

# DESIGN OF PNEUMATIC TRUCK

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**ABSTRACT:** Tipper has lots of applications in today's world. In industrial and domestic considerations, tippers can haul a variety of products including gravel, potatoes, grain, sand, compost, heavy rocks, etc. By considering wide scope of the topic, it is necessary to do study and research on the topic of tipper mechanism in order to make it more economical and efficient. In existing system, tipper can unload only in one side by using pneumatic jack or conveyor mechanism. By this research it is easy for the driver to unload the trailer and also it reduces time and fuel consumption. For making tipper mechanism with such above conditions both mechanisms namely pneumatic jack and conveyor mechanism can be used. But eventually it comes with question that how both systems can arrange in single set up.

**Keywords:** - conveyor mechanism, tipper mechanism, pneumatic jack

## 1. Introduction

Tipper has lots of applications in today's world. In industrial and domestic considerations, tippers can haul a variety of products including gravel, potatoes, grain, sand, compost, heavy rocks, etc.

A dumper is a vehicle designed for carrying bulk material, often on building sites. Dumpers are distinguished from dump trucks by configuration: a dumper 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. Early dumpers had a payload of about a ton and were 2-wheel drive, driving on the front axle and steered at the back wheels. The single cylinder diesel engine (sometimes made by Lister) was started by hand cranking. The steering wheel turned the back wheels, not front. Having neither electrics nor hydraulics there was not much to go wrong. The skip was secured by a catch by the driver's feet. When the catch is released, the skip tips under the weight of its contents at pivot point below, and after being emptied is raised by hand. Modern dumpers have payloads of up to 10000kg and usually steer by articulating at the middle of the chassis (pivot steering).

They have multi-cylinder diesel engines, some turbocharged, electric start and hydraulics for tipping and steering and are more expensive to make and operate. An A-frame known as a ROPS (Roll-Over Protection) frame may be fitted over the seat to protect the driver if the dumper rolls over. Some dumpers have FOPS (Falling Object Protection) as well. Lifting skips are available for discharging above ground level. In the 1990s dumpers with swivel skips, which could be rotated to tip sideways, became popular, especially for working in narrow sites such as road works. Dumpers are the most common cause of accidents involving construction plant. A dumper is an integral part of any construction work and hence its role is important for completion of any constructional site.

One of the problem are cited with dumper in the time and energy for setting the huge dumper in the proper

direction to dump the material it in carrying and hence the need of the project work riser which is about 3 way dropping dumper which can dump the material in any direction except the rental one without moving the truck in any direction.

Hydraulic Dump Bodies Hydraulics was being incorporated into truck mounted dump bodies relatively early on, in which record shows one of the first hydraulic dump bodies was the Roberuston Steam Wagon with a hydraulic hoist that received power from the truck's engine or an independent steam engine. Alley & McLellan of Glasgow developed another early hydraulic dump body in 1907 that was power-driven by steam.

### Articulated Dump Truck:

An articulated dump truck, or in the construction world, has a hinge between the cab and the dump box, but is distinct from semi-trailer trucks in that the cab is a permanent fixture, not a separable vehicle. Steering is accomplished via hydraulic rams that pivot the entire cab, other than rack and pinion steering on the front axle. This vehicle is highly adaptable to rough terrain.

In line with its use in rough terrain, longer distances and overly flat surfaces tend to cause driveline troubles, and failures. Articulated trucks are often referred to as the modern scraper, in the sense that they carry a much higher maintenance burden than most trucks. See the first mass produced articulated dump truck (articulated hauler) . Transfer Dump Truck A transfer dump is a standard dump truck which pulls a separate trailer which can also be loaded with aggregate (gravel, sand, asphalt, clinkers, snow, wood chips, triple mix, etc. The second aggregate container, (B box) on the trailer, is powered by either an electric, pneumatic motor or hydraulic line.

It rolls on small wheels, riding on rails from the trailer's frame, into the empty main dump (A) box. This maximizes payload capacity without sacrificing the maneuverability of the standard dump truck. Transfer dumps are typically seen in the western United States because of the peculiar weight restrictions on western highways. Another configuration is called a Triple Transfer Train, which consists of a B and C box. These are common on Nevada and Utah Highways but not in California.

Depending on the axle arrangement, a Triple Transfer can haul up to 129,000 kilograms (280,000 pounds) with a special permit in certain US states. The Triple Transfer usually costs a contractor about \$105 an hour while A/B configures usually runs about \$85 per hour (2007 stats). 4. Truck and pup: A truck and pup is very similar to a transfer dump. It consists of a standard dump truck pulling a dump trailer. The pup trailer, unlike the transfer, has its own hydraulic ram and is capable of self-unloading.

The photo, or may be of the 'cross spread' type with the gates opening front to rear instead of left and right. The cross spread gates will actually spread gravel fairly evenly the width of the trailer. By comparison, the windrow gates leave a pile in the middle. The cross spreads jam and do not work well with larger materials. Likewise they are not suitable for use where spreading is not desired such as when hot asphalt paving material is being dumped into a paving machine.

### 1.1 Body truck



Fig 1.1 unloading in left direction



Fig 1.2 unloading in left direction

## 2. CONSTRUCTION

### 2.1 Specifications:-

Parts	specifications
Trailer length	62cms
Trailer width	37cms
Compressor capacity	8lits
Cylinder stroke	5inchs
Battery	12v
Motor	12v
Piston diameter	20mm

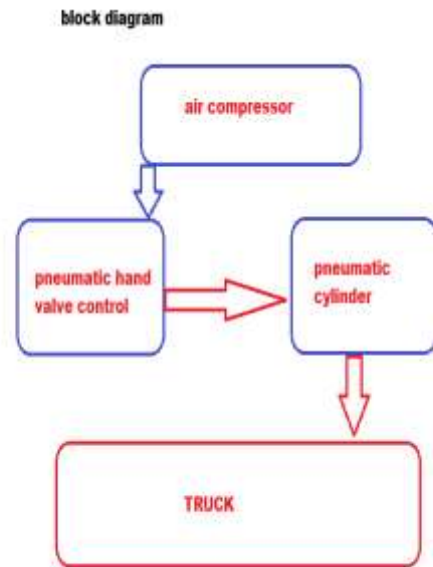
Depending on the job specification, there are multiple forms of body constructions available:

- Tie rod cylinders: The most common cylinder constructions that can be used in many types of loads. Has been proven to be the safest form.



Fig 1.3 unloading in back word direction

### 1.2. Block Diagram



- Flanged-type cylinders: Fixed flanges are added to the ends of cylinder, however,

this form of construction is more common in hydraulic cylinder construction.

- One-piece welded cylinders: Ends are welded or crimped to the tube, this form is inexpensive but makes the cylinder non-serviceable.
- Threaded end cylinders: Ends are screwed onto the tube body. The reduction of material can weaken the tube and may introduce thread concentricity problems to the system.

## 2.2 Material

Upon job specification, the material may be chosen. Material range from nickel-plated brass to aluminum, and even steel and stainless steel. Depending on the level of loads, humidity, temperature, and stroke lengths specified, the appropriate material may be selected.

## 2.3 Mounts

Depending on the location of the application and machinability, there exist different kinds of mounts for attaching pneumatic cylinders:

Type of Mount Ends	
Rod End	Cylinder End
Plain	Plain
Threaded	Foot
Clevis	Bracket-single or double
Torque or eye	Trunnion
Flanged	Flanged
	Clevis etc.

## Sizes

Air cylinders are available in a variety of sizes and can typically range from a small 2.5 mm ( $\frac{1}{10}$  in) air cylinder, which might be used for picking up a small transistor or other electronic component, to 400 mm (16 in) diameter air cylinders which would impart enough force to lift a car.

Some pneumatic cylinders reach 1,000 mm (39 in) in diameter, and are used in place of hydraulic cylinders for special circumstances where leaking hydraulic oil could impose an extreme hazard.

## Valves



Fig 2.3.1 Piston actuated valves

Our piston actuated valves provide a competitive solution for OEM on/off control applications by combining many key benefits in one valve. A unique quality product designed to meet our customer's needs offering reliability combined with high performance shut-off.

## Sanitary check valves



Fig 2.3.2 sanitary check valves

Our stainless steel check valves are suitable for use on a wide range of fluids for applications in process lines, hot

water systems, steam and condensate systems etc. Face-to-face dimensions conform to EN 558 part 2, series 52. It will be used on oil, air, gas and water applications, alternative seat materials are available.

## Stainless steel ball valves



Fig 2.3.3 Stainless steel ball valves

Manufactured to stringent specification providing reliable tight shut-off and less maintenance. Wide range of sizes, materials & body design option providing a suitable model for any application. Precision design providing compact valves and corrosion resistant bodies ensure long life of the product.

## Globe & modulating valves



Fig 2.3.4 Globe & modulating valves

Our pneumatically operated 2/2-way globe valve has a low maintenance membrane actuator which can be controlled by inert gaseous media. The valve plug is fixed to the spindle in such a way as to allow flexing during closure in order to ensure tight shut off. The valve spindle is sealed by a self-adjusting gland packing providing low maintenance and reliable valve spindle sealing even after a long service life. The wiper ring fitted in front of the gland packing protects it against contamination.

## Pneumatic control valves & actuators



Fig 2.3.5 Pneumatic control valves & actuators

Our pneumatically operated control valves have been especially developed to conform to the stringent regulations in the field of cryogenics as well as in the pharmaceutical and food processing industries. The requirements placed on control valves intended for processing plants vary considerably depending on the field of application. Therefore our valves are designed as modular assemblies that allow us to respond with utmost flexibility to our customers' requirements.



### Pneumatic positioners



Fig 2.3.6 Pneumatic positioners

We offer pneumatics positioners to be used with our control valves. Single-acting or double-acting positioners for pneumatic control valves belong to the classics in our brand's product range. Already proven in thousands of applications, they provide safety in processes.

### Sanitary diaphragm valves



Fig 2.3.7 sanitary diaphragm valves

The diaphragm pneumatically operated 2/2-way diaphragm valve has a low maintenance actuator. Normally Closed, Normally Open and Double Acting control functions are available. The modular actuator system permits a variety of options to be used such as tank bottom valves, T valves, sampling valves, multi-port valves and tandem welded configurations.

### Pneumatics



Fig. 2.3.8 Pneumatic cylinders

Our pneumatic cylinders will vary in appearance, size and function, they generally fall into one of the specific categories. However there are also numerous of types of pneumatic cylinder available, many of which are designed to fulfill specific and specialized functions. You just have to ask what you need for your specific application

### Air preparation & hoses



Fig. 2.3.9 Air preparation & hoses

Choose from a range of high performance and efficient Air Preparation products for your application needs. Parker offers a large selection of filters, lubricators, pressure regulators, air dryers and combination units.

### Grippers



Fig 2.3. 10 Grippers

The functions of our grippers (Grip and rotate) can be controlled separately either 90° or 180°, combined in a compact module. The grippers opening angle is infinitely adjustable from 1° to 180°. At 180° opening angle, the workpiece is clear of the jaws, therefore no linear retraction stroke is needed.

### Hydraulics



Fig 2.3.11 Hydraulic cylinders

We offer you a well-structured and systematically engineered range of hydraulic cylinders geared to your application requirements. Our cylinders line conforms to NFPA, ISO, and DIN standards and is 100% tested. The cylinder product range constitutes three different categories according to design type.

### Solenoid valves



Fig 2.3.12 Solenoid valves

We offer a full line of directional (spool and poppet), proportional, pressure, flow, check, logic cartridges, "sandwich" (modular), and cartridge type valves. This is the best formidancing hydraulics systems applications – requiring for example, standard pressure capability to 4500psi and higher, coupled with flow limitations measured to the 1000's of gallons per minute.

### Gear & Transmission Components



Fig 2.3.13 Ball rail systems

Make up your own compact linear motion guideways from interchangeable standard stock elements. We offer ball guide rails and ball runner blocks with such high precision, especially in the running rack zone, that each individual component element can be replaced by another at any time.

### Stainless steel chains



Fig 2.3.14 Stainless steel chains

Standard roller chain is broadly used in power transmission applications ranging from general industrial applications to demanding oil field service to operation in such specialized areas as food processing and heavy construction equipment. Single and multiple standard roller chains, available in many sizes, meet most drive requirements.

#### Gears & components



Fig 2.3.15 Gears &amp; components

Designed to meet the tough challenges of medium and heavy-duty operations, our gears give you everything you choose for outstanding design, durability, minimal failure, easy maintenance and overall efficiency.

#### Tools



Fig 2.3.16 Hand tools

One wrench, many jobs. Wrenches, hammers, screwdrivers and so on. Be prepared for any project, our reinforced tools will help you to do any job. They are heavy duty and easy to



Fig 2.3.17 Power tools

We offer you a wide range of power tools, angle grinders; jig saw, bendable screwdrivers, impact drivers, impact wrenches, soldering iron, electric brad nailer, heat guns, sanders, polishers, hammer drills cutoff saw and so on. The most popular heavy duty battery powered and conventional 110Volts tools.

#### Storage



Fig 2.3.18 Storage

Keep all your tools together and organized, this is the best way to find them fast. Our storage bins features a rugged construction that provides your tools with optimal protection against harsh environments. The Portable Tool

Chest is electrically welded for additional strength, and features a full-length hinge with a watershed. We have a lot of models.

#### Filters



Fig 2.3.19 Air, gas &amp; liquids filters

Our filters have been developed to be used as air, gas and liquids sterilizing filters in the pharmaceutical and biotechnology industries. We have the most popular brands available on the market.

#### 8. CONCLUSION

After carrying out the testing of this project will get positive output. It has been obtained most of the objectives and goals that would set for the designers point of view. It has been able to increase the easiness in unloading trolley, Problems occurred at the time of unloading the trolley in the critical areas are eliminated. And thereby finally reducing overall time and fuel consumption for the unloading of material from the trailer.

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