

# Review Paper on Overloading Effect

Rupal Shah<sup>1</sup>, Yogesh Sharma<sup>2</sup>, Binil Mathew<sup>3</sup>, Vijay Kateshiya<sup>4</sup> and  
Jatin Parmar<sup>5</sup>

<sup>1</sup> Asstt. Prof., Department of Mechanical Engineering, Grow More Faculty of Engineering,  
Gujarat, India

<sup>2,3,4,5</sup> Department of Mechanical Engineering, Grow More Faculty of Engineering,  
Gujarat, India

## Abstract

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 pay load capacity by the use of shock absorber. Analysis is done on a shock absorber by varying the load capacity on bike. This paper reviews the research work carried out so far in the area of overloading of two wheelers.

**Keywords:** *Vehicle overloading, load, road safety, damages*

## 1. Introduction

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 [1]. In this study 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 [2]. 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. Overloading vehicles significantly increases fuel consumption. Tires are more prone to wear, steering becomes more difficult to control and vehicles take longer to react to braking. This can dramatically affect vehicle handling, increase daily wear and tear and increase the likelihood of a costly and potentially fatal accident. The findings indicates that many deaths and injuries when accident occur, they cause death and injuries mainly if there is passenger overloading or if the passenger are not wearing seat belts or both. Many people lose their lives and some are severely injured when accident occurs in these public buses [3].

Overloading on vehicles would increase the effect of engine performance, so that will cause the increase of fuel consumption. That increasing also would affect the concentration of gas emission from vehicles [4]. Road infrastructure is one of the basic facilities needed for the growth and advancement of any modern economy. The growth of every country's economy is

measured by the growth of its transport infrastructure. This is very true the state of failed roads all over nation gives a clear picture of the situation of the economy. The road network system has so failed that travelling within any part has turned to be the most assiduous venture for the citizens to undertake. For these reasons, this research examines the devastating effects of truck overloads on the road pavement failure <sup>[5]</sup>.

As we know and discussed earlier there is much problems of overloading in developing countries in two wheeler as well as four wheeler vehicle, the vehicles are mostly overloaded and is happen due to overweight and no. of persons seated on it. In most of developing countries there are many rules and regulations are there prepared or made by Indian government to overcome the problem of overloading in vehicles but that rules are not followed by the people mostly in the developing countries so that is one of the reason from which the problem of overloading is occurs.

## AS PER GOVERNMENT RULES <sup>[7]</sup>

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

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.

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.

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 , Ahmad Saifizul Abdullah, Hideo Yamanaka, AirulSharizli Abdullah and Rahizarramli <sup>[1]</sup> 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 pay loads. 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.

Kilavo Hassan, Anaelsam, Dina machuve <sup>[3]</sup> 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 severally injured when accident occur in the public buses.

Wahid WAHYUDI, Achmad WICAKSONA, AgusTaufik MULYONA, Putra Abu SANDRA and RegiRisman SANDI <sup>[4]</sup> had done study on impact of axle load overloading on freight vehicles toward the increasing of greenhouse gas emission by oxides and carbon. Overloading on vehicles would increase the effort of engine performance so that will causes the increase of fuel consumption. That increasing also would affect the concentration of gas emission from vehicle. This research will discuss about the impact of overloading towards concentration gas emission from heavy freight vehicle, specially oxides of carbon which cause green hose effect, specifically CO and CO<sub>2</sub>. Due to this air pollution can occurs. Air pollution which is a process of inclusion some substance, energy, or other component to ambient air by human activity can causes decreasing of ambient air quality until certain degree which causes the ambient air cannot fulfill its function. Based on the analysis in this study, it can be concluded that change over the axial load freight vehicles comparable correlation with exists emissions.

Anthony Nkem Ede <sup>[5]</sup> analyzed the cumulative damage effects of truck overloads on Nigerian road pavements. (Table1). Road infrastructure is basic facility needed for the growth and an advancement of any modern economy. The expected pavement load

was quantified thought equivalent single axle load. Analysis of the data result in the existence of high vehicle damage factors caused by overloaded heavy vehicle. Roads in good shape reduce the operational cost of vehicle; ensure punctuality in transport service delivery and guarantees safety of person and goods.

Table-1: Pollutants from motor vehicle emission which can cause air pollution [5]

Emission	Impact	Impact scale
Carbon Dioxide (CO <sub>2</sub> )	Climate change	Global
Carbon Monoxide (CO)	Human health, climate change	Local
Fine particles (PM <sub>10</sub> ; PM <sub>2.5</sub> )	Climate change, esthetics	Local
Road Dust	Human health, esthetics	Local
Lead (Pb)	Human health, ecological hazards	Local
Methane (CH <sub>4</sub> )	Climate change	Global
Oxides of nitrogen (NO <sub>x</sub> )	Human health, ozone precursor	Local and regional
Ozone (O <sub>3</sub> )	Human health, plants, esthetics	Regional
Oxides of sulphur (SO <sub>x</sub> )	Human health, ecological hazards	Local and regional
Volatile Organic Compounds	Human health, ozone precursor	Local and regional

NondeLushinga and Jiang Xin [6] has carried out study on effect of horizontal shear load on pavement performance. Severe pavement damage often occurs in area where vehicles break, accelerate or decelerate such as toll gates and police check point. This meant that where breaking or horizontal was applied, slipping of pavement layer was likely to occur. When overloading condition was simulated, critical strain increase significantly compared to a situation where a normal condition was simulated. This meant that overloading could reduce fatigue life of pavements and increase changes of rutting. Overloading generally crushes and densifies the aggregates in asphalt concrete mixture and reduces air voids. When overloading condition was simulated, critical strains such as tensile

strains at the bottom of wearing surface and compressive strains at the top of subgrade increased significantly compared to a simulation where a standard load conditions was simulated.

Bernard Jacob, Veronique Feypell-de La beaumelle [8] has done study on improving truck safety: potential of weight in motion technology. New technologies are being developed for more efficient overload screening and enforcement. Weight-in-motion technologies allow trucks to be weighted in the traffic flow, without any disruption to operations much progress has been made recently to improve an implement WIM system.



Figure 1 : Overloading Effect

An overloaded vehicle is more likely to be involved in an accident, and have more severe consequences, than legally loaded vehicle. An overloaded vehicle is less stable because of the increased height at the center of gravity and more inertia of the vehicle body. An overloaded vehicle becomes under powered, this results in lower speed on the uphill slope as well as the risk of congestion, inefficient engine braking and overspeeding on downhill slope. Overtaking also takes longer and thus incurs additional risk for the other road users.

Pinjarla.Poornamohan and Laxmana Kishore.T [9] has done practical for design and analysis of shock absorber. Suspension or shock absorber is a mechanical device designed to smooth out or dampen shock impulse and dissipate kinetic energy of spring. In a vehicle it reduces the effect of traveling over rough ground, leading to improved ride quality and increased comfort due to substantially reduced amplitude of the disturbance. Specialized shock absorbers for racing purposes may allow the front end of a dragster to rise with minimum stress under acceleration.

### 3. Conclusion

The outcome of this study has 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 dynamic and braking. The current situation for controlling overloading passenger in public buses to be improved. This condition leads to the increasing of accumulated level of CO and CO<sub>2</sub> in the ambient air and also increasing potential for the formation of the greenhouse gas emission. Base on BISAR 3.0 pavement simulation of a semi-rigid base pavement structure, it was concluded that severe damage often occurs in area of vehicle braking, acceleration or deceleration was caused by combination of excessive horizontal shear stress included by the braking effect of vehicle and overloading. They have also designed a shock absorber used in bike and have modeled it using 3D parametric software by reducing the diameter and stress analysis is performed. They had analyzed that their modified spring has reduced in weight and it is safe. As the technology is growing we need to utilize it for the development of our country. WIM has helped to reduce the number of overloaded trucks and contribute to the more efficient and effective. A reduction in overloaded truck is also conducive to a reduction in crashes.

### References

- [1] Mohamed R K , Ahmad S A, Hideo Y, Airul S A, Rahizar R, Degree of Vehicle Overloading and its Implication on Road Safety in Developing Countries. IISTE (Civil and Environmental Research) , Vol 3(12),20-31,(2013).
- [2] Axle Weighbridges and Axle Weigh Pads,<http://www.averyweigh-tronix.com/axle-weighing>
- [3] Hassan K, Anaelsam and Machuve D, Overview on passengers overloads control in public buses. IJECS , VOL2 (8), 2536-2540, August ( 2013).
- [4] Wahid W, Achmad W, AgusTaufik M, Putra Abu S and RegiRisman S, Impact of axle load overloading on freight vehicles toward the increasing of green house gas emission by oxides and carbon. Proceeding of the Eastern Asia Society for Transportation Studies, VOL.9, (2013).
- [5] Ede A N, Cumulative Damage Effects of Truck Overloads on Nigerian Road Pavement. International Journal of Civil & Environmental Engineering IJCEE-IJENS, Vol 14(01),21-26, February (2014).
- [6] Lushingaand N and Xin J , Effect of Horizontal Shear Load on Pavement Performance. IPCBEE vol. 80(17),Pg No. 83-87(2015)
- [7] [www.theautomotiveindia.com/forum/roads-safety-driving-sense/3115-all-about-indian-motor-vehicle-rules-laws.html](http://www.theautomotiveindia.com/forum/roads-safety-driving-sense/3115-all-about-indian-motor-vehicle-rules-laws.html)
- [8] Jacob B and Veronique Feypell-de La beaumelle, Improving truck safety: potential of weight in motion technology. IATSS Research 34, 9-15,(2010).
- [9] Poornamohan P and Lakshmana Kishore.T Design and Analysis of a shock absorber. International Journal of Research in Engineering and Technology ( IJRET), Vol 1 (4), 578-592, Dec (2012).
- [10] Singh K, Automobile engineering, Vol 1, Standard Publishers Distributors, Delhi (2012).