Manufacturing Space Optimization and Productivity Improvement using Lean Manufacturing on a Medical Device Company

Author: Jonathan Maldonado
Advisor: Carlos Gonzalez, Ph D.

Abstract

Medical Devices industry has been experiencing a competitive environment and striving hard to find methods to reduce manufacturing cost, waste and improve quality. To be competitive, the industry is seeking for tools to be used in order to reduce cost and improve manufacturing capacity without compromising the quality of the products. One methodology used to reduce manufacturing cost and increase process capacity is Lean Manufacturing. The methodology used for the improvement was Lean Manufacturing and the DMAIC (Define, Measure, Analyze, Improve &, Control) tool was applied as the systematic approach. To optimize space the layout of the manufacturing floor was modified from Flow-line layout to Cellular Manufacturing layout.

Problem Statement

A Medical Device company is developing a new product model. The physical structure of the line does not has the required space to manufacture the new model length. An appropriate infrastructure to manufacture the new model and self sustained cell which lead to a continuous improvement environment needs to be created. The intent by the high level management is to manufacture this new model using the available manufacturing resources (existing manpower and equipment). The product flow need to be changed from product batch flow (or large-lot production) to one-piece at a time.

Objective

Transform current manufacturing layout to Cellular manufacturing layout in order to manufacture the new model. Improve actual Yield to 96.5% and Lead Time to 3.5 days. Expect a Year over Year (YOY) of 5% productivity improvement. Increase in Manufacturing Capacity, Quality on the product and Reduction of manufacturing cost per product. The result will build a standardize process that will impact positivity the manufacturing process.

Methodology

The Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology will be applied to complete the objectives of this project. DMAIC methodology focuses on improving an existing process. Lean manufacturing principles will be applied to eliminate "muda" (waste) and non-value activities.

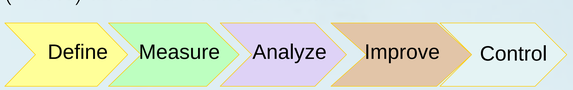

Figure 1
DMAIC Methodology

Results

The Six Sigma based methodology has been used to optimize the EMC operational procedures. The results obtained after implementing were measured in fourth categories mentioned below:
➢ – Considerable time is saved by eliminating non-production (idle) time and by not producing the defective product, the EMC last executing present a 65 turnaround time (Figure 5), just by implementing reorganization and computerized inspection .

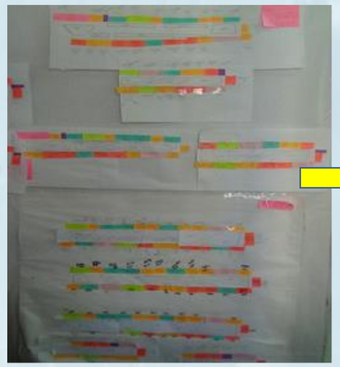

Figure 2
Proposed Cellular Layouts (Card Board)

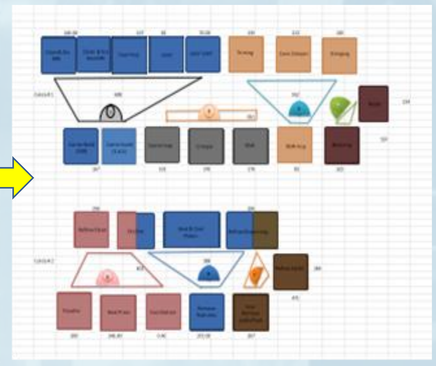

Figure 3
Cellular Manufacturing Layout and Cell Paths

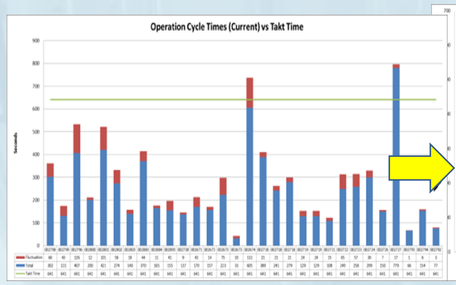

Figure 4
Initial Cycle Times (curent) vs Takt

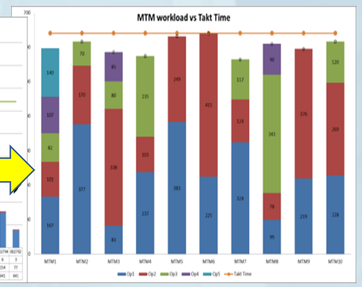

Figure 5
After Implementation Cycle Times vs Takt

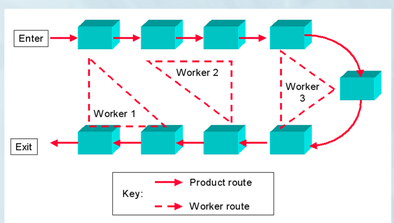

Figure 6
One Piece-Flow

KPI's	ACTUAL	FUTURE
Cells	1	3
HC Total	12	10
Team Leader	1	2
Material Handler	1	1
Space	848 sq-ft	1165 sq-ft (94 sq-ft for Problem Solving Area)

Figure 7
Actual and Future State

Results Cont.

➢Improvement in productivity – Time saved from reworking is time utilized to improve Gate 2 (Kitting properly). The productivity picks up by reduction the waste on the material handling (Figure 2). Higher demand, lower cost of production and optimize supply chain. The change in configuration and implementation of

Key KPI's:

KPI's	Baseline	Result	End Target
UPLH	0.23 units / Lhr	0.30 units / Lhr	0.33 units / Lhr
Lead Time	4.76 Days	N/A	3.5 Days
WIP	112 units	89 units	91 units
Yield	96.5%	100.00%	96.85%

Better than Baseline but not in Target | On Target or Better

Figure 5
New Average Product Output per Hour after the Implementation

Conclusion

Using the Six Sigma methods can yield impressive results. Improve engine care, maximize resources/equipment and also increase productivity and execution on the user/train interaction. The COPQ reduction and sales increment demonstrate the improvement achieved when Sigma is incorporate to the MRO production. The flow of material, the repair station and time consumed is reduced, giving higher profit on daily operation. The integration of new system gives path to visual organization were the continues flow in all the level ensure the material get ship on time and the engine is deliver ahead of schedule. Finally, the control in the process gives the stakeholder the security that the methodologies can be applied to any type of operation , including one where the manpower is the clue for success . The application of Lean and Six Sigma demonstrate that the delivery of process simplicity can put engine downtime in an achievable timeframe of flowing 55 days.

References

[1] P. Dennis, *Lean production simplified*, Productivity Press, 2002.
[2] J. Liker, *The Toyota Way*, New York: McGraw-Hill, 2004.