALYSIS APPROACH

Based on the evaluation of the different types of configurations for the cellular manufacturing line, Cell Type U was selected. The selected Cell Type "U" in Figure 1 represents the shape of the manufacturing line and the location of all equipment of the manufacturing line that creates a continuous flow to proceed the material that completes the product.

Upon completing the configuration, a time study of the line was carried out. On the first-time study, it was observed that some equipment needs improvements to reduce the time cycle of the patch installation process. Afterward, the manufacturing line obtained a capacity of 608 units per day. For a couple of weeks, meetings were held with the different process engineers to make decisions of improvements to the manufacturing line and a series of activities to be completed were established. The improvement of the manufacturing line were the followings:

- Incorporate a planarity inspection using the Keyence brand sensor.
- Remove the 100% inspection on the patches, since it was carried out in the incoming by sampling size.
- Replace some microscopes with inspection cameras.
- Improve the cycle time of some equipment.

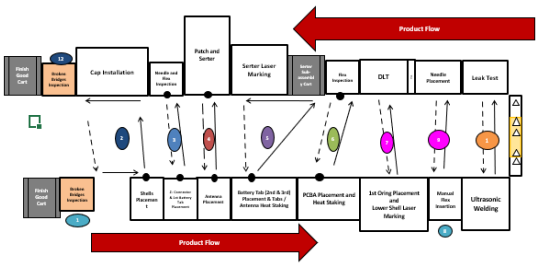

Figure 1
Cell Manufacturing Type U

RESULTS

After completing the configuration of the manufacturing line, all equipment was located in the corresponding area. Once the configuration of the manufacturing line was completed, the capacity is 608 units per day. This capacity was increased during the line improvements were close and implemented. These improvements of the manufacturing line established a new capacity, new design of some components of the manufacturing equipment. When all improvement was incorporated at the manufacturing line to proceed the material in the continuous flow obtain a new capacity. A second-time study of the manufacturing line was completed and is presented in Figure 2. The implementation of improvement of the manufacturing line was worked by phase.

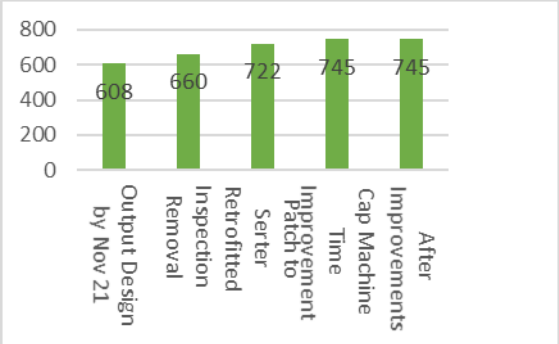

Figure 2
Capacity of Manufacturing Line

DISCUSSION

The goal is to minimize the travel distance between each step and cycle. Also, empower operators and set multimachine and multiskilled operators as a standard. Balance the work to create a flow between workstations that meet demand. Incorporating the improvements increased the capacity from 608 to 745 units per day. Before implementing the improvements to the manufacturing line, the yield was 88%. Work was done on improving the patch installation equipment to increases that percentage.

After the line improvements, the capacity increased to 745 units per day in two shifts. This increment of capacity was 22.5% of more output of the product in the manufacturing line. The cell manufacturing was configurated to use a total of 10 operators multi-skilled per shift.

CONCLUSION

The manufacturing line capacity using Cell Operating System (COS) Method on the company to improve by Cellular infrastructure system. The manufacturing line was performed on the layout to improve the processing time per product.

The first goal of the project was to increase the quantity of the product manufactured since this new product was categorized at a high inventory level. The result of the project demonstrates that this goal was achieved. The manufacturing line capacity increased from 608 to 745 units per day. The improvement represents an increase of 22.5% in the manufacturing line capacity.

The second goal of the project was to reduce the cycle time of the installation system process since impacts the manufacturing output line. To achieve this goal, the manufacturing line was configurated to be grouped according to the process requirements for a set of similar items that require similar processing (Figure 1), and the implementation of improvement of the manufacturing line was completed (Figure 2). This configuration provided faster processing time, less material handling, less work-in-process inventory, and reduced setup time all of which reduce costs. Another benefit of the improvement is the reduction of downtime due to equipment maintenance and production used a method to achieve a continuous improvement of the process.

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