International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Design of 20 Ton Hydraulic Press Machine for Flaring Operation

Viraj B. Ghangale

MET's College of Engineering and Research, Adgoan, Nashik, Maharashtra, India

Abstract: ***The aim of this project is to design hydraulic press to facilitate the ease of operation to manufacture the smaller parts in bulk. The aim of this project is to make the special purpose machine for flaring operation on inlet sleeve which is used in Mahindra blazzo exhaust system. Previously there was no such machine available which is capable of clamping as well as flaring automatically.***

Keywords: hydraulic, flaring, sleeve, automatically

1. Introduction

In previous case holding was accomplished mechanically, as large force is required for flaring operation, mechanical clamping was unable to sustain large amount of force which lead to damage of parts due to slipping. In order to overcome the above circumstances there is need to design hydraulic press.

In tube end flaring process, a circular tube of certain length is axially pushed over a conical die to form a flared end. In this project same method is applied for the component named Inlet Sleeve on which flaring is done at one end. In flaring operation first, the tube end is curled outward with a conical die having a large inner angle, followed by the flaring of tube end. The second process closed up the curled end and formed a hem. The flaring limit increases size of the pre-curl due to improvement in ductility around the tube end.

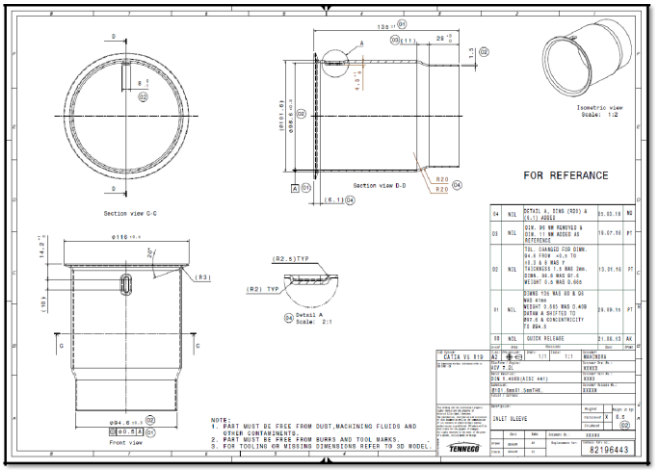

Figure 1: 2D Diagram of Turbo flange adapter.

2. Force Estimation

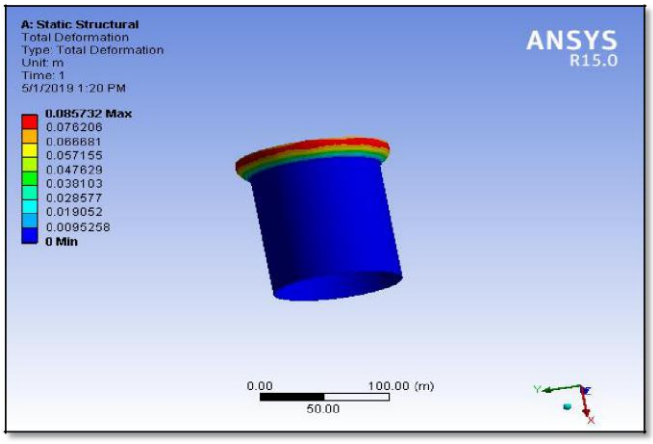

Figure 2: Force Estimation by using Ansys

From the part drawing provided, it is clear that the total deformation require in final product is around 7.8 mm. So, on application of the force around 20 tones produce total deformation of 8.5732mm is proved from the analysis.

3. Design Calculations

Force calculations:

Force for punching (F_1) = 200000 N
Force for clamping (F_2) = 50000 N

Cylinder Dimension calculations:

$$D_1 = \sqrt{\frac{4 \times F}{\pi \times P}}$$

$$= \sqrt{\frac{4 \times 200000}{\pi \times 70 \times 10^3}}$$

D_1= 190.73 mm
D_1 = 200 mm

$$D_2 = \sqrt{\frac{4 \times F}{\pi \times P}}$$

$$D_2 = \sqrt{\frac{4 \times 50000}{\pi \times 70 \times 10^3}}$$

D_2 = 93.365 mm
D_2 = 100mm

Licensed Under Creative Commons Attribution CC BY

System Pressure calculations:

$P_1 = \frac{F \times 4}{\pi \times D^2}$

$P_1 = \frac{20 \times 10^4 \times 4}{\pi \times 0.2^2}$

$P_1 = 63.66$ bar

$P_2 = \frac{F \times 4}{\pi \times D^2}$

$P_2 = \frac{5 \times 10^4 \times 4}{\pi \times 0.1^2}$

$P_2 = 63.66$ bar

Assumed pressure i.e. 70 bar doesn't exceed maximum pressure in system. Thus design is safe.

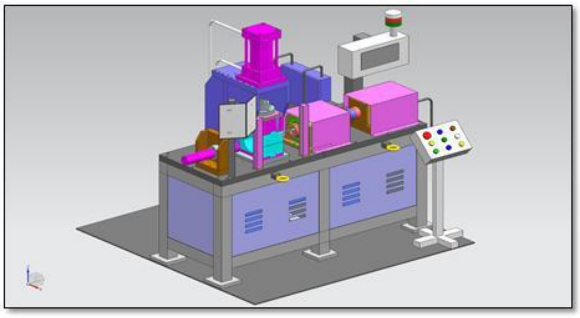

Figure 3: Machine setup 3D drawing

4. PLC programming

The most commonly used programming language is Ladder diagram (LD) also known as Ladder logic. Ladder logic is a programming language that creates and represents a program. Most modern control systems employ a PLC (Programmable Logic Controller) as a means to control motors, pumps, valves and various other equipment used in a process. PLC used in project for -

- Position sensing of cylinder.
- Safety curtains for emergency stop.
- HMI unit for accurate positioning.

Figure 4: Proximity sensor

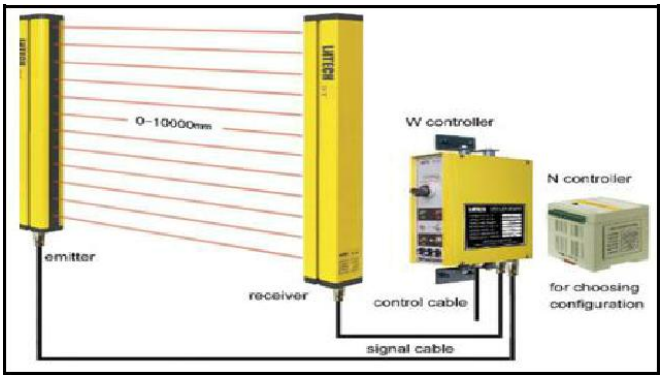

Figure 5: Safety Light Curtain

5. Conclusion

Basic purpose of project is to advancing toward the hydraulic field. This press can be efficiently used in making inlet sleeve for Mahindra Blazzo. It represents the study of various subjects of mechanical field such as design, hydraulics, mechanical engineering material and many more.

This will be more efficient and more reliable. The project mainly emphasizes on the core of the mechanical field.

References

[1] Tan chin Joe, Mohammad Hossein Dord keshan, "Experimental study on tube end flaring process for different bottom end surface textures", International journal of mechanical and production engineering, volume-5, issue-7, 2017.
[2] Malachy Sumaila and Akii Okonigbon Akaehomen Ibhadode, "Design and manufacture of a 30-ton hydraulic press", Research Gate, 2011.
[3] Mr. K. Shravan Kumar, B. Prashanth, "Design fabrication of hydraulic press", International of Scientific Development and Research (IJSDR), 2017.
[4] Asim M. Kamate, Prof. (Dr.) J.S. Bagi design, "Development and Analysis of a 20 ton hydraulic press", international journal of innovative technology and research volume, 2016.
[5] Bethrand N. Nwankwojike, Chukwunonso N. Nwoguand Godswill Kalu , "Development of a Manually Operated Hydraulic Press and Pull Machine", FUOYE Journal of Engineering and Technology, Volume2, Issue2, 20 17.

Books

[6] Oil Hydraulic System, S. R. Mujumdar.
[7] Hydraulics and Pneumatics, Andrew Parr.

Licensed Under Creative Commons Attribution CC BY