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Removing the Problem of Erratic Continuity in Assembly of Lever Combination Switch using Continuous Improvement Process

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Abstract— Company Mindarika had reported poor quality of particular products in the Assembly department which results in increasing cost, lead time, and customer complaints. The purpose of this study is to help Company Mindarika to improve the product quality and to manage the data for a continuous improvement plan 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, Seven Tools of Quality and Assembly process of a specific automotive product (Lever Combination Switch). After the causes of defects were identified, solutions and procedures were recommended to the Company to eliminate defects in the assembly process of Lever Combination Switch.

Key Words: Lever Combination Switch, Erratic Continuity, Continuous Process Improvement, Quality Control Tools.

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

1.2.1) 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.

1.2.2) Mindarika's Quality

Quality of automotive parts and customer service has been the focus of the company to gain market share and to satisfy their customers. The company has received many Certificates and awards from the world wide institutions.

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

It is impossible for organizations to survive without changing or improving. 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. The change in a business environment comes from many resources-

- Competitors create new products;
- Competitors reduce products' prices and
- Competitors use new technology to improve quality of a product.

Customer expectations 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-3 shows additional differences between companies that apply continuous improvement theory and traditional companies. There are different approaches to support continuous improvement theory.

Table- Continuous Improvement versus Traditional Orientation

Company Oriented Toward Continuous Improvement	Traditional Company
Customer Focus	Market-Share Focus
Cross-Functional Teams	Individual
Focus on "What" &"How"	Focus on "Who" and 'Why"
Long-Term Focus	Short-Term Focus
Continuous Improvement Focus	Status Quo Focus
Process Improvement Focus	Product Focus
Problem Solving	Fire Fighting

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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 tools are incredibly simple so all levels of workers can use them easily. These are-Histograms, Pareto Charts, Cause and Effect Diagrams, Run Charts, Scatter Diagrams, Flow Charts, Control Charts.

2.3) Root cause analysis

Root cause analysis (RCA) is a class of problem solving methods aimed at identifying the root causes of problems or events.

It is a structured approach for identifying the factors that resulted in the nature, the magnitude, the location, and the timing of the harmful outcomes (consequences) of one or more past events in order to identify what behaviors, actions, inactions, or conditions need to be changed to prevent recurrence of similar harmful outcomes and to identify the lessons to be learned to promote the achievement of better consequences.

Conversely, there may be several effective measures (methods) that address the root causes of a problem. Thus, RCA is often considered to be an iterative process, and is frequently viewed as a tool of continuous improvement.

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

Figure 1- LEVER COMBINATION SWITCH

III. OBJECTIVE

To remove the problem of Erratic Continuity of Lever Combination Switch.

IV. RESEARCH METHODOLOGY

4.1) Introduction

The purpose of this study is to help Mindarika Private Limited to improve product quality and manage the data for a continuous improvement plan, then provide feedback to the company for the future improvement.

4.2) Define

The problem will be then defined..

4.3) 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.

4.4) Data Analysis

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

V. RESULTS

5.1) Definition of Erratic Continuity-

"The lacking of continuation of Current Flow in the switch due to which Lever will not work properly".

Figure 2- Erratic Continuity

5.2) Analysis & Finding out causes of High Significance

A Failure Tree Analysis has been drawn to find out the causes of Erratic Continuity.

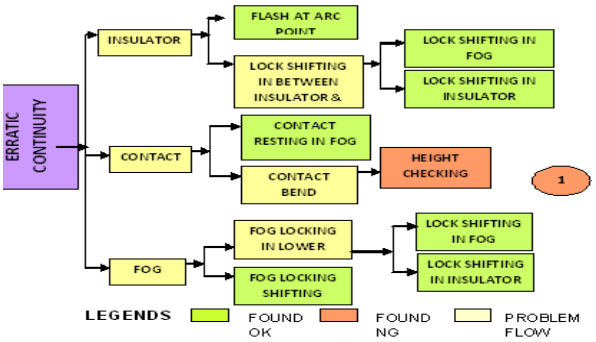

Figure 3- Failure Tree Analysis for the problem of Erratic Continuity

From the failure tree analysis it has been found that the Erratic Continuity is due to problem in the contact bend. This is due to the fact that because of **No Proper Height checking**.

5.3) Confirmation of Root Cause

For determining the root cause of this problem we will analyze a diagram taken from the process line. Simultaneously we will make a Why Why Analysis of Height Checking Not Good Factor.

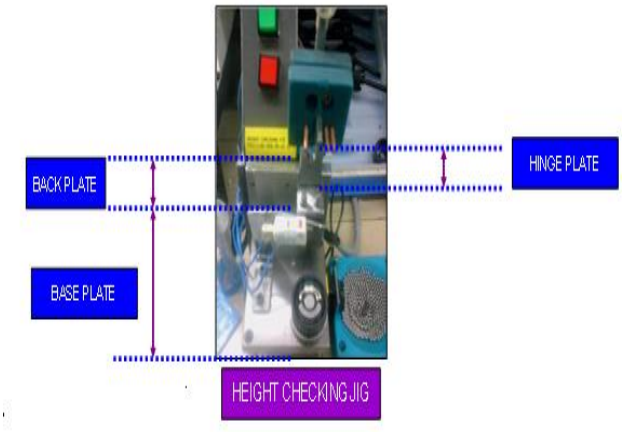

Figure 4- Root Cause confirmation of Erratic Continuity Why -Why Analysis of Height Checking not Good

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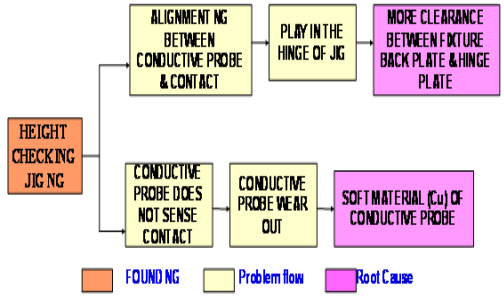

Figure5 -Why-Why Analysis of Height Checking not Good

From the above diagram and the Why Why Analysis of Height Checking we found that the problem is due to the two reasons -

1. Jig for Height Checking is not appropriate
2. Soft material (Cu) of conductive probe wears out.

5.4) Developing solution for problem Erratic Continuity

For removing the first cause i.e. More Clearance between Fixture and Back plate, we can use two solutions–

1. Alignment of hinge plate with back plate
2. Convert existing hinge type Jig to Pneumatic Height Checking Jig.

But the first type of solution is not appropriate because of 2 reasons given below-

1) Chances of error in alignment during maintenance
2) Hinge plate is supported with base plate by spring loaded pins.

So the second solution will give an appropriate solution of the problem of the Erratic Continuity which is "Convert existing hinge type Jig to Pneumatic Height Checking Jig".

For removing the second cause of problem i.e. Soft Material (Cu) of Conductive material, we will exchange the softer material of conductive material with a comparatively harder material. This will not let the material to wear at faster rate.

5.5) Trial Implementation

These solutions are then implemented on the assembly line for resolving the problem of Erratic Continuity.

The first solution (Convert existing hinge type Jig to Pneumatic Height Checking Jig) is implemented to the first problem and it's Before and After condition are explained below in the diagram

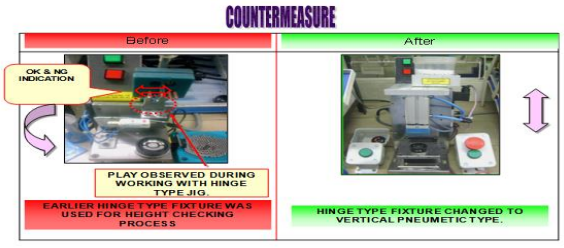

Figure 27-Trial Implementation of Ist Solution

The above comparative diagram of Before and After conditions taken from the assembly line explains that –

a. In Before condition we find that a play exists during working with Hinge type Jig which is used for Height Checking Process.
b. The After condition explains that when we change the fixture to Vertical Pneumatic Type fixture the play problem resolves.

The Second solution (exchanging of softer material of conductive material with a comparatively harder material) is implemented to the second problem (Soft Material (Cu) of Conductive material which gets wear at a faster rate) and it's Before and After condition are explained below in the diagram.

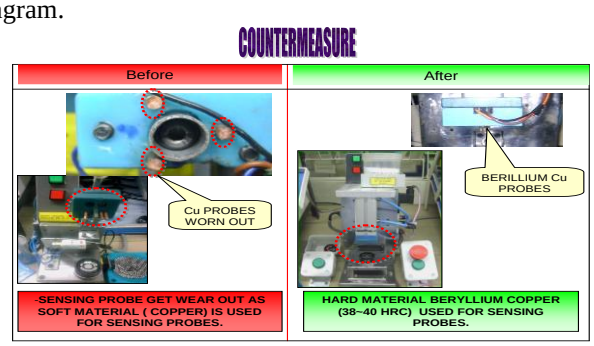

Figure 28- Trial Implementation of 2nd Solution

The above comparative diagram of Before and After conditions taken from the assembly line explains that –

a. In Before condition we find that the sensing probe get wear out as soft material (Copper) is used for sensing probes.
b. The After condition explains the solution of this problem. This condition explains that if we will use a harder material (Beryllium Copper, 38-40 HRC) we can get rid of problem of wear out of sensing probe.

VI. CONCLUSION

For removing the problem of Erratic continuity the following suggestions can be used-

1. Convert existing hinge type Jig to Pneumatic Height Checking Jig.
2. Exchange the Soft Material (Cu Probe) of Conductive material with a comparatively harder material (Beryllium Copper Probe).

VII. RECOMMENDATION FOR FURTHER STUDY

This study provided the procedures and solutions based on the Continuous Process Improvement to solve problem of Erratic Continuity. This study can be applied to other assembly lines, which are facing similar kind of problems, for minimizing the rejection of some particular product.

VIII. ACKNOWLEDGMENT

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