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To Reduce the Rejection of Clamp for Muffler Component at Punching Stage During Manufacturing

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Abstract

Rejection is one of the serious problem which leads to gradual loss in economy of industry. This project deals with rejection analysis of Clamp for Muffler Component at Punching Stage during Manufacturing. After process study, we got main problem for rejection. Today, sheet-metal manufacturing component is a technique for predicting the formability of automotive parts. This report gives the quality improvements that are needed to reduce the defects at the "Punching stage" of manufacturing Clamp Muffler Component at M/S S.K. Precision Egg. Co. Ltd, Faridabad. Haryana. The Punching process of manufacturing Muffler Component was studied and the problem areas that contribute more significantly to defects were identified using fish bone diagram. The major contribution in defectives is due to process inconsistency in punching process due to improper alignment process in open die, Burr, Cracks, Dent, Wrinkle, Blanking, Bending and Restriking. By removing the above process inconsistency after detailed study and observations, significant quality improvements were observed and the defects at punching stage were reduce the rejection rate below or up to 2% which was above 4%. This paper uses tools like Check sheet, Fishbone diagram, Control chart, Pareto chart etc.

Keywords: Punching, Bending, Restriking, power press, Blanking, Burr etc.

1. Introduction

S.K Precision Egg. Co. Limited is serving the Sheet Metal Industry since last twenty years. A large part of products manufactured by the sheet metal division are made different part. The sheet metal HRC division is globally moving and expanding its production sites. In these the quality of the sheet metal used to manufacturing parts by using of the different operation can be completely different. To optimize production and easily adapt to different process, knowledge of the punching, bending, machine and restriking processes used manufacture the component in the S.K industry is important. S.K Group has always been Develops a New Idea or Technique in manufacturing the component of different companies in India. The condition of being safe, Environment and mental or physical condition has always been prime focus for the Company. Nowadays rejection is a serious problem arising in every industry. Definitely it advances into losses of industry. If this Rejection is minimized, then it can increase company's overall profit. There are many factors responsible for Rejection. Such as Human errors, machine errors, process planning, material errors etc. The rejection in Frame bending department has been the major area of concern for the whole organization. Keeping in view the above important aspect this project of reducing the frame rejection is taken over. Before the study rejection rate was showing rising trend and reached unto 4%.

2. Scope

Clamp for Muffler Component manufacturing involves mainly five vital steps. These are blanking, bending-I, punching, restrike, bending-II, incoming, Packaging. Defects are observed more at two stages mainly punching stage. The defects occurring at "punching" stage were studied in details, main reasons were identified with fishbone diagram, and suggestions were made and implemented to reduce these defects. At "punching" stage mainly, punch improper way, incorrect position of component, and punching out in open die, produce these defects.Punching machine is used to punching operation at the end of the component which is third stage operation for manufacture of the component. Due to holding the component improper way during operation more component was going to wastage. The part is mounted on the bed for bending is inserted into the end both parts are held securely. When a bend is made too close to a hole, the hole don't aliened improper. The power press works on 50 ton load. Sheet thickness is taken as 2.30 ± 0.17.

3. Operation Performed on Punching Machine

In S.K. Precision Egg. Co. Ltd, Faridabad. Haryana. Single punching tool machine is used for punching the work piece. In this process work piece are loaded into the upper die portion and after load applied by the press machine. The worker performs the operation by manually. Process characterized by manufacture of small batches of parts and manufacturing. Although the punching of holes is often accomplished with die sets that also perform bending, a punch press is designed specifically for the making of

various shaped holes and cutouts on sheet metal and plate material. The punch press is fitted with punches and dies of the size and shape of the hole required.

Press Capacity is determined by not only available ton, but also by effective throat depth. This determines how large a work piece the press can accommodate. Throat depth is measured from the center of the punching tool to the rear of the press. Other capacities are the movement of the carriage on which the work is mounted and the weight of the work piece.

4. Layout of Punching Machine:

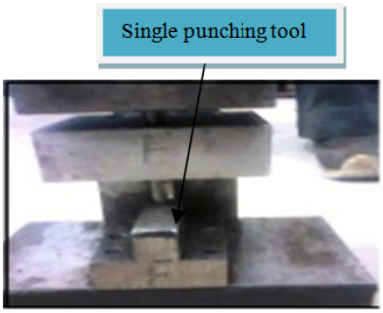


Fig. 1.(a) Punching Machine (before implementation)

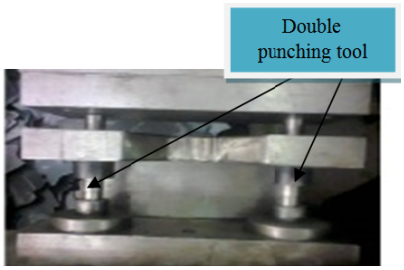


Fig. 1.(b) Punching Machine(After implementation)

5. Stages of Punching

The thickness of the sheet is 2.30 ± 0.17 mm. process is done after bending operation. Press machine worked on 50 ton.

6. Fishbone Diagram

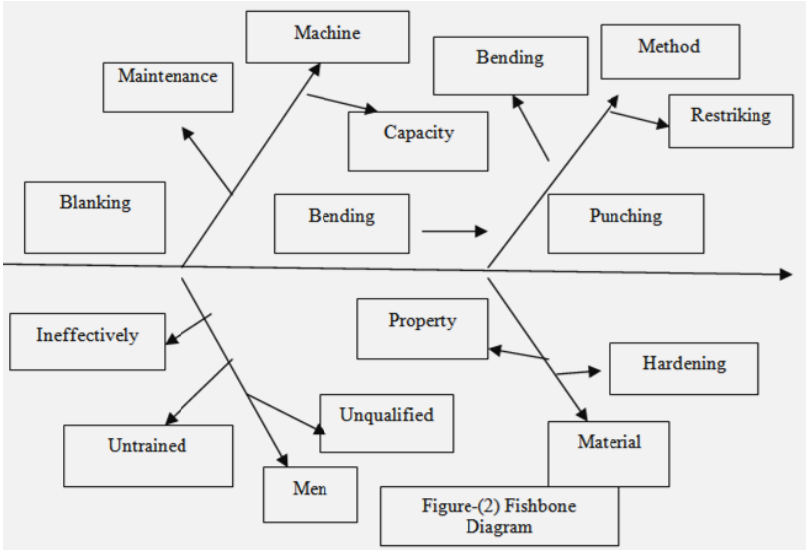


Figure-(2) Fishbone Diagram

7. Parameters which influence the Punching Process

1. Improper stroke length
2. Improper clearance between punch & die
3. Heating of die during restriking operation.
4. Improper pressure of die cushiness / spring.
5. Poor polishing of die.

Recommended action(s):

1. Process validation at defined frequency.
2. Rework/ reject the stock.
3. Preventive maintenance of tools

8. Findings and Suggestions

During punching operation many component was going to wastage. I studies on this serious problem. There was a single punch tool, when the worker do the operation on the component , during first punching the component put between tool and die, in second punching the component come out from the die and again placed the component put between tool and die. At this time punching displaced from the mean position .dimension also not remains in correct way. So a lot of component was wasting. For controlling this type of problem I suggest to the team member to use the double punching tool for punching operation on the component in one time.

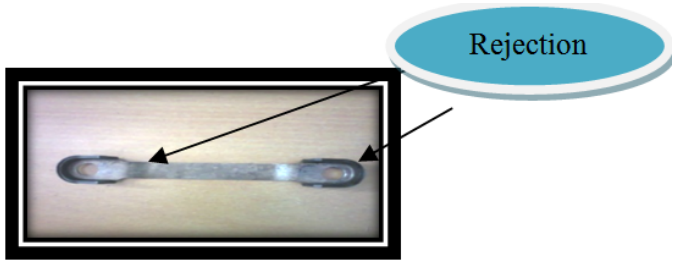
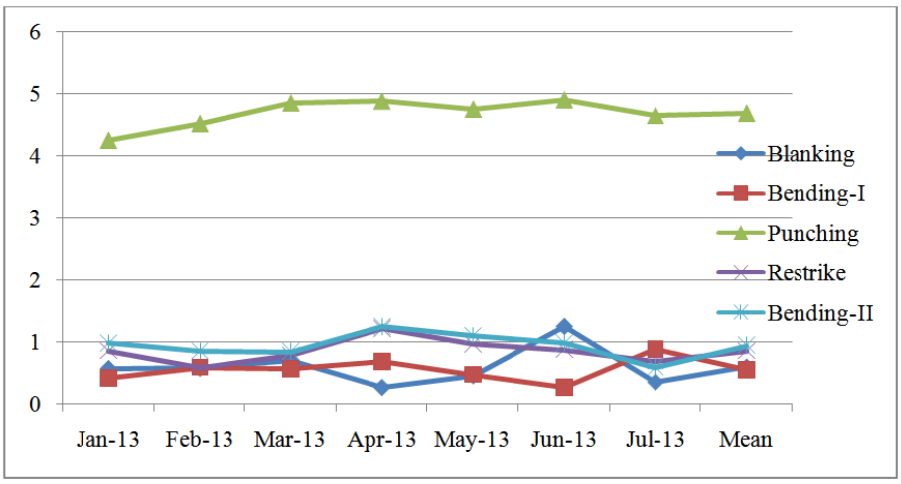


Fig. 3: Punching operation on the component.

Table 1: Past Rejection data:

Month	Blanking	Bending-I	Punching	Restrike	Bending-II	total rejection%
Jan-13	0.572	0.421	4.25	0.859	0.985	7.087
Feb-13	0.576	0.596	4.52	0.596	0.859	7.147
Mar-13	0.698	0.568	4.85	0.789	0.845	7.75
Apr-13	0.268	0.692	4.88	1.221	1.256	8.317
May-13	0.456	0.478	4.75	0.968	1.111	7.763
Jun-13	1.249	0.269	4.9	0.879	0.984	8.281
Jul-13	0.354	0.89	4.65	0.698	0.596	7.188
Mean	0.596142857	0.5591429	4.685714	0.858571429	0.948	7.647571429



Graph 1: Past Rejection data:

9. Optimization of Process Parameters

9.1Reduction of Rejection in making improper punching in punching process the defect due to following ways are observed:-

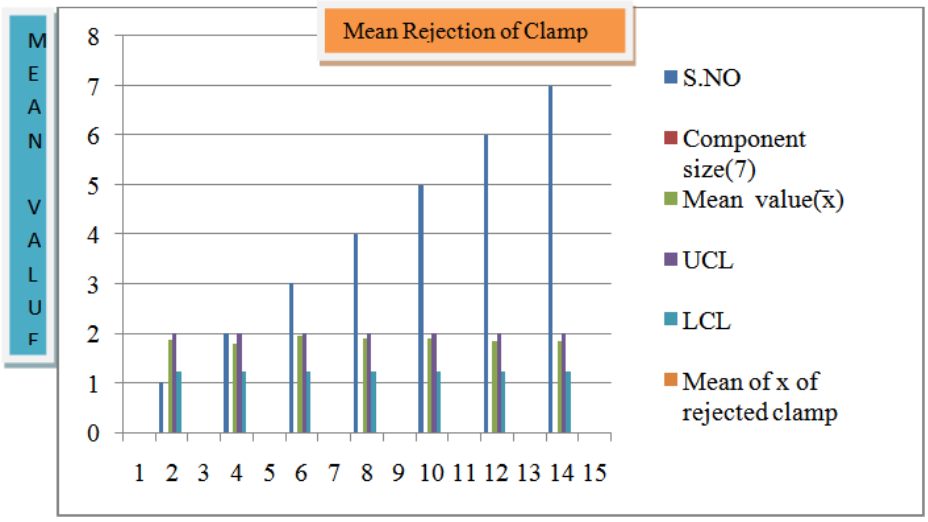
1. Draw and Insert the component from the locating die for doing second punching operation.
2. Due to the mistake of inefficient worker.
3. Not proper alignment of component between punch and die.

10. Implementation & Comparison of Results

The rejection data of punching machine in the month of January 2013 is showing .

Table 2: X-Bar Chart with Their Limits:

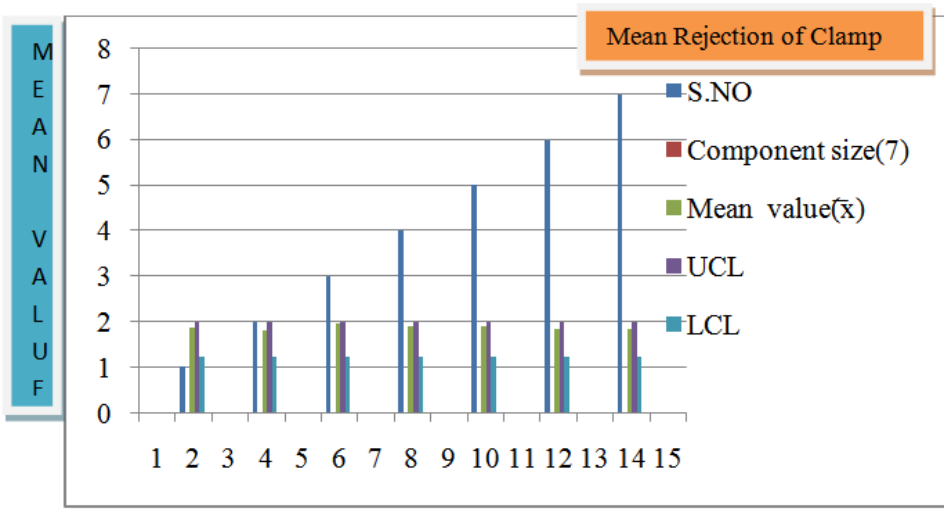
S. No	Sample size(7)	Mean x)	UCL	LCL	Mean of x of Rejected Clamp
1	x1	1.874	1.987	1.215	
2	x2	1.787	1.987	1.215	$\bar{X} = \frac{\bar{X}_1+\bar{X}_2+\bar{X}_3+\bar{X}_4+\bar{X}_5+\bar{X}_6+\bar{X}_7}{7}$
3	x3	1.942	1.987	1.215	
4	x4	1.887	1.987	1.215	$= 1.864$
5	x5	1.889	1.987	1.215	
6	x6	1.832	1.987	1.215	
7	x7	1.834	1.987	1.215	



Graph 2: X-Bar Graph with their limits:

Table 3: R-Bar chart with their limits:

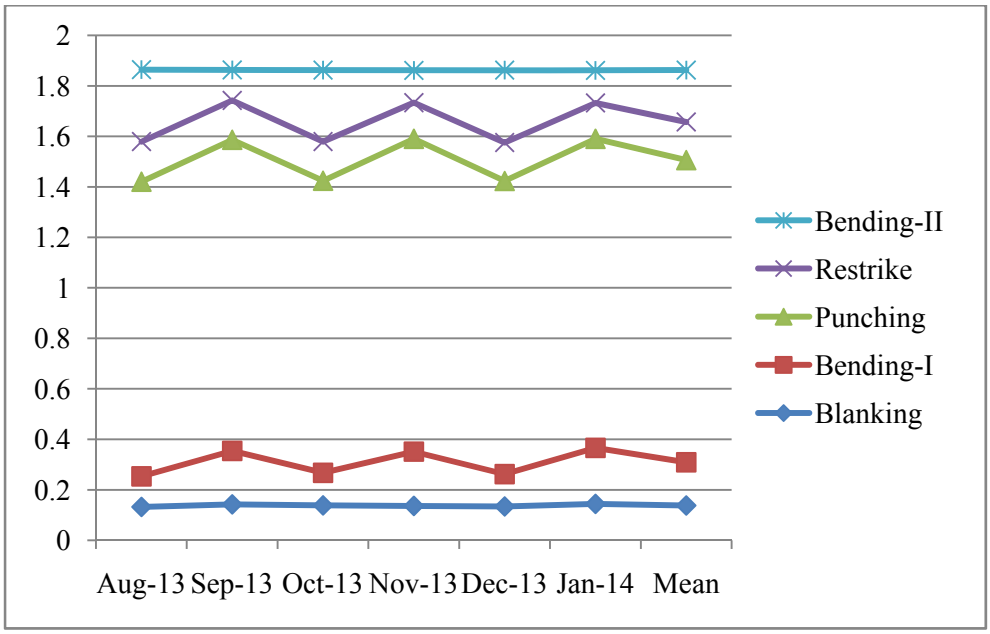
Sample No.	Range(R)	UCL	LCL	Mean Range $\bar{R}$ of Clamp Rejected
1	0.421	0.978	0	
2	0.5	0.978	0	R= R1+R2+R3+R4+R5+R6+R7/7
3	0.65	0.978	0	= 0.452
4	0.28	0.978	0	
5	0.42	0.978	0	
6	0.52	0.978	0	
7	0.37	0.978	0	



Graph 3: R-Bar Graph with their limits:

Table 4: Rejection data from August-2013to january2014 after implementation the remedial measures:

Month	Blanking	Bending-I	Punching	Restrike	Bending-II	total rejection%
Aug-13	0.132	0.121	1.167	0.159	0.285	1.864
Sep-13	0.142	0.212	1.232	0.156	0.121	1.863
Oct-13	0.138	0.129	1.157	0.155	0.283	1.862
Nov-13	0.136	0.215	1.239	0.143	0.128	1.861
Dec-13	0.134	0.128	1.161	0.152	0.287	1.862
Jan-14	0.144	0.222	1.224	0.142	0.129	1.861
Mean	0.137666	0.171167	1.196667	0.151166667	0.2055	1.862166667



Graph 4: Rejection Graph from August-2013to january2014 after implementation the remedial measures:

11. Conclusion

The rejection of Clamp for muffler at punching stage is in the form of defects appeared inside or outside the clamp surface in the form of cracks, incorrect alignment, Should be free from Surface defects. Rust. Dent burr etc, improper pressure of die cushiness / spring**,** improper clearance between punch & die, improper stroke length, poor polishing of die, which cannot be completely removed, but these can be reduced to certain extent by preventive & controlled measures in the form of proper punching. After the constant observation and analysis of the statistical data of total clamp produced and rejected in every month from Jan2013 to Jan 2014, the percentage of

rejected clamp with individual defects (before and after measures implementation) was obtained, after plotting the graph found that the mean rejection on using two punching tools together in punching machine decreases the rejection rate below or up to 2% which was above 4%. On the basis of rejection data on punching stage of October,2013, calculating and observing the Mean, Upper control limit and lower control limit, it was found that the process is within the control condition under significant manner.

12. Future Scope

The upper control limit and lower control limit data of mean suggests that these errors (i.e.1.863%) are mainly due to randomness in the process and cannot be attributed to any assignable causes being studied .In order to reach the zero defect levels in the process more automation rigorous measurements and controls on the process parameters needs to be introduced that can be study further.

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