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# SLEWING DUMP TRUCK

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*Abstract:* An amazingly development in an industrial and infrastructural structures making ecological issues like atmospheric changes, the fabrication of the slewing dumper is were loaded into the dumper with the use of loader machine. The vehicle is developed in such a way that the dumper load carrying body rotates in 180 degree direction. According to this mechanism the driver cabin is designed. This slewing dump truck has four supporting stabilizer legs on both the front and rear end of the vehicle on both the sides to make support of the vehicle for better stabilization while loading and unloading time at any of the direction to make stabilize the vehicle at any type of land conditions. Whereas the slewing control unit is placed inside the driver cabin near the driver with easy handling option. The artificial intelligence (AI) can also be used in were as, if the vehicle travels in an uncertain surface and it leads to accident at some certain degree of slope surface at that time the AI in the vehicle actuates the stabilizer leg on the sloped side and it gets grounded to help the vehicle to stand stable and to avoid collision. This vehicle is can be operated easily to do its operation and the operation timing is also less and the work is done faster and safer.

## I. INTRODUCTION

Dumpers are distinguished from dump trucks by configuration: a dump truck is usually an open 4 wheeled vehicle with the load skip in front of the driver, while a dump truck has its cab in front of the load. The skip can tip to dump the load; this is where the name "dumper" comes from. They are normally diesel powered. A towing eye is fitted for secondary use as a site tractor. Dumpers with rubber tracks are used in special circumstances and are popular in some countries.

A dump truck, known also as a dumping truck, dump trailer, dumper trailer, dump lorry or dumper lorry or a dumper for short, is used for transporting materials (such as dirt, gravel, or demolition waste) for construction as well as coal. A typical dump truck is equipped with an open-box bed, which is hinged at the rear and equipped with hydraulic rams to lift the front, allowing the material in the bed to be deposited ("dumped") on the ground behind the truck at the site of delivery. In the UK, Australia, South Africa and India the term applies to off-road construction plants only and the road vehicle is known as a tip lorry, tipper lorry (UK, India), tipper truck, tip truck, tip trailer or tipper trailer or simply a tipper.

The dump truck is thought to have been first conceived in the farms of late 19th century western Europe. Thornycroft developed a steam dust-cart in 1896 with a tipper mechanism.[1] The first motorized dump trucks in the United States were developed by small equipment companies such as The Fruehauf Trailer Corporation, Galion Buggy Co. and Lauth-Juergens among many others around 1910.

Hydraulic dump beds were introduced by Wood Hoist Co. shortly after. Such companies flourished during World War I due to massive wartime demand. August Fruehauf had obtained military contracts for his semi-trailer, invented in 1914 and later created the partner vehicle, the semi-truck for use in World War I. After the war, Fruehauf introduced hydraulics in his trailers. They offered hydraulic lift gates, hydraulic winches and a dump trailer for sales in the early 1920s. Fruehauf became the premier supplier of dump trailers and their famed "bathtub dump" was considered to be the best by heavy rhaules, road and mining construction firms.

## II.EXISTING SYSTEM

### 3.1 INTRODUCTION

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. The tailgate can be configured to swing up on top hinges (and sometimes also to fold down on lower hinges) or it can be configured in the "High Lift Tailgate" format wherein pneumatic rams lift the gate open and up above the dump body.

In the United States most standard dump trucks have one front steering axle and one (4x2 4-wheeler)) or two (6x4 6-wheeler) rear axles which typically have dual wheels on each side. Tandem rear axles are almost always powered, front steering axles are also sometimes powered (4x4, 6x6). Unpowered axles are sometimes used to support extra weight. Most unpowered rear axles can be raised off the ground to minimize wear when the truck is empty or lightly loaded, and are commonly called "lift axles".

European Union heavy trucks often have two steering axles. Dump truck configurations are two, three, and four axles. The four-axle eight wheeler has two steering axles at the front and two powered axles at the rear and is limited to 32 metric tons (35 short tons; 31 long tons) gross weight in most EU countries. The largest of the standard European dump trucks is commonly called a "centipede" and has seven axles. The front axle is the steering axle, the rear two axles are powered, and the remaining four are lift axles.

The shorter wheelbase of a standard dump truck often makes it more maneuverable than the higher capacity semi-trailer dump trucks

### 3.2 BLOCK DIAGRAM

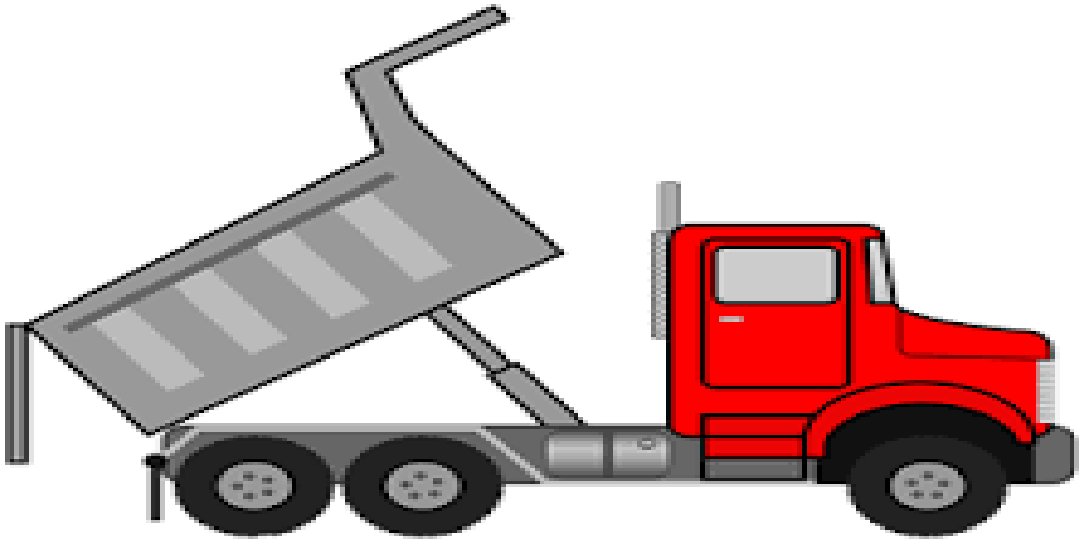


Fig.3.1 Block diagram of existing system

As Shown in fig 3.1 this dump truck unloads in one direction and it cannot rotate in any other direction therefore it does not have any stabilizer legs. This is the current dump truck model which transports the material to construction sites and it can loaded in only one direction, were as this dump lifting jack is directly fitted to chassis of the and to the dump body bade were as it is operated in the upward and the downward motion, therefore the dump body does not rotate in any of the direction and the action of dump body is only done by tilting motion. The driver cabin is fitted without any other additional further provision between them. This above points are of the block diagram of the existing dump truck.

### 3.3 Drawback of Existing System

- Need in additional helper
- Chances of getting accident in narrow roads
- Loading and unloading id difficult by individual person
- Unloading difficulties are faced in uncertain surfaces

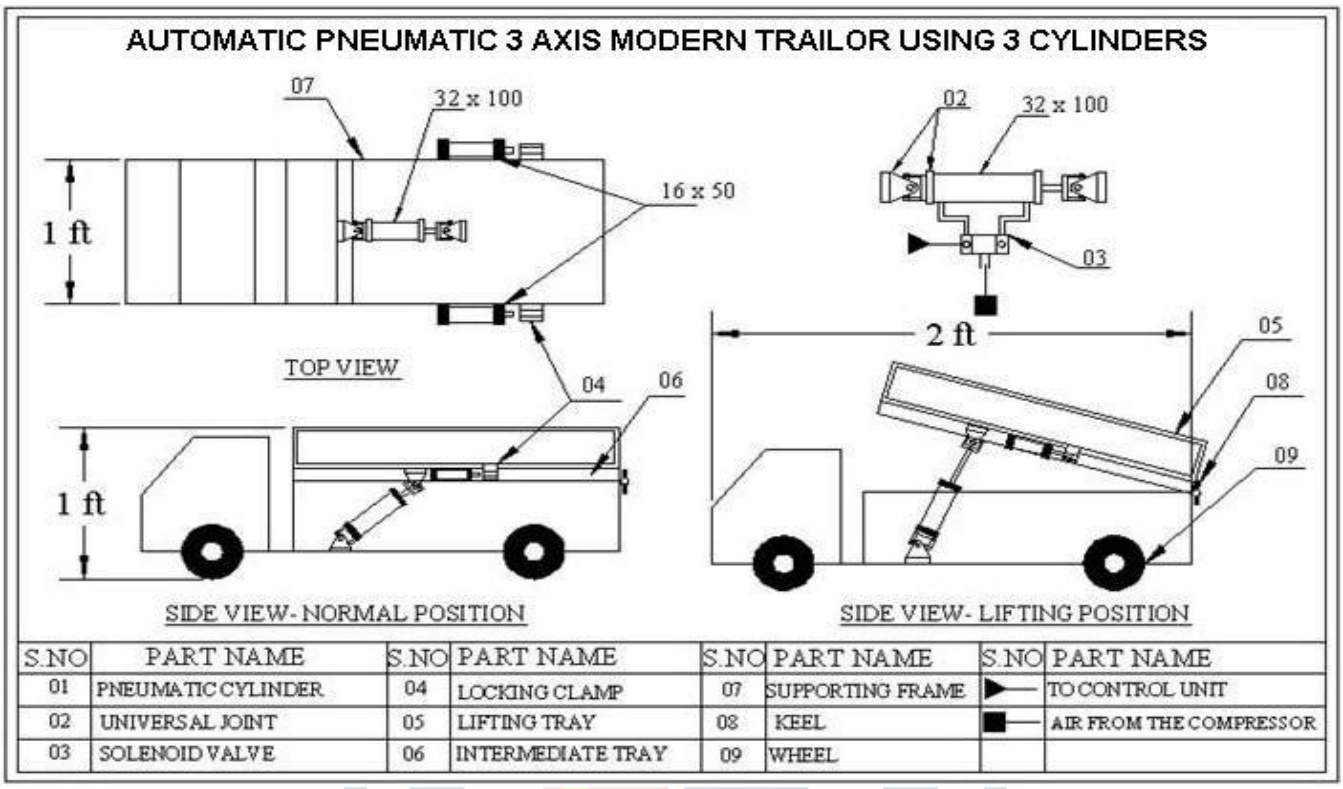
## PROPOSED SYSTEM

### 4.1 INTRODUCTION

The proposed system is done on fabrication with metal sheet and with metal components by joining it with help of welding and the frame is created as per the required dimensions by cutting the 1mm thickness metal sheet. The chassis frame of the vehicle is builded and the driver cabin is designed according to place the rear portion of the vehicle. There is a certain distance or a gap placed between the driver cabin and the dump truck body, because there is a rotational directional operation done on the dump truck load carrying body were the unit should function. A 12V power window motor is placed on the base of dump truck body base were

it functions the rotational operation and the bearings are placed for smooth running operation were as pneumatics cylinder is placed below and the hoses are connected with it to operate its direction on lifting up and down. The controls are placed on the side of the vehicle with the use of operating lever to operate it. The power output is taken from the battery to operate the side directional motion and for lifting up and down the compressor power is needed and taken as the input to operate the jack. The stabilizer leg is placed on the all four corners of the vehicle to make stand the vehicle more stable while loading and unloading the materials from the vehicle in any kind of the surface to avoid the collision. This is the proposed project of the slewing dump truck were it is designed in a prototype manner to operate the functions as above mentioned.

**4.2 BLOCK DIAGRAM**




| S.NO | PART NAME | S.NO | PART NAME | S.NO | PART NAME | S.NO | PART NAME |
|---|---|---|---|---|---|---|---|
| 01 | PNEUMATIC CYLINDER | 04 | LOCKING CLAMP | 07 | SUPPORTING FRAME | ▶ | TO CONTROL UNIT |
| 02 | UNIVERSAL JOINT | 05 | LIFTING TRAY | 08 | KEEL | ■ | AIR FROM THE COMPRESSOR |
| 03 | SOLENOID VALVE | 06 | INTERMEDIATE TRAY | 09 | WHEEL | | |

**4.3 WHEEL**


Fig 4.3 The wheel

The wheel is used in the vehicle to make the vehicle move and operate the vehicle, the wheel also withstands the load of the vehicle and acts as cushion of the vehicle as acting as suspension. The wheel is the main part of the vehicle as the wheel is used in transporting and to make the vehicle travel in the earth surface.

**4.4 BEARING**

Fig 4.4 bearing

The 5202 15 mm Ball Bearing Inner Dimension 15mm X Outer Dimension 35mm X Width 15.8mm is an open style ball bearing designed for high rotational speeds and high dynamic loads.

This bearing is used in the base of the vehicle were it is use to run the smooth operation with the rotational direction of the vehicle. There are 3nos of the bearing used in the slewing dump truck body base, this bearing makes the vehicle operate noiselessly and easily

**4.5 SPUR GEAR**

Fig 4.5 spur gear

Spur gears are a cylindrical shaped toothed component used in industrial equipment to transfer mechanical motion as well as control speed, power, and torque. These simple gears are cost-effective, durable, reliable and provide a positive, constant speed drive to facilitate daily industrial operations.

**4.6 SOLENOID CONTROL VALVE**

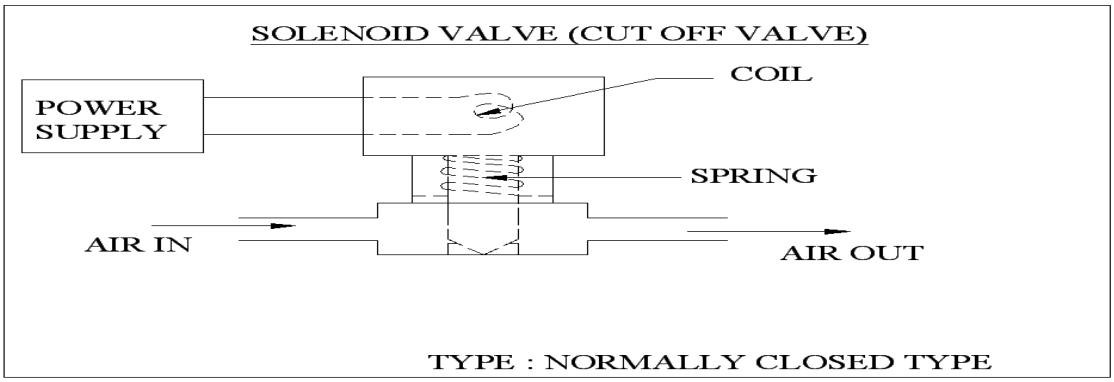
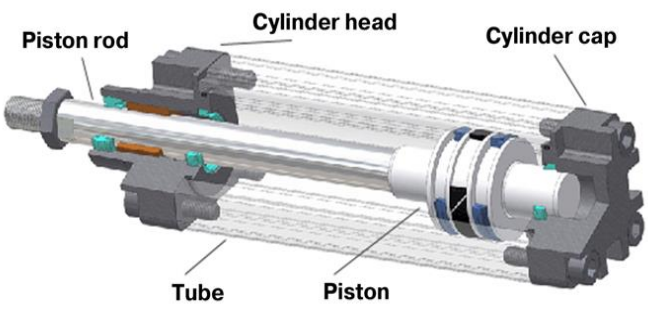



Fig 4.6 solenoid valve

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts. This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve. A solenoid is an electrical device that converts electrical energy into straight line motion and force. These are also used to operate a mechanical operation which in turn operates the valve mechanism. Solenoids may be push type or pull type. The push type solenoid is one in which the plunger is pushed when the solenoid is energized electrically. The pull type solenoid is one is which the plunger is pulled when the solenoid is energized.

The control valve is used to control the flow direction is called cut off valve or solenoid valve. This solenoid cut off valve is controlled by the emergency push button. The 3/2 Single acting solenoid valve is having one inlet port, one outlet port and one exhaust port. The solenoid valve consists of electromagnetic coil, stem and spring. The air enters to the pneumatic single acting solenoid valve when the push button is in ON position.

**4.7 PNEUMATIC SINGLE ACTUATING CYLINDER**




Fid 4.7 pneumatic single actuating cylinder

A single acting pneumatic cylinder is a linear actuator and realizes a working stroke by filling the cylinder with compressed air. The return stroke is usually accomplished by a spring. The cylinder has one connection port that is used either to fill or vent the cylinder.

**4.8 DC MOTOR**

Fig 4.8 DC Motor

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

**4.9 FLOW CONTROL VALVE**

Fig 4.9 Flow control valve

This valve is used to speed up the piston movement and also it acts as an one way restriction valve which means that the air can pass through only one way and it can't return back. By using this valve the time consumption is reduced because of the faster movement of the piston.

**RESULTS AND DISCUSSION**

**5.1 INTRODUCTION**

Fig.5.1 Slewing dump truck

This dump truck suits for smaller and minimal applications were it is mainly operated in narrow construction sites ere the driver can drive and operate the truck easily. For unloading purpose this vehicle is very useful were the driver doesn't need any helper and to help for the operational process, were the driver can operate individually with ease steps and in quicker actions with lesser timing. The vehicle has stabilizer legs also which is more useful to make stable the vehicle in type of earth surface to avoid some sorts of collision and the safety precautions are increased. This also saves time and fuel of the vehicle were unnecessary movements are not driven in the vehicle. This vehicle can be brought to the next advanced level were the AI can also brought in the future were the stabilizer legs automatically lands down while loading and unloading and while the vehicle moving in uncertain surface the legs automatically lands down on the necessary side by detecting the vehicle posture angle and also add AI to the dump truck body with the motion detecting sensors were if it goes to clash with any nearby object when the rotation motion takes place, this AI can also make stop the rotating operation of the vehicle and avoids collision. The AI feature done on the vehicle can also be very useful to operate the vehicle more easier and reduces the driver effort.

## CONCLUSION & FUTURE DEVELOPMENT

### 6.1 CONCLUSION

The dump truck has some cons so we have added some additional components to it were as it is easy to operate with less human effort, easy to operate and secure to operate it. The AI (artificial intelligence) is used in the stabilizer legs were is in some critical road conditions like loosen mud path and in critical slopes the AI in this places shows the vehicle standing degree, above the critical degree the AI alarms into the driver cabin it automatically actuates the stabilizer leg on the sloped side. The AI is used in the rotating dumper body were as the sensor fitted in the dumper body corners which indicates the nearby objects and if it going to touch or dash the object while in rotating motion the slewing unit will stop rotating, this is Artificial Intelligence is going to be added in slewing dump truck.

### 6.2 FUTURE DEVELOPMENT

Accordingly, the further development of this slewing dump truck will have the advancement of AI were the dump body end have the sensors and were as while rotating the dump body it should not colloid and the sensors make stop the rotation of the body automatically. The future advancement will be made according to the requirements and needs of the client and for the usage of the vehicle will the additional paid operating option in the vehicle.

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