Abstract

These Road Bumps play a crucial role in enforcing Speed limits, thereby preventing over speeding of vehicles. It significantly contributes to the overall road safety objectives through the prevention of accidents that lead to deaths of Pedestrians and Damage of vehicles. Despite the importance of Road Bumps very little research has been done to investigate into their design. While documentation exists on quantitative description of road bumps, they offer little guidance to decision making. This work presents a unique approach to solving road bumps design problems. The key variables are bump height, bump width and effective distance between two consecutive road bumps. Since vehicle speed control and vehicle efficiency is the ultimate aim of this project. The relationship between vehicles speed and other variables earlier mentioned has to be established. The project will be done in Two Phase. In first phase Survey will be done to understand the difficulties faced by people on day to day life due to road hump and based on that conceptual design will be made. Whereas in the second phase, the Conceptual Design of the project will be done. In conceptual design we have provided rollers in contact with gears so that they can be rotated in opposite direction and will help in slowing down the speed. The whole structure can be placed on the road level providing only rollers to rotate in opposite direction. This design was proposed so as to overcome the drawbacks of traditional hump i.e. too much height, sudden braking, accidents at night, decrease in efficiency of vehicle etc.
1. Introduction

Speed humps are 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. Variations include the speed hump (or speed ramp), speed cushion, and speed table. The use of vertical deflection devices is widespread around the world, and they are most commonly found where vehicle speeds are statutorily mandated to be low, usually 40 km/h (25 mph), or 8 to 16 km/h (5.0 to 9.9 mph) in car parks. Although speed bumps are very effective in keeping vehicle speed down, their use is sometimes controversial as they can cause noise and possibly vehicle damage if taken at too great a speed. Poorly designed speed bumps are often found in private car parks and can be hard to negotiate in vehicles with low ground clearance, such as sports cars, even at very slow speeds. Vertical deflections may be of different height, width and forms. In fact, there is no particular design which is appropriate for all types of vehicles on the roads. Although humps are usually applied for this purpose, yet there are no acceptable and proper instructions for design of these vertical deflections. They are also known as “Sleeping Policeman”.

1.1 Objectives and Methodology

a. Objectives

The main objectives of the project were to:

- To analyze the decrease in efficiency of a vehicle due to road humps
- To identify the problems faced by people due to humps.
- To model a conceptual design of hump so, as to overcome the drawbacks of traditional humps.
- To compare the efficiency of vehicle in both traditional hump and conceptual hump.

b. Methodology

- Literature survey
- The Analysis on decrease in efficiency of vehicle based on public survey.
- Segregation of data on the basis of different categories.
- Opinion drawn from the survey and efficiency test
- Conceptual design of hump keeping in mind of public opinion and standards.
- Fabrication of conceptualized designed speed hump.
- Analysis of result by comparing the traditional and conceptual speed hump.

2. Survey

![Figure 2.1: Locations for survey](image-url)
Different locations were chosen for the survey.
Jayanagar, Mysore road, Cubbon park, Banashankari, R.R Nagar, Mathikhere.

2.1 Graph Criteria

2.2 Age group 18-30 yrs

2.3 Age group 31-45 yrs

Graphs 2.1 and 2.2 provide data on the vehicle's economy and the number of accidents at night for different age groups and vehicle types.
2.4 Age group above 45 yrs

**Vehicles Economy**

- Strongly Agree: 42%
- Agree: 47%
- Disagree: 11%

**Affect On Vehicle Parts**

- YES: 47.23%
- NO: 36.11%
- Yes (Very Badly): 16.66%

**Accidents at Night**

- Accidents at Night: 58.33% (YES), 41.66% (NO)

Graph 2.3 for age group above 45 yrs

2.5 Two wheeler

**Vehicles' Economy**

- Strongly Agree: 51.12%
- Agree: 37.11%
- Disagree: 8.76%

**Affect On Vehicle Parts**

- Yes (slightly): 58.76%
- No: 18.05%
- Yes (badly): 23.19%

**Accidents At Night**

- Yes: 74.23%
- No: 2.5%

Graph 2.4 for 2-wheeler

2.6 Three wheeler

**Vehicles' Economy**

- Strongly Agree: 55%
- Agree: 45%

**Affect On Vehicle Parts**

- Yes (slightly): 60%
- No: 18%
- Yes (badly): 25%

**Accidents At Night**

- Yes: 85%
- No: 15%

Graph 2.5 for 3-wheeler

Ketan Kumar, Keerti Kumar, Md Tousif Hyder, Nikhil Anand, Uday M: Analysis on Loss of Efficiency in Vehicle Due To Road Hump and Fabrication of Conceptual Design
2.7 Four wheeler

**Vehicles' Economy**

- Strongly Agree: 43.67%
- Agree: 42.67%
- Disagree: 8.66%

**Affect on Vehicle Parts**

- YES (SLIGHTLY): 13.33%
- NO: 33.33%
- YES (BADLY): 53.33%

Graph 2.6 for 4-wheeler

3. Conceptual design of hump

The above figure illustrates the basic design of hump. It consists of a flat bed, two pairs of hollow cylinder and a shaft.

Figure 3.2: Conceptual design with gears
• In the above figure gear mechanism is shown which is used to rotate the rollers in opposite direction when the wheel of vehicle passes by the rollers.

3.1 Working

• The working principle is taken from DYNO Test. which is basically done for testing vehicles performance on the basis of various parameters ie; torque, speed etc.
• It consists of four rollers each on the front and back side. These rollers are used to roll the tyres of vehicle during test. A small gap exists between two consecutive pair of rollers so as to place the tyres in between them.
• Using this concept as the basic principle speed humps were designed. But with small modification.
• As from the figure it is clear that the tyres are made to fit in between the consecutive rollers and then the rolling process takes place. Where as in humps we have provided them with gears so that once the wheel passes by the first roller another roller rotates in opposite direction.
• This rolling of rollers in opposite direction will be used to oppose the motion of vehicle up to some extent.

4. Fabrication

Rectangular hollow metal sections and rollers were cut as per the required dimension. After cutting the rectangular hollow metal section welding was done to build the base structure where as shafts were made for the rollers. Once the rollers were ready knurling was done to increase the friction. Soon after this, assembly was done where rollers were attached to bearing and gears. The complete set was given with small elevation on both the sides for the testing purpose (10° degree).
5 Testing

Efficiency test was carried out on a normal road as well as on the ground so as to understand the Loss in vehicle efficiency due to road hump and the data were tabulated.

Table 5.1: Efficiency test

<table>
<thead>
<tr>
<th></th>
<th>Bajaj Pulsar 150cc</th>
<th>Hero Honda splendour</th>
<th>Hero Honda Karizma R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideal Condition</td>
<td>10km</td>
<td>13km</td>
<td>7km</td>
</tr>
<tr>
<td>Tested with Speed Humps</td>
<td>8.3km</td>
<td>11.1km</td>
<td>5.2km</td>
</tr>
</tbody>
</table>

After the fabrication of conceptual hump test was done to draw the conclusion about its effectiveness.

Table 5.2 Effectiveness test of conceptual hump

<table>
<thead>
<tr>
<th>Vehicle Name</th>
<th>Vehicle Specification</th>
<th>Test Result in km/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Single seater</td>
</tr>
<tr>
<td></td>
<td>Weight (Kg)</td>
<td>Length</td>
</tr>
<tr>
<td>Bajaj Pulsar 150cc</td>
<td>143</td>
<td>1.4</td>
</tr>
<tr>
<td>Yamaha fz 16</td>
<td>135</td>
<td>1.32</td>
</tr>
<tr>
<td>Hero Honda splendor</td>
<td>112</td>
<td>1.30</td>
</tr>
<tr>
<td>Hero Honda karizma</td>
<td>146</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Figure 5.1: During testing
6. Conclusion

- Conceptual designed hump provide multiple advantages over traditional hump. First and most important, conceptual designed hump can be placed on a plane road with no spherical curvature which increases the safety.
- It increases the efficiency of vehicle as they need not have to be completely stopped instantly whereas there will be decrease in speed over a stretch.
- It reduces the noise pollution as well as the wear and tear of vehicle parts due to road hump.
- This concept is best suited for the highways where vehicle at high speed can be slowed down not instantly but over a stretch of few seconds.
- We have provided metal structure with small inclination on both the sides for the test purpose. This can be undone and can be installed on road level. If the installation is done properly on the road level it will increase the efficiency of vehicle by 25-30%.

References

[5] Intelligent speed hump – YouTube

Biographies

1st. Ketan Kumar is a B.E student in department of mechanical engineering from SJB Institute of Technology, Bangalore. His interests are in the fields of engineering design and product development.

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