

MODIFICATION IN 3 POINT CAULKING MACHINE

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ABSTRACT

The manufacturing industry either small scale or medium scale provides varieties of products to full fill the market needs. To face the many challenges of market this industries should increase their production rate with good quality and better accuracy. This paper is the review for our final year project. As per the company present requirement the need such a technique for punching, marking, clamping operation for shock absorber damper which performs at machine named 3 point caulking machine. Caulking is considered as both process as well as material to seal joints or seams in various parts of automobile and other structures. We are focusing on what is caulking machine and its operations, what modifications we perform to improve the production.

Keywords: *3 Point Caulking Machine, Shock Absorber, Modifications*

I. INTRODUCTION

Caulking or rolled-in head formed using single tool, developed for shock absorbers, gas springs and transmission housing of washing machines.

Special purpose machine as per customer's requirement manufactured for conduct caulking / rolled-in-head on number of assembly parts. This machine is developed for 80mm dia. rolled-in /caulking operation of transmission housing or washing machine. The inset photo of machine near 6'+ feet tall standing man.

The 3- point notching operation is done in this machine and also the marking operation is done. This machine is a hydraulic machine but the marking operation is done by pneumatic force. In this machine 3 operations takes place at a time i.e., first is caulking then holding the damper and then the marking is done .In this three operations Caulking operation requires high pressure hence it uses hydraulic actuator. Caulking operation is done to hold the rod guide into the damper. After caulking operation damper holder is get actuated pneumatically. It holds the damper to avoid horizontal movement of the damper while punching (marking). In punching operation some letters are get punched on the damper head. These 3 operations are the operations which were carried out before the modification. After modification Punching is shifted to the oil seal pressing machine and damper holder is get eliminated.

Following are the machines involve in the manufacturing of the monotube shock damper.

1. Cleaning machine
2. Torquing machine
3. Riveting machine
4. Oil seal pressing machine

5. Caulking machine

6. Spinning machine

II. CAULKING MACHINE

Caulk something is to fill the hole or cracks in something, i.e. to caulk is nothing but the sealing operation.

Caulking is both processes and material to seal joints or seams in various structures and some types of tubing.

A. Machine layout

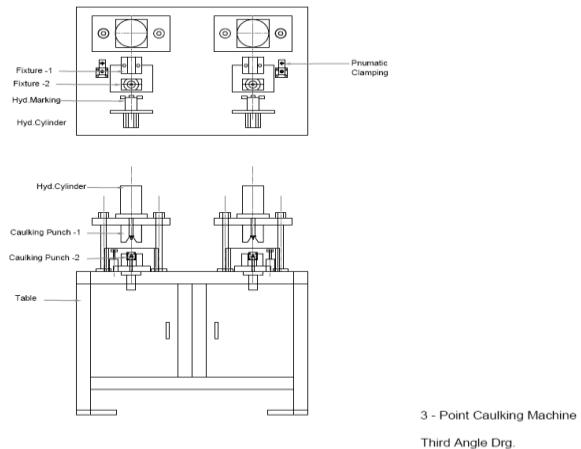


Fig 01: Caulking machine before modification

III. WORKING PRINCIPAL

The project is generally based on the 3 point As the 3 point punch is carried out in only one stroke and simultaneously marking punch and pneumatic clamping is done so this results in the high reaction rate. This machine performs the operation on both LH and RH damper with small variation that is for LH the 3 point punch is at 15 mm and for RH is 8mm from datum line due to number of punches performed at a time required productivity is not achieved .

3.1. Problems arise while operations

Due to 3 operations various defects are observed the common defects are improper marking; caulking punch is up to the limit. This problem is due to the high and low pressure combination of hydraulic and pneumatic circuits. And the root cause for the rejection is horizontal and vertical forces at a time cause unbalancing of shock damper. We found this cause through Why-Why analysis as shown below.

3.2. What is Why-Why analysis?

The why-why analysis is a technique used in the analyse phase of six sigma DAMIC (define, measure, analyse, improve, control) methodology by repetitively asking the question “why” (five times why mostly preferred). The technique was originally developed by Sakichitoyod and was used within the Toyota motor corporation during the evaluation of its manufacturing methodologies. It is a component of problem-solving, delivering as part of introduction into the Toyota system. “It is the scientific method by repeating why five or more times, due to which the nature of problem as well as the solution become clear.”

Following is the analysis for our 3-point caulking machine. Having the basic problem as less productivity and more cycle time.

Less productivity and more cycle

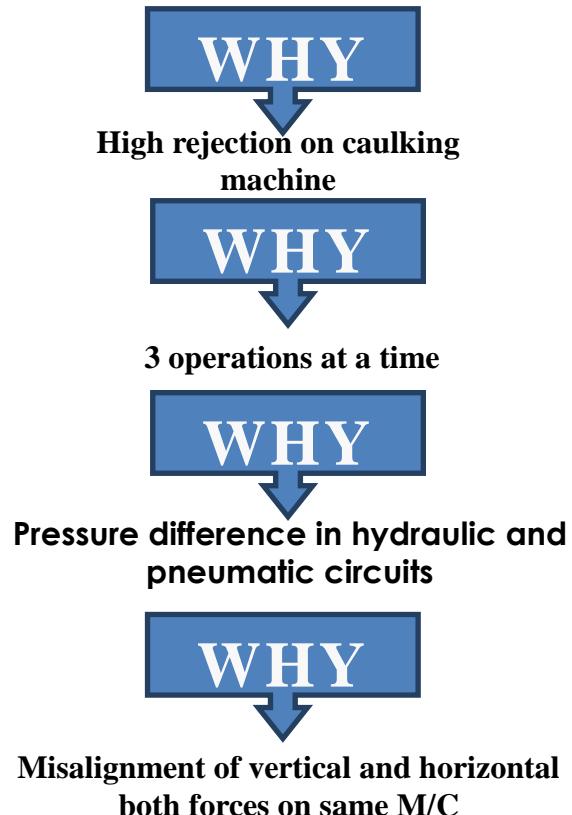


Fig 02: Why-Why Analysis

Benefits of the why-why analysis

1. Help to identify the root cause of a problem
2. Determine the relationship between different root causes of a problem
3. It is a simplest tool and easy to complete without statistical analysis
- From the why-why analysis we observe that the root cause is misalignment of the vertical and horizontal forces. As the vertical and horizontal forces are hydraulic and pneumatic respectively, pressure difference causes unbalancing of the monotube shock damper.

3.3.Fishbone diagram

A fishbone diagram is also known as Ishikawa diagram and known as cause and effect diagram. It is used to categorizing and visualization the potential causes of a problem in order to identify its root cause.

A Japanese expert from quality control department Dr. Kaoru Ishikawa created this diagram to help employees avoid solution that address the symptoms of the problem. It consists of the 4 factors i.e. man, machine, material and method and it's relation with the problem.

For our 3 point caulking problem the fishbone diagram is as follow:

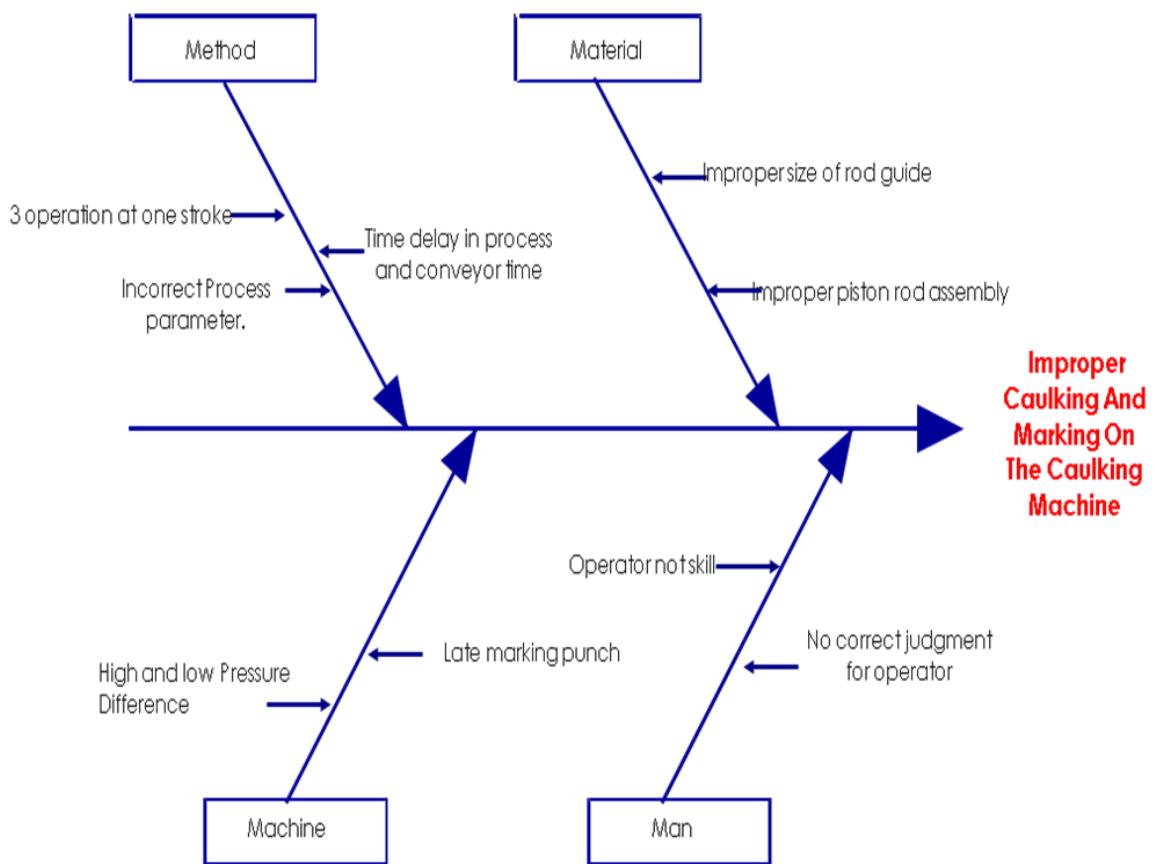


Fig 03: Fishbone Diagram

- 1) Method: it shows the method of operation which causes the problem to be occurring. In this case the major reason for the problem are 3operation at one stroke, time delay in process and conveyor time i.e. process time does not match with the conveyor time and finally improper parameter .
- 2) Material: It shows the relation of problem with the material in our case two major causes are improper size of rod guide and improper piston rod assembly,
- 3) Machine: It show the relation between the problem and the machine operation to be perform in case of caulking machine the main causes are pressure difference in hydraulic and pneumatic circuit and late marking punch.
- 4) Man: It show how man is responsible for the problem occurring on the machine that means the relation between the man and problem. Mostly the problem is due to the unskilled operator and incorrect judgement of operator

3.4.Idea generation for solution

Finally we got the root cause of the rejection of the caulking machine. The root cause is misalignment of the vertical and horizontal forces. Than next step is to generate a verity of solution to solve the problem are

1. Transfer the punch to the oil seal pressing machine
2. Change the fixture design

3. Make a screw arrangement at the bottom of the fixture

Transfer punch on oil seal pressing machine is the best idea for this problem because this can satisfy the all requirement. That the separation of both vertical and horizontal forces i.e. caulking and marking operation is done properly which also reduce the cycle time and increase productivity.

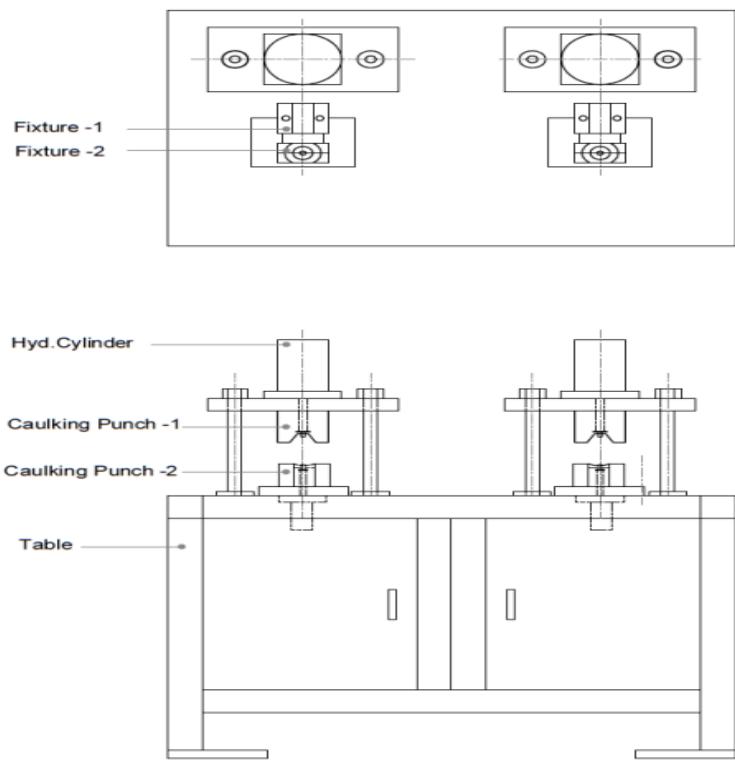


Fig 04: Caulking machine after modification

3.5.Reduce in rejection

Transfer punch on oil seal pressing machine is the best idea for this problem because this can satisfy the all requirement. That the separation of both vertical and horizontal forces i.e. caulking and marking operation is done properly which also reduce the cycle time and increase productivity. This reduce the rejection rapidity compare to the before and after rejection

➤ The reduce in rejection is shown by the graph below:

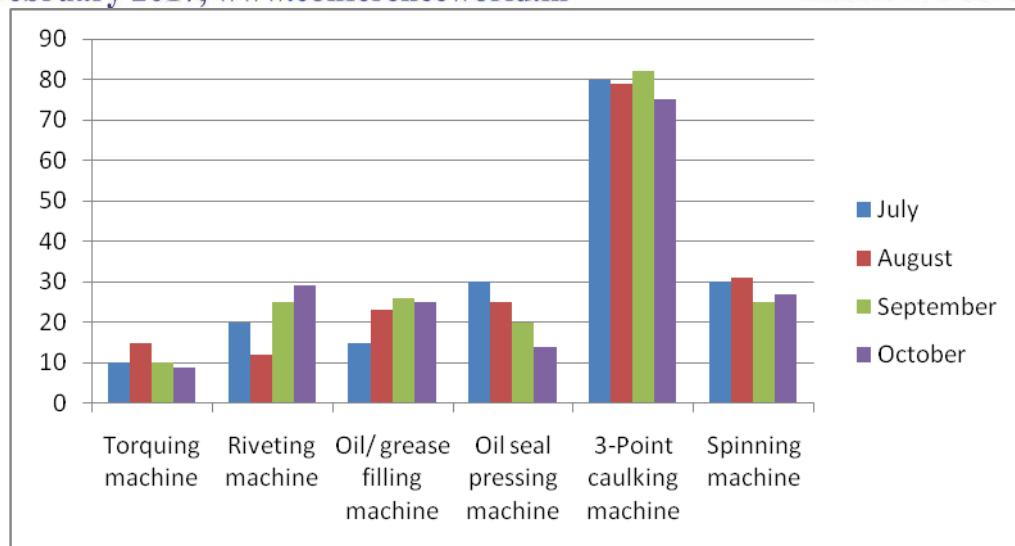


Fig 05: Rejection on caulking machine before modification

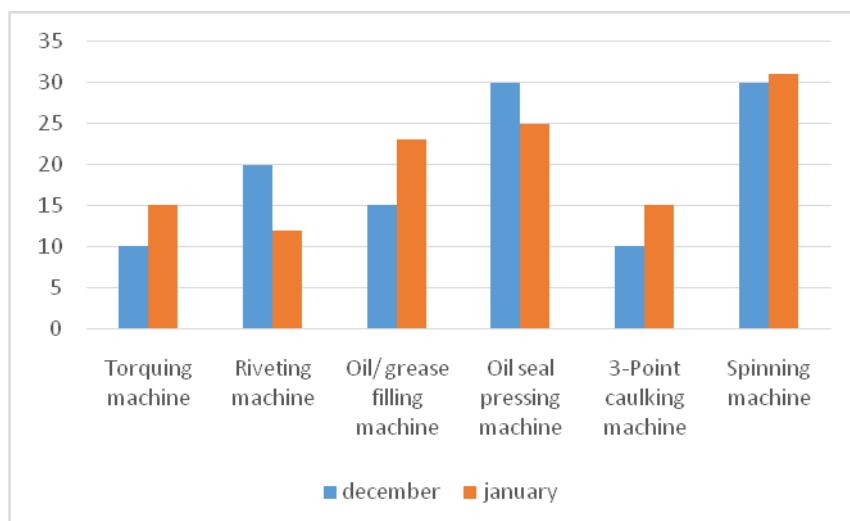


Fig 06: Rejection on caulking machine after modification

Not only the reduce in the rejection is achieve along with that following points are also achieve

- Productivity increases
- Elimination of Improper punching on LH & RH damper in caulking machine
- Cycle time of caulking machine reduces up to conveyor time
- Reduce rework and rejection
- Increase in customer satisfaction

IV CONCLUSION

The 3- point notching operation is done in this machine and also the marking operation is done. This machine is a hydraulic machine but the marking operation is done by pneumatic force

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By using various qualities the solution is provided to the companies which help the company to increase the productivity as well as to achieve total customer satisfaction. This project work also Reduce rework and rejection of the product.

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