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DESIGN OF CONVEYOR SYSTEM FOR UNLOADING HEAVY GOODS

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Abstract - *The aim of this project is to produce the mechanical design of a conveyor system for unloading heavy goods. The current unloading process of heavy goods like LPG gas cylinder is improper which may lead to some major problems. This design of conveyor system will overcome those mistakes done during unloading of LPG gas cylinders. The thorough study is to be done on various designs of conveyor system. From the data analyzed at simple and cost-efficient design of conveyor belt is done. Design of this conveyor system is performed using Solid works and Computer Aided Drafting (CAD).*

Keywords: **Conveyor, Cylinder, Unloading, LPG, System**

1.INTRODUCTION

The major problem in any organization is material handling from one processing station to another. This major problem is solved by conveyor systems. Conveyor belts play a significant role in material handling in any manufacturing unit or dispatching unit. But in small sales industries or warehouses, it becomes financially impossible for that organization to install a conveyor system. There more human efforts are required and this leads to some major human errors. There more human efforts are required and this leads to some major human errors. At small-scale organizations like an LPG gas cylinder warehouse, the unloading process of LPG gas cylinders is done by a conventional method. The LPG gas cylinders are directly thrown from the truck towards the land. This practice may lead to the leakage of LPG gas cylinders and many other damages. This is the complete financial loss of the organization because of the improper unloading process.

Fig -1,2: Current unloading process of LPG gas cylinder

Fig -3: Damaged cylinders due to improper unloading

Conveyor systems are durable and dependable in material transportation and warehousing. Given various standards of operation, there are diverse transport frameworks to be specific: gravity, belt, screw, chain, spiral, grain conveyor systems, etc. The decision however relies upon the volume to be transported, the stature or separation of transportation, and the nature of the material.

A belt consists of an endless and flexible loop of superior material, with two end pulleys (driver and driven) fixed in place and supported by rollers. Pulleys are utilized for giving the drive to the belt through the sprocket and wheel mechanism operated by the human hand

2.LITERATURE REVIEW

The research on conveyor system done by F.I.MALEK, M.MUAZ, S. RUBIAH, M.N.MANSOR, M.A.MUDA says that a conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Many kinds of conveying systems are available, and are used according to the various needs of different industries. The current design of the conveyer machine used timing belt that connected at the motor to move the shaft. The problem of the current design is the timing belt disheveled and shaft was slipping. For the improvement we use sprocket and chain as drive mechanism. Beyond the above improvement the conveyor system is expected to work. This project also helps student to utilize their engineering information and improve the skill of student in solving the mechanical problem

The research on conveyor system done by KONAKALLA NAGA SRI ANANTH, VAITLA RAKESH, POTHAMSETTYKASI VISWESWARAO

says that the belt conveyor is the transportation of material from one location to another. Belt conveyor has high load carrying capacity, large length of conveying path, simple design, easy maintenance and high reliability of operation. Belt Conveyor system is also used in material transport in foundry shop like supply and distribution of molding sand, molds and removal of waste. This paper provides to design the conveyor system used for which includes belt speed, belt width, motor selection, belt specification, shaft diameter, pulley, gear box selection, with the help of standard model calculation.

3.PROPOSED DRAWING OF MODEL

Conventional design of conveyor belt is too costly therefore small organizations cannot afford it. So, we proposed a new design which cost low than current design.

Fig -4,5: Proposed model

3.DESIGN OF COMPONENTS

The prime components used in the system are Idler pulleys(shaft), bearings, lever used for braking system. The following are the formulas for getting the dimensions for the constrained conditions of design.

For shafts. Total two shafts are present in the system, one at the upper end and another at the lower end. As the belt will move around the shaft the shaft is mainly subjected to twisting as well as bending moment as the load of heavy goods will be there on the shaft. The proposed design is based in that.

Here,

M – Maximum Bending Moment

T – Maximum Twisting Moment

σ – Bending Stress

r – Shear Stress

According to maximum Shear Stress Theory

$$\frac{\pi}{16} d^3 \times r_{max} = \sqrt{M^2 + T^2}$$

According to maximum Principal Stress Theory

$$\frac{\pi}{16} d^3 \times \sigma = M + \sqrt{M^2 + T^2}$$

From the above equations whichever value of “d” means diameter of the shaft is bigger is will be considered.

For Lever. The dimensions of prime components of lever to be calculated for the safe design of lever are diameter and length of boss and dimension of lever cross section.

D_b – Diameter of boss

D_L – Length of boss

D – Diameter of break shaft

D_b = 1.6*d

D_L = 1.5*d

Considering the rectangular cross section of lever

Let, b = width of lever
h/t = thickness or depth of lever

The width of lever is given as
$b = 2t \; or \; 3t$
It is 2 or 3 times of the thickness/depth

The lever is subjected to bending moment, the maximum bending moment on the lever is taken near the boss.
i.e $M = P \times (Le - 0.5Db)$

Here, Le = length of lever, which is given by

Le = P × T (Force × Torque) on shaft.
As, maximum bending stress
$\sigma = (6P^*[L_e - 0.5D_b])/bh^2$

4.CONSTRUCTION

This conveyor system consists of components like main frame idler pulleys, conveyor belt braking system and chain and sprocket mechanism. The upper shaft is placed on the upper side of the frame with the help of bearings. Similarly, lower shaft is placed on lower side of the frame with the help of bearings. The conveyor belt is between the upper shaft and lower shaft. The braking system is placed belt and the lever is there to operate it. The chain and sprocket mechanisms is connected to the upper idler pulley.

5.WORKING

This proposed design is for unloading heavy goods mostly LPG gas cylinder. The conventional method of unloading LPG gas cylinder leads to damage of LPG gas cylinder body and other part. The LPG gas cylinder are placed at the upper end LPG gas cylinder get stucked on belt due to the ramps on the conveyor belt. A chain and sprocket mechanism is attached to me system. Ones the belt moves from upper pulley further it travels downward due to gravity. High quality bearing to be used at idler pulley for the smooth functioning of the whole system. But me main barriers is that if the speed of system suddenly increases due to heavy load then some accident may occur. So to avoid that braking system should be there. In current braking system proposed in our model. A roller is present model. A roller is present at the bottom of conveyor belt. The brake pad is present on it and a lever is there which is operated by workers foot lever is pressed me brake pad comes in contact with bottom side of conveyor belt and due to friction brake is applied.

6.CONCLUSION

The unloading process implemented at the warehouse of LPG gas cylinder causes damage to the LPG gas cylinder. This damage includes dents at the body, leakages, leakage at valve of LPG gas cylinder. The organization has to spend its valuable funds for repairing the damage of the LPG gas cylinders. So we decide to make a conveyor system to overcome this problem. We studied the various conveyor system thoroughly and came up with this design of conveyor system. This conveyor system is simple in design, cost efficient than other conveyor system. This conveyor system can be used at many places for unloading heavy goods easily. Hence, the time, money, and human effort will be reduce due to this conveyor system.

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