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# Design and analysis of unloading mechanism of tipper

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**Abstract**:- *Tipper truck is damp truck which is used to transport sand, gravel, dirt, coals,etc. from one place to another place. Generally tippr truck is used in mines to transport heavy materials. But limitations of tipper truck to unload material is only in one direction reduces its efficiency and effectiveness in todays era. Also to unload material in specific area, tipper has to be parked according to it which ultimately time consuming process. Tipping is also a safety consideration. If truck is not parked at relatively horizontal ground, over turning of tipper and slipping of tipper occurs . To overcome these problems it is necessary to study the existing unidirectional unloading technique. To overcome these problems propsed design of tipper is suggesting to use three hydraulic cylinders instead of one , each situated on lateral side of tipper truck to unload the material in left or right side along with the existing rear side material unloading. This paper exhaustive literature review on above topic. The findings and shortcoming obtained from the contribution of various researchers has been presented. It is required to Redesigning the tipper along with hydraulic packs to meet the competitive globlal requirements.*

***Keywords:-*** **tipper, dump truck, hydraulic packs,etc..**

## 1. Introduction

The tipper truck is highly popular in transportation of heavy materials such as sand, gravel, coals, etc.Tipper truck is the advanced version of conventional trucks. Conventioanal trucks can also transport heavy materials from one place to another but huge difference is that , in conventional truck man power is required to unload the material in the truck. While unloading the material, employees just open the side walls of the trolley and with the help of spade. This process is from last few decades.. But this method is time consuming. Extra cost of man power is to be paid for unloading the material.also the existing tipper can not perform in effective in small and congested area such as small roads, construction sites, mines,etc.it also consumes more time and more fuel which ultimately reduces efficiency of the sysyem.

To overcome these problems tipper truck was invented. This truck having hydraulic member in it which lifts the trolley upward to unload the material on rear side. The aarangment was, just backside of cabin head, the hydraulic cylinder is placed which provides the power to hydraulic member which is situated just below the top of the trolley and the chasis frame. With the help of hydraulic member , trolley get lifted upward at front which allows the material in truck to unload at the rear side. This kind of trucks are much popular uptill due to the unloading mehanism.

But it has also its own drowbacks. Truck has to be parked well according to site where material is to be unloaded. This consumes more time and cost of fuel which leads to reduction in efficiency. Also there are chance of sudden slipover or turning of trucks if is not parked properly in uneven sites such as coal mines,etc.

For safety consideration of life of human being and material safety these drowbacks are need to be resolve. So keeping these in mind,we are proposing three way unloading mechanism of tipper. In this mechanism, need to parked vehicle at right place will be resolve. We can easily parked vwhicle and according to requirment, we will be able to unload the material , whether it is on right side or left side of the truck.we are suggeting instrsd of using one hydraulic cylinder use tree, so as to give the trolley three way unloading mechanism. Which will increase effictiveness and efficiency of the system. Risk of life in overturning of vehicle will get reduced.ultimately this new proposed design will change tipper truck working to provide better to performance.

## 2. Literature review

The exhaustive literature review has been carried out on tipper lifting mechanism. The contribution of various researchers is presented below.

Schmitz Cargobull and AG Bahnhofstr (2006) has discussed about truck tipper M.KI.it is versatile on all construction sites. He suggested that its mobility should be Superior and the quick unloading process make the M.KI a vehicle that is ideally tailored to the requirements of the construction industry. This is an optimised vehicle design which have high payload capacity. This Vehicle can be able to operate at uneven terrain. The Schmitz Cargobull modular system offers more choice of rounded steel bodies in various versions. [1]

Mark Jacobs (2013) analysed a side dump truck. He said that in conventional rear tipping dump truck, it is immune to tipping over while dumping. In case of side dump truck its prone to unload the material on either side of truck rather than in existing tipper truck. Side dump truck has

hydraulic which tilt the dump body onto its side.it has advantage that it can dsone rapid unloading and can carry more load tham existing tipper. But has some limitations that if loading stops prematurely the truck gets stuck and also unloaded material on side of the truck , which makes hurdle in way of truck to move further because material covers the path of truck.[2]

Sudhakar Amboji, Yogesh Humne, Rohan Chavan, Jyotsna Patil, Prashant Kshirsagar (april 2014) have discussed about the three way tipper mechanism using conveyor mechanism. Author has suggested that this tipper can unload material on three sides rather than only in one direction as that of in case of existing tipper mechanism. This tipper mechanism generally relates to conveyor equipment and mechanism for unloading material from trailor in left or right side and use of hydraulic jack for unloading in rear side. The conveyor mechanism includes a single continuous belt member wrapped around rollers. A lever is connected to the first roller and the surrounding belt member. This will unload material from tipper in left and right side. This tipper will overcome the problems and limitations of existing tipper which requires more space, time and fuel.[3]

Prof. Dr. C T Foo, S F Loke, Prof. Dr. S C Low has discussed about the revolutionary efficiency of tipper barge system.Tipper barge system is the system which carry out unloading in the ocean. The tipper barge system has the capability of loading cargo at breakneck speed. Conceptually, it is similar to a land based tipper truck. The tipper from many years has been used for loading, transporting and unloading sand, gravel, and other aggregates.

Based on the fact alone, it is envisioned that the tipper barge system, if adopted by the industry, would likely also remain in use in the long term. The concept for both the systems are similar core control mechanism: discharging laden cargo through pushing a button resulting in tipping of containers.The bottom slit hopper barge, the flat top cargo barge and the trailing suction hopper barge are the three types of tipper barge system. As comparing tipper barge system with the tipper truck system , time taken to discharge material is so low that it tooks only 3 years to complete project as compare to 30 years taken with existing system. Here tipper trolley get uplifted from its middle portion and delivered or unload material to its respective sides.[4]

Prof. S A Deshmukh ,Pradip Lonkar, Tushar Bhong, Dadaso Kale (march 2016) have discussed about the three axis pneumatic modern trailer mechanism. The existing tipper method will unload the material only in one direction. It is difficult to unload the material in small compact streets and roads. In this project these problems are rectified to unload the material from trailor in all three sides very easily.This projects work is unloading the material from train in rear side, left side and right side unloading.In this project, they have made special type of wooden platform in Z shape. Each of two platforms are connected using a plastic syringe piston and cylinder arrangement. This system will helps in reducing lifting cost. It will be free from the wear adjustment and took less power to operate. The author also have discussed about the various types of trucks in history such as early truck mounted dumb bodies , hydraulic dump bodies , crawler tractor trucks , Euclid dump trucks, saint john first truck, etc. they also have discussed mechanism of dump trucks[5]

Prof. Akshay Pachpore, Ajinkya Gharote, Virendra Paulzagade (3 june 2015) has discussed about the three way trolley mechanism. In this, author said that, The older dropping trolley/dumper has been conceived by observing the difficulty in unloading the materials.The existing tipper mechanism can unload only in one direction. Existing tipper requires more space, Time and fuel. so to overcome these problems three way mechanism is proposed.This tipper mechanism generally relates to ball socket joint is used to provide motion in three direction. In this mechanism, the relative motion of ball socket joint and trolley moves in left and right direction. To unload the material in right side or in left side, they have fix the one side by hinge joint using pin.

The hydraulic jack is attached below whole setup to lift the trolley for unloading. The proposed mechanism used for unloading purpose is safe and efficient and could be used safely in different areas. This type of system is specially designed for easy unloading of goods in congested space without wasting time and fuel. To understood this a prototype of suitable arrangement has been designed. The vehicles can be unloaded from the trailer in three axes withoutapplication of any impact force. Further modifications andworking limitations will put this work in the main league of use. This concept saves time & energy which leads to efficient working.[6]

Prof. Mrs. R.S. Tupkar, Aditya Malewar, Rohit Ramteke, Harshal Lakhade, Shubham Navghare (2017) has discussed about design and fabrication of unidirectional dumper. The dumper has limitations to unloads the material in only one direction. But this incapability can be fulfilled by a new method mechanism as the unidirectional dumper. This mechanism is an approach to reduce the idle time to settle the dumper. The material is unloaded in any direction so it is called as unidirectional dumper. The major outcomes of unidirectional dumper has overcome space requirement problem of existing system, which often result in road

blocking. By using hydraulic cylinder in unidirectional dumper, the material can be unload in 180 degrees as per requirement. This mechanism prevents blocking of road, saves time and enhances productivity at lowest cost. This dumper with swivel can unload in 3 directions, so it can work in narrow raod. So ultimately, The inefficiency occurred in existing tipper system will be overcomes by the unidirectional.[7]

R.Santos, D.Riesland,(2001) said that , the measure of a rough terrain forklift trucks , resistance to overcome under rigidly controlled static condition that includes consideration for dynamic factors encountered in normal application of operation. The standard allows for determination of stability by either tilting platform tests or calculated stability values. Using ADAMS a model was developed to simulate forklift tip over test. ADAMS is a modeling tool. Author discussed about simulation of fitting platform test. The rough terrain forklift is considered stable if it doesn't overturn when the test platform is tilted to specified platform slope values.Overturn is defined as the point at which the truck completely overturn. Not the point at which a wheels leaves the platform. Because of ADAMS ability to truck body acceleration, velocity and displacement during simulation machine overturn can be easily determined.[8]

## 4. Conlusion

From the findings and shortcomings of literature study it is concluded that it is essential to design such a mechanism which would help to unload the material in different directions. Hence it is decided to design three side unloading mechanisms which reduce the time to unload material. As time to unload the material will get reduced, this will ultimately reduced the consumption of fuel and ultimately cost will get reduced.

It will increase efficiency of truck to unload material at desired place without considering the parking area. Also the problems such as over turning of truck and slipping of truck on un-even site wiil get solved.

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