Design And Selection of Actuator For Welding Fixture of RSW

Nilesh Sathawane[1], Dr. P. V. Walke[2]
Dept of Mechanical
[1, 2]G H Raisoni College of Engineering, Nagpur

Abstract- *Now-a-days, In the manufacturing sector there is race to increases the productivity by applying new techniques. That new technologies deal with the smooth handling of the system sometime it changes the whole system and sometime it changes the part of the system. In this paper we are not changing the whole system but we changing the some part of the system. In welding technologies there are lots of changes takes place in the welding but very less on the fixture. So in this we are focusing on the modification of welding fixture which is been useful for high temperature welding such as resistance spot welding. Improvement in the welding fixture has a great impact on system and handling on the system.*

Keywords- Technologies, Handling, Resistance, Spot, Welding

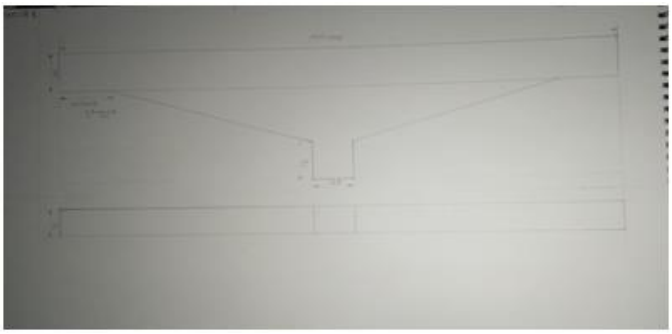
I. INTRODUCTION

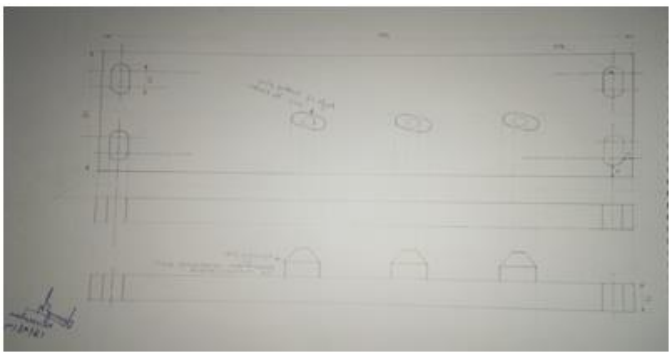
It is very important in industry to do proper machining of object or part to increase the productivity. There is a less error can make the more rejection in the industry. This is the perfect example of this if we consider the proper positioning in welding fixture that is a true myth. I am making the fixture semi-automated which will lead to the better welding position for operator to take the weld. It Will decrees the chances of the failure and less chance of happening accident which is good for the organization.

II. PART DRAWING OR DETAIL DRAWING

`

It is also known as production drawing during manufacturing. This is a drawing type of component drawing on the shop floor. In fact it is used to expand and point to dimensions, limits. In Part Drawing, it gives information on the material, process, equipment, size, etc. In my project I redesigned the welding fixation arm more than the previous one, and the metal plate design of the copper (qi) with the locking pin. I am designing a metal plate, when the operator tries to fit the rear reinforcement into the fender top assembly it is enough to automatically find the pin of the metal plate.





III. PRODUCTION PROCESS ANALYSIS

While working on this project, I noticed that the product was the main part. So I analyze how much is produced in a day. At that time I was working on whether the company needed the maximum product. For this I went to the shop floor for a daily production plan.

I did a 10-day study on rejecting this piece for the following reason.

.

Date	Defect Rejection			
	Scratch	Rundown	Dent	Back Reinforcement
4/11/2019	5	1	-	8
5/11/2019	2	4	3	10
6/11/2019	6	1	1	10
7/11/2019	3	3	-	7
/11/2019	5	4	2	9
8/11/2019	3	1	-	10
9/11/2019	4	4	4	11
10/11/2019	6	3	3	13
11/11/2019	3	2	1	8
12/11/2019	2	2	1	5
13/11/2019	3	1	-	7

Ac

IV. EQUIPMENT / PLATFORM AND DESIGN

Very few tools are used in this project or the software is creo-parametric. The software was originally developed in collaboration with parametric technology, which is used for design purposes, such as part drawing, assembly drawing, modeling, 2D, 3D, etc. It is also used for NC (Numeric Control) and formatting.

I have designed this software by hand for the welding fixture in the welder shop along with the metal plate used for resistance spot welding. So far I'm designing a metal plate for RSW and stability arm with the right dimensions.

The other instrument in this project is the Linear Actuator, which is the basis of this project. Actuators are used to move up and down to accelerate the arm of the welding fixture. To meet our weld shop requirement, the pneumatic actuator must be used as the reason behind not using the hydraulic and electric actuator. In electric actuators, we know that we are using it in the weld shop, that the coolant is being used and the breakdown at the station affects the actuator and is not safe for the operator.

V. SELECTIONOF THE ACTUATOR

Pneumatic actuator is a mechanical device which used the compressed air to perform the work or to lift the load in linear path. Used of pneumatic system in the automobile or aerospace center it is an latest trend because it has less maintenances and easy to handle.
-*

This are the following limitation which will have satisfied while selection of actuator,

- Distance between rigid base plate to arm is = 40 mm
- Weight of plate = 2.9 kg
- Air pressure= min. 4 bar
- Plate area= 380 mm x 90 mm
- Actuator stroke= 25 mm
- Weight of arm = 2.7 kg
- Total weight = 5.6 kg
-

Consider the total weight is 6 kg. (Round fig.)
Ref.-
https://www.hafnerpneumatik.com/news/hafner_pneudactic?desktop=true

Now ,

So our requirement of stroke length is up to 25 MM.
Take the diameter from the above standardized chart,

Piston diameter

D = 10 mm,

Surface area of the drive piston

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

$$A = \frac{\pi \times (10)^2}{4}$$

$$A = 78.5\ m^2$$

Operating pressure

$$P = 4\ bar = 0.4\ \frac{N}{mm}$$

Force calculation

$$F = P\ .\ A = 0.4 \times 78.5 = 31.4\ N$$

- Which means we have theoretical force is **31.4 N**
- As we know about the thumb rule we can deduct 5% for the friction so the value is **29.83 N**
- If we divide the force by gravity (9, 81 m/s^2), we find - in practice - that our cylinder can hold a mass of about **3.04 kg.**

Having the piston diameter of 10 mm not satisfying the load lift.

Similarly,

Piston diameter

D = 12 mm,

Surface area of the drive piston

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

$$A = \frac{\pi \times (12)^2}{4}$$

$$A = 191.54 \text{ m}^2$$

Operating pressure

$$P = 4 \text{ bar} = 0.4 \quad \frac{N}{mm}$$

Force calculation

$$F = P \cdot A = 0.4 \times 314 = 76.616 \text{ N}$$

- Which means we have theoretical force is **76.616 N**
- As we know about the thumb rule we can deduct 5% for the friction so the value is **72.78 N**
- If we divide the force by gravity (9, 81 m/s^2), we find - in practice - that our cylinder can hold a mass of about **7.419 kg.**

12mm Piston Diameter having actuator is satisfying the case but it is no closed the required weight.

Therefore from above calculation we can select the actuator having piston Diameter of 12 mm but I am preferring the D =16 mm

- Distance between rigid base plate to arm is = 40 mm
- Weight of plate = 2.9 kg
- Air pressure= min. 4 bar
- Plate area= 380 mm x 90 mm
- Actuator stroke= 25 mm
- Weight of arm = 2.7 kg
- Total weight = 5.6 kg
- Piston diameter (D) = 16 mm,
- Surface area of the drive piston (A) = 200.96 m^2
- Operating pressure (p) = 0.4 $\frac{N}{mm}$
- Force calculation (F) = 80.34 N
- As we know about the thumb rule we can deduct 5% for the friction so the value is **76.27 N**
- If we divide the force by gravity (9, 81 m/s^2), we find - in practice - that our cylinder can hold a mass of about **7.769 kg.**