Reduction in Rejection of 3-Point Caulking Machine

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***Abstract*— In the fastest industrial growth the leading industries cannot affords maximum rejections on the production line. We have two SPM machines which have high tooling and operation time i.e. three point caulking machine and oil seal press machine. Products rejected after caulking operation due to mismatch caulking or faulty punching. In this project we have to integrate these machines to increase the productivity and the precision of the work piece with simplicity of work and time saving operations. The productivity is increased through decreasing the time needed for taking off finished product.**

***IndexTerms*—Caulking, Method Study, DIMAC, PDCA.**

I. INTRODUCTION

The manufacturing industry mainly small scale and medium scale provides wide range 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. Therefore for all of this market needs to be fulfilled company needs to achieve. In the fastest industrial growth the leading industries can't affords maximum rejections on the production line. The Mono Tube production line mainly consist of seven machines in that two SPM are 'Oil Seal Press Machine'&'3 Point Caulking Machine' are major area of our project. Due to two operations carried out on single machine mismatch of tooling occurs that resulting into faulty caulking and faulty punching. That faulty caulking is the major problem of rejections of product at next stages like spinning, damping test. Hence our project is 'Reduce the rejections at 3-point caulking machine'& stabilize productivity of mono tube production line.

II. LITERATURE REVIEW

Since it is an ancient desire of the process engineers to make somehow quicker and easier the setup and fixture planning and the fixture design Fixture helps us to increase the productivity and the precision of the workpiece. The productivity is increased through decreasing the time needed for taking off the finished workpiece, and setting up new one, and through increasing the parameters due to stable supporting and clamping of the workpiece. From this recruitments follows that we have to carefully select the layouts which will unhindered motion of tool. To reduce the stand time we also must keep the number of setups as low as possible. [1]

Flexible fixture is being used with NC machine or machining centres to clamp the different workpiece. Flexible fixture is divided into two categories one is traditional flexible fixture and other is the modern flexible fixture with the innovative principle and structure. The flexible fixture modular has the characteristics of high flexibility and strong expansibility and meets requirement when processing the special workpiece. The operation is simple and convenient, greatly increasing.[2]

Six Sigma is a formal and highly disciplined methodology for reducing process variation to ensure customer satisfaction, cost reduction and profitability of the organization. States that the fundamental plan behind the Six Sigma philosophy is to monitor the process continuously and aims at elimination/reduction of defects or failures from the manufacturing processes States that defect can be defined as any deviation in the performance of the critical to quality (CTQ) characteristics. The Six Sigma's unique approach to continuous process and quality improvement is DMAIC methodology. Claims that prominent key success factors to six sigma are the step by step approach or road map using DMAIC methodology. In this case study, the statistical tool called Taguchi robust design was used for analysis of various critical process parameters. Deployed Six Sigma along with Taguchi robust design to analyze various painting process parameters that affect the quality characteristics, after intensified implementation the optimized process parameters were achieved that result in reduced defect rate.[3]

III. PROPOSED METHODOLOGY

Method Study is defined as 'the systematic recording and critical examination of existing and proposed ways of doing work as a means of developing and applying easier and more effective methods and reducing costs'.

While selecting the work for method study the following factors should be considered:

- Economic consideration
- Technical consideration
- Human consideration

As we observer during implant training that the most rejection is on monotube line so we find out the various defects that occurs in respective machine and then collect the previous rejection data for selection of the major problem.

DEFECTS	MACHINE	MONTHLY AVARAGE REJECTION
Improper rod assembly	Piston rod assembly	15
Torquing not ok	Torquing machine	23
Riveting not ok	Riveting machine	54
oil missing	Oil / grease filling machine	33
Grease Missing		42
Oil seal pressing not ok	Oil seal pressing machine	51
caulking defect	3-point caulking machine	77
marking defect		89
Spinning not ok	Spinning machine	68

Figure 1. Monthly Average Rejection

Caulking Machine

Caulk something is to fill the hole or cracks in something, i.e.to caulk is nothings but the sealing operation. Caulking is both processes and material to seal joints or seams in various structure and some types of tubbing. Caulking or rolled-in head formed using single tool, developed for shock absorbers, gas springs and transmission housing of washing machines. 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.

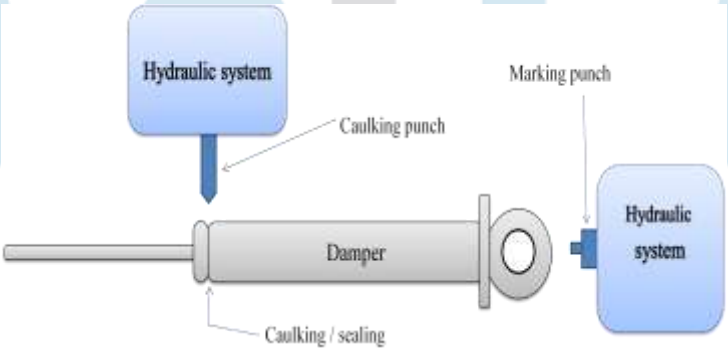

Figure. 2: Working of 3 point Caulking Machine

FISHBONE DIAGRAM

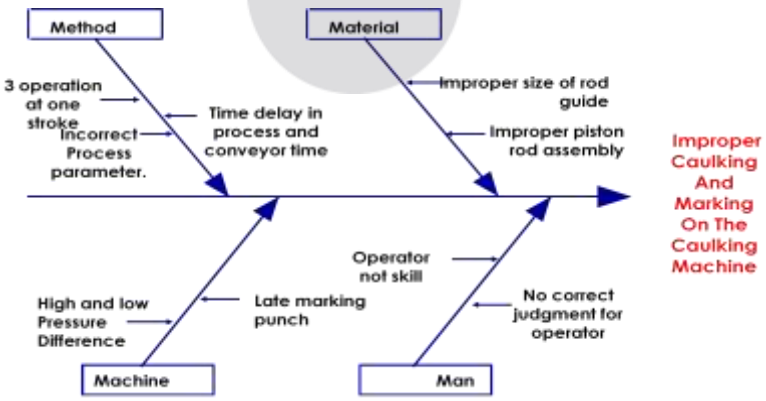

Figure. 3: Fishbone Diagram

MODIFICATION IN CAULKING MACHINE:

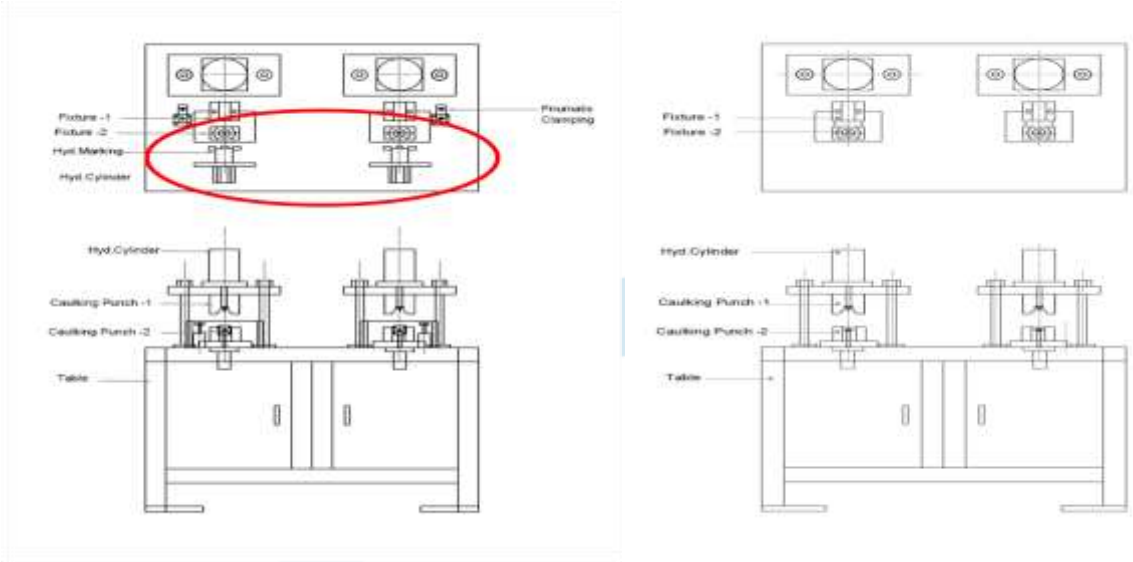

Figure. 4: Modification In 3 Point Caulking Machine

Oil Seal Press Machine

After filling the oil or grease in the hydraulic damper the oil is seal by pressing oil seal on the oil seal pressing machine which is as shown in the figure. For easy operation we transfer the marking punch on the oil seal pressing machine. The monotube damper is place vertically in the oil seal fixture and oil seal is pressed vertically. The change we did is we just change the bottom fixture. Before the fixture is fully plane which is only use to hold and support the damper but after modification the plain fixture is replace by the modified fixture which consist of the marking blocks at the bottom.

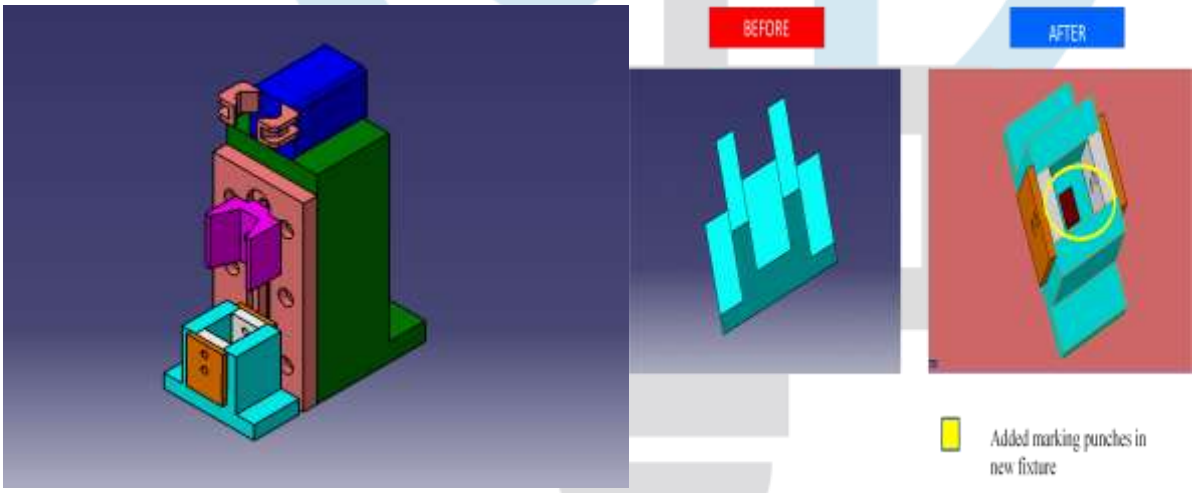

Figure. 5: Oil Seal Press Machine

We actually install the new solution that is transfer the punch to the oil seal pressing machine on the field and take the further readings. Figure shows the machine before modification consisting of the 3 punches. 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.

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IV. Results

As all collected data we are forward to design & manufacture a fixture for oil seal press machine, as reduce th we have to reduce handling time.
Existing time taken by machines are as follows

Cycle time of Oil seal pressed m/c : - 3 sec for one product.
Cycle time of 3 Point Caulking m/c : - 12 sec for one product.
In this caulking time 6 sec & Punching time 6 sec.
Pressure for oil seal pressing :- 30 to 40 kg/cm2
Pressure for caulking :- 25 kg/cm2
Pressure for punching :- 15 kg/cm2

Existing total machine time by both machines is: - 15 sec for one product
So it's necessary to decrease machine time and handling time thus the productivity increases.

a) Time taken by machine for caulking operation with punching is 12 sec.
So the production per shift is given by,

Production = 27000/12 = 2250 product/ shift

In three shifts the production rate of caulking machine was,
3* 2250 = 6750 product/day

b) Time taken by machine for oil seal pressing is 3 sec,
So the production per shift is given by,

Production = 27000/3 = 9000 product/ shift

In three shifts the production rate of caulking machine was,
3* 9000 = 27000 product/day

c) Combine Production Time By machine is,
12 + 3 = 15 sec
Production = 27000/15 = 1800 product/ shift
In three shifts the production rate of caulking machine was,
3* 1800 = 5400 product/day

d) After installation of fixture at oil seal press machine caulking takes 6 sec and oil press machine takes 3 sec so the combine operation takes 9 sec only.

e) Time taken by machine for caulking operation with punching is 6 sec.
So the production per shift is given by,

Production = 27000/6 = 4500 product/ shift

In three shifts the production rate of caulking machine was,
3* 4500 = 13500 product/day

Production increase by
6750/13500= 50%

f) Time taken by machine for oil seal pressing with punching is 3 sec,
So the production per shift is given by,

Production = 27000/3 = 9000 product/ shift

In three shifts the production rate of caulking machine was,

3* 9000 = 27000 product/day

g) Combine Production Time By machine is,

6 + 3 = 9 sec

Production = 27000/9 = 3000 product/ shift

In three shifts the production rate of caulking machine was,

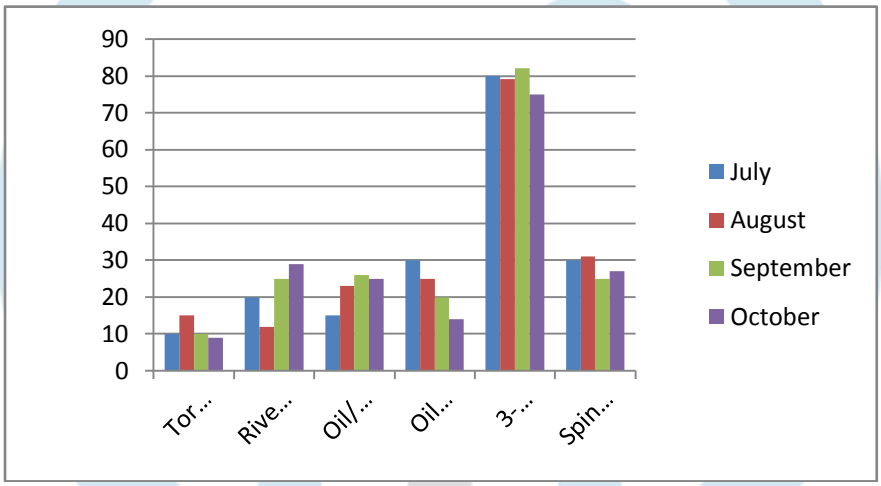
3* 3000 = 9000 product/day

Production increase by

5400/9000 = 60%

Hence the integration of SPMs gives 60% more products than existing System with low rejection rate.

REJECTION RATE



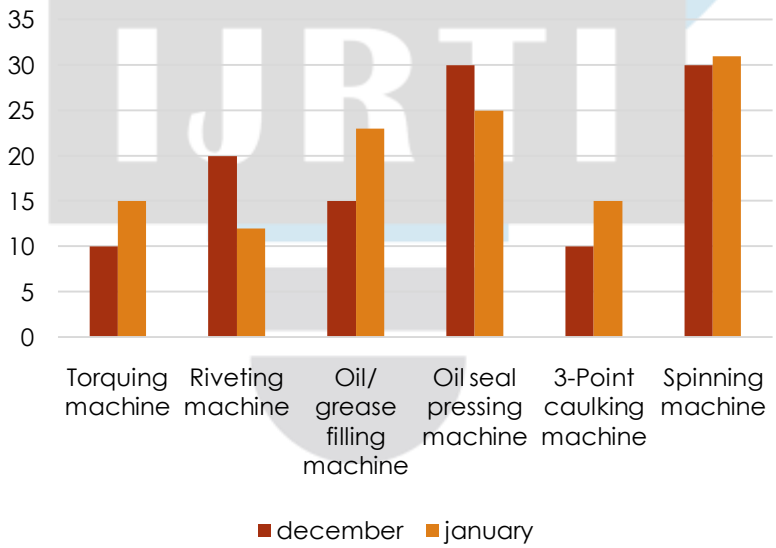


Figure. 6: Rejection Rate

V. CONCLUSION

By using various qualities the solution is provided to the companies which help the company to increase the productivity. By reducing Handling and machining time we can improve the productivity. It gives higher accuracy. It saves rework cost of company.

It saves rejection cost of company. It improves company profile in the market. It improves standard of living of employees and workers. It gives total customers satisfaction. It increases profitability of company. It increases human safety.

VI. Acknowledgment

It gives us great pleasure in presenting paper on Reduction In Rejection Of 3 Point Caulking Machine. We would like to take this opportunity to thank our guide Prof. S. J. Aswar for giving us all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.

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