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Fabrication of Dump Truck Tilting System with Advanced Pneumatics

Kumar Raman, C. Thamotharan, P. Naveenchandran and Debabrata Sahooand

Abstract--- *With the advancement of the transport technologies, companies are trying to find ways to find simpler and cost effective technologies. Our project suggests a simple but advantageous mechanism for the dump truck. A dump truck is used for transporting construction material. They have a tilt-able trolley. The mechanism for this operation is to be enhanced in our project. It proposes the idea of using a folding mechanism coupled with pneumatics to tilt the trolley of the dump truck. The system employs the use of a linkage hinged to together and a pneumatic cylinder is attached to the hinge. Thus when the pneumatic cylinder works in the forward direction, the linkages ate stretched and when it is made to return, the linkages get folded up.*

Keywords--- *Dump Truck, Trolley, Pneumatics, Pneumatic Cylinder, Linkage*

I. INTRODUCTION

The hydraulic cylinders used for the dump truck tilting system are very long so that it can be lifted to a good height. It also requires a cylinder with greater diameter so that is can bear the weight of the materials in the truck. This requires a large space to house the cylinder and also the cylinder is prone to damages as it has to bear heavy loads.

This not only occupies more space, but also increases the weight of the vehicle, which indirectly affects the fuel economy of the truck. Thus there is a surge to find possible methods for improving the mechanism of the dump truck hydraulics.

This project proposes the idea of using a folding mechanism coupled with pneumatics to tilt the trolley of the dump truck. The system employs the use of a linkage hinged to together and a pneumatic cylinder is attached to the hinge. Thus when the pneumatic cylinder works in the forward direction, the linkages ate stretched and when it is made to return, the linkages get folded up.

Kumar Raman, M. Tech Student, Department of Automobile Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai.

C. Thamotharan, Professor, Department of Automobile Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai.

P. Naveenchandran, Professor & Head, Department of Automobile Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: naveenchandran.automobile@bharathuniv.ac.in

Debabrata Sahooand, M. Tech Student, Department of Automobile Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai.

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Fig: Existing Model of Dump Truck

II. TRUCK TYPES OF DUMP:

Standard Dump Truck

A standard dump truck is a truck chassis with a dump body mounted to the frame. The bed is raised by a vertical hydraulic ram mounted under the front of the body, or a horizontal hydraulic ram and lever arrangement between the frame rails and the back of the bed is hinged at the back of the truck

Transfer Dump Truck

An exchange dump is a standard dump truck pulling a different trailer with a portable freight holder, which can likewise be stacked with development total — rock, sand, black-top, clinkers, snow, wood chips, triple blend, and so on. The second total compartment on the trailer ("b" box), is controlled by an electric engine, a pneumatic engine or a water driven line.

Super dump:

A Super dump is a straight dump truck furnished with a trailing hub, a lift capable, stack bearing pivot appraised as high as 13,000 pounds (5,897 kg). Trailing 11 to 13 feet (3.35 to 3.96 m) behind the back couple.

Semi-Trailer End Dump Truck

A semi end dump is a tractor-trailer combination wherein the trailer itself contains the hydraulic hoist. A typical semi end dump has a 3-hub tractor pulling a 2-pivot semi-trailer.

Semi-Trailer Bottom Dump Truck

A semi base dump (or "gut dump") is a 3-pivot tractor pulling a 2-hub trailer with a mollusk shell sort dump door in the midsection of the trailer. The key favorable position of a semi base dump is its capacity to lay material in a windrow (a straight store).

Side Dump Truck

A side dump truck (SDT) comprises of a 3-pivot tractor pulling a 2-hub semi-trailer. It has water powered rams which tilt the landfill body onto its side, spilling the material to either the left or right half of the trailer. The key points of interest of the side dump are that it permits quick emptying and can convey more weight.

Haul Trucks

Utilized as a part of extensive surface mines and quarries, they have an inflexible casing and customary directing with drive at the back wheel. Starting at late 2013, the biggest ever creation pull truck is the 450 metric ton BelAZ 75710, trailed by the Liebherr T 282B, the Bucyrus MT6300AC and the Caterpillar 797F, which each have payload limits of up to 400 short tons (363 t; 357 long tons

III. PROPOSED MODEL:

This work proposes utilizing a collapsing system combined with pneumatics to tilt the trolley of the landfill truck. A dump truck or trailer for pulling and dumping dry mass solids routinely by gravity furthermore having the capacity of passing on the solids upward to a storeroom. The unit incorporates a holder mounted to an edge on wheels. A water driven slam tilts the compartment for dumping through a back outlet. A pneumatic transport is conveyed by the casing with an admission at the back of the compartment. An entryway permits the solids to be dumped customarily by gravity, or to be passed up the pneumatic transport.

Advantages:

- Free from wear adjustment.
- Less power consumption
- Less skill technicians required
- Installation is simplified very much.
- Reduced stroke length of cylinder
- Reduced cost in pneumatics.

IV. LITERATURE REVIEW

The innovation of pneumatics has increased colossal significance in the field of working environment legitimization and robotization from antiquated timber works and coal mines to current machine shops and space robots. It is in this manner imperative that specialists and architects ought to have a decent information of pneumatic framework, air worked valves and extras.

Machine Construction:

The machine is fundamentally comprised of gentle steel. Reasons: 1.Mild steel is promptly accessible in market. 2. It is sparing to utilize. 3. It is accessible in standard sizes. 4. It has great mechanical properties i.e. it is effortlessly machinable. 5. It has direct component of security, since figure of wellbeing results superfluous wastage of material and substantial choice. Low consider of security results superfluous danger of disappointment. 6. It has high rigidity. 7. Low co-efficient of warm extension Properties of Mild Steel: M.S. has carbon content from 0.15BRIGHT MATERIAL.

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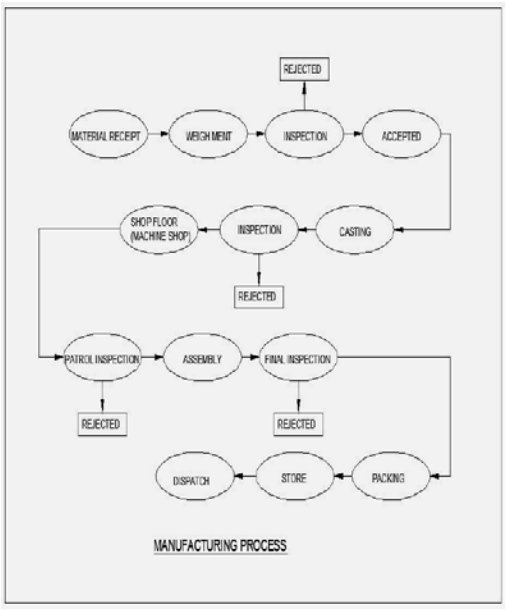
Manufacturing Process:



Metal cutting:-Common cutting processes include sawing, shaping (or arranging), proposing, boring, pounding, turning and processing.

Sawing:-The name of the saw needs to do with the move that makes put amid the cutting procedure, which figures out how to keep both the metal and the sharp edge from turning out to be excessively hot. An icy saw is fueled with power and is normally a stationary sort of observed machine as opposed to a versatile kind of observed.

Welding:-In this procedure an electrical machine (which might be DC or AC, however these days is typically AC) supplies current to an anode holder which conveys a terminal which is ordinarily covered with a blend of chemicals or flux. An earth link interfaces the work piece to the welding machine to give an arrival way to the current. The weld is started by tapping ('striking') the tip of the anode against the work piece which starts an electric circular segment. The high temperature created (around 6000oC) immediately delivers a liquid pool and the finish of the cathode ceaselessly dissolves into this pool and structures the joint.

Components & Detail:

- Pneumatic cylinder
- Hand Lever solenoid valve Solenoid valve
- Flow control valve
- Horse and connectors
- Linkages
- Tilt-able Trolley
- Frame

Double Acting Pneumatic Cylinder

- Stroke length: Cylinder stoker length 160 mm = 0.16 m
- Quantity: 1
- Seals: Nitride (Buna-N) Elastomer
- End cones: Cast iron
- Piston : EN – 8

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- Media : Air
- Temperature : 0-80 º C

Pressure Range: 8 N/m²

Solenoid Valve: Generally known as DCV, this valve is utilized to control the heading of wind current in the pneumatic framework. The directional valve does this by changing the position of its inside portable parts

House & Fittings: It is provided for the passage of compressed air from the compressor outlet to the operating valve.

Flow Control Valve:

Flow Control Valves are fitted to all the distribution tubes. This valve is made of brass. Both the ends have stepped surface to insert hoses. A handle is provided to control the flow of oil in every valve.

(a) Technical Data

Size: ¼"

Media: Air

Port size: 0.635 x 10^{-2}m

Pressure: 0-8 x 10^{5} N/m²

Media: Air

Quantity: 1

CONNECTOR:

Max working pressure: 10 x 10^{5} N/m²

Temperature: 0-100 º C

Fluid media: Air

Material: Brass.

HOSE SPECIFICATION:

Max pressure: 10 x 10^{5} N/m²

Outer diameter : 6 mm = 6 x 10^{-3}m

Inner diameter: 3.5 mm = 3.5 x 10^{-3}m.

(b) Purpose

This valve is utilized to accelerate the cylinder development furthermore it goes about as a one – way confinement valve which implies that the air can go through just a single way and it can't return back.

By utilizing this valve the time utilization is lessened in view of the quicker development of the cylinder.

TILTABLE TROLLEY:

The trolley is attached to the frame.

Material: Mild steel and sheet metal.

Length: 120 cm

Width: 74 cm

Load capacity: 5 kg (our model).

FRAMES:

Material: Mild steel

Length: 120 cm

Width: 75 cm

The system employs the use of a linkage hinged to together and a pneumatic cylinder is attached to the hinge. Thus when the pneumatic cylinder works in the forward direction, the linkages at stretched and when it is made to return, the linkages get folded up.

Hand lever solenoid valve get the air and passed through the pneumatic cylinder depend upon the hand lever directional changed.The linkages are those that support the trolley against the frame and they are hinged at the centre.

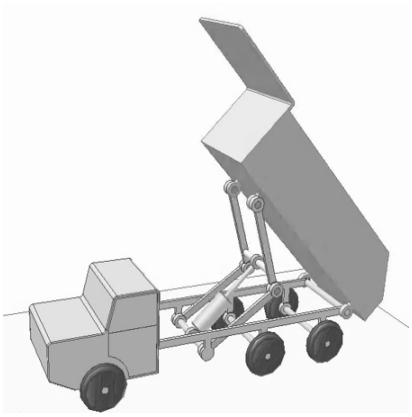

Fig: Block Diagram Showing Our Model

List of materials:

Sl. No.	P Parts	Qty.	Material
i.	Pneumatic Double Acting Cylinder	1	steel
ii.	5/2 Direction Control Valve	1	Aluminium
iii.	Tilt-able Trolley		
iv.	Polyethylene Tube	-	Polyurethane
v.	Hose Collar and Reducer	-	Brass
Vi.	Stand (Frame)	1	Mild steel

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V. CONCLUSION

This examination work has given us a phenomenal open door and experience, to utilize our restricted learning. We picked up a considerable measure of commonsense information with respect to, arranging, buying, amassing and machining while doing this venture work. We feel that the examination work is a decent answer for extension the doors amongst establishment and businesses.

We are pleased that we have finished the work with the constrained time effectively. The "Landfill Truck Tilting System with Advanced Pneumatics" is working with acceptable conditions. We can comprehend the challenges in keeping up the resiliences furthermore quality. We have done to our capacity and aptitude making most extreme utilization of accessible offices.

In this way we have built up a "Dump Truck Tilting System with Advanced Pneumatics" which knows how to accomplish minimal effort robotization. The working technique of this framework is extremely straightforward, so any individual can work. By utilizing more procedures, they can be altered and created by applications.

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