Journal of The Gujarat Research Society
ISSN: 0374-8588
Volume 21 Issue 9, September 2019

IMPACT OF SPEED BUMP ON VEHICLES NOISE

Dr. C Saravanan
Faculty of Engineering and Technology,
Jain (Deemed-to-be University), Ramnagar District, Karnataka – 562112
Email Id: c.saravanan@jainuniversity.ac.in

Abstract

The most commonly used transportation is roadways. There are many vehicles passing day and night on roads. Since many are using the same way of transport, there is a risk of accidents and noise pollution everywhere. Most accidents are caused by excessive speed or aggressive driver behavior. One of the most popular speed regulation implementations is speed bumps. However, there are some problems with speed bumps as well - it has been noticed that speed bumps increase motor vehicle-induced noise. This article presents investigation on how speed bumps increase motor vehicle-induced noise.

Keywords: *Accident, Noise, Speed bump, Speed, Vehicles.*

I. INTRODUCTION

The over speed of vehicles is the major factor in the road accidents. According to the NHTSA (National Highway Traffic Safety Administration), a crash is mainly due to over speeding of vehicles. The use of vertical deflection devices is popular around the world to minimize collisions, and a low-speed limit, below 40 km/h (25 mph) or lower, is most frequently seen to be implemented. This equipment is known as the speed breaker. The common name for a family of traffic calming devices that use vertical deflection to slow motor-vehicle traffic in order to improve safety conditions is speed bumps (or speed breakers). Initially, for the stopping vehicle speeding system, the speed breaker was designed to lift the crosswalks five inches above road level[1]. In India, 1,214 road accidents occur every day. Two-wheelers make up 25 percent of the estimated deaths from road accidents. Every day, 20 children die under the age of 14. The state with the highest number of road accidents in Tamilnadu. This system's biggest downside is that it has a huge impact on emergency vehicles. It will not provide the vehicle, like the ambulance, with a simple route[2].

With increase of automation of the manufacturing industry and agriculture, traffic flows in towns and residential areas as well as with household appliances becoming more modern, the number of acoustical discomfort zones is rapidly growing. One of the key factors predetermining the comfort measure is the amount of noise in the workplace or home environment, so increasing attention is paid to the study of noise processes. Noise is described as an irritating sound that induces discomfort. Much of the noise one hears comes from the actions of humans. The key sources of noise are: transport, equipment for manufacturing and building and special events. In industrial communities and towns, noise pollution is rising. Traffic-generated noise accounts for 60-80 percent of the noise in cities, and noise levels in

cities have risen by approximately 0.5-1 dB per year over the last 10 years[3]. Therefore, shields and walls that protect against noise and emissions are installed along high-traffic streets, highways and noisy factories all over the world in order to minimize noise pollution in the environment. It is well known that noise has many negative physiological and psychological effects on individuals and many residents suffer from noise produced by traffic - continuous noise acts as a factor that induces stress and nervous stress. Urban noise, primarily due to heavy road and air traffic, has become a major environmental issue, although several technologies have been implemented to minimize industrial noise. Among the most severe health consequences of urban noise is sleep disruption. The question of traffic noise is almost 30 years old because of crossroads with traffic lights and roundabouts[4].

The origins of environmental noise are human activities especially associated with the process of urbanization and the development of transport. A few most common approaches for reducing environmental noise levels are as follows:

- Reducing noise at source - from machines, engines,

.tires and surface;

- reducing speeds and traffic volume;

- limiting the transmission of noise by placing sound barriers between the source and people affected;

- reducing noise at the reception point, such as noise insulation of buildings[5].

The level of noise caused by the vehicle depends on the number of components: driving speed, vehicle technical state, traffic strength, tires, road paving, etc. Traffic noise consists of two components: the sound wave produced directly by the source of noise, which involves mechanical noise - noise from the engine and electric fan, and noise generated by the tire-pavement contact. The noise reflected by the pavement surface is the second part. Speed reductions are a means of minimizing traffic noise, provided that the steps required do not contribute to acceleration and deceleration changes. Drivers know from experience that humps cause large vehicle body pitching movement, large suspension travel at high crossing speeds, and can further result in wheels losing contact with the road surface. On the other hand, speed limit bumps have a serious impact on riding at low crossing speeds and can lose their effectiveness at higher crossing speeds[6].

A speed bump, speed hump or ramp is a traffic calming road design measure used to slow traffic or decrease traffic by vertical deflection. To discourage vehicles from driving before and after the hump, humps are mounted across the road to slow traffic and are often built in a sequence of several humps. Before humps, a warning sign notifies motorists. In general, humps have pavement markings to improve visibility and a taper edge near the curb to allow a drainage gap. In places where very low speeds are required and acceptable, speed humps are used. Usually, speed humps are installed on rural roads and are not used on main roads or primary routes of emergency response. In general, location is mid-block between intersections. There are common speeds of 15-30 km/h resulting from speed humps. Studies show an average reduction in traffic volume of 18 percent and an average reduction in accidents of 13 percent. While speed bumps are very effective in holding the speed of vehicles down, their use is often controversial because if taken at too high a speed, they cause noise and probably vehicle harm.

In vehicles with low ground clearance, such as sports cars, poorly built speed bumps often found in private parking lots are difficult to navigate, even at very slow speeds.

If not readily seen, speed bumps often pose serious hazards to motorcyclists and bicyclists, but a slight cut in the bump in some cases enables such vehicles to pass through without impedance. It is assumed that an optimum hump shape would cause the driver maximum discomfort above the speed limit while reducing discomfort below the reference speed. Light car diagrams going over hump and bump speed. Parabolic, circular, and sinusoidal are typical speed hump shapes. While similar to speed bumps, at low speeds, humps are less violent than speed bumps and are used on real streets, as opposed to bumps primarily installed in parking lots. The humps slow cars to 15-30 km/h, although speed bumps usually slow cars to 8-15 km/h). The narrow design of speed bumps also allows high-speed vehicles to drive over them without disrupting the wheels and suspension only, hardly impacting the cab of the vehicle and its occupants[7]. At higher speeds, the relatively long slopes of speed humps gradually accelerate the entire vehicle in a vertical direction, causing the disruption of the cab to gradually become more intense. Speed cushions are traffic calming devices that are built as many small speed humps with gaps between them mounted around the width of the lane. They are normally mounted in a sequence that resembles a split speed hump across a roadway. As they ride with one or both wheels on the hump, the nature of speed cushions causes cars to slow down. The wider axle of fire engines (and all other large vehicles) allows the cushions to be straddled without slowing down, however. Before and after the bump, drivers slow down and at places where the system does not stretch over the entire street, perform diversion man oeuvres by travelling short distances in bus lanes, bus stops, or oncoming traffic lanes. Increased road noise induces this kind of conduct - clatter driving over the speed bump, acceleration after it. That also depends on the type of vehicle - heavy vehicles produce more noise going over the speed bump than passenger cars and speed bump duration - as can be seen in the above image, if the speed bump is long, it is often easier to go through and less inconvenience is faced by the drivers. But if the speed bump is short, then the vehicle trembles more and that increases noise and drivers feel more uncomfortable[8].

Other sources argue that speed bumps increase pollution as traffic travels in a lower gear using significantly more fuel per mile are a substitute for active enforcement increase noise by both traversing over the bumps and by using more engine revs than normal. Its effect on emergency vehicles is the drawback of speed humps. For fire trucks and fire engines, the response time is delayed by 3-5 s per hump and up to 10 s for ambulances with patients on board (Institute of Transportation). Therefore, speed humps are not commonly installed on primary response routes. Instead, speed cushions might be put on these roads. Traffic noise from the braking and acceleration of vehicles on roads with speed humps, particularly from buses and trucks, has sometimes increased. Other consequences include increased fuel consumption and emissions for automobiles - as most fuel injection systems in modern internal combustion engines work with acceleration in open-loop mode (fuel-rich) - and increased wear and tear on brakes, engines and suspension parts. Heavy sedans, trucks, and S.U.Vs are often less impacted by speed humps (a big vehicle with an engine that provides power to all four wheels that is usually used for ordinary driving), and do not have to slow down as drastically[9].

II. CONCLUSION & DISCUSSION

The noise levels on the main road near residential areas or educational areas are above the recommended level (65 dBA). This is mainly caused by heavy vehicles which generate more

noise in engine crossing road obstacles. When driving through a speed bump, most noise was emitted when comparing vehicle-induced noise results at different form speed decreasing units. That is because speed bumps (too tall, too sharp an angle for the expected speed) are poorly built, whereas speed cushions or humps are flat and low. The majority of traffic noise reported was caused by passenger cars (95 percent). The remaining 5% are heavy vehicles that have created the highest levels of noise. If speed bumps are broken over time, noise levels are slightly lower, but vehicle speed is also higher, and a speed control system is no longer functional and loses its function, all speed reduction devices must be continuously renewed.

III. REFERENCES

[1] D. Garcia-Pozuelo, A. Gauchia, E. Olmeda, and V. Diaz, "Bump modeling and vehicle vertical dynamics prediction," *Advances in Mechanical Engineering*, 2014, doi: 10.1155/2014/736576.

[2] M. Pau and S. Angius, "Do speed bumps really decrease traffic speed? An Italian experience," *Accident Analysis and Prevention*, 2001, doi: 10.1016/S0001-4575(00)00070-1.

[3] M. Ramadan, M. Khaled, and H. El Hage, "Using Speed Bump for Power Generation-Experimental Study," 2015, doi: 10.1016/j.egypro.2015.07.192.

[4] T. A. O. Salau, A. O. Adeyefa, and S. A. Oke, "Vehicle speed control using road bumps," *Transport*, 2004, doi: 10.1080/16484142.2004.9637965.

[5] M. S. R. Jones and R. T. K. G. Santhosh, "A Break Free Path for Ambulance using Speed Breaker A Break Free Path for Ambulance using Speed Breaker," no. January, 2018.

[6] C. Bose and H. Deepanjali, "Height Adjustable Speed Breaker and U-Turn Indicator," vol. 6, no. 3, pp. 240–244, 2018.

[7] A. Gupta, "Study on Speed Profile Across," pp. 1–43, 2014.

[8] T. Januševičius and R. Akelaitytė, "Speed bumps impact on motor transport noise," *Baltic Journal of Road and Bridge Engineering*, vol. 10, no. 2, pp. 191–199, 2015, doi: 10.3846/bjrbe.2015.24.

[9] A. Azam, M. A. Aslam, S. Ali, and F. Q. Yousef-Zai, "138. Speed Breaker Power Generator," 2016.