Fabrication of Model Using Pneumatic System for Unloading Wagon

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Abstract- **The project being complicated was decide to be developed on a small scale model that should be constructed using light weight material and should be pneumatically operated using pneumatic cylinder arrangement. Also this pneumatic piston and cylinder arrangement was decided to be motor driven to make the same automatic. These motor run using a battery/ SMPS and are controlled using a remote control that is attached with the base model using wires / FRC cable and these after controlled by operator.**

Index Terms- SMPS, PTT, FRC.

I. INTRODUCTION

A rotary car dumper or wagon tippler is a mechanism used for unloading certain railroad cars such as hopper cars, obsolete or Lorries . It holds the rail car to a section of track and rotates the track and car together to dump out the contents. Used with gondola cars, it is making open hopper cars obsolete. Because hopper cars require sloped chutes in order to direct the contents to the bottom dump doors (hatches) for unloading, gondola cars allow cars to be shorter, thus lowering their center of gravity, while carrying the same load. The primary alternative to rotary dumping has long been provided by a wide variety of self-unloading cars. Most of these are bottom-dump cars of various sorts, equipped with doors of one sort or another at the bottom to allow bulk cargo to be unloaded by gravity. Drop-bottom gondolas, for example, are low-sided open-topped cars where much of the floor of the car is composed of trapdoors. While drop-bottom cars could usually be used for other purposes, side-dump cars and hopper cars with sloping floors to guide the cargo to unloading doors can only be used for bulk cargo. All of these have the advantage that they can be unloaded anywhere, but the disadvantage that any imperfection in the seals of the doors allows material to spill onto the track.

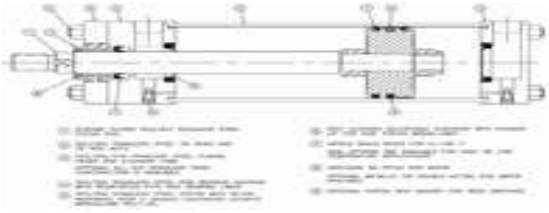
In the mining industry, the long established standard for dumping mine cars was to run them into horns at the ends of the rails at the tipple. The inertia of the car would cause it and sometimes a short segment of hinged rail to tip forward, dumping the load out the end of the car. Some of these dump mechanisms completely overturned the car end-for-end, and some allowed the car to continue onward after being dumped. In the 19th century, a patent was issued for a machine to tip entire railroad cars endwise for unloading.

II. NEED OF PROJECT

In Process industries and robotics and other applications, technology have been utilized in several purpose to carry out and need the operation in automation mode. Out of this technology pneumatic technology is important one, in fast life where time is a first important factor; we need to utilize automation technology for future growth. Keeping this factor in mind it has been found that pneumatic technology can be deliberately used to have very effective and good result about his work and cost effectiveness. By considering lot of examples, one example is that today we show various type of conveyer such as gravity, roller, belt etc., all of these examples utilize complicated mechanisms for sorting operations hence to overcome this, we can use simple technology to do the required work is one pneumatic technology

III. SPECIFICATION OF COMPONENTS

A. PNEUMATIC CYLINDER



Pneumatic cylinders (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. For example, in the mechanical puppets of the Disney Tiki Room, pneumatics are used to prevent fluid from dripping onto people below the puppets.

Although the diameter of the piston and the force exerted by a cylinder are related, they are not directly proportional to one another. Additionally, the typical mathematical relationship between the two assumes that the air supply does not become saturated. Due to the effective cross sectional area reduced by the area of the piston rod, the in stroke force is less than the outstroke force when both are powered pneumatically and by same supply of compressed gas.

B. AIR COMPRESSOR

An air compressor is a device that converts power (usually from an electric motor, a diesel engine or a gasoline engine) into kinetic energy by compressing and pressurizing air, which, on command, can be released in quick bursts. There are numerous methods of air compression, divided into either positive-displacement or negative-displacement types. Most air compressors either are reciprocating piston type, rotary vane or rotary screw. Centrifugal compressors are common in very large applications. There are two main types of air compressor's pumps: oil-lubed and oil-less. The oil-less system has more technical development, but is more expensive, louder and lasts for less time than oil-lubed pumps. The oil-less system also delivers air of better quality.

C. PNEUMATIC PIPE

Pneumatic tubes (or capsule pipelines; also known as Pneumatic Tube Transport or PTT) are systems that propel cylindrical containers through a network of tubes by compressed air or by partial vacuum. They are used for transporting solid objects, as opposed to conventional pipelines, which transport fluids. Pneumatic tube networks gained acceptance in the late 19th and early 20th centuries for offices that needed to transport small, urgent packages (such as mail or money) over relatively short distances (within a building, or, at most within a city). Some installations grew to great complexity, but were mostly superseded. In some settings, such as hospitals, they remain widespread and have been further extended and developed in recent decades.

A small number of pneumatic transportation systems were also built for larger cargo, to compete with more standard train and subway systems. However, these never gained popularity.

D. SOLENOID VALVE

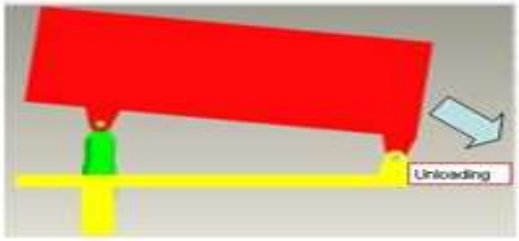
A solenoid valve an electromechanically operated valve. The valve is controlled by an electric current through a solenoid in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold. Solenoid valves are the most

frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. Besides the plunger-type actuator which is used most frequently, pivoted-armature actuators and rocker actuators are also used. There are many valve design variations. Ordinary valves can have many ports and fluid paths. A 2-way valve, for example, has 2 ports; if the valve is open, then the two ports are connected and fluid may flow between the ports; if the valve is closed, then ports are isolated. If the valve is open when the solenoid is not energized, then the valve is termed normally open (N.O.). Similarly, if the valve is closed when the solenoid is not energized, then the valve is termed normally closed. There are also 3-way and more complicated designs. A 3-way valve has 3 ports; it connects one port to either of the two other ports.

E. SMPS

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. Ideally, a switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time. In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor .This higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

F. HINGE JOINT



The other bottom end of the body of the truck is connected by a hinged joint with the chassis. So, when the hydraulic cylinder pushes the body in its forward stroke the entire body gets tilted about the axis of the hinged joint and the material gets unloaded and by the return stroke of the hydraulic cylinder body comes and seat to its original position with respect to the hinged axis. But in this types of tipper can unload materials only at the backside of the tipper. 3-way tipper can overcome this problem, as it can unload material on three sides.

Three way tipper mechanism:

As already mentioned, a three-way tipper can unload materials in all three sides. To control the sides of tipping there needs to be required one more pneumatic cylinder apart from the main hydraulic cylinder. Also we require special types of hinge joints in this case.

IV. ADVANTAGE

1. Air is available everywhere.
2. Reduce time consumption
3. Less skill technicians is sufficient to operate
4. Less energy consumption
5. Less worker required
6. Less maintenance required
7. Risk free and easy to use
8. Handling is easy
9. Repairing is easy.

V. APPLICATION

1. It is used in industries.
2. It is used in automobile companies .

3. It is used torlies.

VI. OBJECTIVE

1. To increase the efficiency.
2. To reduce the hard work.
3. To reduced time to unloading the wagon
4. To make use of pneumatic system were working fluid is readily available

VII. CONCLUSION

Wagon damper or tipper is useful for power plant industries for time saving and easy manual free operation .It can take less time for dumping for continuous production of power in plants. The developed prototype exhibits the expected results. Further modifications and working limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working. This further line should be modeled using equations and an experimental agreement. The constructional work or the infrastructural work demands efficient and user friendly machinery which will lead to more and more use of Axis Modern Pneumatic trailer.

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