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Rejection Analysis of a Nozzle Holder Manufacturing Unit using Root Cause Analysis Method

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Abstract— Rejection is one of the basic reason of any manufacturing unit which lowers the productivity and hence the profit. It is very important for any industry to control rejection rate to gain high amount of profit. To achieve this goal it is necessary to carry out rejection analysis of manufacturing unit and find out main causes for rejection of products. There are several techniques of rejection analysis of manufacturing unit. In this paper, Root Cause Analysis method is used for rejection analysis of nozzle holder body manufacturing unit. Various possible causes are identified using Cause & Effect Diagram (fishbone diagram), and the rate of rejection for various processes are analyzed using Pareto Analysis where the processes are divided into 80% and 20% according to their rate of rejection. Root causes for the failure of Nozzle Holder Body are found out and based on these results the solution is proposed to overcome rejection.

Index terms - Cause & Effect Diagram (Fishbone diagram), Nozzle Holder Body, Pareto Analysis, Rejection Analysis, Root Cause Analysis.

I. INTRODUCTION

Root Cause analysis (RCA) is a method of solving the problems of rejection by identifying the root cause. Every equipment failure happens for a number of reasons. There is a definite progression of actions and consequences that lead to a failure. Root Cause Analysis is a step-by-step method that leads to the discovery of faults or root causes [3]. RCA is an iterative process, and is a tool of continuous improvement. RCA initially, is a reactive method of problem detection and solving. This means that the analysis is done after an event has occurred. By gaining expertise in RCA it will become a pro-active method.

Root cause analysis is not a single, sharply defined methodology. There are many different tools, processes, and philosophies of RCA in existence. However, most of these can be classified into five categories as follows:

1. Safety-based: Safety-based RCA descends from the fields of accident analysis and occupational safety and health.
2. Production-based: Production-based RCA has its origins in the field of quality control for industrial manufacturing.
3. Process-based: Process-based RCA is basically follow-on to production-based RCA and it has scope in business processes.
4. Failure-based: Failure-based RCA is used in practice of failure analysis and is useful in engineering and maintenance to improve productivity.
5. Systems-based: Systems-based RCA is a combination of above types along with ideas taken from fields such as change management, risk management, and systems analysis.

II. LITERATURE REVIEW

***Jayswal et.al*[1]** Suggested Root Cause Analysis method, based on the combination of pareto analysis and fishbone diagram. This methodology is applicable to different production systems. It focuses the attention on important fundamental causes, discover opportunities for improvement and provide critical guidance to design for sustainability.

***Lagad & Inamdar*[2]** Carried out RCA for bonnet cable failure in vehicles. Various possible causes are identified using fishbone diagram. Why-why analysis was carried, to find root cause and solution is proposed.

It has been observed from the above literature review that, the Root Cause Analysis is suitable method for the rejection analysis of manufacturing unit.

***Mahto & Kumar*[3]** Adopted Root-cause identification methodology to eliminate the dimensional defects in cutting operation of CNC oxy flame cutting machine and it was found that rejection has been reduced from 11.87% to 1.92% on an average. A detailed experimental study was carried out for effective application of proposed methodology.

They concluded that the conventional Root Cause Analysis tools and methods provides some tools to overcome human event problems. This empirical study shows application of RCA to overcome dimensional defects that will prevent the problem from recurring. Thus, it is one of the best practices, which allows all stakeholders to have a clear idea and the reality to promote its effective solution all the time. The Root Cause tools and methods could be utilized according to prevalent conditions and situations of man, material, machines, systems and processes.

***Tomic & Brkic*[4]** Briefly highlights major steps, that should be taken in the right sequence to overcome any problem from chaotic process. It has two major areas, root cause analysis and corrective action process which are interrelated. The first one serves the purpose to detect the correct root cause of the problem which is the source of rejection and other is a set of actions to eliminate the root cause with proposed solutions.

It has been concluded from this paper that Root cause corrective action for non-conformances is a requirement of any industry. It is a process of determining the causes that led to a nonconformance of event, and implementing corrective actions to prevent a recurrence of event.

III. RCA ANALYSIS

This paper deals with rejection analysis of manufacturing processes used in manufacturing of nozzle holder body of Bosch pump, details of nozzle holder body are shown in Fig.1.

Main objectives are to reduce rejection occurring in regions highlighted in fig.1.

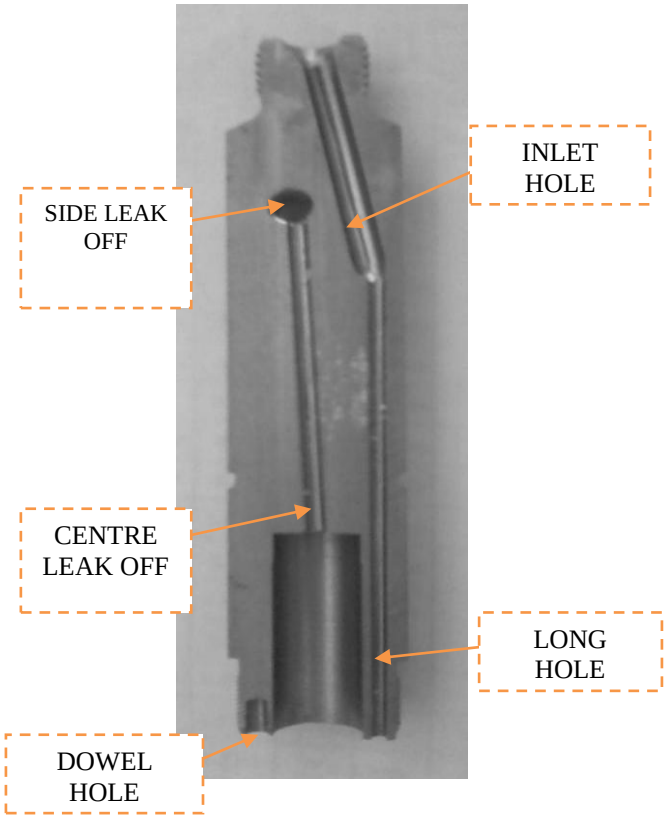

Figure.1.Cut section of nozzle holder body

A. Methodology used for RCA Analysis

Main causes of failure for identification of failures continuous monitoring of manufacturing activities used in manufacturing of nozzle holder body was carried out. RCA technique is used to overcome the problems of rejection. RCA methodology used for monitoring manufacturing activities is as defined below.

Phase I- Process Flow Diagram:

The flow diagram of every process in a manufacturing unit is constructed by monitoring the manufacturing activity.

Phase II- Data Collection:

Data collection is important phase in RCA. Data was collected available control charts (for 90 days).

Phase III- Root Cause Diagram (RCD) for analysis of data:

Based on the data collected, root cause diagrams (fishbone diagram) were constructed for each manufacturing activity. It gives nature of failures.

Phase IV- Result of RCD's:

Following results are obtained from Root Cause Diagram which causes the failure.

1. Improper fixture design.
2. Improper locator.
3. Poor handling.
4. High burr saturation.

Phase V- Corrective Action & Implementation:

For all above causes corrective actions are suggested and best affordable solution is implemented.

Implemented solutions for the causes are as below:

1. Modification in existing fixture plate.
2. Arrangement of covers on fixture to remove burr accumulation.
3. Modification in existing material handling tray.
4. Proper practices for declamping of nozzle holder body.

Phase VI- Result After Implementation:

After implementing all corrective actions, it is found that rejection rate is reduced from 2% to 0.25 %.(Rejection analysis is carried out by Pareto Analysis)

B. Cause & Effect Diagram (Fish Bone Diagram)

After brainstorming, various possible causes contributing to rejection of nozzle holder body are enlisted. Cause and effect diagram (Fig. 2 Fishbone diagram) is constructed by considering all possible causes which are identified during observation of manufacturing process and brain storming.

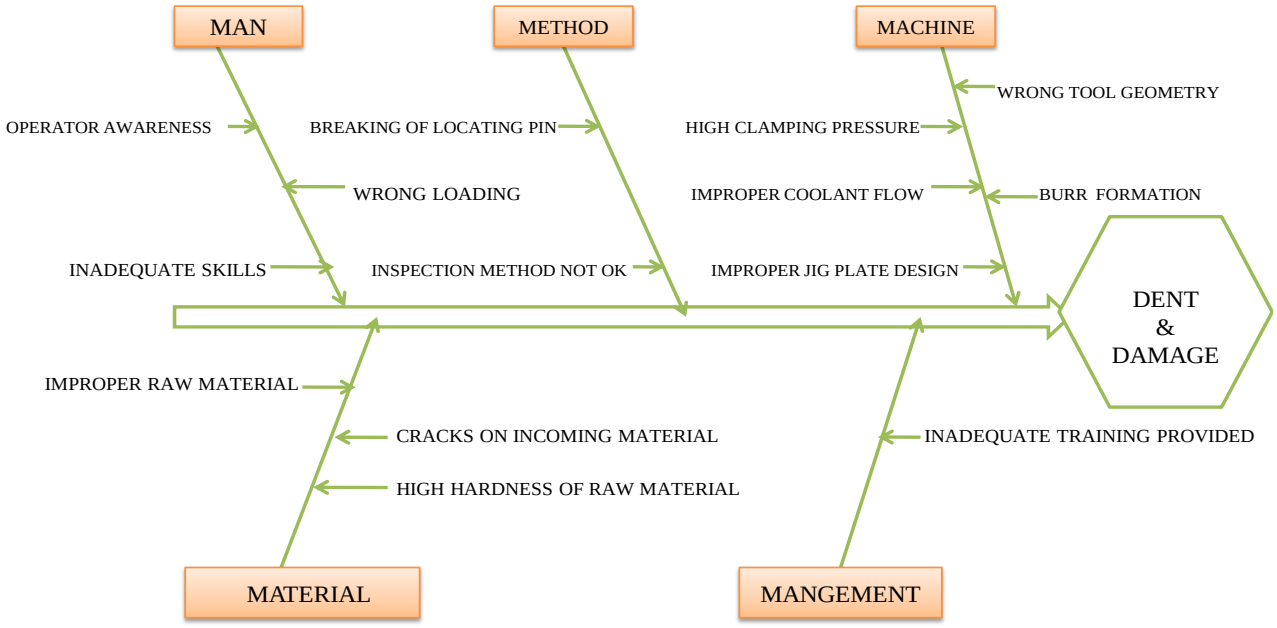

Figure.2.Fishbone Diagram

IV. CONCLUSION

1. Root Cause Analysis is the most practiced method for rejection analysis which gives reliable corrective action process for improving productivity of a manufacturing unit.
2. After Root Cause Analysis and constructing Fishbone diagram for manufacturing unit of Nozzle Holder Body, damages and their reasons are as follows:

2.1. Dowel hole damage is occurred due to improper locator and high burr saturation.

2.2. NSS (Nozzle Seating Surface) damage occurs due to sticking of burr and improper handling.

2.3. High clamping pressure is responsible for Cone face damage.

2.4. Improper handling causes Thread damage.

2.5. Sticking of burr to the surface causes Cone chamfer damage.

3. After successfully implementation of outcomes of Root Cause Analysis, rejection is decreased from 2% to 0.25%

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REFERENCES

[1]. Jayswal A., Li X., Zanwar A., Lou H.H,and Huang Y.(2011).A sustainability root cause analysis methodology and its application,Computers and Chemical Engineering 35, pp.2786– 2798.

[2]. Lagad A. D. and Dr. Inamdar K. H. (2013) Root Cause Analysis of field failure corner for improvement in durability

of vehicle system, International Journal of Mechanical Engineering and Technology (IJMET),Volume 4, Issue 3, pp. 232-243.

[3]. Mahto D. and Kumar A.(2008) Application of root cause analysis in improvement of product quality and productivity, Journal of Industrial Engineering and Management (JIEM),Volume 1, pp.16-53,ISSN: 2013-0953.

[4]. Tomic B. and Brkic V.S.(2011),Effective Root Cause Analysis and corrective action process,Journal of Engineering Management and Competitiveness (JEMC),Volume 1, No. 1/2, pp.16-20.

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