

Elimination of Heat Check Marking In Chip Stripper

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ABSTRACT: Increasing cost of consumable materials has put an enormous pressure on the pricing as well as the profitability of an organization. Without any compromise on quality, the variable cost has to be reduced. This demands novel thinking and creativity for constant improvement in manufacture, resulting in good profits. The basic idea of this work is to reduce the rework and scrap losses by eliminating heat check mark in wheel rim. In general, an increase in temperature brings out a decrease in strength, an increase in ductility, and a decrease in the rate of strain hardening – all effects that would tend to promote ease of deformation and heat marks in the wheel rim.

KEYWORDS: Heat check mark, stripper, quality circle, reverse engineering

1. INTRODUCTION

As technologies advanced customers demand for higher strength combined with higher ductility, better toughness and quality both at ambient and elevated temperatures. All these factors lead to higher levels of thermal & mechanical stresses on the casting dies. These stresses are manifest in the form of Heat Check marks in the component. The Problem is identified in the component after Flange forming is the **Heat check mark** or **stress mark** in the rim due to improper heat translation which increases the rework. Rim is the outer edge of a wheel, holding the tire. It makes up the outer circular design of the wheel on which the inside edge of the tire is mounted on vehicles such as automobiles. Causes for the problem are listed using brain storming technique such as, stripper wear, stripper crack, stripper chipped, stripper bolt broken, component height variation, heat check mark in component, stripper hardness, heat variations, insufficient cooling water flow, punch bolts loosen, excess load, untrained operator, improper setting, ram excess play.

II. TOOLS AIDED

2.1 Cause-and-Effect Diagram:

Cause-and-Effect Diagram is a tool that helps identify, sort, and display possible causes of a specific problem or quality characteristic. It graphically illustrates the relationship between a given outcome and all the factors that influence the outcome. This type of diagram is sometimes called an "Ishikawa diagram" as it was invented by Kaoru Ishikawa, or a "fishbone diagram" because of the way it looks. A Cause-and-Effect Diagram is a tool that is useful for identifying and organizing the known or possible causes of quality, or the lack of it. The structure provided by the diagram helps team members who think in a very systematic way. Some of the benefits of constructing a Cause-and-Effect Diagram are that it increases knowledge of the process by helping everyone to learn more about the factors at work and how they relate and identifies areas where data should be collected for further study, helps to determine the root causes of a problem or quality characteristic using a structured approach, uses an orderly, easy-to-read format to diagram cause-and-effect relationships and also indicates possible causes of variation in a process. Cause-and-Effect Diagram of our component

is shown in Figure 1.

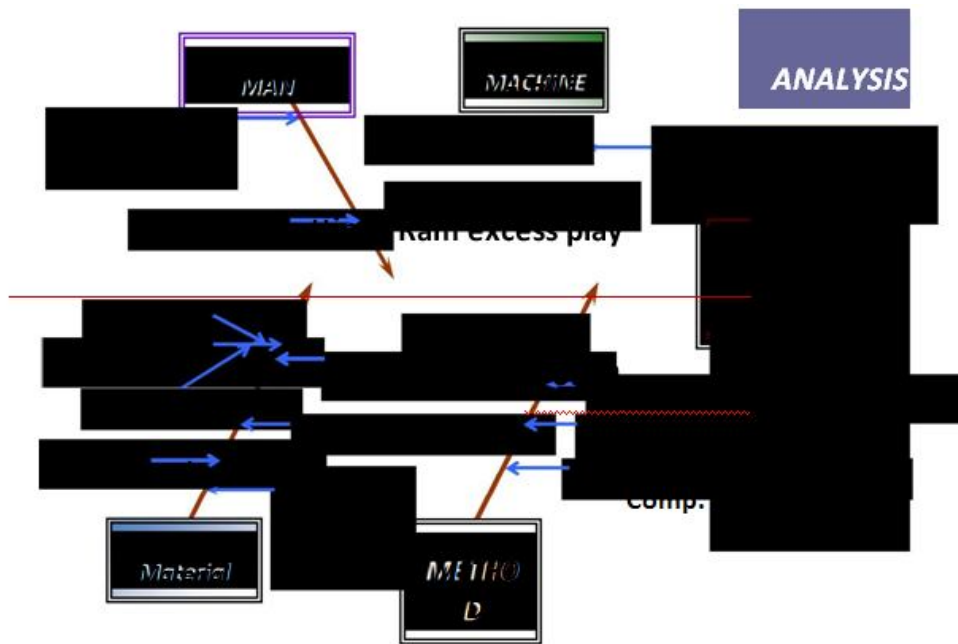


Fig. 1 Fish Bone Diagram for Wheel rim

2.2 Scatter Diagram:

Scatter Diagram is another quality tool that can be used to show the relationship between paired data and can provide more useful information about a production process. Figure 2 gives the relation between tool angle and tool life and tool angle and rework.

SCATTER DIAGRAM

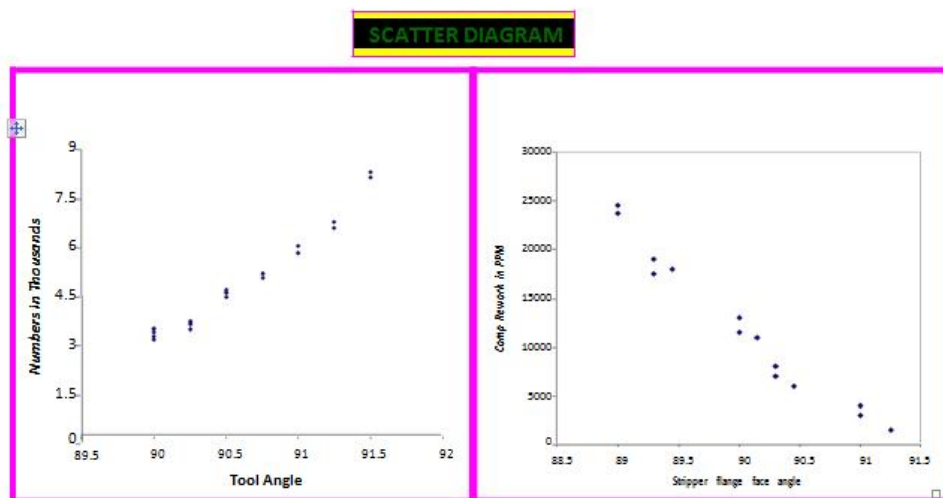


Fig. 2 Scatter Diagram

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 4, Special Issue 3, March 2015

First National Conference on Emerging Trends in Automotive Technology (ETAT-2015)

Organized by

SAE INDIA Velammal Collegiate Club, Velammal Engineering College, Chennai, India on 20th March 2015

III. PRODUCT ENGINEERING AND DESIGN

At this stage, to evaluate each solution objectively against the stated design criteria or requirements, a quantitative basis for judging and evaluating each design alternative is needed. One widely used method to formalize the decision-making process is the decision matrix. The decision matrix is a mathematical tool you can use to derive a number that specifies and justifies the best decision.

3.1 Root Causes:

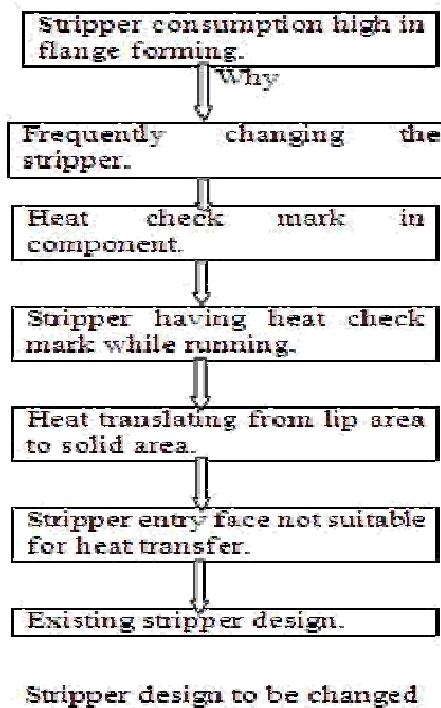
SL.No	Problem related to man/machine/material/method	Description of the cause	Consideration for further analysis	Reason for eliminating the cause
1	Machine	Ram excess play	Considered	Slide clearance to be checked
2	Method	Heat check mark in component	Considered	Heat check mark found in stripper
3	Method	Heat check mark in stripper	Considered	Frequent change of stripper
4	Material	Stripper hardness	Considered	check material hardness

3.2 Validation of Causes:

SLNo	CAUSE	VALIDATION	Inference			SELECT
			Low	Medium	High	
		Checked in the line and the observation are as follows				
1	Stripper hardness	Hardness of the stripper 58/60 RC	yes			Not significant
		Hardness of the stripper measure - 60 RC				
2	Ram excess play	Jib clearance SPEC value 0.006" to 0.008"	yes			Not significant
		Actual value 0.008"				
3	Rework high	Rework data taken and found more heat check mark rework			yes	significant
		Heat check mark rework average 12548ppm.				
4	Frequent change of stripper	Found frequent change monthly 12 times changed			yes	significant

3.3 Why-Why Analysis:

By Why Why Analysis problem can be identified and stripper design has to be changed.



IV. INTERACTION BETWEEN MACHINE, TOOL AND WORKPIECE

A typical system for a metal-forming process is presented here through forging. The platens are manipulated by a hydraulic cylinder. The force applied to the workpiece through the piston and platens is contained by the frame. The resultant force on the system is zero. However, the frame must be strong enough to contain the forming forces. Today's modern presses are automated. The following description is the state of the art in several of the most advanced designs.



Fig. 3 Stripper Tool

The shape of the product, together with other information about the feed stock is given as the input to an online computer that activates the press and its accessories. The entire workpiece, tooling, and press manipulations schedules are calculated by the computer. Workpiece after workpiece is automatically fed to the press from its storage. An

assortment of tools is stored on a rack at the press, and automatic selection of the desired tools at the proper portion of the cycle is affected. The tools and workpiece are manipulated in synchronization to shape the workpiece to the proper design by repeated forging actions. When forming of one workpiece is completed, the workpiece is removed to make room for the next one. Hydraulics and electronics with robotics combine to provide motion inspection and vibration control.

V. RESULT AND DISCUSSION

The average tool cost in two months and the average cost incurred in 400 ton HMT press are shown in Figure 4 and Figure 5.

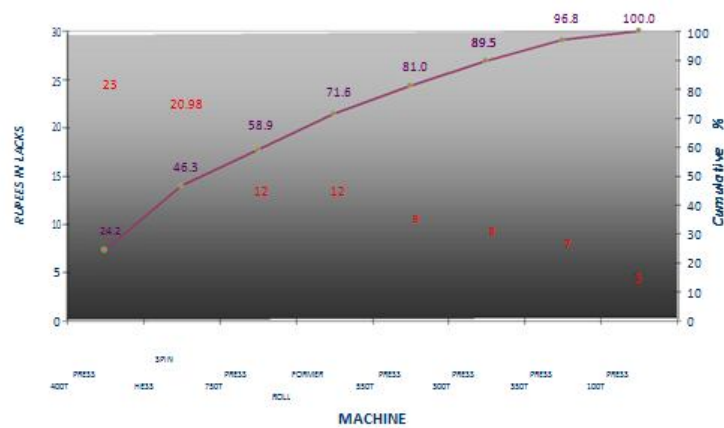


Fig. 4 Average tool cost in two months

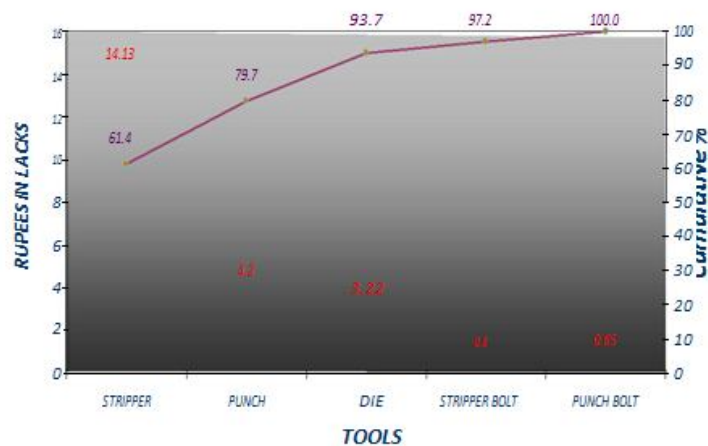
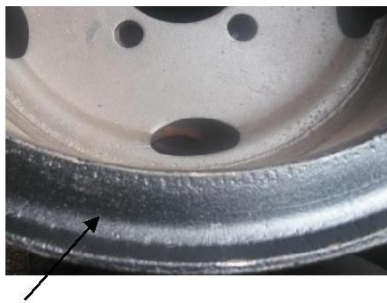


Fig. 5 Average cost incurred in the machines.

BEFORE QUALITY CONTROL



Heat Check Marks

AFTER QUALITY CONTROL



No Heat Check Marks

Fig. 6 Heat Check Marking in Chip Stripper

Strippers recondition is to be done after every 8150 component.

5.1 Cost Analysis:

Before QC:

Stripper (7/CN 1178) = Rs.2, 33,700
2 months consumption is 1 no = Rs.2, 33,700
Stripper in cost 20 times/2 month = Rs.21, 000

After QC:

Stripper (7/CN 1178) = Rs.2, 33,700
2 months consumption is 1 no = Rs.2, 33,700
Stripper in cost 20 times/2 month = Rs.1, 050.
For development one time investment

Expected cost savings for stripper =Rs.19, 950.

1)Cost savings from production = Rs.11,400
2)Cost savings from rework = Rs.3,361
3)Expected cost savings for stripper = Rs.19, 950.

Total cost savings per 2 months = Rs.34, 711.

VI. CONCLUSION

In this work, rim process rework and scrap losses are reduced and material and man work in this operation was saved. Increasing cost of consumable materials has put an enormous pressure on the pricing as well as the profitability of an organization. Therefore without any compromise on quality, the variable cost has reduced. This work implements the concept of design and cost. Stripper entry space is not suitable for the heat transfer. Heat translates from lip area to solid area. Stripper design is changed to with stand heat translation at flange entry phase. Applying **reverse engineering** concept, tool angle changed from 90° to 89° and then by trial & error it is further modified to **91°30'**.

REFERENCES

1. Phillip F Ostwald and Jairo Munoz, "Manufacturing process and systems", Ninth Edition.
2. G. Dieter, "Mechanical Metallurgy", 2nd Edition.

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 4, Special Issue 3, March 2015

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3. Kurt Lange: SME, "Hand Book of Metal Forming", 1985.
4. Ertas, A, Jones, J. C, John Wiley and Sons, "The Engineering Design Process", New York, 1996.
5. PSG College of Technology, Design Data Book for Engineers, reprint edition, 2010
6. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
7. Amitava Mira, "Fundamentals of Quality Control and Improvement", Pearson education, 2nd edition, 2003.