

# DEVELOPMENT OF THREE AXES LIFTING MODERN TRAILER

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## ABSTRACT

Trailer has lots of applications in today's world. In industrial and domestic considerations, tippers can pull a variety of products including gravel, grain, sand, fertilizer, 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 hydraulic jack mechanism can be used. This paper has mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valves which activate the ram of the hydraulic cylinder which lifting the trailer cabin in require side. By this research it is easy for the driver to unload the trailer and it reduces the time.

**KEYWORDS** – Modern Trailer, Three Axes, Trailer

## 1. INTRODUCTION

A trailer is a vehicle designed for carrying bulk material, often on building sites. Trailers are distinguished from dump trucks by configuration: a trailer 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 "trailer" comes from. A trailer 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

trailer in the time and energy for setting the huge trailer 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 trailer which can dump the material in any direction except the rental one without moving the truck in any direction.

## 2. LITERATURE REVIEW

Ganesh Shinde et al studied the 'Modern 3 Ways dropping dumper' which has been conceived by observing the difficulty in unloading the materials. The survey in this regards in several automobile garages, revealed the facts that mostly some difficult methods were adopted in unloading the materials from the trailer. They have mainly focused on above difficulty. Hence a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes without application of any impact force. The Direction control valve which activates the ram of the hydraulic cylinder which lifting the trailer cabin in require side. 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.

Amboji Sudhakar R. et al studied that 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 hydraulic 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 hydraulic

jack and conveyor mechanism can be used. But eventually it comes with question that how both systems can arrange in single set up? Answer to this question is nothing but this research work.

Alley & McLellan of Glasgow studied 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 Robertson Steam Wagon with a hydraulic hoist that received power from the truck's engine or an independent steam engine was developed another early hydraulic dump body in 1907 that was power-driven by steam.

### 3. CONCEPT

In this work the trailer is pulled up in three axis. The figure 1 shows the working principle of hydraulic cylinder used in this modern trailer. For the trailer action we are using hydraulic as a source. The 3/2 direction control valve is used to control the direction of the hydraulic. When the inlet port is open the hydraulic is pumped from the sump using hydraulic pump. The trailer is now pushed upward in the "Y" axis direction and the outlet port is activated now, then the trailer was pushdown in Y axis direction. Now the knee joint of the trailer is removed for trailer action in 'Z' axis. Then again the inlet port is open. The trailer is now pushed upward in the "Z" axis direction and the outlet port is activated now, then the trailer was pushdown in 'Z' axis. Again the knee joint is removed for the trailer action in 'X' axis. Then again the inlet port is open. The trailer is now pushed upward in the "X" axis direction and the outlet port is activated now, then the trailer was pushdown in 'X' axis. we can dispatch the load in three axis in the trailer by using the universal joint in the hydraulic cylinder.

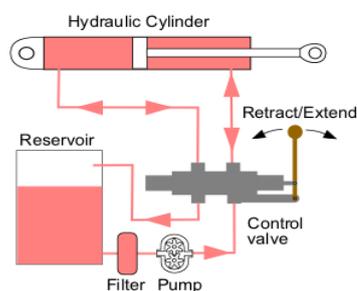


Figure 1 Working principle of hydraulic cylinder

### 4. CONSTRUCTION

This machine is constructed using various materials like MS Sheet, Plywood, MS Square Pipe, Polished Rod, Double Acting Hydraulic Cylinder, Universal Joint,

Hydraulic Pipes, Directional Control Valve, Hydraulic Fluid, Hydraulic Pump, and Reservoir. First of all a base frame structure is prepared using MS Square Pipe. The Trailer body is prepared using MS Sheet. The Structure is 360 mm length and 250 mm breadth. The universal joint is attached with the frame using welding process. Another universal joint is attached on Bottom of the Trailer Body. A Double Acting Cylinder connects both the universal joint in the Frame which in the Trailer body is connected with a Frame using Knee Joint. Hydraulic pipes are connected to the Double acting Hydraulic Cylinder. Another Side of the Hydraulic pipe is attached to the Directional Control valve. Hydraulic fluid is filled in the Reservoir Tank. Another side of the Hydraulic Pump is connected to the Directional control valve. This assembly is attached with hydraulic cylinder that operates the trailer. The cylinder and piston arrangement is fitted in front of the trolley that is situated at the back of the frame member. Figure 2, 3 and 4 show the photographic view of modern trailer.



Figure 2 Photographic view of Modern trailer



Figure 3 Photographic view of working of trailer



Figure 4 Photographic view of lifting of trailer in one direction

## 5. CALCULATION

$$\begin{aligned} \text{Area of plate (A)} &= 360 \times 250 \\ &= 90000 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume of the Trailer Box (V)} \\ &= 360 \times 250 \times 225 \\ &= 20250000 \text{ mm}^3 \end{aligned}$$

Lifting Capacity of the Cylinder = 3 Tons

## 6. FUTURE MODIFICATION

As the world progressing at faster rate we meet mover and mover huge construction which head to be dig big and big amount of the earth and thus more efficiently working equipments are to be required and hence the Development of Three Axis Lifting Modern Hydraulic trailer may be used more than the two way or one way. India is progressing at higher rate and hence infrastructural development is on its high. Hence the future of this project work seems promising.

The project work can be modified further more on following basis:-

- Dual stage cylinders can be used.
- Oil pump can be used instead of powered cylinder.
- Capacity can be increased.
- Wheel steering can be adopted for avoiding the lifting of vehicle along with trailers.

## 7. CONCLUSION

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 three way dropping trailer.

## 8. REFERENCES

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