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Design and analysis in drill offset using root cause analysis

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Abstract – In this our main problem is that the drill is off setted in MS-Bush while drilling. This is because of the vibrations occurred during drilling process while putting the drill through the MS-Bush. To overcome this problem we have made an jig by rotating the shaft to 90 degree where the bush is fixed. This problem is solved by using tools of RCA like Why Why Analysis & Cause and Effect Diagram. Root-cause identification for quality and productivity related problems are key issues for manufacturing processes. It has been a very challenging engineering problem particularly in a multistage manufacturing, where maximum number of processes and activities are performed. However, it may also be implemented with ease in each and every individual set up and activities in any manufacturing process. In this paper, root-cause identification methodology has been adopted to eliminate the dimensional defects in drilling operation.

Keywords: root cause analysis, cause and effect diagram, Why Why analysis.

I. INTRODUCTION

Beneath every problem is a cause for that problem. In order to solve a problem one must identify the cause of the problem and take steps to eliminate the cause. If the root cause of a problem is not identified, then one is merely addressing the symptoms and the problem will continue to exist. For this reason, identifying and eliminating root causes of problems is of utmost importance (Andersen and Fagerhaug 2000; Dew 1991; Sproull 2001). Tools that help groups and individuals identify potential root causes of problems are known as root cause analysis tools. The cause-and-effect diagram (CED), the interrelationship diagram (ID), and the current reality tree (CRT) are three root cause analysis tools frequently identified in the literature as viable mechanisms for solving problems and making decisions. The literature provides detailed descriptions, recommendations, and instructions for their construction and use.

Furthermore, the literature is quite detailed in providing colorful and illustrative examples for each of the tools so they can be quickly learned and applied. In summary, the literature confirms that these three tools are capable of finding potential root causes.

Conversely, although there is much information about the individual attributes of these root cause analysis tools, there is little information regarding the performance of these tools relative to each other.

Thus, problem solvers and decision makers are likely to select a tool based on convenience rather than on its actual performance characteristics. Thus, the purpose of this article is to explore and synthesize the current literature for a head-to-head performance analysis of the CED,ID, and CRT.

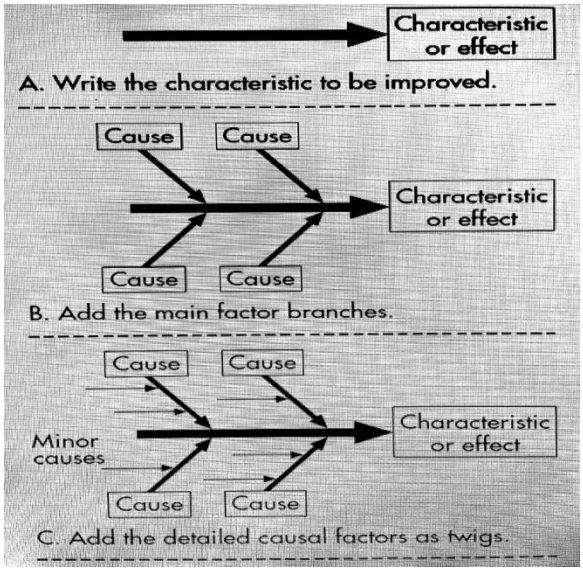
The intent is to provide problem solvers with a mechanism that can be used to select the appropriate root cause analysis tool for the specific problem.

The first section of this article presents an overview and a background of the CED, ID, and CRT. For each tool, there is a brief history, a presentation of various construction techniques, and a

summary of the tool's advantages and disadvantages. The second section reviews published articles that compare these tools. The third section analyzes the literature and provides a conceptual framework with a head-to-head comparison for problem-solving practitioners and decision makers.

The final section concludes with implications and recommendations for management.

Steps in building a cause-and-effect Diagram



II. LITERATURE SURVEY

[1] Dalgobind Mahto has made an study that Root-cause identification for quality and productivity related problems are key issues for manufacturing processes.

[2] Mark Dogget has made a study on a framework for analyzing the performance of three popular root cause analysis tools: the cause-and-effect diagram, the interrelationship diagram, and the current reality tree.

[3] Richard W. JONES has made an study that Root Cause Analysis (RCA) is the most widely used system analysis tool for investigating safety related incidents in selecting the tool and to make an analysis on the material selection.

[4] Victor Muntes-Mulero has made a study on survey that it provides a review of Root Cause Analysis on the particular aspects.

III. CAUSE AND EFFECT DIAGRAM

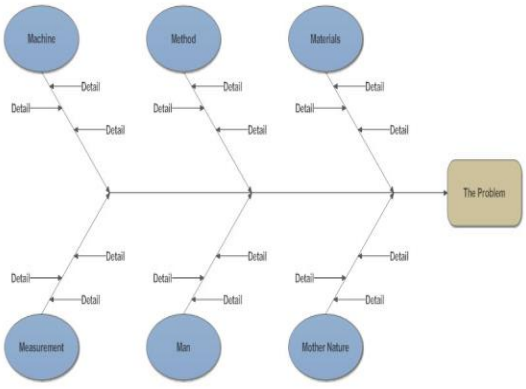
Cause and Effect diagram is also known as fish bone diagram (or) Ishikawa Diagram. In this diagram there are 5M they are Machine, Method, Man power, Material, Measurement.

There are also 4S method used in industries they are Surrounding, Suppliers, Skill, Systems. By using this method we can easily find where the problem is started in the product. A recurring theme in a lean or six-sigma transformation is removing the clutter to allow you to see waste or opportunities for improvement.

A fishbone diagram aims to break down and organise the Causes of an issue to reveal what elements have the greatest impact. Grouping the "causes" means you can think about the different elements of the problem as separate from the overall process.

One or two of these "causes" will have a greater effect than the others and will guide you to the root of the problem. This structure also allows you to tackle smaller chunks which have a large impact on the problem.

Looking at elements of the problem and not the whole process will likely make finding your solution less daunting and problem solving more manageable.



Root Cause Analysis is intended to reveal key relationships among various variables, and the

possible causes provide additional insight into process behavior.

The causes emerge by analysis, often through brainstorming sessions, and are grouped into categories on the main branches off the fishbone. To help structure the approach, the categories are often selected from one of the common models shown below, but may emerge as something unique to the application in a specific case.

Each potential cause is traced back to find the root cause, often using the 5 Why technique.

A fishbone diagram is useful in brainstorming sessions to focus conversation. After the group has brainstormed all the possible causes for a problem, the facilitator helps the group to rate the potential causes according to their level of importance and diagram a hierarchy.

The design of the diagram looks much like a skeleton of a fish. Fishbone diagrams are typically worked right to left, with each large "bone" of the fish branching out to include smaller bones containing more detail.

IV. WHY WHY ANALYSIS

5 Whys is aniterative interrogative technique used to explore the cause-and-effect relationships underlying a particular problem. The primary goal of the technique is to determine the root cause of a defect or problem by repeating the question "Why?" Each answer forms the basis of the next question. The "5" in the name derives from an anecdotal observation on the number of iterations needed to resolve the problem.

Not all problems have a single root cause. If one wishes to uncover multiple root causes, the method must be repeated asking a different sequence of questions each time.

The method provides no hard and fast rules about what lines of questions to explore, or how long to continue the search for additional root causes. Thus, even when the method is closely followed, the outcome still depends upon the knowledge and persistence of the people involved.

1. ***Why?*** – Increase in Flute Length in Drill Bit. (First why)
2. ***Why?*** – To Make the operation In Single Operation.(Second why)
3. ***Why?*** – It Is Due To Jig Design. (Third why)
4. ***Why?*** - The alternator belt was well beyond its useful service life and not replaced. (Fourth why)
5. ***Why?*** – To Make The Operation In Less Time Of Period. (Fifth why, a root cause)

While the 5 Why technique is used to identify the root cause of a problem, corresponding "how" methods may be used to identify a solution to the problem. One technique is to match the 5 whys with 5 hows. Using the same logic, "how," is asked 5 times until the best solution for a problem is found.

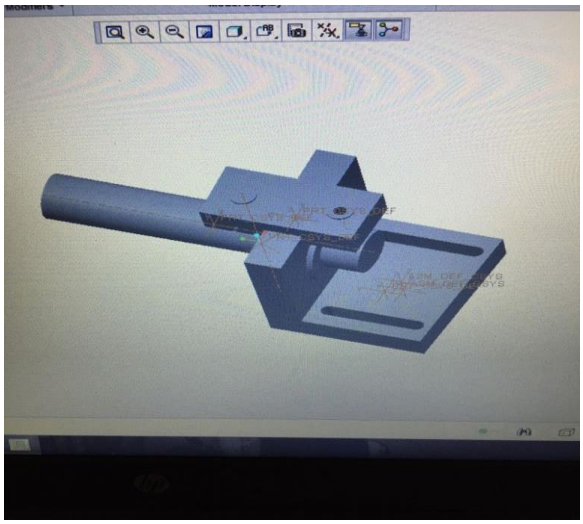
V. EXPERIMENTAL SETUP

In this the jig is newly designed and then it is produced. In this normally, the jig is design in one part and then in that the workpiece is fixed and then it is drilled in single operation and then the workpiece is drilled and it is offsetted by the vibration in the drill bit.

To overcome from this problem which is raised we have fixed an extra shaft in the other side. By help of that shaft we can able to rotate the shaft by 90 Degree.

In this we have Reduced the Flute Length of the drill bit. By using the newly designed jig we can rotate the shaft and we have fix the workpiece the drill is formed in an straight manner and we have reduced the drill offset.

In the other side of the shaft a pin is available to lock the shaft and to make an drill through the other side of the shaft.



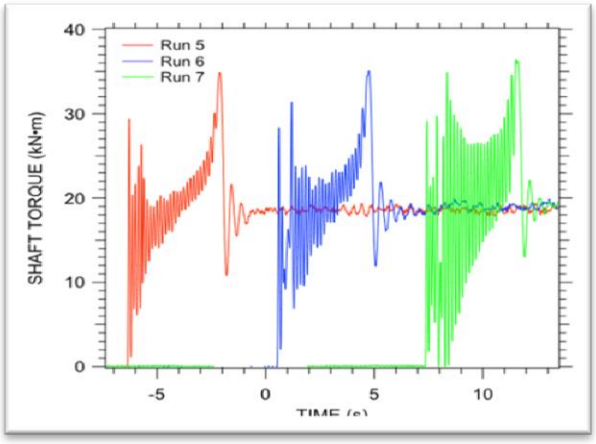
VI. RESULT ANALYSIS

Before Analysis-Before we have analysed on the drill offset in MS Bush that drill is performed in an single operation by the drill flute length of about 8.3 mm length.

After Analysis-Because of that much of flute length vibration is occurred during that operation and then drill is off-setted in another side.

We have reduced the flute length of about 4 mm length, and we have made an same change in the jig then we have fixed the shaft by the rotating feature.

In that jig we rotate the shaft of about 90 degree pin is available to lock one side of the shaft, and then we have put the drill on both sides. After that we have came to an conclusion that the problem is fully solved.



VII. CONCLUSION

From this analysis, we have concluded that we have reduced the drill offset by adding a new idea on the jig by rotating the shaft for 90 degree and by reducing the flute length by 4mm length. Then we have arrest the rotation of shaft by adding a pin to it.

We have made an new idea of rotating the shaft in which the work-piece is fixed. Thus, we have reduced the drill offset in MS-Bush.

VIII. REFERENCES

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