

# Conceptual Approach Towards Automation and Design of Three Axis Trolley Dumper used in the Industrial Applications

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## ABSTRACT

Number of vehicles on our roads is increasing day by day, also the technology has developed but the safety factor is always needed to be considered. Now a day's vehicles come fitted with lots of safety features. One of the essential safety feature that need to be installed is automatic upper-dipper control of headlight, this feature can mainly use during night time driving. This feature can be installed in three axis trolley which are mainly used for industrial purpose.

**Keywords:** Upper dipper, relay module

## I. INTRODUCTION

Automation plays an important role in automobile. Nowadays almost all the automobile vehicle is being atomized in order to product the human being. The automobile vehicle is being atomized for the following reasons:

- To achieve high safety
- To reduce man power
- To increase the efficiency of the vehicle
- To reduce the work load
- To reduce the fatigue of workers
- To high responsibility

- Less Maintenance cost

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.

In this paper we have proposed a design of trolley capable of disposing load around 360 where as in case of normal dumper the disposal takes place only in one direction.

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.

## II. LITERATURE SURVEY

The word 'pneuma' comes from Greek and means breather wind. The word pneumatics is the study of air movement and its phenomena is derived from the word pneuma. Today pneumatics is mainly

understood to mean the application of air as a working medium in industry especially the driving and controlling of machines and equipment.

Pneumatics has for some considerable time been used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation.

Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it will indeed be necessary to deal with the question of compressed air supply.

The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivers the air at a high pressure.

Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature.

The compressibility of the air was first investigated by Robert Boyle in 1662 and that found that the product of pressure and volume of a particular quantity of gas.

The usual written as

$$PV = C$$

(or)

$$P_1 V_1 = P_2 V_2$$

In this equation the pressure is the absolute pressure which for free is about 14.7 Psi and is of course capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer. Any gas can be used in pneumatic system but air is the mostly used system now a days.

[1] 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.

[2] The current work contains the load cases & boundary conditions for the stress analysis of chassis using finite element analysis over ANSYS. Finite element model of the vehicle chassis is made. Shell elements have been used for the longitudinal members & cross members of the chassis. The advantage of using shell element is that the stress details can be obtained over the subsections of the chassis as well as over the complete section of the chassis. Beam elements have been used to simulate various attachments over the chassis, like fuel tank mountings, engine mountings, etc. Spring elements have been used for suspension & wheel stiffness of the vehicle. Impact loads have been measured (in terms of 'g') experimentally by using accelerometers on the front & rear axles. Input spectrum for Power Spectrum Analysis has been obtained by using FFT Analyzer for the secondary roads at the driving speed of 30 kmph

[3] This paper presents the study of the vibration characteristics of the truck chassis that include the natural frequencies and mode shapes. The responses of the truck chassis which include the stress distribution and displacement under various loading condition are also observed. The method used in the numerical analysis is finite element technique. The results show that the road excitation is the main disturbance to the truck chassis as the chassis natural frequencies lie within the road excitation frequency range. The mode shape results determine the suitable mounting locations of components like engine and suspension system. Some modifications are also suggested to reduce the vibration and to improve the strength of the truck chassis.

### III. OBJECTIVE

- The paper aims to design a prototype of a truck trolley such that it is capable of offloading its contents in a 360 direction as required.
- The system is technologically made better by installing a sensor based upper dipper module.
- Also if the system is overloaded the relay operates to stall the further activity of the system.

### IV. METHODOLOGY AND MATHERIALS

The equipment used for building the prototype are 433MHz Transmitter-Receiver RF Modules, 1.5 V to 12 V Variable Power Supply Boards, 12 V-1 Amp Transformers (230 V to 12 V), Relay Circuit Modules, Bread Boards, Connecting Wires, Resistors, LEDs, Toggle Switches, Antennae. The LEDs will eventually be replaced by the actual headlamps.

In this project, in upper dipper section the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is used as comparator circuit.

When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low.

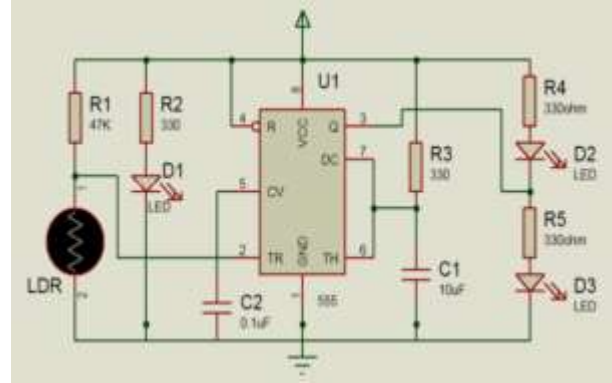


Fig 1: Circuit diagram of upper dipper

A relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Microcontroller pins.

In case of heavy load conditions excess current is drawn by the system which will be sensed and a relay operation takes place that will disconnect the complete system operation from the supply.

### V. CONCLUSION

The work for making a prototype of the trolley having smart control can have an efficient application when implemented in practical manner. The paper has proposed a design of trolley which has the capability of disposing its load in all the directions as required. Also, the operation is shut down of the trolley is being loaded more than its capacity. The prototype has made use of the relay-based design having transistors and 12V supply.

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