Improving the Productivity of Lever Combination Switch using Continuous Improvement Process

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Abstract*— Most of the companies always report poor quality of particular product during its operation which results in increasing cost, and customer complaints. The purpose of this study is to help Company Mindarika to improve the product quality and to increase productivity by using Continuous Process Improvement and the Quality Control Techniques. Methods and procedures of this study include a review of literature relevant to Continuous Improvement, Quality Control Techniques, Root cause Analysis. After the causes of defects are identified, solutions and procedures are recommended to the Company to eliminate defects in the assembly process of Lever Combination Switch so that the productivity can be improved.

Keywords — Lever Combination Switch; Continuous Process Improvement; Quality Control Tools; Noise in Switch. Greasing of ratchet.

I. INTRODUCTION

1.1 Background

Quality is now involved in every kind of business: manufacturing, hospital, school, food industry, public utility, etc. This is not focused only in production areas but in service areas also. It has turned out to be a core competency for many companies to improve their competitive advantage. Why is quality important? High quality products or services are leading to business success, improved competitiveness, higher customer loyalty, and lower costs.

Continuous process improvement and Quality Control Techniques are the strategies that can help organizations to satisfy customer needs and help organizations to have greater performance.

1.2 Project/Concerned Place Introduction

Mindarika Pvt. Limited, with Rs.1.30 billion (USD 32.12 million) in revenue, is India's largest 4 wheeler automotive switch manufacturer. Mindarika Pvt. Limited has consciously evolved into a complete design and development centre for four wheeler automotive switches.

It offers customized solutions to the automotive industry in the realm of product improvisation and new product development. The core strengths at Mindarika are skilled manpower, adherence to the highest quality standards and providing cost effective solutions.

II. LITERATURE REVIEW

This chapter will discuss concepts of quality including continuous improvement, lean techniques. Moreover, this chapter is devoted to the review of literature which includes the concept of automotive parts manufacturing and processing.

2.1) Continuous Improvement

Companies are always keen to search ideas through which productivity and ultimately the benefits can be improved. The organization's ability to survive in a highly competitive business world depends on how the organization manages and adapts to demands of a changing environment.

Customer always needs new products and their needs are always changing. Therefore, many companies have had to improve in terms of products or services to satisfy customers' needs. Continuous improvement is an ongoing effort to improve products, services, or processes. It is more focused on customer service, process improvement, higher product quality and long-term strategies.

Table-1 shows additional differences between companies that apply continuous improvement theory and traditional companies.

Table-1
Continuous Improvement versus Traditional Orientation

Company Oriented Toward Continuous Improvement	**Traditional Company**
Customer Focus	Market-Share Focus
Focus on "What" &"How"	Focus "Who" & 'Why"
Long-Term Focus	Short-Term Focus
Process Improvement Focus	Product Focus
Incremental Improvements	Innovation
Problem Solving	Fire Fighting

2.2) Seven Tools of Quality

Kaoru Ishikawa developed seven basic visual tools of quality so that the average person could analyze and interpret data. The seven tools of quality are used for improving processes, identifying problems, seeking root causes of problems, and solving problems. These are-Histograms, Pareto Charts, Cause and Effect Diagrams, Run Charts, Scatter Diagrams, Flow Charts, Control Charts.

2.3) View of Product under consideration (LEVER COMBINATION SWITCH)

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Figure 1- Schematic of a LEVER COMBINATION SWITCH

III. OBJECTIVE

To improve the productivity of Lever Combination Switch.

IV. PURPOSE OF THE STUDY

The need of this study is to help Mindarika Private Limited –
1. To minimize the rejection of a specific product,
2. To improve the product quality and

V. SCOPE OF THE STUDY

This study will help the various automotive/process industries-
1. In minimizing the rejection of a specific product,
2. In improving the product quality and

VI. RESEARCH METHODOLOGY

6.1) Introduction

The purpose of this study is to help Mindarika Private Limited to improve productivity of Lever Combination Switch, then provide feedback to the company for the future improvement.

6.2) Define

We than define the main problem which provides the limitation in increasing the productivity.

6.3) Data Collection

Data related to production will be collected. It will include the total produced quantities, rejected quantities and type of defects in the specific product.

6.4) Data Analysis

The various Quality tools will be used to analyze data, identify problems, seek root causes of problems, and solve problems.

VII. RESULTS

The purpose of this study is to help Mindarika Private Limited to improve product quality and improve the productivity by continuous improvement plan.

7.1) Identifying and analyzing problems in Mindarika-

Company Mindarika Private Limited has faced unsteady quality of automotive products, which results in increasing cost and customer complaints. One of the reasons for this is that the company's business has increased dramatically within the past couple years. As a result, the variety of automotive products has been escalating. Another reason for quality issues at Company Mindarika private limited relates to new employees hired to support the growing business who lack quality knowledge of material/ product characteristics. During the last quarter in 2012, Company Mindarika private limited has noted a countable rejection in various products manufactured by it. The details of these rejections are given below in the histogram chart in figure-

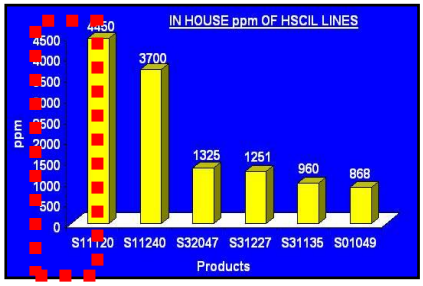

Figure 2- Histogram showing details of rejection of various products

As we have chosen the product S11120 (Combination Lever Switch) so it is marked with red dots around it.

Now as per our need we will identify the problems associated S11120, which leads to the rejection of this product.

Table 2 Problems related with S11120

S.N.	PROBLEMS RELATED TO S11120	AREA	CATEGORY		
			A	B	C
1	PART SHORTAGE ON LINE	5S		B	
2	OVERTIME ON LINE	PRODUCTIVITY		B	
3	PART FEEDING ON LINE	5S	A		
4	SHORTAGE OF BIN	5S		B	
5	MORE NO. OF DOCUMENT ON LINE	5S	A		
6	MORE ABSENTEESISM ON LINE	PRODUCTIVITY	A		
7	NO PROPER LOCATION OF SMALL PARTS ON LINE	QUALITY		B	
8	MORE LOSSES DUE TO MACHINE BREAK-DOWN	PRODUCTIVITY		B	
9	ERRATIC CONTINUITY	QUALITY		B	
10	LOCKING NG	QUALITY		B	
11	CAPACITY CONSTRAINT	PRODUCTIVITY	A		
12	NOISE IN THE SWITCH	QUALITY		B	
13	SCREW MISS	QUALITY		B	
14	BATCH CODE MISS	QUALITY		B	
15	DELIEVERY FAILURE	DISPATCH		B	
16	MARKING OF COMPONENTS	QUALITY		B	
17	FLASH ON COMPONENTS	QUALITY		B	
18	SCRATCH ON COMPONENTS	QUALITY		B	

From the table Shown above we found that there are **Total 18 (Internal) Problems** associated with S11120.

Also on the basis of above sources we have divided these problems into following 3 categories-

A– problems can be solved by the assembly department

B– involvement of other departments is a necessity

C– management sanction may be needed

QUALITY PROBLEMS RELATED WITH S11120 =9

Among the 9 problems 8 of the problems are solved with the help of the Lean or Kaizen Techniques. Now only 1 Quality related problem is remaining.

Table 3-Total Quality Problems

TOTAL QUALITY PROBLEMS = 9 NO.'S				
S.N.	**PROBLEM**	**TOTAL**	**SOLVED (KAIZEN)**	**REMAINING**
1	'A' -TYPE	01	01	00
2	'B' -TYPE	08	07	01
3	'C' -TYPE	00	00	00

Now the single problem which remained unsolved is-
"Extra noise observed in switch while turn is on".

7.1.1) Definition of Problem (Noise in the Switch)?
Noise in switch may be defined as the **"The unpleasant sound from the Combination Lever Switch while the turn is On".**

7.1.2) Analysis & Finding out causes of High Significance
For finding out the causes of Noise in switch let us draw the process flow chart where the problem actually happened and how it bypassed the existing checking parameters.

1. Fog Contact assembly
2. Fog contact assembly with lever
3. Soldering of wire with base cap
4. Wire insertion in lever
5. Manual assembly of ratchet with case assembly after greasing
6. Holder assembly
7. Lower case assembly
8. Wire terminal assembly
9. Coupler fitting
10. Wire terminal mouth checking
11. Sound test and final inspection
12. Dispatch to HSCI

We will now draw a Cause and Effect Diagram to find out the causes of Noise in switch-

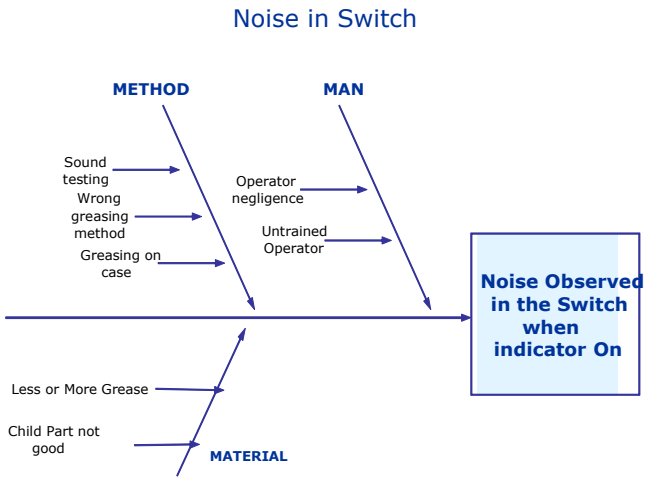

Figure 3- Cause and effect diagram for Noise in Switch

From the cause and effect diagram we have found that the problem of Noise in Switch is due to the following reason-
1. Ratchet was rubbing during the movement
2. Grease not done in the moving slot of ratchet
3. Operator did the greasing on wrong position
4. Process sequence was difficult to adhere for operator hence possibility of grease missing or miss positioning of greasing.

7.2) Developing solution for problem –
From the cause and effect diagram we found that the problem mainly arises due to the following reasons-
1. Ratchet was rubbing during the movement
2. Grease not done in the moving slot of ratchet
3. Operator did the greasing on wrong position
4. Process sequence was difficult to adhere for operator hence possibility of grease missing or miss positioning of greasing.

7.2.1) Developing solution of the problem
To remove the problem of Noise in switch we have to find the solutions of the above reasons.
After thorough analysis we developed the two solutions for removing these problems. These are –
1. Improvement in the greasing process.(Refer App. 1)
2. OGS (Operator Guidance Sheet) and PQCS (Process quality control Sheet) updated for the changed process. (Refer App. 2,3,4).
3. Check points have to be added at 200% inspection stage to check the ratchet sound.

7.3) Making recommendations for the removing the problem of Noise in the Switch –
From our research we found that the following problem is associated with combination lever switch-
"Noise in the switch when indicator On".
Recommendations for removing Noise problem from Switch -

By using the CI techniques we recommend the following solutions for this problem-
1. Improvement is required in greasing process.
2. (Appendix 1)
3. OGS and PQCS must have to be updated for the changed process.(Appendix 2,3,4)
4. Check points have to be added at 200% inspection stage to check the ratchet sound.

VIII. CONCLUSION

The causes of these problems has been determined-
1. Ratchet was rubbing during the movement
2. Grease not done in the moving slot of ratchet
3. Operator did the greasing on wrong position
4. Process sequence was difficult to adhere for operator hence possibility of grease missing or miss positioning of greasing.

Recommendations Related to this Study

1. Improvement is required in the greasing process.
2. OGS and PQCS must have to be updated for the changed process.
3. Check points have to be added at 200% inspection stage to check the ratchet sound.

By using the Above Recommendations we can definitely improve the productivity of the Lever Combination Switch upto a certain degree which is the required target of our research work.

Recommendations for Further Study

This study provided the procedures and solutions based on CI to solve only single problem. In addition, this study can be applied to other assembly lines, which are facing similar kind of problems, for minimizing the rejection of some particular product.

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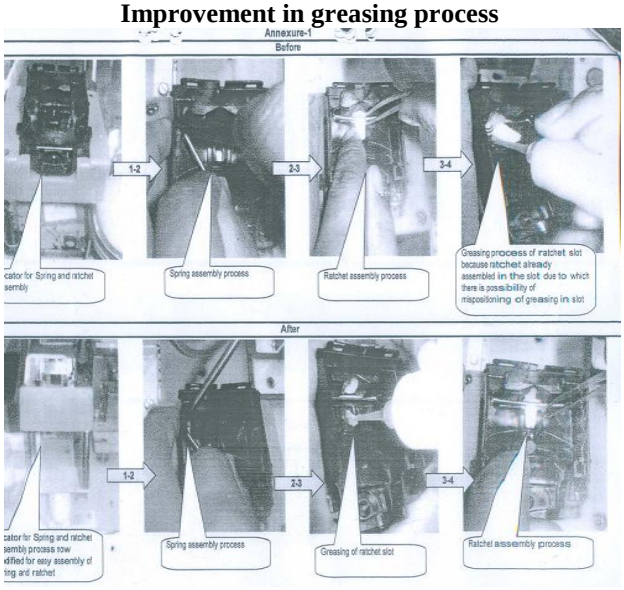
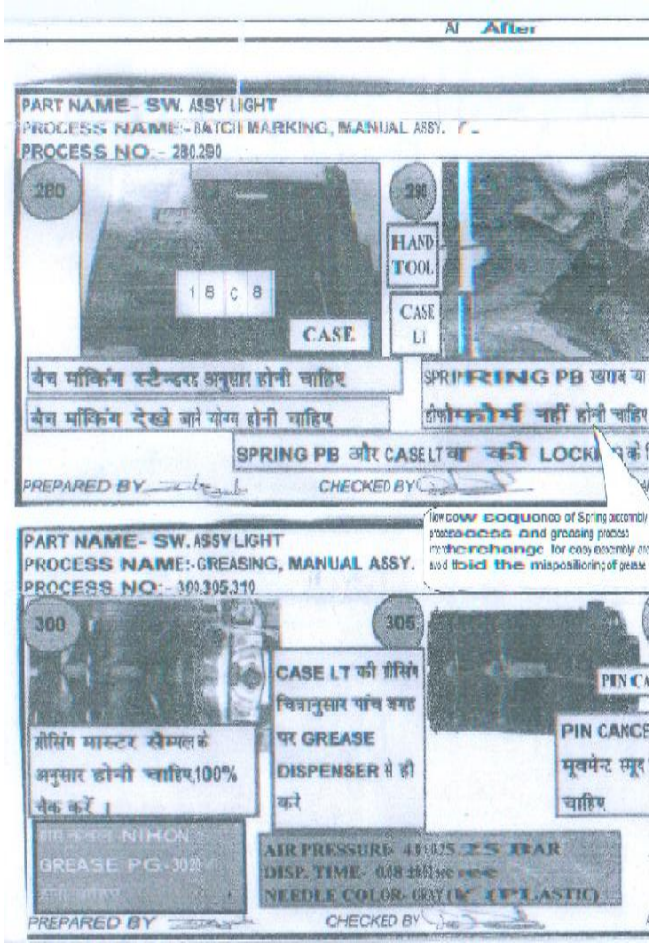
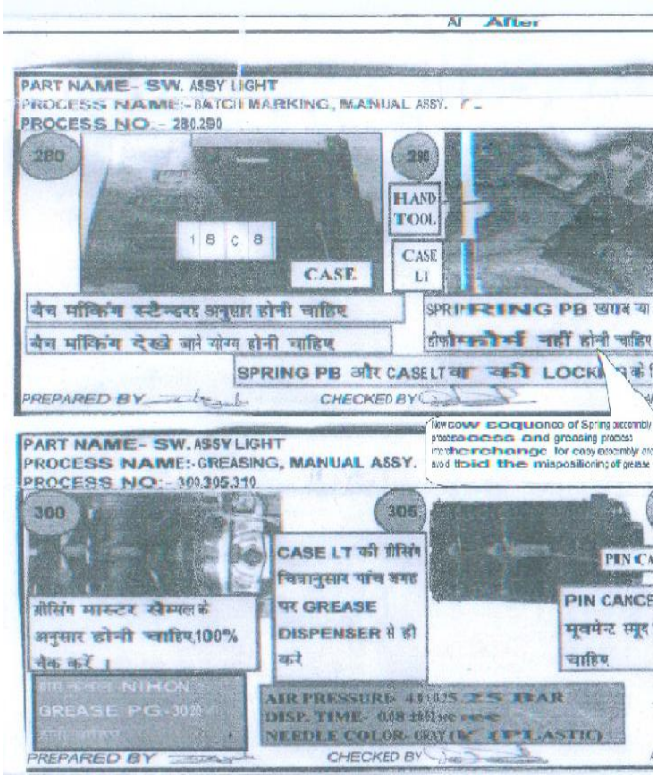
Appendix 1
Improvement in greasing process



Appendix 2
OPERATOR GUIDENCE SHEET
Before Implementation of Solution



Appendix 3
OPERATOR GUIDENCE SHEET
After Implementation of Solution



Appendix 4
PROCESS QUALTIY CONTROL TABLE