DESIGN & FABRICATION OF PROTOTYPE OF MULTIDIRECTIONAL PNEUMATIC DUMPING TROLLEY

Vishal G. Salunkhe*[1], Ravi S Bandgar*[2], Ajay B. Balikar*[3], Abhishek B. Chavan*[4], Omkar D. Ghadage*[5], Ganesh J Salunkhe*[6], Sujit S Patil*[7]

*[1]Assistant Professor, Department Of Mechanical Engineering, Annasaheb Dange College of Engineering And Technology, Ashta, India.

*[2,3,4,5,6,7]Students, Department Of Mechanical Engineering, Annasaheb Dange College of Engineering And Technology, Ashta, India.

ABSTRACT

This project name named "MULTI-DIRECTIONAL PNEUMATIC DUMPING TROLLEY" has been moderate having contemplated the merciless in emptying the materials. Our review in the regard in some auto carports, uncovered the realities that routinely some dangerous strategies were embraced in receipt the materials from the trailer. The trailer will release the material only one independent way. It is hard to empty the materials in little crushed roads and little streets. In our undertaking these are cured to drop the trailer in each of the three sides without any problem. As of now the undertaking has chiefly lively on this effort, and consequently a reasonable arranging has been planned. To such an extent that the vehicles can be dumped from the prevue in three tomahawks denied of request of any effect power. The compacted air is energies to the pneumatic chamber completed valve. The smash of the pneumatic chamber exhibitions as a lifting the trailer lodge. The car motor drive is coupled to the compressor motor, with the goal that it arrangements the compressed air when the vehicle running. This compressed air is reused to bounce the air-filled chamber, when the valve is begun.

I.   INTRODUCTION

Material transporting is the basic requirement in civil work. The material supply to civil and construction is supplied through trucks, dumper etc. The material must be appropriately loaded, managed, stacked, transported and unloaded. The dumper transports the material which is loaded from the site, where the material is originally stored. It is then loaded to the dumper and supplied to the necessary site and then unloaded. The major problem raises over here, the compact size of site and streets of the site with the completely loaded dumper causes a lot more settling time for the trolley to get the material appropriately arranged and transportation time to arrive at site.

The dumper unloads the material in one direction only. But this issue can be fulfilling by a new mechanism as the multidirectional dumper. This mechanism is a proposal to reduce the idle time to settle the dumper. The material is unloaded in any direction so we can called it as "Multidirectional Dumper." The main outcomes of multidirectional dumper are to overcome space requirement which frequently causes road blocking. Hence, we have created a mechanism providing the unloading in 180 degree rotations. This mechanism prevents jamming of road, saves time and enhances productivity at lowest cost

II.   METHODOLOGY

a. Method and analysis which is performed in your research wPool of the prerequisiteweather data.
b. Cooling load calculation.
c. Design and sizing of the air conditioning system.
d. Optimization of the system.
e. Material gaining and construction of the untried system.
f. Show estimate and economic analysis.
g. Analysis of upshot and making of recommendations.

III.   CONSTRUCTION AND WORKING

Construction

The prototype of multidirectional dumper is based on pneumatic system for small weight load and for large weight load hydraulic system is appropriate. This prototype model consists of, pneumatic cylinder (Single acting), geared motor, control switch, flow control valve (FCV), inlet valve, exhaust valve etc. An operating

system consists of electric geared motor to rotate the dumper horizontally in required direction. Two Chassis (Frame) is provided on which trolley is mounted, where first frame of chassis is stationary & attached to shaft of geared motor to rotate the trolley horizontally in required direction. One end of Pneumatic cylinder which is hinged with this frame of chassis & other end of pneumatic cylinder is hinged but to the one end of trolley to give vertical movement accurately

Fig. No. 1 Multidirection Dumping System

Working

1) Dumping of the system-

Dumping will be carried out by using pneumatic cylinder, air compressor, flow control valve etc. The inlet is connected to the air compressor since as a source through pipe. Then outlet is connected to the pneumatic cylinder and flow control valve. To control the flow of air we use the flow control valves at inlet and outlet of the pneumatic cylinder. Dumping will carried out in following ways, air coming from air compressor through pipe flowed at inlet or outlet to the pneumatic cylinder. We can adjust the flow of air by using flow control valve. Hence due to the reciprocating motion of piston and cylinder dumping will be carried out.

2) Rotation of the system-

Here we use a geared motor for the rotation of that system. It has speed of 60 rpm and torque of motor is 50 Nm. The geared motor is directly coupled with a vertical shaft which is joined to the lower case of trolley. Hence when the motor will rotate then upper chassis also rotate. Hence rotation will be carried out. To limit the rotation of system at 180 degree the limiter are used. The geared motor operates on dc current and 12 volt. Hence here we use the switch mode power supply which converts AC supply to DC supply also it converts 230 volt to 12 volt which is required for working of dc re-motor.

Fig no. 2. Rotation of trolley

IV.   DESIGN CALCULATION

4.1 Design of Cylinder-:

Assume minimum load to be lift = 15 kg

= 15 × 9.81

= 147.15 N

Force = Area × Pressure

147.15 = Area × 0.8 Mpa

Area = 183.93 mm^2

Diameter of the Piston (D) = $(\sqrt{183.93 * 4})/\ \pi$

= 15.34

= 20 mm (For safer side).

4.2 Design of Rod Diameter (d)-:

Pressure acting (p)   = 8 bar

Material used for rod = C45

Yield Stress (σy) = 36 kg

= 353.16 N/mm2

Factor of Safety = 2

Design stress (σ_y) = (yield stress/FOS) = 353.16/2

= 176.5 Mpa

Design of Rod Diameter (d) = $\sqrt{(4F/\sigma\pi)}$

F = 147.15 N

σ = 176.5 Mpa

d = 10 mm

Therefore, least distance across of bar needed for the heap is 10 mm

4.3 Length of Piston Rod-:

According to standard sizes, suitable length of piston rod is 50 mm.

V. CONCLUSION

Subsequent to completing the testing of this project will get positive output. It has been acquired a large portion of the targets furthermore, objectives that would set for the designers perspective. It has had the option to build the effectiveness in dumping trolley, Issues happened at the time of emptying the trolley in the critical regions are disposed of What's more, along these lines at long last reduced by and large an ideal opportunity for the dumping of material from the trailer.

VI. REFERENCES

[1] Amboji Sudhakar R , Humane Yogesh A , Chavan Rohan R., Patil Jyotsna C ,

[2] Khirsagar Prashant R , "International Journal of Research in Advent Technology, Vol.2,   No.4, April 2014 E-ISSN: 2321-9637"

[3] V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill Publishing   company Third edition

[4] A.S.Pal1, A.G.Shahu2, D.P.Mandaokar3, R.I.Meshram4, Ms.U.T.Dhanre5, "A Review on Three Direction Dropping Dumper", International Journal of Innovative Research in Science,Engineering and Technology, Vol. 6, Issue 3, March 2017

[5] P. Shashidar1, P. Laxminagaprasad2, U. Anil Kumar3, "DESIGN AND FABRICATION OF MODERN THREE WAY DUMPING TROLLEY MECHANISM", 2nd International Conference On "Innovative Trends In Science, Engineering And Management", 05 November 2016,ISBN:978-93-B6171-10-8.

[6] Omkar Mule, Omkar Dumbre, Rushikesh Dhavale, Dipak Aware, "A Review on Development of Three Axis Hydraulic Dumping Trailer", National Conference on Information, Communication and Energy Systems and Technologies - 2019, Volume 5 | Issue 7 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099.

[7] Deore Vinod1, Endait Sunit2, Prajapati Mahesh3 ,Attarde Bhushan 4, "Design & Fabrication Of Three Directional (270 Degree) Rotating Trolley", Vol-3 Issue-2 2017 IJARIIE-ISSN(O)-2395-4396.