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Design and analysis of press tool for combining pre crimping and final crimping operation in horn

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Abstract - The main objective of the project is to design and analysis of a crimping press tool for hydro-pneumatic press machine which is used to combine the parts of horn into 45 & 90 degrees. The existing process uses two separate press tools for bending the part such as pre crimping and final crimping. Press tool design is modified in such way the pre crimping and final crimping process can be done in single press tool. If both the process are done in a single press tool. The tool has been designed in such a way that the Productivity gets increased and the operator fatigue will be reduced.

Index words – pre crimping , final crimping , horn , horn fixture , punch holder.

I.INTRODUCTION

The existing press tool design is modified in such way the pre crimping and final crimping process can be done in single press tool. If both the process is done in a single press tool, Productivity gets increased and the operator fatigue will be reduced.

The Existing process uses two separate press tool for bending the part such as,

[1] Pre crimping

[2] Final crimping

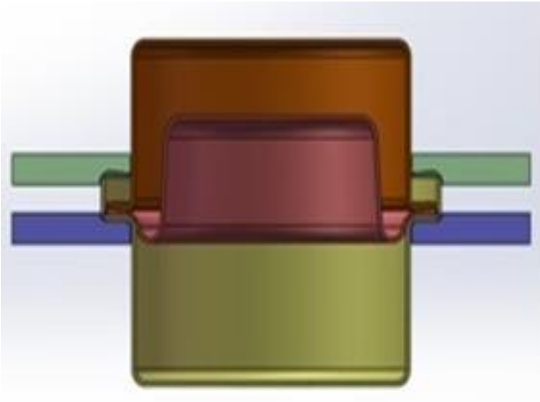
[1] Pre crimping process:

This base tool of a double acting cylinder which is actuated by the compressed air press ranges of 6 bar for the pre crimping operation. During the forward stroke the rod end pushes the set up upwards at the chuck opens and thus the diaphragm plate is placed over the horn case, during the return stroke of the cylinder the fixture apply force on the diaphragm and make a bend on them up to 45 degree

[2] Final crimping process:

In this final crimping operation the force required for the crimping the diaphragm plate with the horn case is 2-3 bar pressure.

Fig.1 Before crimping



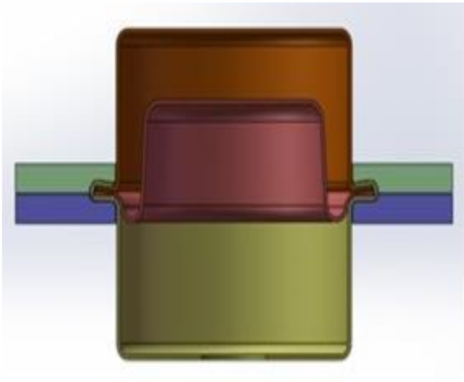


Fig.2 After crimping

During the forward stroke the rod end pushes the set up upwards at the chuck opens and thus the 45 degree bended diaphragm plate with the horn case is placed over the base tool. During the return stroke of the cylinder the fixture apply force on the diaphragm and make a crimping between the horn cases to the diaphragm plate.

II. LITERATURE SURVEY

[1]Author Womack Jones and Roos discuss that lean manufacturing uses less of everything compared to mass production, half the human effort in the factory, half the manufacturing space, half the investment in tools, and half the engineering hours to develop a new product. In addition, it requires keeping far less than half of the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products.

[2]Tian Yu et al.,Crimping process discuss in this paper belongs to metal forming which form directly by punching, and the process can be simplified as shown in Fig. The two boards shown as upper die and lower die respectively, three are three components involved in this process, their name from top to bottom on the model are, in order, Cover, Body and Diaphragm.

[3]Dmitry V. Zhmurkin et al**.,** paper explains that numeric simulation of an open-barrel crimping process of 7-stranded wire has been conducted using a full 3-dimensional non-linear explicit dynamic finite element model. This work concentrated on studying the effect of serrations. Three types of open barrel crimps were compared –one with 2 serrations and two with 3 serrations of different kind .In addition, serration geometric parameters were varied. The model was validated using experimental results. The goal of the study was to investigate the effects of the number of serrations and their length, as well as serration width, depth, and the slope of serration sidewall on the quality of an open barrel crimp connection.

[4]John Balconi et al.,explains that The crimping process using a polyurethane tool and hydraulic pressure can be used in the assembly of tubular components. This crimping operation was evaluated with the aid of the finite element method (FEM) and its application to the assembly of tubular components was investigated. The goal was to enhance the performance of the assembly by determining the optimum process and geometrical parameters, such as the material properties of the tube, the interference between the inserted rod and the tube and the rod–tube interface friction. FE simulations were used to evaluate the crimping operation under various process conditions. The crimping process of a double grooved rod /bullet with a tubular casing was evaluated as a case study. It was possible to determine the effect of manufacturing tolerances and misalignment between the rod and the casing on the quality of the final assembly in terms of the pull out force.

[5]Ping Liuet al**.,** paper mainly studies the crimping process of turbo actuator at passenger vehicle. Firstly design a series experiments with a method of orthogonal test, then study and analysis the crimping results both by single factor visual analysis and multi-factor orthogonal matrix analysis, finally it concludes the influence tend of the main three process parameters at crimping including surface bevel β and contour radius R of upper die and stamping pressure P on the main three forming quality indicators including E, F and thickness T of actuator’s cross section dimension. Moreover it puts forward an optimal process parameters combination of one actuator’s crimping process and verifies the conclusion by sample statistical analysis in continuous trail run production.

III. EXISTING DESIGN

The existing design consist of two punch holder which is known as pre crimping and final crimping punch holder which is shown below.

Pre crimping punch holder:

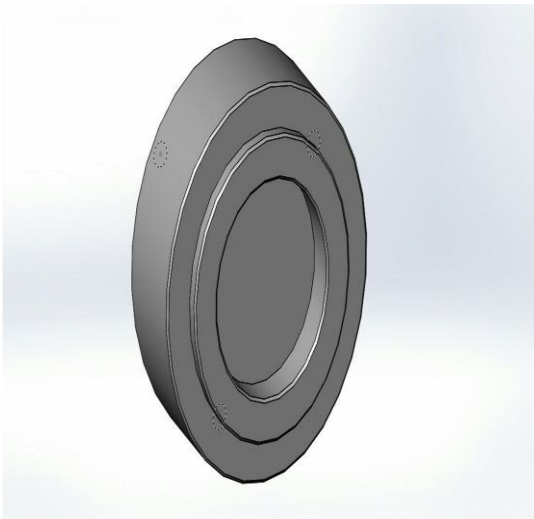


Fig.3 Pre-Crimping punch holder

Final Crimping punch holder:

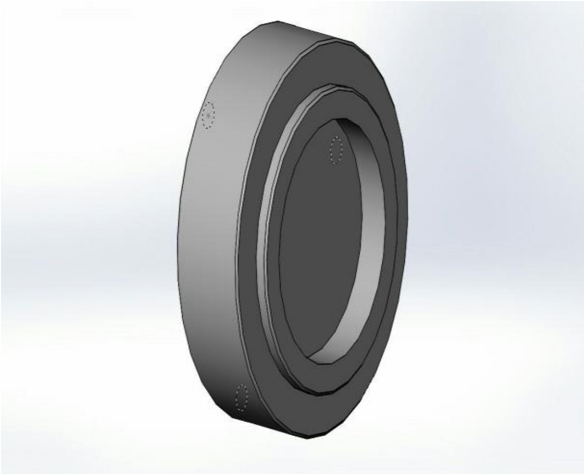


Fig.4 Final Crimping punch holder

IV.PROPOSED DESIGN

The main objective of this design is to combine both the operation. Thus a model is designed based on the criteria. The following diagram shows the combined punch holder.

Fig.5 Combined crimping punch holder

V. DESIGN ANALYSIS OF COMBINED PUNCH

The analysis of the following design is carried out using solid works software. The following fig represents the analysis.

Static nodal stress diagram:

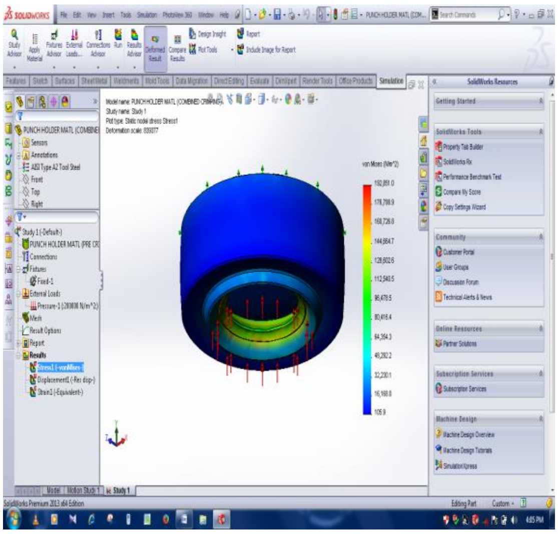


Fig.6 Static nodal analysis

Static displacement analysis diagram:

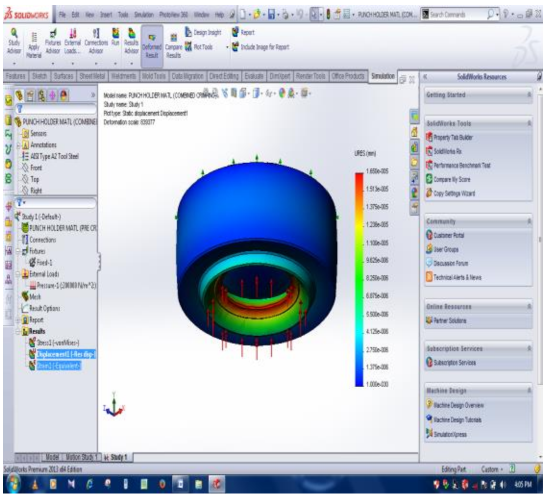


Fig.7 Static displacement analysis

VI.RESULT

Using previous method the time taken for production is 28.03secs.The following table illustrates the reduction in the production time.

Table .1: Result Data's

S.No.	Process	Time taken, t (sec)										Avg. Time
		1	2	3	4	5	6	7	8	9	10	
1	House checking	4	3	4	2	3	4	3	3	4	3	3.3
2	Pre &Final Combining Crimping	12	13	14	13	12	14	13	12	11	13	12.7
3	Send to Conveyor Time	1.0	1.2	0.9	1.4	1.3	1.2	0.9	1.1	0.8	1.0	1.08

Total time=17.08 seconds

VI.CONCLUSION

By implementing the project in industries various time consuming activities in assembly line can be reduced. It will not only increase the productivity of horn but also reduce the human effort and intervention in the assembly line. If this system is modified and used in the industries it will increases the production quantity and also quality.

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