DESIGN AND FABRICATION OF 3-AXIS PNEUMATIC TRAILER LIFT

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Abstract-

The principal point of our venture is to plan and manufacture a pneumatic worked fork lift with the end goal of material taking care of at a quicker rate. At present forklifts, bed trucks are utilized with the end goal of material dealing with. For forklift it requires a well-experienced specialized individual for taking care of activity. For bed trucks, it doesn't have enormous cross-area, as the material to be handles is in little unit. For both the gear the underlying expense is high

INTRODUCTION

A dumper is a vehicle intended for conveying mass material, frequently on structure locales. A truck or lorry is an engine vehicle intended to transport cargo.[1] Trucks change enormously in size, power, and design; littler assortments might be precisely like a few cars. Business trucks can be enormous and incredible, and might be designed to mount specific hardware, for example, on account of fire engines, solid blenders, and suction excavators The pneumatic siphon with chamber course of action is utilized to lift the high weighted material starting from the earliest stage. [2]This pneumatic fork lift is hand worked one. It is mobile from one spot to other spot effectively by a legitimate wheel plan. Material taking care of is a particular action for an advanced assembling concern. It has been assessed that 60-70% of the cost creation is spent in material dealing with exercises. [3]

I. BREIF OVERVIEW OF THE MARKET

A regular dump truck is furnished with an open-box bed, which is pivoted at the back and outfitted with water powered rams to lift the front, enabling the material in the bed to be stored on the ground behind the truck at the site of delivery.[5] The biggest of the standard European dump trucks is usually called a centipede and has seven axles. The front hub is the guiding hub, the back two axles are fueled, and the staying four are lift axles.

The shorter wheelbase of a standard dump truck regularly makes it more flexibility than the higher limit semi-trailer dump trucks. In the United States most standard dump trucks have one front directing pivot and a couple of (6x4 6-wheeler) back axles which commonly have double wheels on each side. The key bit of leeway of a semi end dump is a huge payload. A key impediment is that they are entirely insecure when brought up in the dumping position restricting their utilization in numerous applications where the dumping area is uneven or off dimension.[6]

II. STUDY OBJECTIVES

· To achieve high safety

· To reduce man power

· To increase the efficiency of the vehicle

· To reduce the work load

· To reduce the fatigue of work

A. Exixting system problem

A dump truck, referred to likewise as a dumper truck or tipper truck is utilized for transporting free material, (for example, sand, rock, or obliteration squander) for construction.[4] A common dump truck is outfitted with an open-box bed, which is pivoted at the back and furnished with water powered smash to lift the front, enabling the material in the bed to be stored *(dumped) on* the ground behind the truck (single heading) at the site of conveyance.

B. Proposed system

The trolley's which are being used will empty the material in just one single bearing. It is hard to empty the material in little reduced boulevards and little streets. In our venture these are corrected to empty the materials on trolley in every one of the three sides in all respects effectively.

III. MATERIAL SELECTION AND SPECIFICATION

- Air Compressor
- Pneumatic valves
- Solenoid valve
- Single acting cylinders
- Double acting cylinder
- Air Seal
- "O" Ring:
- Bearing with bearing cap

IV. SPECIFICATION OF WORK CARRIED OUT

- Frame size : 66*30 cm.
- Trailer size :47.5*30cm.
- Mild Steel: 1inch sq. Ft[18 gauge].
- Ball Bearing: inner Día -15mm, Outer Día- 40mm.
- M S Sheet metal: 18 gauge.
- M S plate : 47.5*7.5 cm.
- Air compressor : INGCO 12v.
- Cylinder : Pneumatic Double acting cylinder 10 PSI.
- Cylinder rod dia :10mm.
- Cylinder stroke length : 150mm.
- Battery : Amtech 12v 1.3ah.
- Wheels : 20.5 cm Dia.

V. DESIGN CALCULATION

Rear wheel axle shaft Design For a main shaft which is a power generator, power is given as, P=FxV

Our whole assembly will have weight approximately equal to 15 kilograms. Thus total force acting will be on 4 wheels. we have maximum load acting on rear wheels mounted on shaft. This shaft is subjected to approximately 15 kilograms of load.

So force acting on shaft is given by, F=mxg Putting m=15kg g = 9.81 m/s2 Thus F = 15×9.81 = 147.15 N Operating pressure of the compressor = 10 Bar

Rated Power of the DC Motor = 30 W. Force exerted by the cylinder rod. In forward stroke $Ff = P * A = 10 * 105 * .25 * \pi * 0.03222$=804.247N

In backward stroke $Fb = P * A = 10 * 10\,5 * .25\pi * (0.0322 -. 00322\,) = 796.205$N Torque produced by the motor Power Developed = $2 * \pi * n * T \backslash 60$, $\Rightarrow T = 18 * 60 \backslash 2 * \pi * 30$ T = 5.72N.

Calculation of weight to be dump(Fc) $Fv = Ff * cos\theta = 804.24 * cos69.72 = 278.75N$ $Fh = Ff * sin\theta = 804.24 * sin69.72 = 750.34NN$ •

Torque balance equation $Fv * d = Fc * b$ $278.75 * 180 = Fc * 215$ $Fc = 233.372N$ $Fc = 23.789Kg$ Where, P=Compressor Operating Pressure[Pa] A=Area of Piston[$m2$]

Ff=Force exerted by the piston during forward stroke[N] Design and Fabrication of 3-Axis Pneumatic Trailer Lift 2018-2019 Page 22 Fb =Force exerted by the piston during backward stroke[N] n=Speed of DC Motor[rpm]

 T= Torque developed by the DC motor[N-m] Fv=Vertical Component of the Piston force[N] FFh =Horizontal Component of the Piston Force[N] θ =Inclination of the Piston with respect to the Vertical axis.

VI. RESULT

- The materials can be dumped (unloaded) in any required direction.
- The material can be unloaded directly in the site.
- It can be implemented in the existing trucks .
- Labor cost is reduced.
- Requirement of labor is also eliminated

SIDE VIEW

FRONT VIEW

VII. CONCLUSION

A model which shows the normal outcomes is created. With investigation of working and with the assistance of pneumatic framework. Lifting task can be effectively done absent much exertion. This system isn't just material dumping truck yet in addition for different assembling ventures. [7]Thus we have built up a three pivot pneumatic trolley which realizes how to accomplish minimal effort robotization. The working strategy of this framework is exceptionally basic along these lines, individual can work. By utilizing more systems, they can be adjusted and created by the applications.[8] Further alterations and working impediment will put this work in the principle class of utilization

VIII. FUTURE SCOPE

Presentation of single water powered chamber rather than pneumatic chamber can make the framework progressively productive.

• Another change that can be made is to present a few rollers in the middle of the heap lodge and body of the vehicle.

• This setup will make the pivot of the heap lodge simpler and in this way the turning plate will never again need to encounter the total burden.

• Dual stage chamber can be utilized.

• Sensor and alert can be utilized to know the rakish dislodging of burden lodge.

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