JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Improve Productivity By Using Lean Manufacturing Tools In Automobile Industry

Mayank Singh [1], Raj Kumar [2*]
[1]*Research Scholar,*[2*]*Assistant Professor, ME Department, UIET, MDU, Rohtak,*
Ermayank3110@gmail.com

Abstract

Now a day, *Manufacturing industries was struggle to sustain our business by improving or changing their business strategy and adopting new manufacturing tools like as Indian SMED, OEE, kaizen, Total Productive Maintenance, 5S'.Due to cut and throat competitive environment.so, customer decide the cost of product. So it is very essential to reduce the wastes and cost of the final product. The aim of the company is to achieve zero defects, zero breakdowns in our organization. By implementation of these tools to eliminate system wastages or reduces the balanced cycle time. The research is to identifying the system wastages by implementation of manufacturing lean tools. These tools help to optimize the business strategy and improve the overall production efficiency of an organization.* These optimization and reduction of cost will increase productivity, increase moral environment. In Pavna Industries Limited, some improving point will consider and counter at same time.

Keywords: Overall production efficiency, Pavna Industries Limited, manufacturing lean tools, 5s, kaizen, TPM & OEE.

1. Introduction

The lean manufacturing (LM) or Toyota Production System (TPS), invented by a Japanese automobile firm, Toyota has gained acceptance in almost all nations due to its dominance in terms of price, quality, flexibility, and quick response worldwide. [1] Lean is a method that seeks to decrease waste while increasing value for customers along the whole value stream. It is an entirely client-focused approach that places a strong emphasis on value stream optimization[9]. This Lean thinking concept was inspired by the By identifying value-added activities and removing waste, the Toyota Production System (TPS) determines the value of any process, ensuring that every step adds value.[2] The 5S method of workplace organisation can be used to create a superior workplace environment. [8] By using less resources, this technique attempted to increase the finished product's quality. When lean was fully adopted in 1995, Lantech, a U.S. equipment maker, reported the following benefits in comparison to their batch-based approach in 1991: a 90% drop in faults, a 45% reduction in manufacturing space per machine, a reduction in lead time for product delivery from 4-20 weeks to 1-4 weeks, as well as a production cycle time reduction.Waste is everything that doesn't help change a portion to suit the wants of the consumer. The goal of lean manufacturing is to reduce waste throughout the entire production process, including supplier networks, customer interactions,

and product design.[9]

The Seven Forms of Waste from Toyota (Ohno) The "father" of the **Toyota Production System, Taiichi Ohno**, first named seven types of wastage [10].

3. Objective of the lean system in Pavna automobile industry.

At Pavna Industries Limited, management has decided to increase Bajaj 3-wheeler lock 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 extremely difficult and makes it difficult to dispatch orders while adhering to quality standards.[3] 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. In this case study, we have only improved some selective points, which are shown in the below points.

1. Waste reduction.
2. Work place Standardization and SOP.
3. Effective /Smooth plant layout.
4. Quality will improve on a source level.
5. Increase output from the dispatch order by 10–20%.
6. Minimize Production cost.
7. Reduce the Risk of non-compliance.
8. Late Delivery.

4. Problem Formation

There are some of steps to implement lean tool in manufacturing industry.

1. Identify waste.
2. Categories type of wastages in Bajaj 3- Wheeler.
3. Found root cause of the identified wastes by applying of why-why analysis.
4. The last step complete after finding the solution of wastes and test them and success to implement by using lean manufacturing tools.

5. Research Methodology

In this study, a leanness evaluation metric based on continuous performance monitoring and an efficient implementation approach for lean manufacturing techniques are developed (CPM). [4] Design, method, and strategy A systematic lean implementation technique for manufacturing businesses has been presented and is based on five lean principles. For the continual evaluation of lean implementation, The Seven Forms of Waste from Toyota (Ohno) The "father" of the Toyota Production System, Taiichi Ohno, first named seven types of wastage [10].

5.1 LEAN-MANUFACTURING TOOLS & TECHNIQUES

Numerous Kinds of lean tools are present and utilization of these tools to optimize system operation by reduces or eliminating wastes. [6],[7] These techniques like as.

1. Just in time (JIT).
2. Kanban.
3. KPI (Key Performance Indicator).
4. OEE (Overall Equipment Effectiveness).
5. TPM (Total Preventive Maintenance).
6. SMED.
7. Kaizen.
8. 5'S.
9. 5M.
10. FIFO & LIFO.
11. Poka Yoke.
12. Plan-Do-Check-Act : PDCA/PDSA etc.

6. Experimental Work

From the above 12 points in manufacturing lean tools. For this case study we are using only 4 tools used for reducing or eliminating the company objective.

1.5'S

2.KAIZEN

3.POKA YOKE

4. Process flow

7.Improvement Approach

Using techniques like CAPA, Poka Yoke, Kaizen,5S' and on-the-job training, high quality issues like (Dent on RE body during drilling operation and lock moment hard, Material handling and flow chart) that are primarily found on Three-Wheeler Lock Set will be resolved as part of the process of defect reduction and continuous improvement.

8.Introduction Bajaj 3- wheeler lock On-line.

There are 13-process to complete set of locks which are shown below.

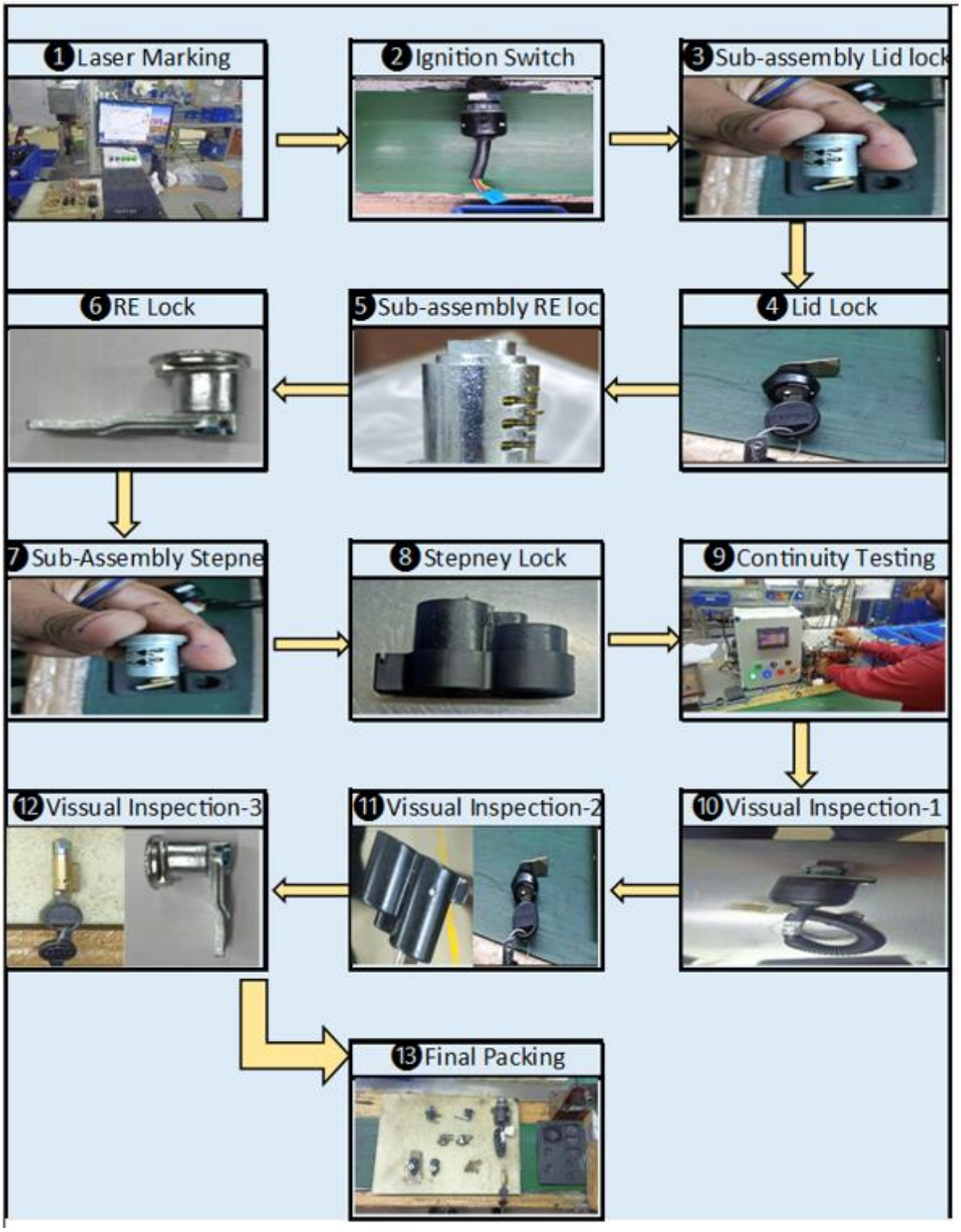


Figure 8.1: Process flow diagram online.

9 ROOT CAUSE ANALYSIS OF THE IDENTIFIED PROBLEMS

9.1.0 ROOT CAUSE OF PROBLEM 'LATCH FITTED IN WRONG DIRECTION.

The process of fitting the levers in the switch assembly line is related to the lock rejection issue. During the examination, it was discovered that the lock assembly is rejected because the lock lever control chamber, seen in fig. 4.11, is skipped. Process drilling is done in series at this station. The operator must complete the lock process before beginning the drilling process. Each operation has its own fixture, and each one functions separately. It has been noted that there is always a chance of bypassing the drilling step during the measurement phase. It might occur as a result of operator error or weariness.

Figure 9.1: Wrong side lever process before improvement

SOLUTION IMPLEMENTATION:

The root cause of the issue was determined during the analytical phase to be operator error or fatigue, which results in the rejection of a process RE lock assembly. As both fixtures (levers) are operating independently, the assembly line's subsequent processing proceeds, and the RE lock assembly is ultimately rejected. The problem of operations being skipped because the operator is drained or makes a mistake can be resolved using a lean technique. The fittings have been synced when the drilling procedure is complete. The drilling operation can be carried out once the technique is finished. Poka Yoke uses the zero-defect concept throughout its design, making system errors impossible. A self-monitoring defect control system called Poka Yoke tracks and prevents the migration of problematic.

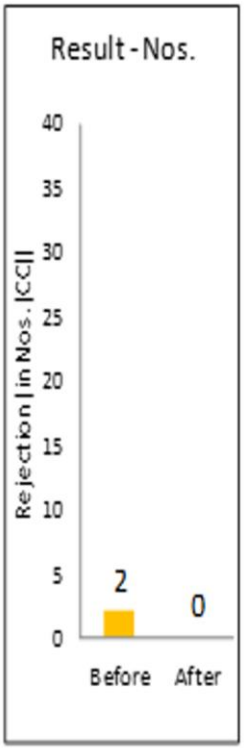
KAIZEN – Q Improvement

THEME : "Customer Complaint Is zero"

Implemented Date: 05.06.2019

PROBLEM PRESENT STATUS: Latch Fitted In Wrong Direction In Engine Cover Lock

BEFORE	AFTER
ANALYSIS :	KAIZEN IDEA: Countermeasure :
W1 : Latch Fitted In Wrong Direction	1. Pin Provided In Fixture
W2: Latch Locator Not Avail In Fixture	



ROOT CAUSE : Latch Locator Not Avail In Fixture

BENEFIT :0 Nos. rejection of part till now after implementation

Horizontal Deployment:

Sustenance : Poka Yoke monitoring sheet

Fig.9..2: lever fitted into right direction process after improvement

EFFECT CHECK

After the solution—synchronizing the process—had been implemented, the line for this process was again seen. The sub-assembly was found without skipping a problematic drilling step. The rejection rate dropped from 1% to 0% at this station. The on-line assembly process's process rejection owing to a missing guide pin is compared in Table 9.1 below before and after improvement.

Table 9.1: Rejection comparison

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

2. ROOT CAUSE OF PROBLEM DENT MARK DURING DRILLING OPERATION

The major cause of this problem is that to spreading scrap over drilling fixture and all closed area of drilling process, which will create material handling problem and making defect by drilling operation. This problem is make a process more time taken and difficult to handling as shown in fig. 9.3.

Fig. 9.3:Turning Spread in all area during drilling operation before

IMPROVEMENT SOLUTION IMPLEMENTATION:

The production team occasionally faces more difficult situations when attempting to produce multiple products simultaneously at different lines while adhering to the quality cycle due to the company's increased productivity over the past few years in response to customer demand in the same or a limited geographic area. Therefore, it's more crucial to adopt 5S lean tools and ensure that daily procedures adhere to an organization's structure. It helps to shorten cycles, lessen the possibility of material mixing, shorten cycles overall, lessen defects, and perform more effectively in challenging situations. This information was provided by PAVNA INDUSTRIES LIMITED.

Apply kaizen to improve material handling 5S.

The production team occasionally faces more difficult situations when attempting to produce multiple products simultaneously at different lines while adhering to the quality cycle due to the company's increased productivity over the past few years in response to customer demand in the same or a limited geographic area. Therefore, it's more crucial to adopt 5S lean tools and ensure that daily procedures adhere to an organization's structure. It helps to

shorten cycles, lessen the possibility of material mixing, shorten cycles overall, lessen defects, and perform more effectively in challenging situations. This information was provided by PAVNA INDUSTRIES LIMITED.

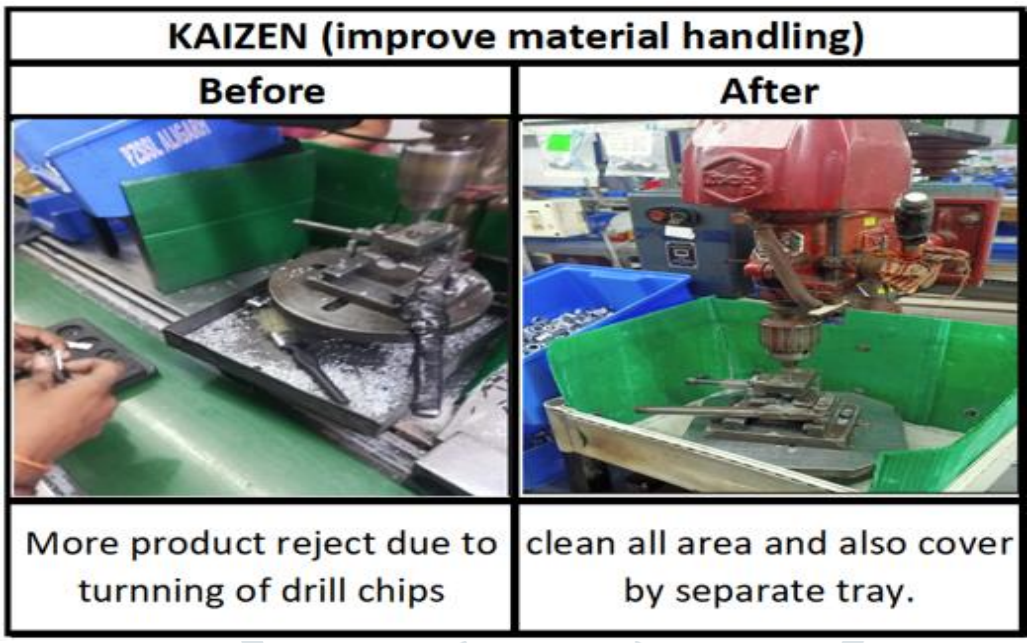


Fig.9.4 Drilling operation on Bajaj 3- Wheeler assembly line.

EFFECT CHECK:

After the locator design solution had been applied from horizontal to vertical, the line had been repeatedly observed for this operation. Drilling always involves drilling through scrap that is found during drilling. More defects in the final product, such as denting, screaming, and improper drilling, are brought on by this trash. Following the implementation of the solution in the form of a locator design, the cycle time for the process dropped from 45.2 seconds to 42.4 seconds, as shown in table 4.18.

Figure 9.5: RE Lock Drilling after improvement

After implementation of 5S' we have achieved 39 pcs. more then the previous production rate.

Table 9.2: Cycle Time Comparison

Process/Activity	Before Improvement	After Improvement	Effect
Drilling operation	45.2 sec	42.4 sec	13.83%
Rejection	2%	0%	100% Reduction

After implementation of Kaizen and 5S on shop floor, The productivity to be increased with 6.54 % which is very high achievement for organization aim.

Before 5S' =(7.5*60 *60)/45.2 =597 pcs.

After 5S' =(7.5*60*60)/42.4 = 636 pcs.

10.Result and Discussion

The ratio between the after improvement implementation is to high with eliminating process defect. There are two problem are selected in production on drilling machine which will make a bottle nack operation with having defect ratio, so we consider these two problem to solving and removing bottle nack operation for increasing productivity in daily production hours,

Solving problem 1 (Latch fitted in wrong side in lock body)

After implementation of Kaizen on shop floor, The productivity to be increased with 2 % by eliminating rejection rate which is very high achievement for organization aim.

Total Producing =(7.5*60*60)/42.4 = 636 pcs.

After removing 2% rejection =623 pcs only packed .

After implementation of kaizen /improvement production has achieved total producing quantity in packing quantity without losing single good.

Solving problem 2 (Dent mark during drilling operation)

After implementation of Kaizen & 5S' on drilling operation ,the productivity of good are increased with quality demand. It has to remove unwanted scrap which is spreading over drill fixture by fixing a tray which is time to time clean and add air device to remove all scrap chips from the location of drill in fixture.

Before 5S' =(7.5*60 *60)/45.2 =597 pcs.

After 5S' =(7.5*60*60)/42.4 = 636 pcs.

Table 10.1: Cycle Time Comparison

Process/Activity	Before Improvement	After Improvement	Effect
Rejection	2%	0%	100% Reduction
Drilling operation	45.2 sec	42.4 sec	13.83%

11.Conclusion

In Bangladesh, the idea of lean manufacturing is relatively new, and forward-thinking businesses have already been seen using this technology in their functional divisions. This is mainly because having lean manufacturing results in numerous cost advantages.

The continual improvement initiatives will aim to reduce waste and increase product quality, increasing the firm's competitiveness and profitability, according to an analysis of the seven major wastes. This will make the automobile worker feel more at ease at work.

12.References

[1] Rameez, H. M. and Inamdar, K.H, —Areas of Lean Manufacturing for Productivity Improvement in a Manufacturing Unit||, World Academy of Science, Engineering and Technology, Vol.45, pp.584-587, 2010.

[2] M. Mohan Prasad, K. Ganesan, K.P. Paranitharan, R. Rajesh, An analytical study of lean implementation measures in pump industries in India, Int. J. Enterprise Network Manage. 10 (2) (2019) 133–151.

[3] Kuo, T., Shen, J. P. and Chen, Y. M., —A Study on Relationship between Lean Production Practices and Manufacturing Performance||, International Symposium ofQuality Management, Taiwan, pp.1-8, 2008.

[4] Chahal, V., —An Advance Lean Production System in Industry to Improve Flexibility and Quality in Manufacturing by Implementation of FMS & Green Manufacturing||, Int. Journal of Emerging Tech. and Advanced Engineering, Vol.2(12), 2012.

[5] Marc Karschies (2017) Advance quality management workshop for healthcare sector.

[6] (2021) Wikipedia Muda. Muda (無駄, on'yomi reading, ateji) is a Japanese word meaning "futility".
[7] Toshifumi Hibi, Remo Panaccione, Miiko Katafuchi, Kaoru Yokoyama, Kenji Watanabe, et al. (2017) The 5C Concept and 5S Principles in Inflammatory Bowel Disease Management. J Crohns Colitis 11(11): 1302-1308
[8] Selim A, Noor A M, Rafikul I (2013) Effects of Lean Six Sigma application in healthcare services: a literature review. Rev Environ Health 28(4): 189-194.
[9] Yaifa Trakulsunti, Jiju Antony (2018).
Can Lean Six Sigma be used to reduce medication errors in the health-care sector? Leadersh Health Serv (Bradf Engl) 31(4): 426-433.
[10] Simon Deblois, Luigi Lepanto (2016) Lean and Six Sigma in acute care: a systematic review of reviews. Int J Health Care Qual Assur 29(2): 192- 208.
[11] D. Shah, "Productivity Improvement by Implementing Lean Manufacturing Tools in manufacturing industry," International Research Journal of Engineering and Technology (IRJET), vol. 5, no. 3, march 2018.