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ELIMINATING SEVEN WASTES BY USING LEAN MANUFACTURING TOOLS IN AUTOMOBILE INDUSTRY: A CASE STUDY

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ABSTRACT: The aim of this paper to study improving productivity and quality on transfer meeting lines, the DMAIC approach incorporated with lean ideas may be used for enhancing line reputation in terms of productivity and quality. The aim of the company is to achieve Minimize Production cost, Effective/Smooth plant layout, Workplace Standardization and SOP, Waste reduction, zero defects and zero breakdowns in our organization. Increase output from the dispatch order by 10–20%. Pavna Industries Limited, management has decided to increase Bajaj 3-wheeler lock set productivity. Nowadays, customers demand more products in a very short period of time. Due to this company has decided to increase productivity at the same line by applying lean tools and techniques. which is very challenging and makes it very tough to dispatch orders with adherence to quality parameters. Then management adopted all the lean tools which can be used in the manufacturing process at each and every stage to increase productivity by selecting some objectives in the assembly of the Bajaj 3-wheeler line.

KEY WORDS: Lean tools, DMAIC, improvement.

INTRODUCTION

Companies all over the world are coping with new problems brought on by a shifting environment. The business environment has pressured businesses to apply their infrastructure at most stages to stay competitive in the market[1]. As a result, throughout the industry, customer demands are driving production to make consistent and continuous changes. In this environment, only value-effective, efficient, and first-rate manufacturers can be retained in the marketplace.[2]. In a dynamic, competitive, and volatile commercial enterprise environment, lean manufacturing devices can provide a competitive advantage to producers. [3]. Auto component manufacturers and industries have opened new doors for India to improve economically through adopting new technology and operational techniques. [4]. Poka-yoke, standardization, and technique capability enhancement are all equipment that can be used to improve the exceptional of an enterprise's operations. For many years, Japanese groups have been eager to implement poka-yoke in the automobile industry [5]. The major thrust for satisfactory development needs to be on the minimization of rejections at some point of first-rate control [6]. The DMAIC technique allows us to pick out and signify virtually the

problem at hand. It gives a methodical method for discovering the actual supply of a hassle, after which it imparts a viable approach to quitting the problem once and for all [7]. In the modern-day competitive economic system, product innovation and development take on accelerated importance [8].

PROBLEM FORMULATION , METHOD APPROACH AND IMPLEMENTATION

In the way of lean journey as the competition gets together, there is more pressure on organizations to improve their productivity and quality and customer satisfaction while reducing cost and waste. A common challenge faced by organization in this changing scenario is to increase the productivity with in limited resources of manpower and available floor space, without investing in new technology, thus improving process under cost constraints. A number of tools and techniques are available to the modern day managers which can help in affecting such changes. Reduced lead times, improved on-time delivery, waste elimination, and cost reduction are all part of a lean manufacturing process. In this course of action when processes are rationalized, there is greater possibility for improving the productivity and once the system of manufacturing Cut backs in inadequacies, if reasoned, can yield enormous benefits. In the end, over output will lead to a surplus. waste, and redundant movements are eliminated. As a result of these improvements, a company can take market from its competitors. For MIL, we are applying lean principles and the DMAIC technique to boost production through the identification and elimination of waste. Lean concepts along with itscomponents5S,kaizen and poka-yoke, and by integrating with the DMAIC method, a firm can discover and eliminate waste, thus streamlining work processes, shortening lead times, reducing costs, and enhancing quality. Consequently, the organization's productivity increases. In the way of considering method approach and implementation a specific procedure is adapted. After collecting and analyzing initial data online, a comparison is made between qualitative and quantitative approach of implementation. In order of considering method approach and it simple mutation a deeper study is made about problems and its root causes, then it will help in finding optimal solution of the problems[9-15]. Due to productivity variance online and to meet customer demand, operators are put on over time. Standard time for the activities was obtained by adding 10% PFD (personal, fatigue and delay)allowance to the basic time or normal time to compensate those parameters which force the worker to stop the work and do other things. Basic time and standard time for the activities were calculated as[9-15]:

Basic time= Observed time x(Observed rating/Standard rating).

Standard Time=Basic time(1 +PFD allowance)

By implementing lean techniques into the lock set production line, this study aims to increase productivity. Problems at each level of manufacturing were examined using lean ideas such as kaizen, 5S and poka-yoke. The process can be further analyzed by analyzing the cycle time of each workstation or the time it takes to complete each process step once the process has been explained. Primary data are those that are first gathered, whereas secondary data are those that have already been collected but can still be used for additional analysis [9-15].

EXPERIMENTAL WORK

This strategy focuses on identifying and eliminating waste over time during the manufacturing cycle in assembly line through the application of lean concepts and process automation.This approach permits a rapid response to market changes due to reduction in lead time [9-15]. In this context to improve the productivity of 3- wheeler lock set assembly line, a path which consists the application of lean concepts and process automation for few processes will be followed.

Table 1: Standard time for activities

S.No.	Process Name	No. of Frequency	Average Cycle Time Sec.	Basic Cycle Time Sec.	Standard Cycle Time Sec.
1	Laser marking	1	35.1	35.1	36.3
2	Ignition Switch Lead Assembly	1	28.24	28.24	29.9
3	Lid lock Barrel Filling	2	40.3	40.3	41.5
4	Lid Barrel Body Fitting	2	38.24	38.24	38.6
5	RE Barrel Filling	1	25.8	25.8	26.2
6	RE Barrel Body Fitting	1	45.2	45.2	46.9
7	Stepney lock Barrel Filling	2	40	40	41.2
8	Stepney Barrel body Fitting	2	35.32	35.32	36.98
9	Continuity Testing EOL	1	28.44	28.44	29.8
10	Visual Inspection 1	2	32.12	32.12	33.9
11	Visual Inspection 2	3	42.1	42.1	43.7
12	Visual Inspection 3	2	32.57	32.57	33.9
13	Packing	1	38.44	38.44	39.9
14	**Total Second**		**461.87**	**461.87**	**478.78**
15	**Average time**		**35.52**	**35.52**	**36.83**

COMPANY'S CURRENT PERFORMANCE: ANANALYSIS

The present performance parameters of the company will be identified and projected in this section based on the data gathered during the measurement phase. We'll concentrate on the following factors in our research:

1. Rejection status (Process or customer complains).
2. Process completion time (effectiveness).

Table 2:Problems on assembly line

Problem related to 3-Wheeler Auto locks of Set				
S.No.	**Assembly**	**Activity/Process**	**Lean Area of problem**	**Effect**
1	More time consumption	Latch fitted in wrong direction	Kaizen and Poka-Yoke	Productivity loss.
2	More time consumption	Material searching	5S	Productivity loss.
3	More time consumption	Drilling in wrong direction	Kaizen and Poka-Yoke	Productivity loss.
4	Switch rejection	EOL testing/Continuity testing process	Quality	Quality and Productivity loss

Table 3. Effect check below before and after improvement

Process/Activity	Before Improvement	After Improvement	Effect
Latch fitted in wrong direction	2%	0%	100% Reduction

Table 4:Process completion time sheet after improvement

S.No.	Process Name	No. of Frequency	Basic Cycle Time Sec.
1	Laser marking	1	35.1

2	Ignition Switch Lead Assembly	1	28.24
3	Lid lock Barrel Filling	2	40.3
4	Lid Barrel Body Fitting	2	38.24
5	RE Barrel Filling	1	25.8
6	RE Barrel Body Fitting	1	45.2
7	Stepney lock Barrel Filling	2	40
8	Stepney Barrel body Fitting	2	35.32
9	Continuity Testing EOL	1	28.44
10	Visual Inspection 1	2	32.12
11	Visual Inspection 2	3	42.1
12	Visual Inspection 3	2	32.57
13	Packing	1	38.44

Table5:Production parameter comparison before and after improvement

Parameter	Before improvement	After improvement	Effect
Rejection	1%	0%	100% (reduction)
Product cycle time	35.52 sec	32.24 sec	3.28 sec (reduction)
Lead time	461.87 sec	387.91 sec	73.96 sec (reduction)
Line capacity	760 switches	837 switches	49 switches (increase)
Takt time	35.52 sec	32.24 sec	3.28 sec (reduction)

The DMAIC strategy's control phase, which comes after improvement and implementation activities, must be taken into consideration. Monitoring and modifications must be made to the implementation process.

RESULTS AND DISCUSSION

This chapter compares the outcomes before and after making changes to the parameters that helped the Bajaj 3-Wheeler lock set assembly line become more productive. Additionally, this chapter goes into great detail into each of the factors listed under the heading "Company performance according to stated objectives."

Table6:Summary for Compiling Data on Improvements

S. No.	Description	Unit	Before	After	Percentage Index
1	Cycle time	Sec	35.52	32.24	10.6% Reduction
2	Production/Shift	No./shift	760	837	10.1% Increase
3	Manpower	Nos.	13	13	No change
4	Production/man	No./man	58	64	10.3% Increase
6	Lead Time	Sec	461.87	387.91	16.6% Reduction
7	Rejection	%	1	0	100% Reduction
8	Annual Saving (man hr)	Rs.	0	258720	Cost Reduction

COMPANY STATUS AFTER IMPROVEMENT : A COMPARATIVE ANALYSIS.

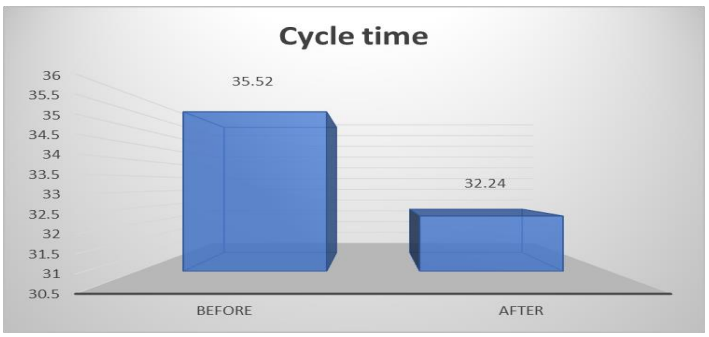

Figure1:Cycle time before and after improvement

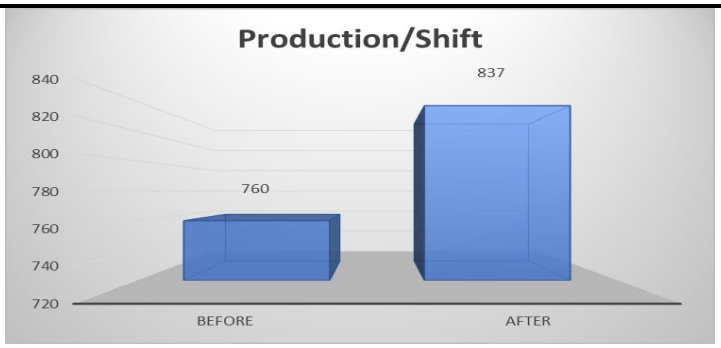

Figure2:Production per shift before and after improvement

Figure3:Man power before and after improvement

Figure4:Lead time before and after improvement

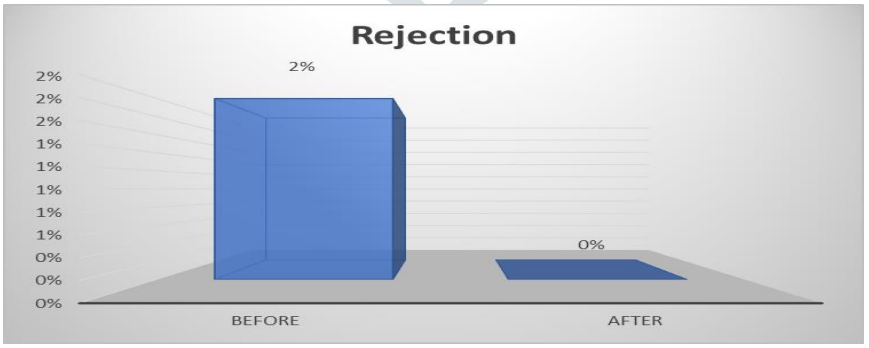

Figure 5:Rejection before and after improvement

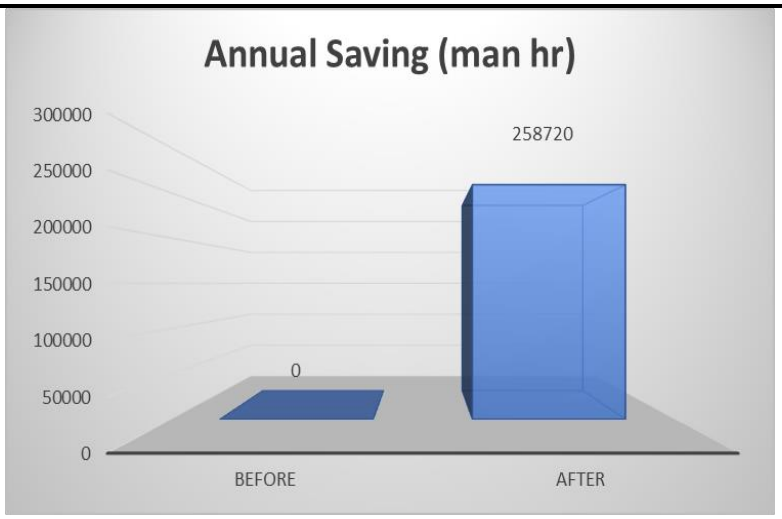

Figure6:Annual cost savings before and after improvement

CONCLUSIONS

This study looks into how lean concepts affect business performance in terms of quality, productivity, and total profitability. In this scenario, by eliminating waste across the manufacturing cycle in the Bajaj 3-Wheeler auto lock set assembly line using people participative continuous improvement strategy, we have achieved decreased product prices, productivity and quality improvement. Based on the results and discussion the improvement in assembly line of Bajaj 3 Wheeler lock set may be summarized as:

- Cycle time for the product 9.23%reduction.
- Production per shift 10.1%increase.
- Productionperman10.3%increase,
- Leadtime16.6%reduction,
- Rejection100%reductionand

Organizational performance is greatly impacted by effective Lean initiatives. The aforementioned data makes it abundantly evident that firms' competitive priorities are based on product improvement through significant changes to the manner in which production is carried out. In this study, we used the DMAIC cycle along with kaizen and 5S to successfully enhance the line condition rather of concentrating on productivity and quality issues.

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