

Design and Fabrication of Overload and Over Seat Prevention System in Two Wheelers

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Abstract: *In this modern world, vehicle is fundamental need for everyone. So both the rich and poor need a vehicle (at least a bike) for their transportation. Buying a bike is not a difficult thing today. But the increasing in price of fuels made him difficult to manage the expenses. Hence a bike with good mileage will be a better choice. Even though the bike gives good mileage, the handling decides its mileage. One important factor which lowers the mileage is overload & over seat. When a bike is overloaded & over seat its mileage and performance will be decreased. Therefore an overload & over seat prevention will be helpful in indicating in case a vehicle is loaded over its limit. This project mainly focuses on improving the mileage and safety performance with the help of overload & over seat prevention system. This system needs no extra space as it is placed inside the seat & shock absorber.*

Keywords: fuel economy, over load detector, over seat, prevention, safety

1. Introduction

Commercial Vehicle overloading on highways a menace; a bane to the exchequer having the onus of maintaining the road infrastructure - it not only increases his expenses but, is also one of the major causes of road accidents. And, over 50 % of the Commercial vehicles plying on our National / State Highways are overloaded. Although there are legal axle load limit and gross vehicle weight limit of the vehicles plying on roads, they are violated wickedly by the transporters. The damage by over-loaded vehicles to pavements is exponential. It is believed that the damage caused to a pavement by an axle load twice the standard axle is 16 times the damage incurred by the latter. There are standard legal axle load limit and gross vehicle weight limit but neither are followed by transporters nor enforced stringently by the enforcement authority. Overloading vehicles reduce the design pavement life. Controlling overloading not only prevents premature failure of the pavement but, also brings in monetary benefit to the Concessionaire.

Commercial vehicle safety has been an important focus of commercial vehicle enforcement agencies for some time. Overloaded vehicles produced higher kinetic energy, resulting in greater impact forces and damages to other vehicles or to the infrastructure, especially when met with an accident and are more likely to be fatal. Many researchers have shown that the important reason for road damage is the vehicle load. A study by the International Road Dynamics Inc. found that 10% increase in weight can accelerate pavement damage by over 40%. Furthermore, overload could cause the main part of the vehicle to be damaged and malfunction.

Overloading & over seat in vehicles decreases the mileage, performance and also difficult to handle them. When the vehicle is overloaded, the engine needs more power to pull the vehicle. So the fuel supply to the cylinder is increased than the normal loading case. Hence there will be a mileage drop in the vehicle thus decreasing the performance. Vehicles that are overloaded cause excessive wear and damage to roads, bridges, and pavements etc. Design and

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Serious overloading can affect your safety by making the vehicle less stable, difficult to steer and take longer to stop when braking. As the fuel cannot be renewed and it is of high cost it becomes one of major problem in wasting them. This has to be controlled. In order to control the mileage drop and therefore the performance there is a need of overload detector in the vehicle. These detector indicate whenever the vehicle is overloaded. When the vehicle is overloaded above the permissible level the spring gets compressed and the rod inside the spring touches the bottom surface. Thus the circuit becomes closed circuit and rod begins to conduct making the LED indicator to glow which simultaneously cutoff the load on battery.

1.1. Problems due to overloading

There were several adverse consequences that may occur when the vehicles exceed the maximum permitted limit i.e.

- 1) Vehicles that are overloaded cause excessive wear and damage to roads, bridges, and pavements etc.
- 2) Serious overloading can affect your safety by making the vehicle less stable, difficult to steer and take longer to stop when braking
- 3) Overloaded & over seat vehicles are in unfair competition with other haulers. In the long term, keeping within weight limits.
- 4) Overloaded & over seat vehicles are illegal - this may affect the insurance cover for the vehicle.
- 5) Overloading & over seat vehicles lead to decrease in mileage and performance.

1.2. Objectives

There are some objectives behind to develop the overloaded & over seat prevention system in vehicles that may increase the safety of vehicles & did not exceed the maximum permitted limit on vehicle.

- 1) To make stability of the vehicle.
- 2) To reduce braking default because besides the system itself, it depends on the tire and suspension performance

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which is designed for the maximum allowable weight indicated on the vehicle documents.

- 3) To reduce overloading of tire and high risk of tire blowouts.
- 4) To make a system for reduce accident or loss control of the vehicles will result in higher risk due to overloaded & over.
- 5) The main aim of this project is to make the system on the vehicle by which it will stop the overloading on vehicles automatically so that overloaded vehicle damaging the roads is reduced or avoided, and accidents avoided.

1.3. Overloading and Road Safety

Overloading and road safety has been recognized to be both a safety concern as well as a cost concern, and the National department of transport has incorporated a campaign against overloading in its Road to Safety strategy. Economic growth demands an adequate transport infrastructure. Overloaded vehicles, especially freight vehicles, are destroying our roads, impacting negatively on economic growth the damage caused grows exponentially as the load increases. Damage to roads as a result of overloading leads to higher maintenance and repair costs and shortens the life of a Road which in turn places an additional burden on the state as well as law abiding road users who ultimately carry the costs of careless and inconsiderate overloading. If the problem of overloading is not controlled, this cost has to be carried by the road user, Which will require significant increases in road user charges such as the fuel levy, vehicles license fees, and overloading fees to mention just a few.

Overloading is a safety hazard that leads to unnecessary loss of life, and also the rapid deterioration of our roads, resulting in increased maintenance and transportation costs. The phenomenon of vehicle overloading is not new and has been discussed in relation to adverse effects on road safety, accidents, and GHG emissions. Exceeding a vehicle maximum permissible weight is not only danger but also it is an illegal offence which carries with a range of risks and penalties. Overloading on vehicles would increase the effort of engine performance, so that will cause the increase of fuel consumption. In this project a overload indicator is designed for two wheeler vehicles, which indicates the maximum payload capacity by the use of shock absorber. Analysis is done on a shock absorber by varying the load capacity on bike. This project research work carried out so far in the area of overloading of two wheelers. The main purpose of this study is to understand and establish the extent to which vehicle overloading is happening in a developing country. The phenomenon of vehicle overloading is not new and has been discussed in relation to the adverse effects on vehicle engine, road safety and environment problem. Although much has been said in the context of the more developed countries, in developing countries there has not been much discussion on vehicle overloading. Design and Fabrication of Overload and Over Seat Prevention System in Two Wheelers

Vehicle overloading in a developing country is established. Many types of problems are produced due to overloading. It is found that there is moderate increase in accidents due to overloading or higher weight. An overloaded vehicle is less stable and thus incurs additional risk for the other road users.

In this project we are trying to resolve this problem of overloading in bike by allocating overload indicator system which will work based on suspension system of bike. Exceeding a vehicle's maximum permissible weight is not only a danger to the driver and road users; it is an illegal offence which carries with it a range of risks and penalties, from fixed fines to prison sentence. For any business, maximizing efficiency is key to reducing operating cost and improving profit margins. When transporting goods, the temptation to overload a vehicle in a bid to maximize payload and reduce overall fuel costs can be a costly mistake.

1.4. Government rules regarding over loading & over seat of vehicle

Here are some rules and act by Indian government for reducing the problem of overloading or to control the problem of overloading.

- a) Driving or permitting to drive a vehicle carrying excess load for heavy vehicles. Ss, 113(3), 114,115 r/w S.194 (1) of MV act.
- b) Driver of a two wheeler/motorcycle carrying more than one person in addition to himself.S.128 (1) r/w S.177 of MV act.
- c) Any person in charge of a vehicle carrying or permitting to carry any person on the running board, etc. S. 123(1) r/w S.177 of MV acts.

2. Literature Survey

Mohamed Rehan Karim and Et.al in their study have highlighted the magnitude of the problem of vehicle overloading. Apart from the impact on pavement damage and carbon emission, vehicle overloading would lead to more hazardous road environment because of the limitation in vehicle dynamics and braking performance of the vehicle to cope with the higher demands for the excess payload. As discussed earlier vehicle overloading will lengthen the stopping distance beyond the usual case when the vehicle is not overloaded. Being a developing country, effects of reduce facilities from traffic accidents have to be intensified. The occurrence of a high degree of vehicle overloading in a developing country like India, a phenomenon which may not be found in the more developed country. It is important for those responsible for the maintenance and operation of highway infrastructure to monitor and prevent vehicle overloading. [1]

Kilavo Hassan and Et.al done overview on passengers overload in public buses has been a problem in various countries. The current situation for controlling overloading passengers in public buses needs to be improved. There is a need to device a new system which can overcome all this difficulties as the technology is growing we need to utilize it for the development of our country. This may include safety and comfort during the journey, safety at the stop point and terminals, buses travel and stop in the assign routes and terminal. The finding indicate that many deaths and injuries when accident occurs, they causes deaths and injuries mainly if there is passengers overloading or if the passengers are not wearing seat belt or both. Many people lose their

lives and some are severely injured when accident occur in the public buses. [2]

Traffic Penalty Point System

What you need to know

- Points in addition to regular fine for same violation
- Pending challans will not be counted
- Violations from August 1 to be considered
- Focus on driver with on-the-spot action
- Points will be accrued for driver, not owner of vehicle
- Up to 3 months in jail and vehicle will be seized if caught driving despite licence suspended
- Penalty points accrue on driving licence of individual
- Points to remain for a block period of 24 months
- Commuters have to be aware of penalty point system to avoid suspension of driving licence

Notifications

- Every time you accrue a point, you will get an SMS
- Point tally available on RTA m-Wallet app
- Challan notice too will have information on points accrued

Awareness programmes have been conducted. Everything is set for implementation of the new system from Tuesday

— V RAYENDER, Joint Commissioner of Police (Traffic)

POINTS FOR EACH VIOLATION

Points	Violations
1	No seat belt/helmet Extra passengers in front seat of auto (taxis)
2	Unauthorised carrying of passengers in goods vehicle Wrong side driving Driving at speed up to 40 kmph higher than permitted limit
3	Driving at speed exceeding 40 kmph higher than permitted speed Drunk driving of 2-wheeler Racing and trial of speed while driving
4	Drunk driving of 4-wheeler, truck, goods carrier Driving dangerously, using cellphone while driving, excess load projection on either side, jumping signal, lane crossing
5	Drunk driving of a public service vehicle, i.e. bus, cab, auto Violating road safety, noise and air pollution laws Using the vehicle while committing chain snatching, robbery, similar offences

Additional violations (6-12 points):

- Violating road safety, noise and air pollution laws
- Using the vehicle while committing chain snatching, robbery, similar offences
- Driving without insurance certificate
- No public liability certificate for vehicles carrying or meant to carry hazardous substances
- Cognizable offences involving (i) 279/336/337/338 of IPC

3. Working

The overloading detector setup consists of the following parts. They are spring, metallic rod, electric circuit, metal board frame, drive motor, belt drive, shaft, bearing, wheel etc. A coil spring, also known as a helical spring, is a mechanical device which is typically used to store energy and subsequently release it, to absorb shock, or to maintain a force between contacting surfaces. They are made of an elastic material formed into the shape of a helix which returns to its natural length when unloaded. Metal frame board is used to hold the springs in a fixed position so that they do not move during environmental vibrations. It is also used to hold the springs with smaller diameter inside the in the middle of the springs with large diameter in a fixed position. Frame board is used to hold the spring at both the top surface and the bottom Surface. A small hole is half drilled at the frame board whose thickness is half of the frame board Thickness and its diameter of the hole is exactly same as the external diameter of the spring. The springs and metallic rod are being fixed to the frame board as shown in Fig.4.1. Another hole is drilled in the center of the half drilled frame board whose diameter is as same as the diameter of the metallic rod which is on the top frame surface. In the bottom frame surface a hole is drilled straight to the metallic rod and a bolt is fixed through the hole and a nut is used to tight the bolt.

The overload detector is used for indicating the overload in two wheelers. This mainly depends on the compression of the spring. Two frame boards are used. Two springs are fixed in between the two frame boards. The springs with smaller diameter is inserted within the two springs which are fixed to the top frame board. The length of the spring with smaller diameter is lesser than that of the spring and it also depends on the tension of the spring. The two rods are connected by a metallic connecting wire and is connected to the positive terminal of the LED. The negative terminal of LED is connected to the positive terminal of battery. The two screws in the lower frame board are connected to negative terminal of the battery. When load goes beyond its permissible limit the spring gets compressed and the smaller

springs inside the spring touches the bottom screw which is attached to the lower board. Thus the model becomes a short circuit leaving the electron flow from positive to negative of Design and Fabrication of Overload and Over Seat Prevention System In Two Wheelers the battery. Thus circuit is capable of conducting current which leads the LED to glow. Thus the overload in the vehicle is indicated using this model. When implementing in two wheelers the springs are replaced by the shock observers in them. The smaller springs is inserted within the shock observers. The length of small spring is smaller than that of the shock observer. Depending upon the tension of the spring the small spring length can be adjusted. The two small springs are connected by a metallic connecting wire and is connected to the positive terminal of the LED. The negative terminal of LED is connected to the positive terminal of battery. The two wheeler battery is used in original care but in the model a battery holder with two batteries is used. The over load detector does not require a separate space in the vehicle as the rod is placed inside the shock absorber which act as the spring in our model.

In this project we are make an overload & over seat prevention system in two wheel vehicle being moved by the DC motor drive through belt drive with, load carrying system which is having coil spring cushioning and the cushioning is set for the particular load and if overloaded, will activate the micro-switch to trigger the control circuit to indicate the small light on the dash board and sound a buzzer so that the driver come to know the overloading and simultaneously cutoff the supply of battery to prime mover , so that the overloading is controlled. If the driver tends to move the vehicle with overload, the buzzer sounds continuously which is heard by the driver only & due to after pre calculated over seat & overload the system will cutoff the supply of battery to prime mover. When the vehicle is moving on road and when it comes across the police station or outpost, it is sensed by the vehicle through radio remote frequency receiver circuit within the vehicle (radio remote frequency are continuously transmitted by the check post or police station or police vehicles of the same frequencies) which is received and the control circuit will

trigger the siren on, drawing the attention of the police enforcer or authorities to stop the vehicle and penalize and force to unload the extra load. The vehicle is moved by DC motor to show the demonstration.

4. Construction

Overloaded & over seat prevention system generally consists of following components can be given below,

Sr. No.	Material	Qty.
1	Pedestal Bearing	2
2	Gear Motor 50 Watt, 60 Rpm	1
3	Motor Pulley	1
4	Shaft Pulley	1
5	Belt	1
6	Coil Springs	2
7	12 Volt ,5 Amp Transformer	1
8	Nut & Bolt	10
9	Electronics control with timer	1
10	Supporting frame	1
11	Buzzer indicator	1

5. Advantages & Applications

Advantages

- 1) The safety of driver & passenger is ensured.
- 2) The operation of the new system is well controlled.
- 3) It minimizes misalignment & less floor space is required.
- 4) Only simple support structures are required Design & fabrication is easy.

Application:-

- 1) It is used for passenger safety which overcomes the problems of accidents due to over seat & overloads of commercial vehicles like two wheelers, Car, Buses & Trucks by using this automation system.



6. Conclusion

While concluding this report, we feel quite fulfill in having completed the project assignment well on time, we had enormous practical experience on fulfillment of the manufacturing schedules of the working project model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose. Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of balancing problem. Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction.

The model develops by us fulfill the required objectives of the project. After some modifications in this system develop automation unit for vehicle safety that can easily be adopted in today"s automobile field. Hence, we are satisfied with our project work.

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