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Three Axes Hydraulic Modern Trailer

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Abstract - *A Trailer is generally an unpowered vehicle pulled by a powered vehicle. Commonly, the term trailer refers to such vehicles used for transport of goods and materials. Sometimes recreational vehicles, travel trailers, or mobile homes with limited living facilities where people can camp or stay have been referred to as trailers. In earlier days, many such vehicles were towable trailers. Automation can be achieved through computers, hydraulics, robotics, etc., of these sources, hydraulics form an attractive medium. Automation plays an important role in automobile. Nowadays almost all the automobile vehicle is being atomized in order to product the human being.*

Key Words: **Double acting, Hydraulic cylinder Solenoid vale, Flow control valve, Connectors, Hoses, Motor, control unit**

1. INTRODUCTION

Hydraulics has for some considerable time between used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of hydraulic technology for automation.

Hydraulic systems operate on a supply of compressed fluid which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the hydraulic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed fluid supply.

The key part of any facility for supply of compressed fluid is by means using reciprocating reservoir. A reservoir is a machine that takes in fluid, fluid at a certain pressure and delivered the fluid at a high pressure.

Reservoir capacity is the actual quantity of fluid compressed and delivered and the volume expressed is that of the fluid at intake conditions namely at atmosphere pressure and normal ambient temperature.

The compressibility of the fluid was first investigated by Robert Boyle in 1962 and that found that the product of pressure and volume of a particular quantity of fluid.

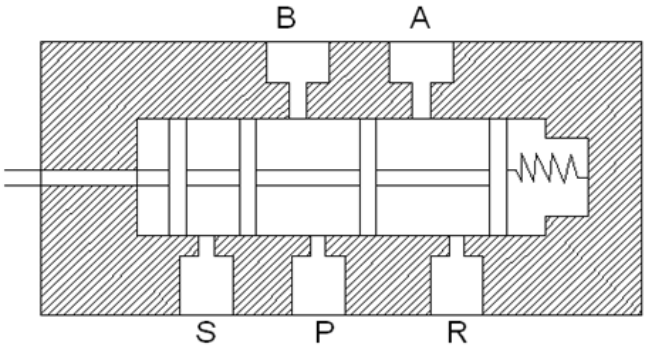
The usual written as

$PV = C$ (or) $P_1V_1 = P_2V_2$

In this equation the pressure is the absolute pressured which for free is about 14.7 Psi and is of courage capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer. Any fluid can be used in hydraulic system but fluid is the mostly used system now a days.

1.1 Working Principle:-

In our project we are doing unloading material in using three axis Hydraulic modern trailers. In this working the loading material is unloaded by using Hydraulic cylinder. The compressed fluid passes through the reservoir. Reservoir is control by the controller for ON the Hydraulic. This Hydraulic force used for rivet to moves downwards. After a few seconds delay the controller will off the reservoir, so that the Hydraulic moves upwards. In automatic control movement controller control the Hydraulic cylinder positioning with the help of relay and solenoid valve. The controller gives the signal to relay drive. The main function of relay drives to change the direction of fluid flow movement in solenoid valve. Then the piston movement automatically changes in Hydraulic cylinder. Then the motor is to adjust with help of manual operated for where we have to unload the material by moving with help of wheels.



1.2 Selection of Hydraulics:-

Mechanization is broadly defined as the replacement of manual effort by mechanical power. Hydraulic is an attractive medium for low cost mechanization particularly for sequential (or) repetitive operations. Many factories and plants already have a compressed fluid system, which is capable of providing the power (or) energy requirements and

the control system (although equally hydraulic control systems may be economic and can be advantageously applied to other forms of power).

The main advantage of an all hydraulic system are usually economic and simplicity the latter reducing maintenance to a low level. It can also have outstanding advantages in terms of safety.

1.3 Production Of Compressed Fluid:-

Hydraulic systems operate on a supply of compressed fluid, which must be made available. In sufficient quantity and at a pressure to suit the capacity of the system. When hydraulic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed fluid supply.

The key part of any facility for supply of compressed fluid is by means using reciprocating reservoir. A reservoir is a machine that takes in fluid, fluid at a certain pressure and delivered the fluid at a high pressure.

Reservoir capacity is the actual quantity of fluid compressed and delivered and the volume expressed is that of the fluid at intake conditions namely at atmosphere pressure and normal ambient temperature. Clean condition of the suction fluid is one of the factors, which decides the life of a reservoir. Warm and moist suction fluid will result in increased precipitation of condense from the compressed fluid. Reservoir may be classified in two general types:

1. Positive displacement reservoir.
2. Turbo reservoir

Positive displacement reservoirs are most frequently employed for compressed fluid plant and have proved highly successful and supply fluid for hydraulic control application.

The types of positive reservoir

1. Reciprocating type reservoir
2. Rotary type reservoir

Turbo reservoirs are employed where large capacity of fluid required at low discharge pressures. They cannot attain pressure necessary for hydraulic control application unless built in multistage designs and are seldom encountered in hydraulic service.

Built for either stationary (or) portable service the reciprocating reservoir is by far the most common type. Reciprocating reservoirs lap be had is sizes from the smallest capacities to deliver more than 500 m^3/min. In single stage reservoir, the fluid pressure may be of 6 bar machines discharge of pressure is up to 15 bars. Discharge pressure in the range of 250 bars can be obtained with high pressure reciprocating reservoirs that of three & four stages.

Single stage and 1200 stage models are particularly suitable for hydraulic applications , with preference going to the two stage design as soon as the discharge pressure exceeds 6 bar , because it in capable of matching the performance of single stage machine at lower costs per driving powers in the range.

2. FACTORS DETERMINING THE CHOICE OF MATERIALS:-

The various factors which determine the choice of material are discussed below.

2.1 Properties of Material:-

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

1. Physical
2. Mechanical
3. From manufacturing point of view
4. Chemical

The various physical properties concerned are melting point, Thermal Conductivity, Specific heat, coefficient of thermal expansion, specific gravity, electrical Conductivity, Magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

2.2 Manufacturing Case:

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

2.3 Quality Required:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go for casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

2.4 Availability of Material:

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed.

The delivery of materials and the delivery date of product should also be kept in mind.

2.5 Space Consideration:

Sometimes high strength materials have to be selected because the forces involved are high and the space limitations are there.

2.6 Cost:

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored.

Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

3. DESIGN AND DRAWINGS

3.1 Pneumatic Cylinder

Design of Piston rod:

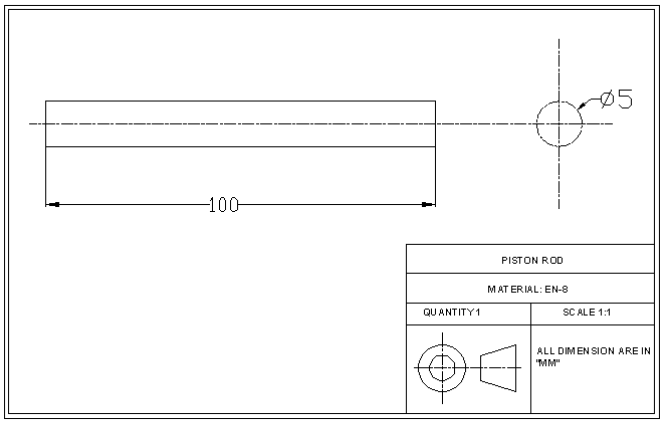


Fig -1: Piston rod

Load due to air Pressure.

Diameter of the Piston (d)= 40 mm

Pressure acting (p) = 6 kgf/cm^2

= 6 ×0.981

= 5.886 bar

= 0.5886N/mm^2

Material used for rod = C 45

Yield stress (σ_y) = 36 kgf/mm^2

= 36×98.1

= 3531.6 bar

= 353.16N/mm^2

factor of safety = 2(data book page.no 8.19)

Force acting on the rod (F)=Pressure x Area

= p x (Πd^2 / 4)

= 0.5886 x {(Π x 40^2) / 4 }

F = 739.6 N

Design Stress(σ_y) = σy / F0 S

= 353.16 / 2

$\therefore$d =$\sqrt{4F/\pi [\sigma y]}$

= $\sqrt{(4\times739.6)/\pi[176.5]}$

$\therefore$ Minimum diameter of rod required for the load=2.3 mm

We assume diameter of the rod =15 mm

3.1.2 Design of cylinder thickness:

Material used = Cast iron

Assuming internal diameter of the cylinder

=40 mm

Ultimate tensile stress = 250 N/mm^2

Working Stress = Ultimate tensile stress / factor of safety

Assuming factor of safety = 4

Working stress (f_t) = 250 / 4

= 62.5 N/mm^2

According to 'LAMES EQUATION'

Minimum thickness of cylinder (t)= r_i {$\sqrt{(f_t+p)/(f_t-p)}$-1}

Where,

r_i = inner radius of cylinder in cm.

f_t = Working stress (N/mm^2)

p = Working pressure in N/mm^2

∴ Substituting values we get,

T = 2.0 {√ (62.5 + 0.5886) / (62.5 – 0.5886) -1}

T = 0.27mm

We assume thickness of cylinder = 2.5 mm

Inner diameter of barrel = 40 mm

Outer diameter of barrel = 40 + 2t

= 40 + (2 x 2.5)

=45 mm

3.2 Design of Piston Rod:

3.2.1 Diameter of Piston Rod:

Force of piston Rod (F) = Pressure x area

=p x Π/4 (d^2)

= 0.5886 x (Π / 4) x $(40)^2$

= 739.6 N

Also, force on piston rod (F) = (Π/4) $(d_p)^2$ x f_t

F = (Π/4) x $(dp)^2$ x 62.5

739.6 = (Π/4) x $(dp)^2$ x 625

∴ dp^2 = 739.6 x (4/Π) x (1/62.5)

= 15

dp = 3.8 mm

By standardizing dp = 15 mm

3.2.2 Length of piston rod:

Approach stroke = 160 mm

Length of threads = 2 x 20 = 40mm

Extra length due to front cover = 12 mm

Extra length of accommodate head = 20 mm

Total length of the piston rod = 160 + 40 + 12 + 20

= 232 mm

By standardizing, length of the piston rod = 230 mm

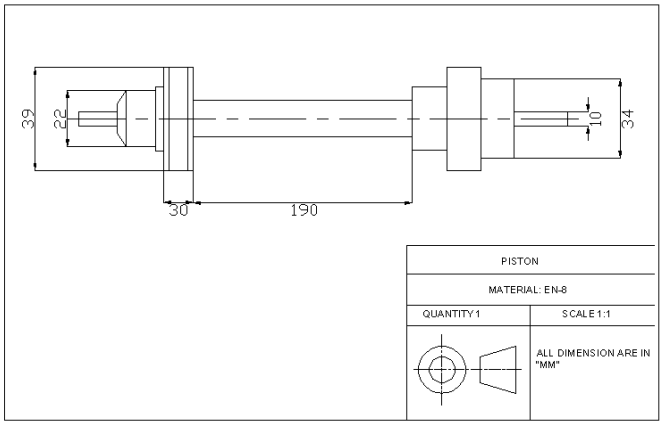


Fig -2: Length of piston rod

3.3 Design of Ball Bearing:

BearingNo.6202

Outer Diameter of Bearing (D) = 35 mm

Thickness of Bearing (B)= 12 mm

Inner Diameter of the Bearing (d)= 15 mm

r_1 = Corner radii on shaft and housing

r_1 = 1(From design data book)

Maximum Speed = 14,000 rpm (From design data book)

Mean Diameter (d_m) = (D + d) / 2

= (35 + 15) / 2

d_m = 25 mm

3.4 Wahl Stress Factor:

$$Ks = \frac{4C - 1}{4C - 4} + \frac{0.65}{C}$$

$$= \frac{(4 \times 2.3) - 1}{(4 \times 2.3) - 4} + \frac{0.65}{2.3}$$

Ks = 1.85

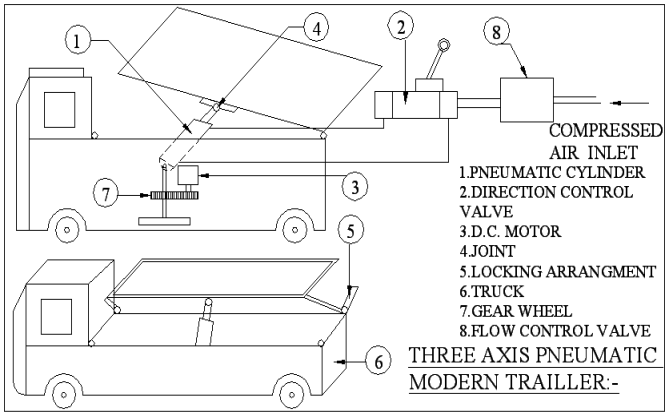


Fig -3: Three Axes Modern Trailer

4. CONCLUSIONS

This project is made with pre planning, that it provides flexibility in operation.

This innovation has made the more desirable and economical. This project "THREE AXIS HYDRAULIC MODERN TRAILER" is designed with the hope that it is very much economical and help full to auto garages, etc,...

This project helped us to know the periodic steps in completing a project work. Thus we have completed the project successfully.

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