A PROJECT REPORT

ON

"Design and Fabrication of Semi-Automatic System for Welding Hydraulic Cylinder"

Submitted by

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In partial fulfillment for the award of the Degree

Of

BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERING

UNDER THE GUIDANCE

Of

Prof. Javed Kazi

DEPARTMENT OF MECHANICAL ENGINEERING

ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL,

NAVI MUMBAI – 410206

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ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL

(Approved by AICTE, recg. By Maharashtra Govt. DTE,

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CERTIFICATE

This is to certify that the project entitled

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Submitted by

Syed Zaid (11ME59)
Mukri Yasir (12ME74)
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To the Kalsekar Technical Campus, New Panvel is a record of bonafide work carried out by him under our supervision and guidance, for partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering as prescribed by **University Of Mumbai**, is approved.

Project co-guide	**Internal Examinar**	**External Examiner**
(Prof. Javed Kazi)	(Prof. Zoya Rizvi)	

Head of Department	**Principal**
(Prof. Zakir Ansari)	(Dr. Abdul Razzak Honnutagi)

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APPROVAL OF DISSERTATION

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(Internal Examiner) **(External Examiner)**

Prof. Zoya Rizvi ____________________

Date: 27/04/2015

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Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Date: 27/04/2015

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Abstract

In this era of automation technology, industries have put a very high demand on fast and reliable methods. Hydraulic system is one of the latest technologies in industrial field. Hydraulic cylinder is an important part of hydraulic system which makes it more important as industrial product.

Fixtures are used to hold the work piece and serve as one of the most important facility of mass production system. Welding fixtures are normally designed to hold and support the various components (work pieces) to be welded. It is necessary to support them in a proper location which is capable of preventing distortions in work pieces during welding.

We will be evaluating the existing system of processing hydraulic cylinder in the plant. The current system uses manually rotation of the cylinder. Hence, we will be designing a welding fixture which will be holding the hydraulic cylinder in one position and welding can be done at the required area. The present report discusses the various methods and effective system which is adopted to increase the productivity of the plant.

Chapter 1 Introduction

1.1 Company's Introduction

We are working for "BELL FLUIDTECHNICS PRIVATE LIMITED" that deals with hydraulic products. Established in the year 1996, The Company manufactures supplies and exports of Valves, Oil Coolers, Linear Transducers and Pumps. The company has their branches in Mumbai and Bangalore. The plant that we are working in manufactures Hydraulic power pack, hydraulic cylinder, lift valves and hydraulic accessories like return line filter, drain plug etc.

1.1.1 Application of company's product

i. HYDRAULIC CYLINDERS which are widely used in various applications such as construction equipment, manufacturing machines. It is used to provide unidirectional force. They are cost effective & reliable.
ii. RETURN LINE FILTER is used in return line/tank line prior to tank port. Is used to protect foreign/dirt material entering the oil tank and protecting the system.
iii. DRAIN PLUG is made of Carbon steel and precision machined. Used in hydraulic oil tank to plug the drain port.
iv. HYDRAULIC JACK with power pack is used to lift petrol truck and heavy vehicle.

1.2 Welding

Welding is a fabrication process in every industry large or small. It is a principal means of fabricating and repairing metal products.

The process is efficient, economical and dependable as a means of joining metals.

The process finds its applications in air, underwater and space.

Why welding is used- Because it is,

i. Suitable for thickness ranging from fractions of a millimeter to a third of a meter.
ii. Versatile, being applicable to a wide range of component shapes and sizes.

1.2.1 MIG Welding

Metal inert gas (MIG) welding also known as Gas Metal Arc Welding (GMAW) process consists of heating, melting and solidification of parent metals and a filler material in localized fusion zone by a transient heat source to form a joint between the parent metals.

The shielding gas can be both inert gas like argon and active gases like argon-oxygen mixture and carbon-di-oxide which are chemically reactive. It can be used on nearly all metals including carbon steel, stainless steel, alloy steel and aluminum.

MIG welding gives much greater penetration and higher speeds. There is no slag to clean off after welding because no flux used and no weld spatter. It is fast and more economical efficiency then TIG (Tungsten Inert Gas) Welding.

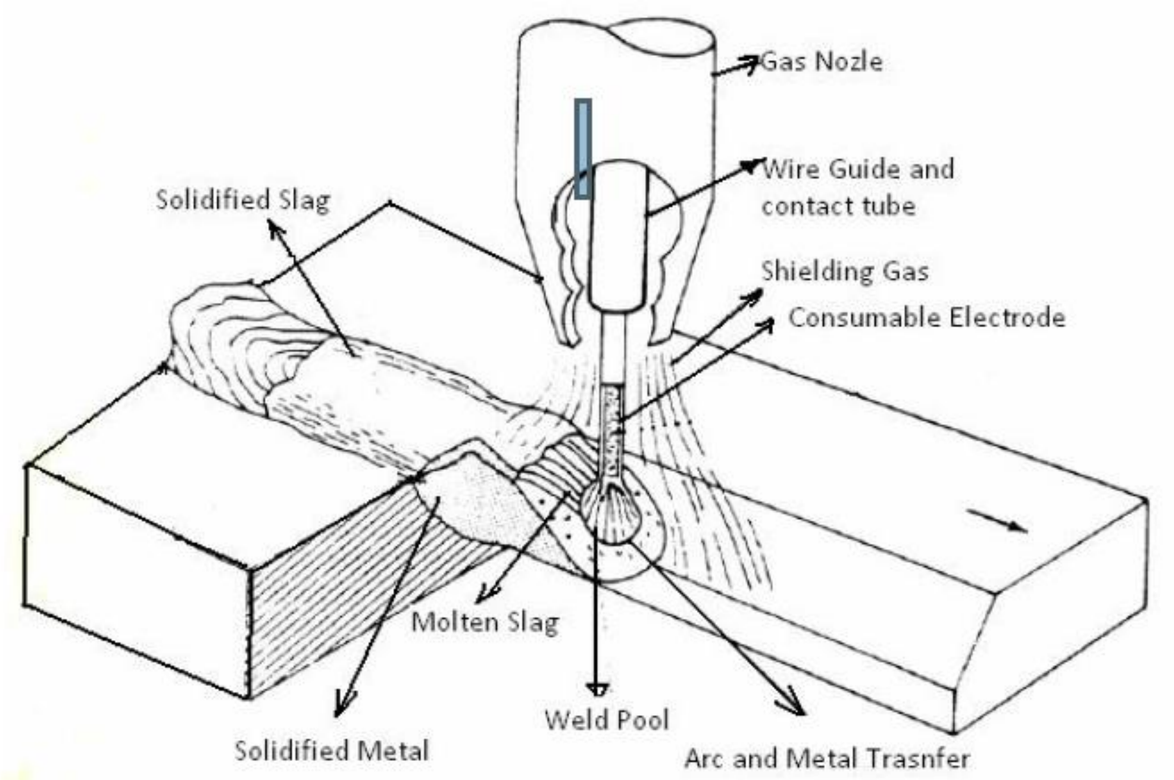

Figure 1.1 MIG Welding

1.3 Hydraulic Cylinder

Hydraulic cylinders (also called a linear hydraulic cylinder) are one of the most common components of the hydraulic systems used in many engineering applications like;

automatic manufacturing and montage lines, heavy construction equipments, control systems, sensitive measurement and test systems.

They are used for producing linear motion in the hydraulic systems and they convert hydraulic energy to mechanical energy.

Hydraulic cylinder gets their power from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinder consists of a cylindrical barrel, in which a piston connected to a piston rod moves back and forth. The barrel is closed on one end by cylinder bottom (also called the cap) and the other end by the cylinder head (also called the gland) where the piston rod comes out of the cylinder.

The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end/head end).

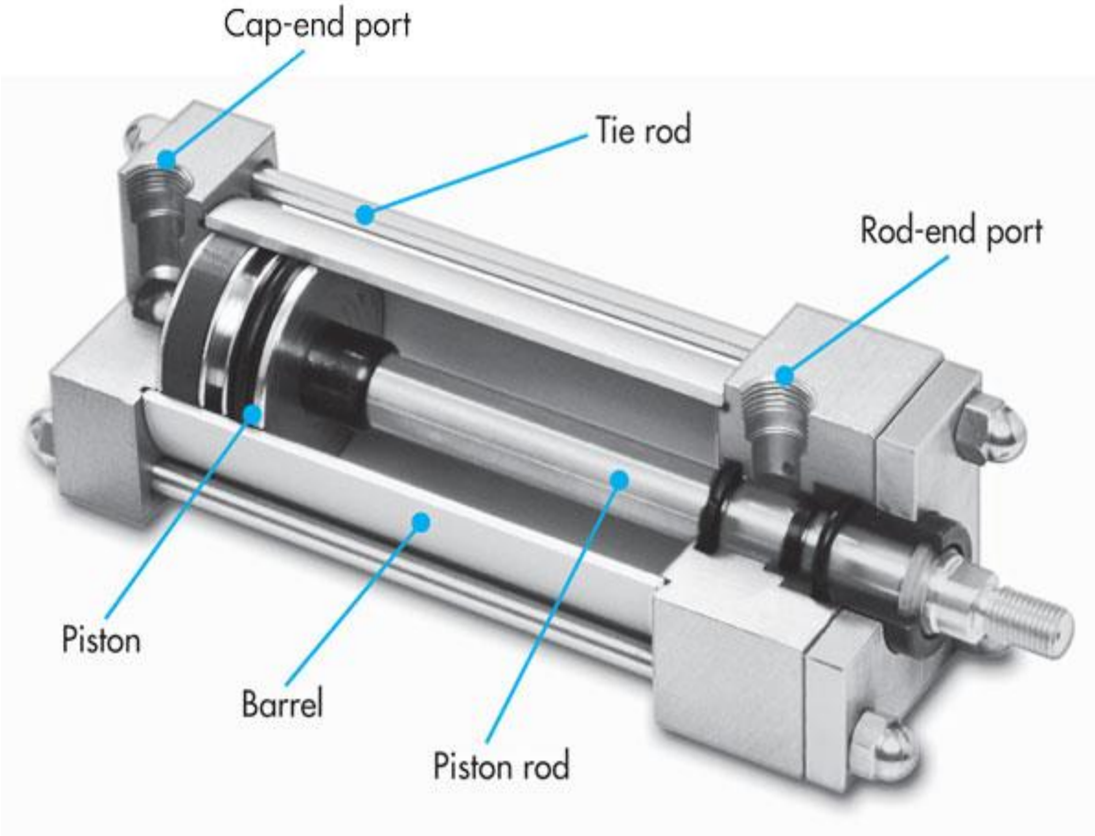

Figure 1.2 Hydraulic Cylinder

1.4 Geared Servo Motor or Servo Motor with Gearbox

Gear motors are electric motors that utilize a type of gear system on the output of motor. This gearing arrangement is called a gear reducer or gearbox. The combination of an electric motor and gearbox reduces design complexity and lowers cost, particularly for motors built for high torque and low speed application. In addition, gearboxes can be used as a means to reorient the input shaft in different directions.

The first step on selecting a gear motor is determining the type of gear motor. The primary distinction of gear motor id whether it is an AC motor or DC motor.

Gear motors may contain many types of gearboxes which differ mainly based on the construction and arrangement of gears. The operational characteristics of gearboxes are largely dependent on these different configurations.

1. Spur Gears
2. Planetary Gears
3. Worm Gears
4. Bevel Gears

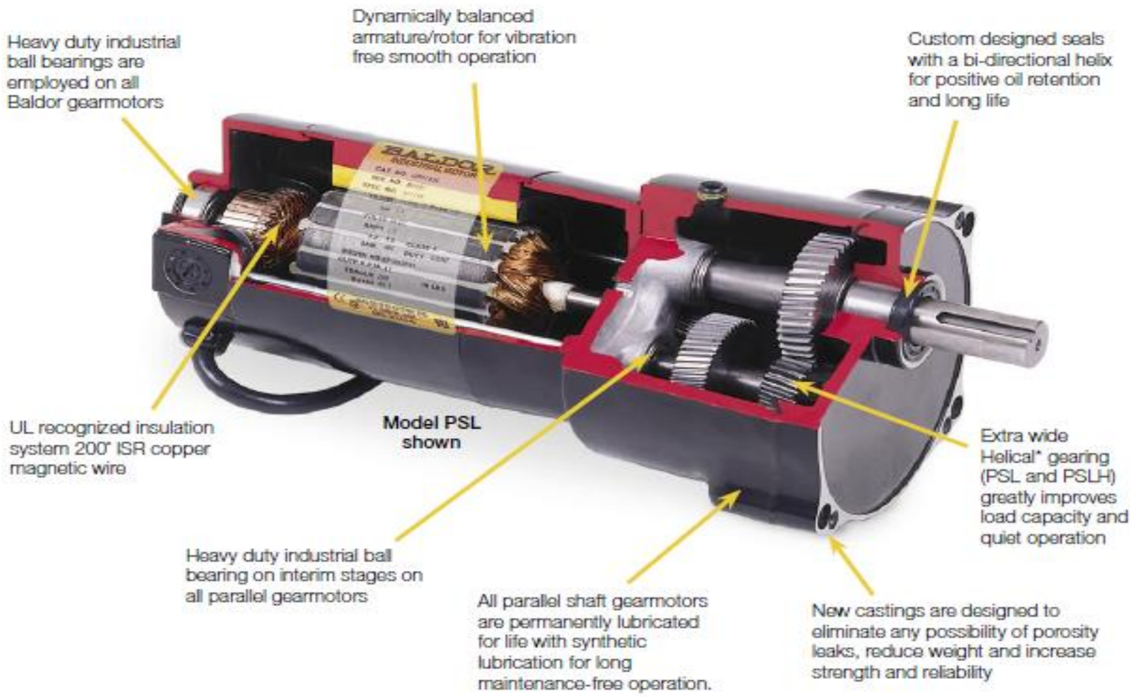

Figure 1.3 Geared Servo Motor

Chapter 2 Review of Literature

Bhargav C. Patel, Jaivesh Gandhi (2013) [13] in their research paper "Optimizing and analysis of parameter for pipe welding: A literature review" emphasis on the study of the effect of different input parameter of TIG and MIG welding on the weld quality. They studied the effect of various welding parameter by conducting different experiments.

As we know the most popular method for welding pipe is the shielded metal-arc process; however, gas shielded arc methods have made big inroads as a result of new advances in welding technology.

"SAFETY CONSIDERATIONS IN A WELDING PROCESS: A REVIEW" by Kapil Singh, Ankush Anand (2013)[4] aimed at highlighting the safety aspects in a welding process. In this research article, following aspects of welding had been considered: (a) HAZARDS IN WELDING. (b) SAFETY ASPECTS. (c)RISK ASSESMENT. It will help system designers, industrialists and welding professionals to overcome the issues being faced by the present day welders in a manufacturing environment, thus ensuring greater safety.

M. Rama Narasimha Reddy et. al in their paper "Design of Hydraulic Power Pack for Vertical Turret Lathe"(2014) [5] have designed hydraulic power pack to obtain various motions of Vertical Turret Lathe. Also clamping and unclamping is done using hydraulic system. Their design has made automation possible for all types of movements. In addition, speeds and forces can be easily controlled in this system. Special emphasis is made on design of power pack in which the elements, maintenance aspects and trouble-shooting methods is dealt with.

Gautam Kocher, Sandeep Kumar, Gurcharan Singh(2012)[6] studied on welding speed as process variable while arc voltage, welding current, wire feed rate distance between the nozzle and the plates are fixed in this experiment. The effect of weld speed on the weld bead profile is been discussed with the effect of weld speed on the fusion angle and wetting angle. The effect of weld speed on the weld bead dilution i.e. penetration area and reinforcement were area also discussed.

"Numerical strength and fatigue analysis in application to hydraulic cylinders" by W. Torbacki (2007) [11] discussed about the strength and fatigue limit analysis applied to piston type hydraulic cylinders. Design analysis has been done via Finite Element Method. They also presented fatigue graph for different values of operating mean pressure and stress concentration factor.

Satyaduttsinh P. Chavda, Tushar M. Patel et al presented the technique used for obtaining optimal process parameters with the use of experimental data. The aim of their paper "A Review on Parametric Optimization of MIG Welding for Medium Carbon Steel Using FEA-DOE Hybrid Modeling"(2013) [3] is to review the of optimizing process parameters of MIG welding process and compare the experimental result with FEA for optimizing parameter.

Shailesh S.Pachbhai, Laukik P.Raut (2014)[7] researched in his paper "A REVIEW ON DESIGN OF FIXTURES" on various types of fixture and clamping process which can be used for locating various shapes of object. It also showed to detail procedure for design of the fixture including the parameters to be considered before designing the fixture. Also have studied on how the design of fixture can improve the production rate and reliability. It has also reduced the time of engagement and disengagement time of setting of the work piece.

"Precision Planetary Servo Gearheads" by G.G. Antony, Neugart, A. Pantelides [16] et al studied the planetary (epicyclical gear systems) for "servo applications" (applications using servo motors) and the parameters influencing the positioning accuracy repeatability of a planetary servo gear. And also introduce a simple and reliable method of determining the required gearbox torque rating for a selected servo motor/gearbox application.

"Enhancement of the Performance of Hydraulic Power Pack by Increasing Heat Dissipation" (2014) [8] reviewed the heating of hydraulic oil and the inefficiencies results in loss of input power. M.L.R. Chaitanya Lahari, DR.B.SRINIVASA REDDY made an attempt to reduce the heating of the oil by changing the material of the tank and providing fins. Finally the improvement of efficiency of power pack by reducing the heat losses has been studied and analyzed.

"Analysis and Failure Improvement of Shaft of Gear Motor in CRM Shop" by D. K. Padhal, D. B. Meshram (2013)[2] studied the frequent failure analysis of output shaft of gear motor used for cold rolling mill to drive the Pay-off Four-HI (Horizontally inserted). The analysis has been done by calculation and then it is compared with the values in ANSYS software and parameters than can increase shaft life have been discussed.

"FINITE ELEMENT MODEL TO PREDICT RESIDUAL STRESSES IN MIG WELDING" by Harshal K. Chavan, Gunwant D. Shelake, M. S. Kadam (2012) [9] researched on the responses of single pass corner-joint of arc welding are evaluated through the finite element software (ANSYS). They studied the effects of varying heat input, welding speed on the thermo mechanical responses of the weldment after cooling down to room temperature. The results were as follows:

a. As heat input changes, strain changes respectively.
b. As the heat input increases temperature generates in the plat increases and thus the stress generated decreases.
c. The faster the welding speed is made, the less heat is absorbed by the base metal and thus stresses induced decreases.

"DESIGN OF WELDING FIXTURES AND POSITIONERS" studied by Prof. S.N.Shinde et al, (2014) [12], reviewed the construction & design feature for welding fixture and made consideration of the following parameters: that is properly positioning of the work piece which will help the welder to easily access the area to be weld and also reduces welder fatigue. It also ensures safety to the welder. When a weldment is a cylindrical, it is eligible to be supported when rotated. Small turning rolls idlers and jack stands with rollers can support the cylinder during rotation. These do not help offset loads center of gravity away from the center of the table out toward the edge of the table or further

Mohan B. Raut, S. N. Shelke(2014) [1]in their paper "Optimization of Special Purpose Rotational MIG Welding by Experimental and Taguchi Technique" presented the case study to find the design optimization for special purpose MIG welding operation. This paper presents the effect of welding parameters like welding current, welding voltage, welding speed, gas flow rate, rotational speed of work piece, filler wire feed rate on MIG welding. An Orthogonal Array, Signal to Noise (S/N) ratio and analysis of variance (ANOVA) are used to find out the welding characteristics and optimization parameters. Finally the confirmations tests have been carried out to compare the predicted values with the experimental values.

“Design of Modern Hydraulic Tank using Fluid Flow Simulation” in their paper presented the development of industrial hydraulic tank. Lovrec (2012) [14] et al studied several variations of new hydraulic tank designs compared with industrial hydraulic tank. Further, to reduce oil swirling and improve stability of oil flow, CFD simulation of oil flow inside hydraulic tank were made. Also function and application of hydraulic tank along with the stream line result is also discussed.

In the paper “A Review on Speed Control techniques of Single Phase Induction Motor” various types of speed control methods for single phase induction motor are described. Atul M. Gajare, Nitin R. Bhasme (2012) [15] elaborates speed control by means of input parameters like frequency. They used MOSFET as a switching element and concluded that the frequency range is 16 to 57 Hz at constant voltage for changing the speed of induction motor.

“Design Study and Analysis of Water Hydraulic High Torque Low Speed Motor” by Sagar Sonawane, Saurabh Pandharikar, R.M.Tayade (2014) [10] studied High Torque Low Speed (HTLS) Motor. Their work showed that hydraulic direct drives are more desirable than high speed motors with mechanical multipliers. Analysis for variation of Torque, various losses, various forces have been carried out. Mechanical, hydraulic and overall efficiency of the motor design has been evaluated at various operating pressures and Speed-Torque characteristics of the motor have been evaluated.

Chapter 3 Report on Present Investigation and Work

3.1 Problem Definition

We are currently working on one of the important product of the hydraulic system that is hydraulic cylinder. The company manufactures the cylinder by welding one of its ends (THE AREA OF OUR INTEREST) and the other end is sealed. The hydraulic fluid (Acantis HM 68) is filled in the cylinder when welding is done. After the fluid is filled the end other end is sealed using head end cover.

The end part which is being welded was earlier rotated using VEE BLOCK which is shown in the image below in figure 3.1.The cylinder is kept on this VEE block and rotated with hand. Because of rotating the cylinder with hand, the rotation is not smooth and hence the welding is also not smooth and continuous. There are irregularities at different places which are removed by filing. This increases the time of production of the cylinder.

Figure 3.1 VEE block used by company

3.2 Methodology Adopted

We have adopted the procedure as shown in the flow chart.

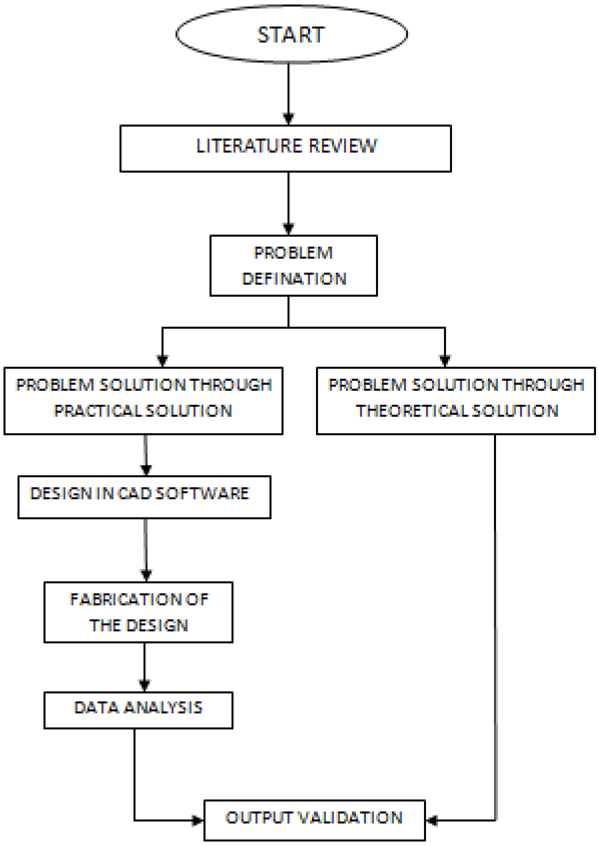

Figure 3.2 Flow ChaRT

3.2.1 Working Status (Our Work)

- FIRST STAGE

In the initial part, we have provided a tool named as ROLLERS which is shown in the image. Since, the cylinder is now rotating on rollers. It has pure rolling action and the cylinder is rotated easily and smoothly.

Figure 3.3 Rollers

From our survey we have found three ways to rotate the cylinder.

i. Rotating the cylinder using a hand wheel i.e. manual rotation.
ii. Rotating the fixture using electric motor.
iii. Rotating the fixture using hydraulic motor.
iv. Rotating the fixture using geared motor.

Since the company wants an automation system to rotate the cylinder. Our first option was eliminated.

From market search, we came to know that the minimum available electric motor speed is 1440 rpm. So to reduce and bring the speed to 5 rpm needs a very high gear ratio which is 288:1. This could not be achieved in single stage gear box. It needs at least two stage gear box which will make the system bulky and costly. Moreover, maintenance of such a system is high. Hence, the second option was eliminated.

The third option was using hydraulic motor. The system is costly but the company itself produces the components. So the third option was suitable for the company and desired speed can be easily achieved using this system.

The fourth option is using geared motors. These motors produce high torque at low speed which is our motto to be achieved.

So both the last option can be fulfill our requirement. Therefore, we have planned and design both the possible options which can resolve our problem. Further methodology discusses the HYDRAULIC and GEAR MOTOR design along with costing.

3.2.2 Design Using Hydraulic System

A hydraulic system is a drive or transmission system that uses pressurized hydraulic fluid to power hydraulic machinery.

A hydraulic system consists of three main parts:

a. The generator (e.g. a hydraulic pump), driven by an electric motor
b. Valves, filters, piping etc. (to guide and control the system)
c. The actuator (e.g. a hydraulic motor) to drive the machinery.

- ***Components require in a hydraulic drive system***

The following are the components require in a hydraulic system drive:

i. Electric motor:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Electric motors are used to produce linear or rotary force.

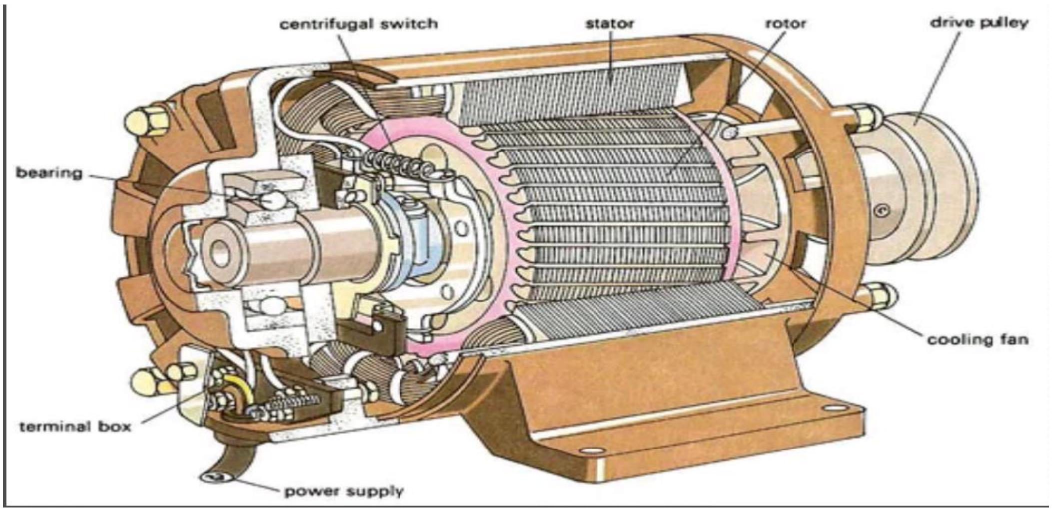

Figure 3.4 Electric Motor

ii. Hydraulic Pump:

A hydraulic pump is a mechanical source of power that converts mechanical power into hydraulic energy. When a hydraulic pump operates, it creates a vaccum at the pump inlet, which forces liquid from the reservoir into the inlet line to the pump and by mechanical action delivers this liquid to the pump outlet and forces it into the hydraulic system.

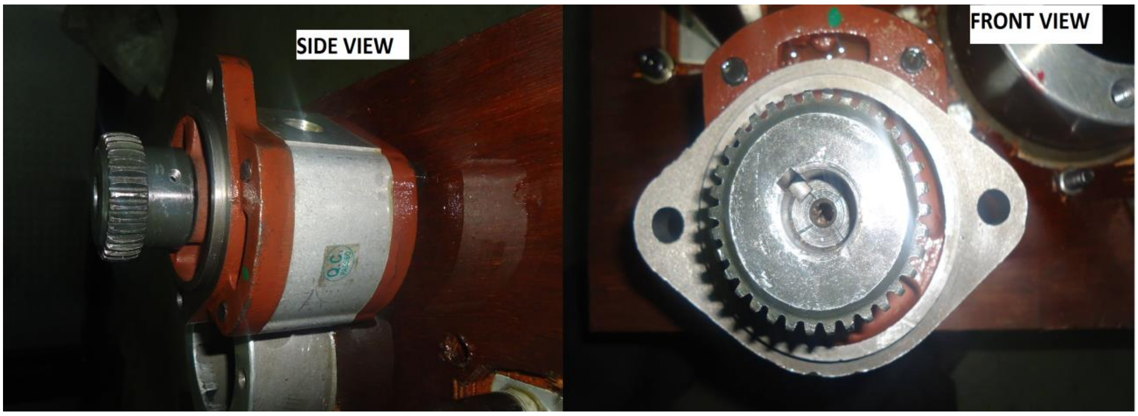

Figure 3.5 Gear Motor

iii. Oil Tank or Reservoir:
The hydraulic fluid reservoir holds the excess hydraulic fluid to accommodate volume changes. The reservoir is also designed to aid in separation of air from fluid and also works as a heat accumulator to cover the losses in the system when peak power is used.

iv. Control valve:
Direction Control Valve route the fluid to the desired actuator. They usually consist of a spool inside a cast iron or steel housing. The spool has a central (neutral) position maintained with springs; in this position the supply fluids is blocked or returned to tank. Sliding the spool to one side routes the hydraulic fluid to an actuator and provides a return path from actuator to tank.

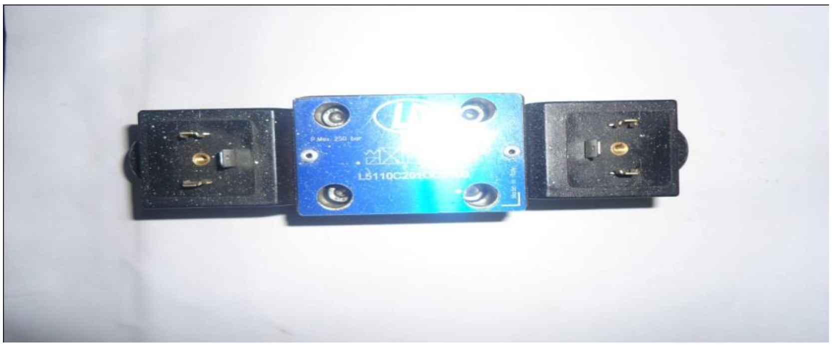

Figure 3.6 Solenoid Operated DC Valve

v. Hydraulic Motor:
A hydraulic motor is a mechanical actuator that converts hydraulic pressure and flow into torque and angular displacement (rotation).

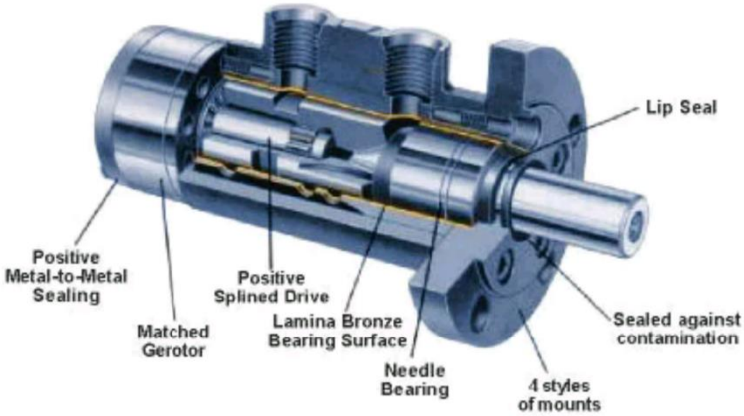

Figure 3.7 Hydraulic Motor

vi. Hydraulic fluid:

Hydraulic fluid is the life of the hydraulic circuit. It is usually petroleum oil with various additives. The major function of hydraulic fluid is to provide energy transmission through the system which enables work and motion to be accomplished. Hydraulic fluids are responsible for lubrication, heat transfer and contamination control.

vii. Tubes, pipes and hoses:

Hydraulic Tubes are seamless steel precision pipes, specially manufactured for hydraulics. The tubes are interconnected by different types of flanges, welding cones/nipples and by cut-rings.

Hydraulic pipe is used in case standard tubes are not available. Generally these are used for low pressure. They can be connected by threaded connections, but usually by welds.

Hydraulic Hose is graded by pressure and temperature, fluid compatibility. Hoses are used when pipes or tubes cannot be used, usually to provide flexibility for machine operation and maintenance. The hose is built up with rubber and steel layers.

viii. Filters:

Filters are an important part of hydraulic systems. Metal particles are continuously produced by mechanical components and need to be removed along with other components.

ix. Hydraulic Manifold:

A hydraulic manifold is a manifold that regulates fluid flow from between pumps and actuators and other components in a hydraulic system. It is like a switchboard in an electrical circuit because it lets the operator control how much fluid flows between which components of hydraulic system.

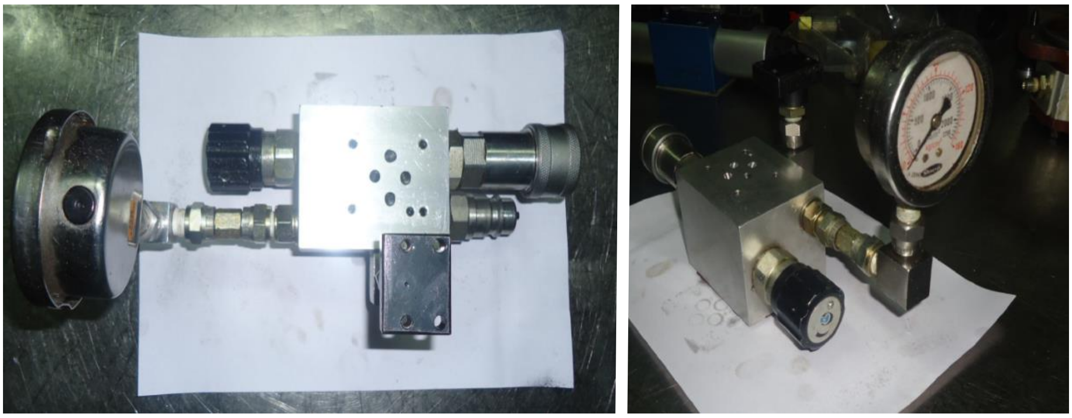

Figure 3.8 Manifold Assembly

- ***Circuit diagram of hydraulic motor system***

  The circuit of the system is designed in FESTO software

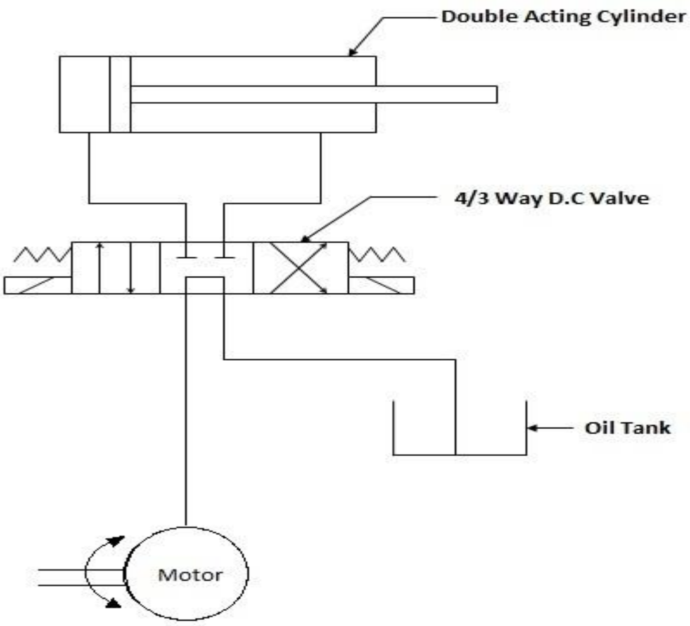

Figure 3.9 Circuit Design in Festo

- ***Working of the Hydraulic System***

A simple working diagram of the system is shown in the figure below. Pump-inlet and motor return (via the directional valve) are connected to the hydraulic tank. The flow is returned to tank through the control valve's open center; that is, when the control valve is centered. Otherwise, if the control valve is actuated it routes fluid to and from an actuator tank. The fluid's pressure will rise to meet any resistance, since the pump has a constant output. If the pressure rises too high, fluid returns to tank through a pressure relief valve.

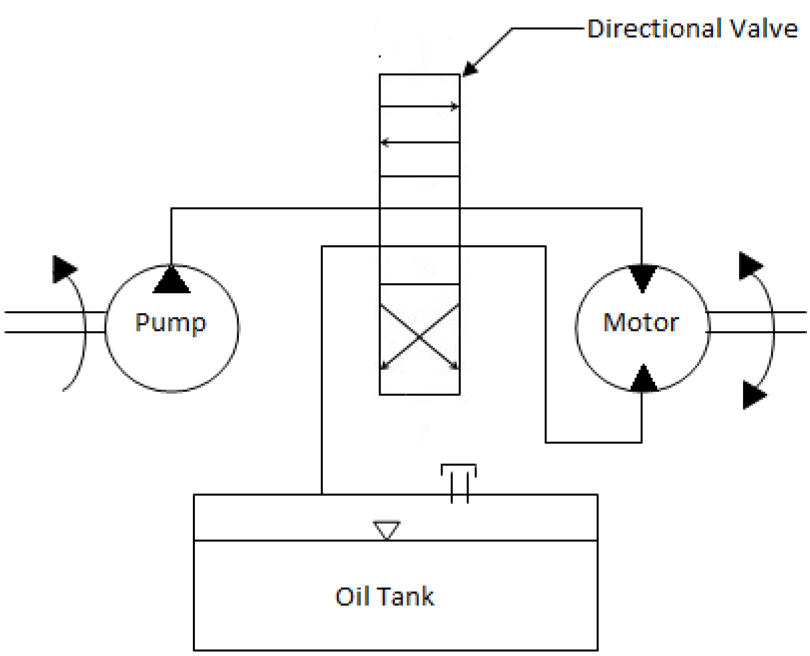

Figure 3.10 Simple Working Figure

➢ ***Calculation***

The required parameters are calculated using the formulas below.

a) TORQUE

For calculating TORQUE, we have selected a motor of 0.5 HP or 0.363 KW. Using the formula below, we can calculate TORQUE

$$Torque, T = \frac{P}{2\pi N} = 238.7\ Ncm$$

b) PRESSURE IN THE SYSTEM

$$Torque, T = \frac{Pressure\ (Bar) \times Displacement\ (cc)}{2\pi} = 250\ Bar$$

c) FLOW RATE

$$Hydraulic\ Motor\ Speed, N = \frac{Flow\ Rate\ (LPM)}{Displacement\ (cc)} \times 1000$$

OR

$$Motor\ Input\ Power, KW = \frac{Pressure (Bar) \times Flow\ Rate\ (LPM)}{600}$$

$$Flow\ Rate = 4\ LPM$$

➢ ***Analysis of oil tank or reservoir for hydraulic system***

Table 3.1 Physical Property

Mass	**0.0892415 kg**
Area	94521.2 mm^2
Volume	85429.3 mm^3
Center of Gravity	x=-12.0451 mm y=58.3855 mm z=30.2483 mm

Table 3.2Material Properties

Name	Steel, Mild, Welded	
General	Mass Density	7.85 g/cm^3
	Yield Strength	207 MPa
	Ultimate Tensile Strength	345 MPa
Stress	Young's Modulus	220 GPa
	Poisson's Ratio	0.275 ul
	Shear Modulus	86.2745 GPa
Part Name(s)	Base Plate Face 1 Face 2 Face 3 Face 4	

- **Operating conditions**
  i. Pressure:1

Load Type	Pressure
Magnitude	1.145A

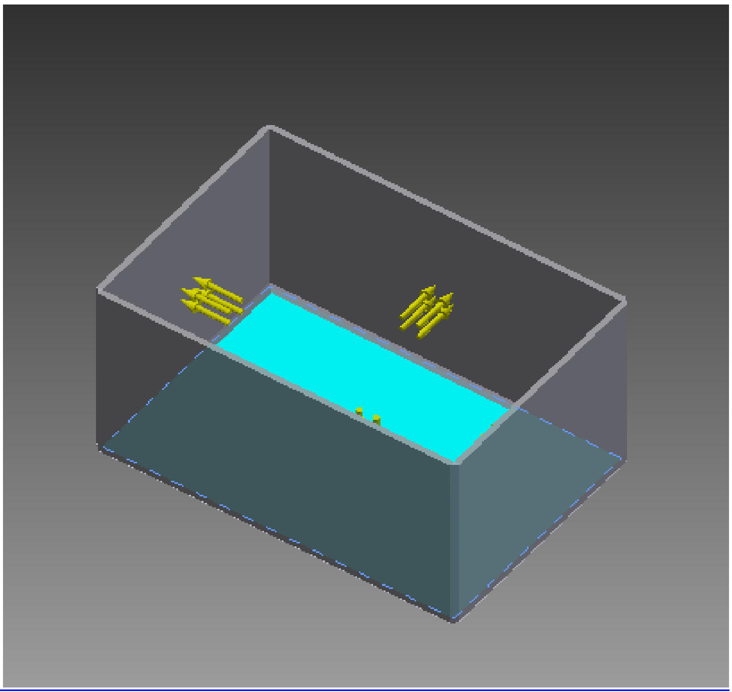

Figure 3.11 Pressure at base

ii. ***Pressure 2***

Load Type	Pressure
Magnitude	1.145A

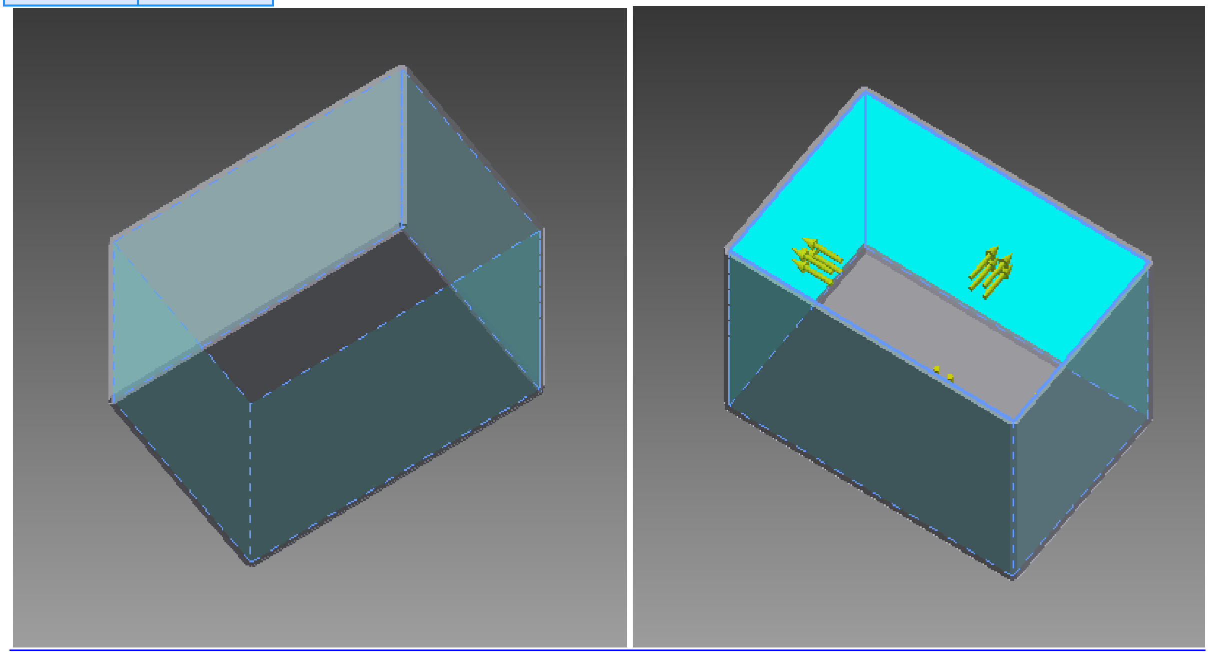

Figure 3.12 Pressure on all faces

iii. Gravity

Load Type	Gravity
Magnitude	9810.000 mm/s^2
Vector X	0.000 mm/s^2
Vector Y	0.000 mm/s^2
Vector Z	-9810.000 mm/s^2

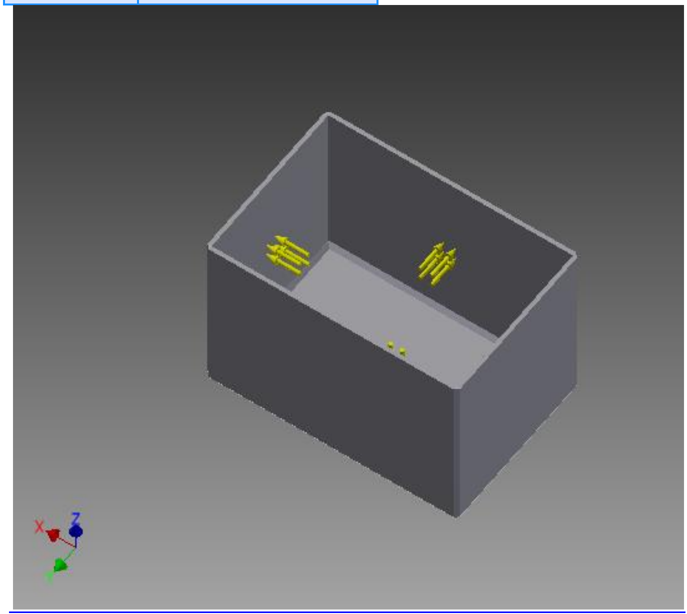

Figure 3.13 Gravity

Table 3. 3Result Summary

Name	**Minimum**	**Maximum**
Volume	85429.3 mm^3	
Mass	0.659161 kg	
Von Mises Stress	0.3343 MPa	3657.41 MPa
1st Principal Stress	-409.496 MPa	5397.61 MPa
3rd Principal Stress	-2255.8 MPa	1594.77 MPa
Displacement	0 mm	6.05604 mm

Safety Factor	0.0751898 ul	15 ul
Stress XX	-1239.32 MPa	4686.94 MPa
Stress XY	-1745.95 MPa	1701.45 MPa
Stress XZ	-379.9 MPa	377.989 MPa
Stress YY	-1274.08 MPa	2772.54 MPa
Stress YZ	-452.035 MPa	454.614 MPa
Stress ZZ	-1122.14 MPa	2253.29 MPa
X Displacement	-0.300884 mm	0.299464 mm
Y Displacement	-6.04882 mm	6.05592 mm
Z Displacement	-0.101989 mm	0.0762954 mm
Equivalent Strain	0.00000129895 ul	0.0515152 ul
1st Principal Strain	-0.00000767387 ul	0.0610757 ul
3rd Principal Strain	-0.0304584 ul	0.0000840247 ul
Strain XX	-0.0157792 ul	0.0463523 ul
Strain XY	-0.0337027 ul	0.0328436 ul
Strain XZ	-0.00528738 ul	0.00648141 ul
Strain YY	-0.0154446 ul	0.0160174 ul
Strain YZ	-0.00872579 ul	0.00877557 ul
Strain ZZ	-0.00474342 ul	0.00956578 ul
Contact Pressure	0 MPa	2175.28 MPa
Contact Pressure X	-1480.69 MPa	1530.46 MPa
Contact Pressure Y	-1880.88 MPa	1844.21 MPa
Contact Pressure Z	-557.026 MPa	622.779 MPa

❖ ***Figures***

a. Von Mises Stress

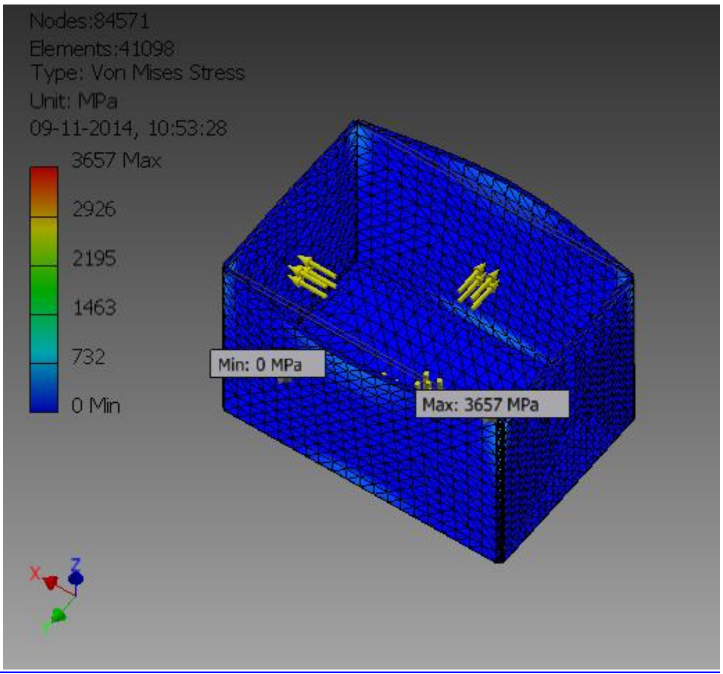

Figure 3.14 Von Mises Stress

b. Displacement

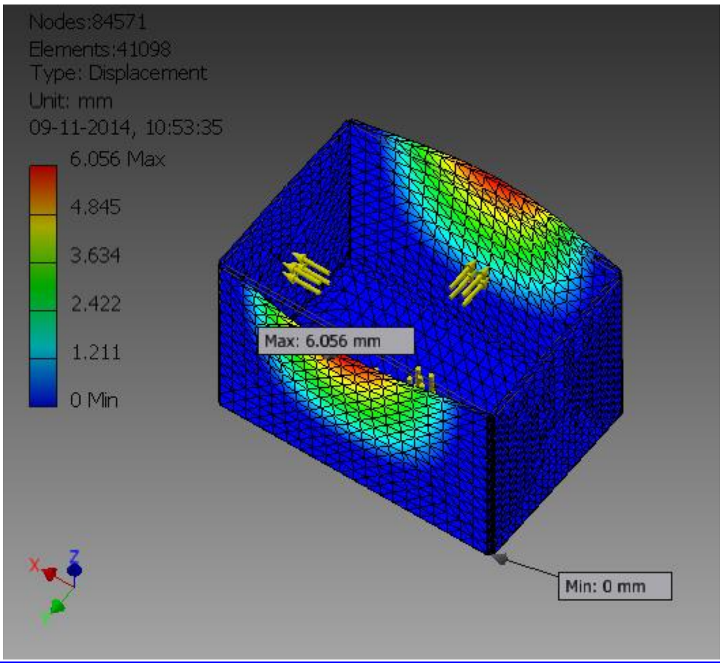

Figure 3.15 Maximum Displacement

c. X Displacement

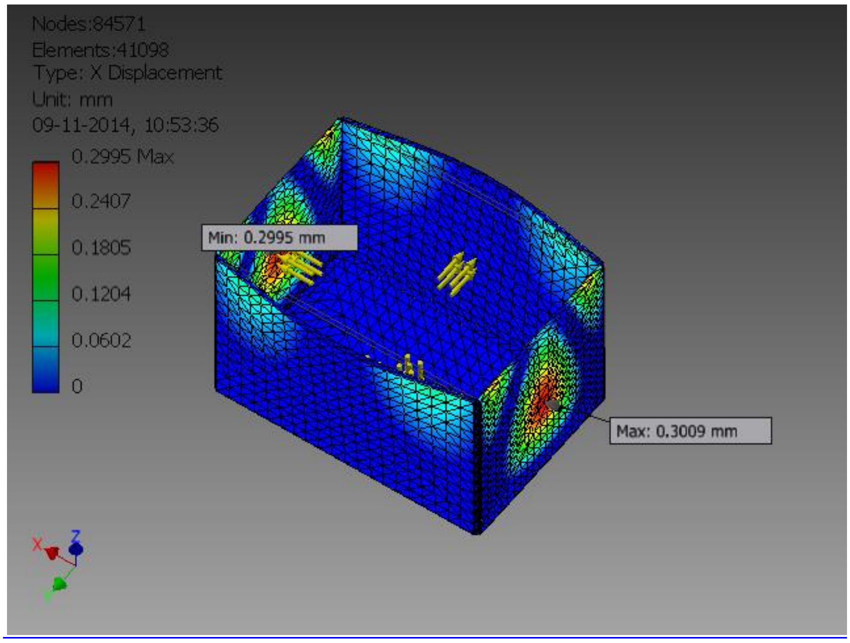

Figure 3.16 Displacement in X-direction

d. Y Displacement

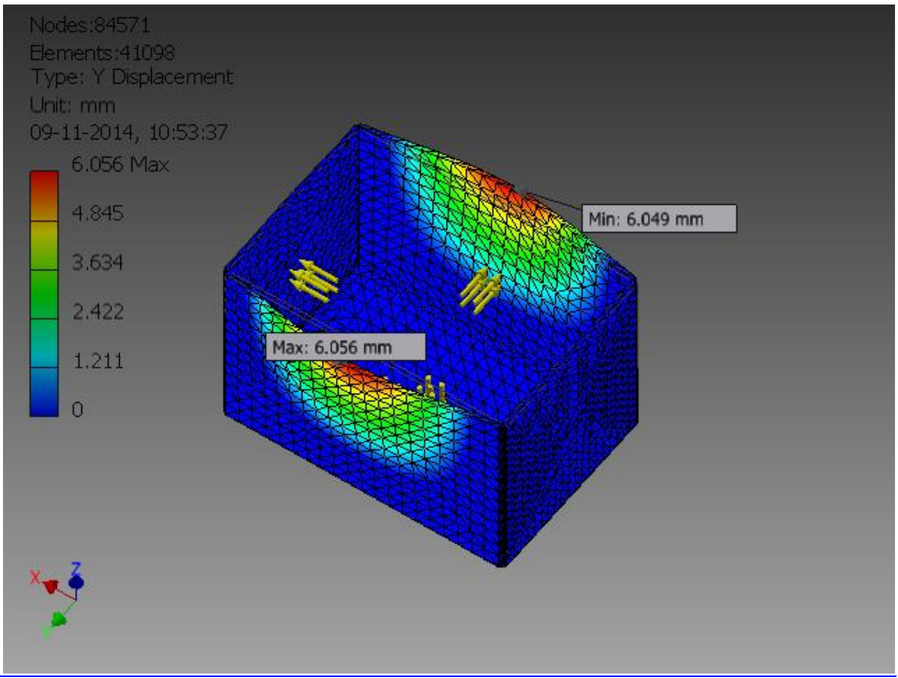

Figure 3.17 Displacement in Y-direction

e. Z Displacement

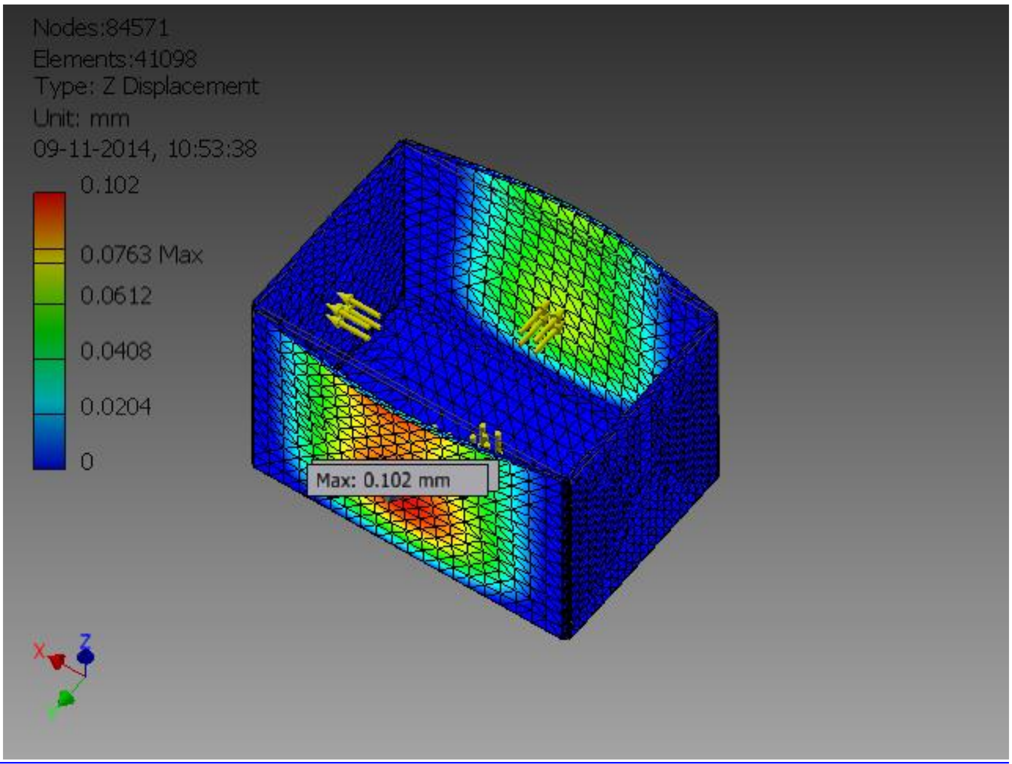

Figure 3.18 Displacement in Z-direction

- Fixture material and design
  Considering the strength required we have selected Plain Carbon Steel material of grade C40 having properties as shown below:

Table 3.4 Chemical Composition of C40

Chemical	C	Si	Mn	S	P
Composition (%)	0.37-0.44	0.25	0.6-0.9	0-0.05	0-0.04

Density: 7.8 g/cm^3
Elastic Modulus: 210 GPa
Specific Heat Capacity: 450 J/kg-K
Tensile Strength: 550-630 MPa

- Fixture Design
  - 2D DESIGN of FIXTURE

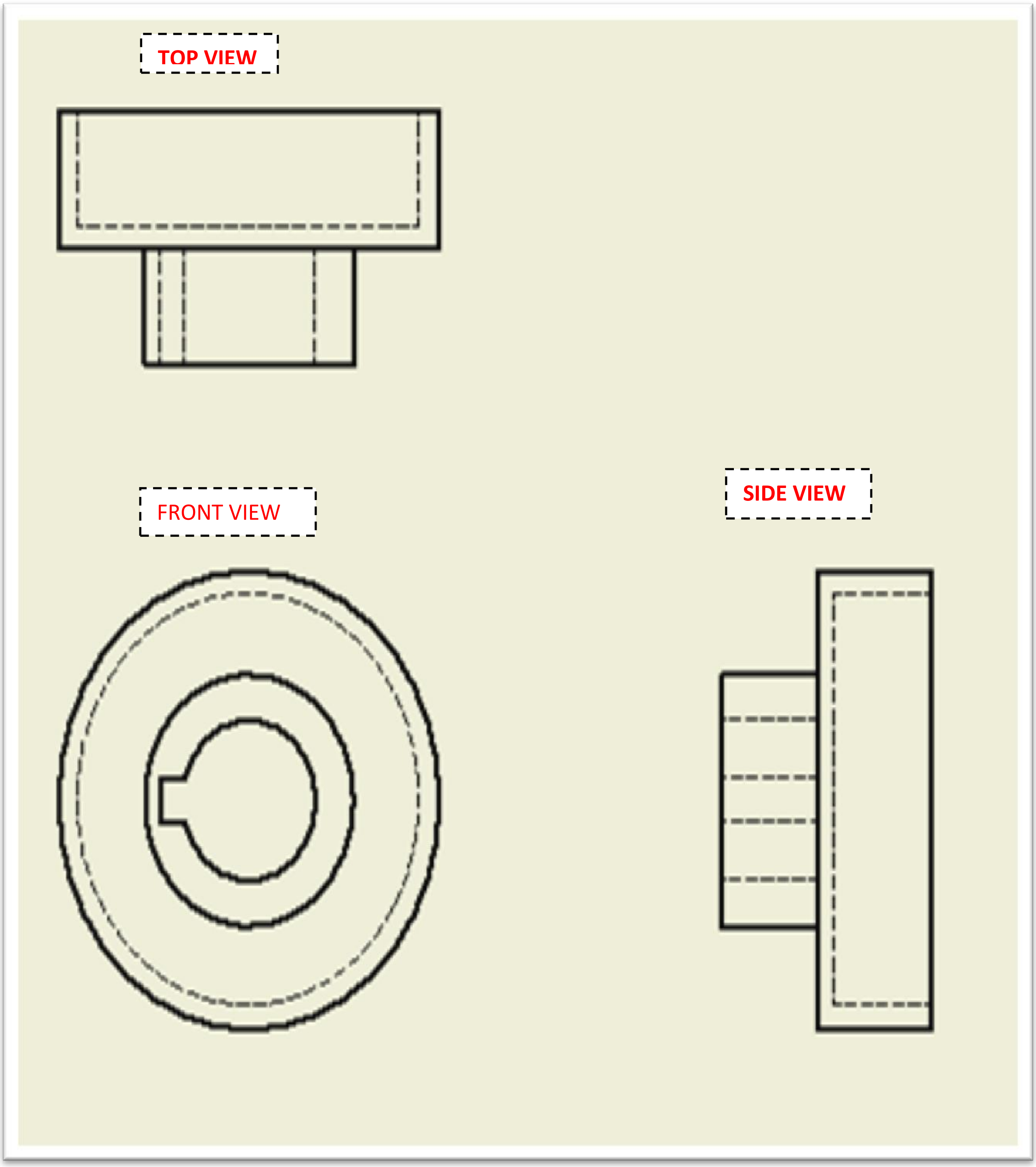

Figure 3.19 Design of Fixture

❖ 3D view of FIXTURE

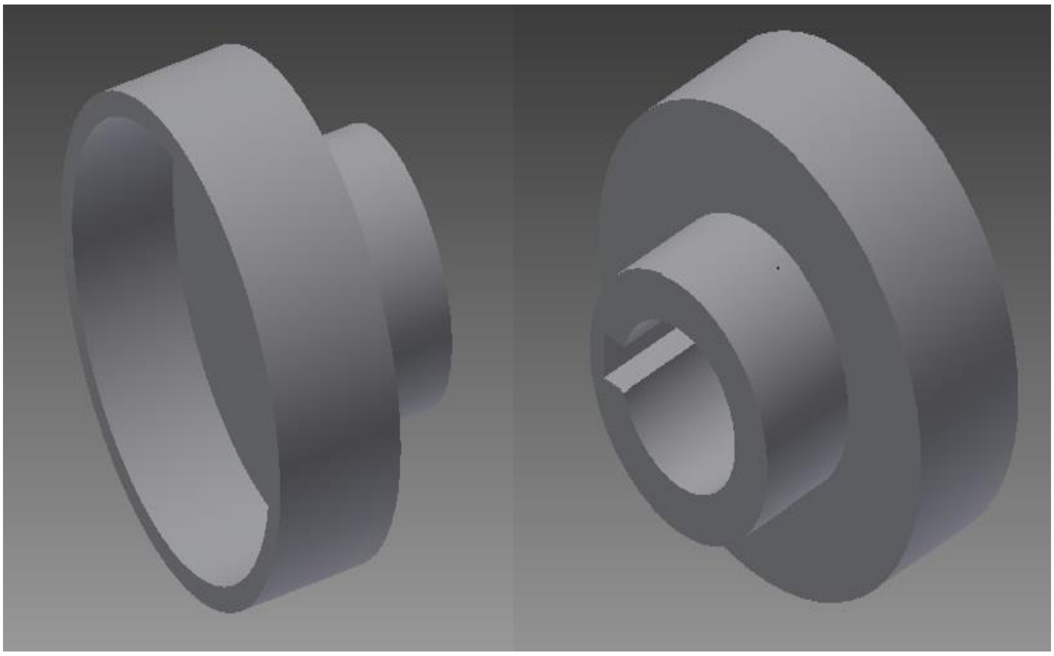

Figure 3.20 Design of Fixture

➢ Costing of hydraulic system

Table 3.5 Costing of Hydraulic System

S.R. No	Component	Price (Rs)
1	Electric Motor	3850
2	Gear Pump	3750
3	Oil Tank/ Reservoir	4000
4	Hydraulic Motor	10250
5	DC Valve Liver operated	3000
6	Manifold	1700
7	Hydraulic Hoses	1800
8	QARC Coupling	2365
9	Adapters & Others	2700
10	Fixture Material + Fabrication	1500
TOTAL		**34915**

3.2.3 Design using Geared Servo Motor

In this system we will be using a servo motor with gearbox installed in it. This motor provides us with 10 RPM speed and we require a speed of 5 RPM. So to reduce the speed, we can use pulley or gear attachment to get the required speed.

The parts that we require for this system:

a. PARALLEL SHAFT GEARMOTOR: Gear motors are electric motors that utilize a type of gear system on the output of motor. This gearing arrangement is called a gear reducer or gearbox. The motor is selected on the basis of input speed i.e. 10 RPM

b. FIXTURE: this fixture is designed to rotate cylinder of any diameter. We need a base platform to support FOUR ROLLERS. The back rollers will be connected to shaft of the pulley and pulley will run through the gear motor. The front two rollers will act as idle roller and will help to rotate cylinder.

The working and design is discussed in the next part.

- Design of geared motor system

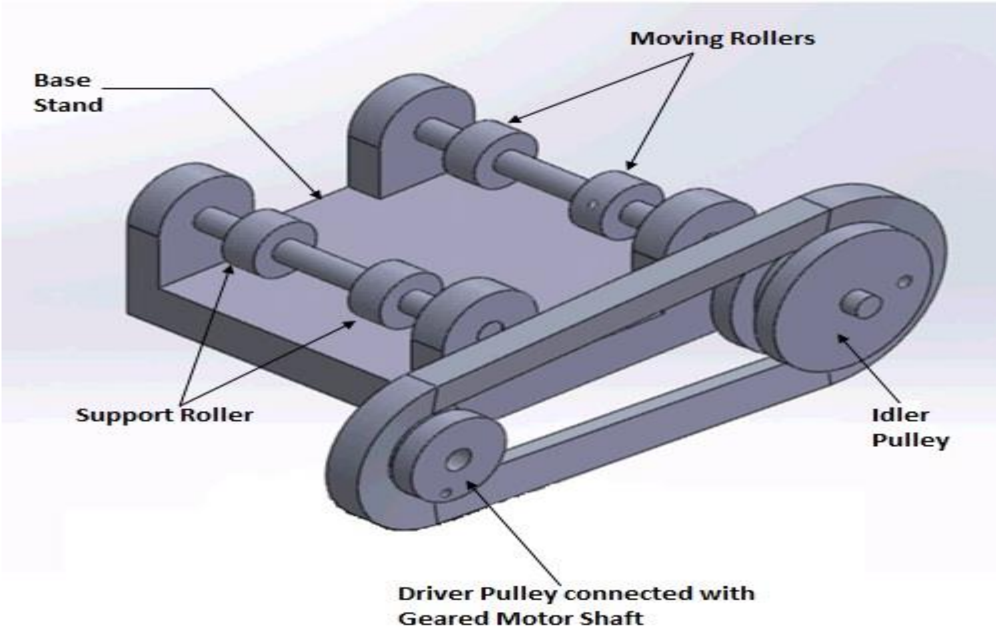

Figure 3.21 Gear Motor System

- Working

  As shown in the design, the main component is the gear motor which will be driving the pulley. This pulley is connected to another pulley via belt drive. The driven pulley is smaller is size so as to reduce the speed from 10 RPM to 5 RPM. The ratios of the diameters is 1:2

The shaft of the driven pulley is connected to one side of the two roller connected in series. As the driven pulley moves, the rollers also move with the same speed as that of the driven pulley. The other two wheels help to support the cylinder. When the cylinder is kept vertically across the cylinder, the moving rollers rotate the cylinder in the opposite direction as that of the roller. The idler roller rotates because of the rotation of cylinder. This way cylinder of various sizes can be rotated using the same system.

Further if this speed is fast for the welder then it can be reduce simply by changing the idler pulley i.e. driven pulley. The diameter for idler pulley can be found out by using the formula given below

$$\frac{Diameter\ of\ Driven\ pulley\ (D2)}{Diameter\ of\ Driver\ pulley\ (D1)} = \frac{Input\ Speed\ (N1)}{Output\ Speed\ (N2)}$$

Where,
Diameter of driver pulley (D1) = 10 cm (we are fixing)
Input Speed (N1) = 10 RPM
Output Speed (N2) = 5, 4 …. 1 (depending upon the user)
Substituting these values we can find the diameter of required driven pulley.
The material used for fabrication of fixture is same as that of the hydraulic system.

- Costing of gear motor system

Table 3.6 Costing of Gear Motor System

S.R. No	COMPONENT	PRICE (Rs)
1	Gear Motor	2500
2	Fixture material + Fabrication	1500
TOTAL		4000

Chapter 4 Result & Discussion

As per the methodology adopted, the systems are able to give us required output. But the question arises which one is better than the other.

We will take a look at differentiating factors in both the systems and finally conclude with the best suitable methods which will be cost effective and will help to improve the productivity and efficiency of the company.

Table 4.1 Distinguish between Hydraulic & Gear Motor System

PARAMETERS	HYDRAULIC SYSTEM	GEARED MOTOR SYSTEM
Costing	System is costly because requires large number of components.	Relatively much cheaper.
Size	Requires large space	Compact Design
Change in SPEED	To achieve change in speed fluid pressure has to be controlled which is difficult.	Speed change can be achieved easily by changing the size of IDLER pulley
Power	High power generation capacity	Less power compared to hydraulic system
Maintenance	High	Low
Productivity	1 minute 10 seconds per cylinder	1 minute 10 seconds per cylinder
Fabrication	Different diameters cylinder requires special arrangement i.e. BUSH PRESS FIT to be welded on same fixture.	Single design i.e. ROLLERS can be used to rotate cylinder of varies diameters

Chapter 5 Conclusion & Future Scope

5.1 Conclusion

We have provided the industry with both the solutions i.e. using hydraulic and gear motor system. Keeping the costing and difficulty in hydraulic system, the industry decided to go with the gear motor system. Since, it is cost effective and is an easy system to be used.

Further from the maintenance point of view, the gear motor system can be easily maintained compare to hydraulic system.

Implementation of any of the two systems will decrease the time of productivity of each cylinder and increase the production of the industry. Earlier time required for production of one cylinder was 5 minutes 38 seconds, while with implementation time will be reduced to 1 minute and 10 seconds.

5.2 Future Scope

The system can be further automated by making the welding part of the system automated. Moreover, the system can be analyzed using various techniques like ANOVA, VARIANCE and REGRESSION etc. to study the change in output with change in input.

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6.1 Company Certificate

CERTIFICATE

This is to certify that **Mr. Syed Zaid Karim**, a student of Anjuman-I-Islam Kalsekar Technical Campus, New Panvel has successfully completed his Training Project on **"Design and Fabrication of Semi-Automatic Fixture for Cylinder "** from 1st October 2014 to 8th April 2015 in **"Bell Fluidtechnics Pvt. Ltd"**

We wish him all the success for future endeavors.

For Bell Fluidtechnics PVT. LTD.

CERTIFICATE

This is to certify that **Mr. Syed Mohd. Talha Jafri Asrar Husain**, a student of Anjuman-I- Islam Kalsekar Technical Campus, New Panvel has successfully completed his Training Project on **"Design and Fabrication of Semi-Automatic Fixture for Cylinder "** from 1st October 2014 to 8th April 2015 in **"Bell Fluidtechnics Pvt. Ltd"**

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We wish him all the success for future endeavors.

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6.2 Publication

- **A study on the welding technique used in the industry**

OPEN ACCESS

International Journal Of Modern Engineering Research (IJMER)

A Review on Various Welding Techniques

Javed Kazi[1], Syed Zaid, Syed Mohd. Talha, Mukri Yasir, Dakhwe Akib

(Department of mechanical engineering, Mumbai University Anjuman-i-Islam's Kalsekar technical campus)

ABSTRACT: *Quality and productivity play important role in today's manufacturing market. Now a day's due to very stiff and cut throat competitive market condition in manufacturing industries. The main objective of industries reveals with producing better quality product at minimum cost and increase productivity. Welding is the most vital and common operation use for joining of two similar and dissimilar parts. In the present research paper an attempt is made to understand various welding techniques and to find the best welding technique for steel. Special focuses have been put on TIG and MIG welding. On hardness testing machine and UTM various characteristics such as strength, hardness, modulus of rigidity, ductility, breaking point, % elongation etc. at constant voltage were analyzed.*

Keywords: *MIG, TIG, Welding*

➢ Paper on the design of GEAR MOTOR SYSTEM

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Volume-5, Issue-2, April-2015
International Journal of Engineering and Management Research
Page Number: 366-370

Design of Semi-Automatic System for Welding Hydraulic Cylinders

Javed Kazi[1], Syed Zaid[2], Mukri Yasir[3], Syed Mohd. Talha[4], Akib Dakhwe[5]
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ABSTRACT

In this era of automation technology, industries have put a very high demand on fast and reliable methods. Hydraulic system is one of the latest technologies in industrial field. Hydraulic cylinder is an important part of hydraulic system which makes it more important as industrial product. In the present paper, we are evaluating the production system of hydraulic system. In the present production system, the total production is done manually. We will be evaluating the present manual system in "semi-automatic" system. we will be designing a system which will be rotating the hydraulic cylinder at a constant speed so that it can be welded continuously and smoothly. We will also the discussing various possible methods of rotation of cylinder and implementing the best system in the industry.

Keywords---- Cylinder, Geared Motor, Welding