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Reading and Analyzing of Non-Newtonian speed Bumps (speed breakers)

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Abstract - *A speeding car can be a threat to other road users especially on roads where communication between motorized and non-motorized vehicles is high, such as highways, school areas and communities. Although there are speed indicators, there is much left to the drivers' code of conduct as to whether they should follow them. Therefore, vehicle speed control is an important factor in traffic control. Another way to control speed is to use a speed breaker that generates stress while the driver is passing by. It plays an important role in using speed limits, thus preventing excessive speeding.*

Keywords: Non Newtonian Fluid Speed breaker, Speed Breaker, Non-Newtonian Fluid

1. INTRODUCTION

1.1 GENERAL

Measures to silence traffic are very common in today's society. Traffic mitigation measures are a physiological process that develops or forces drivers to drive at a certain speed. They prevent the car from speeding up and can increase overall road safety. Silencing traffic can also make the roads easier and more convenient for other users such as pedestrians, cyclists and nearby residents. The main purpose of the mitigation measures is to prevent the vehicle from speeding up and to create a safe and secure traffic area. Speed breakers are a type of step that is often used to prevent a car from speeding through seating areas. A typical speed breaker usually consists of a concrete or asphalt hump structure on the road. They are designed to be blown up at a comfortable design speed, while causing extreme vibration at high speeds. Drivers should slow down when driving over the speed limit to avoid damage to their vehicle. However, even if it is moving at a limited speed designed or below, these common speed developers can disrupt car components, such as shock absorbers and steering system. This study is related to a vehicle speed control device that is sensitive to vehicle speed. The good news is that when the car is moving at low speeds, the intensity of the non-Newtonian fluid speed breaker decreases so that the vehicles can pass easily without jumping or jumping. However, when the vehicle exceeds the design speed, the speed of the Newtonian fluid speed breaker increases and the vehicle jumps faster. This speed control device will also allow emergency vehicles to pass the speed breaker without reducing their speed which will reduce their response time to emergencies.

2. BOOK REVIEW

Various studies were conducted and one of them was a study in the Netherlands and Australia by Zaidel D. et al. (1992).

The review of road bumper books includes many questions about the construction of speed bump systems that can respond quickly to road conditions. Speed bumpers are elevated sections of road that are designed to limit the speed of vehicles. They are about 15 feet [4 m] long, between two and a half inches [76-100 mm], and can cover a whole or a half of the width of the road. The speed bump works by transmitting rising energy to the car, as well as its passengers, as they cross the bump. The force causes the speed to jump from front to back in the cars. Acceleration decreases at high speeds due to the absorption of the impact on vehicle suspension.

1)Various studies have been conducted on speed conflicts covering geometrical bump designs or guidelines, proper design of structures, bump efficiency, speed variation over bump, factors influencing bump designs, etc. For bump design a straightforward process should also be followed in order for this guide to research by Sahoo P.K. (2009)

2) Where a computer model was developed to mimic the geometric features of speed bumps and motor speeds. On the basis of the research the measures were; first select a specific design for the 85th percentile bump-cross crossing and then find the required A / W ratio in the appropriate equation and then select the node shape: circle, additional corresponding profiles to be used, bump width and A / W The maximum lump length should be obtained and its validity should be checked. Based on the observations found in the study, Bump crossing speed was predicted based on the measurement of the area using different geometric speed bump designs and the result obtained was R-Sq equal to 0.56 for two wheels and R-Sq equal to 0.6 for cars of passengers. Similarly Henry County, U.S. province. Georgia, has a specific code for Henry County.

3) That jeopardizes the full speed limit for Henry County, which includes its purpose, method of installation, application for public reading and hearing, grievance redress, petition filling, required signature number, speed zones and poles of warnings, etc. To be included, a study conducted by the department. you should find that the speed problem exists at 85 percent of at least 11 miles per hour the speed limit sent. Specification speed bump 4inch height rise, 22ft height horizontal length, and flattop-decline and maximum allowable installation time is 3 months. The geometric road design proposed by Weber Philip A. (1998)

[4] includes the goal of reducing traffic in human settlements. The purpose of this study was to work on improving the speed bump design standards in Canada wAccelerations were recorded on a test subject and compared to discomfort criteria determined by recording speeds over existing bumps. A multiple regression model was formulated to estimate the accelerations measured using Root Sum of Squares (RSS) acceleration and optimal factorial designs were formed that produced acceleration levers equal to the discomfort criteria. From the model & optimal designs, speed bumps lengths and heights were recommended. On streets expended to carry automobile traffic only, 5.2 m by 100 mm, *7.9* m by 100 mm and *9.1* m by 75 mm speed bumps were recommended for desired speeds of *30, 40* and 50 km/h respectively. On bus routes, 6.1 m by 100 mm and *8.8* m by 100 mm speed bumps were recommended for desired speeds of 30 and 40km/h respectively. For a speed bump, proper width has to be considered for its design as varying the width effective of the bump also. Hence a case study was done by **Daniel Basil David (2012)**

2. REVIEW OF COMMON TEST RESULTS:

A speed breaker is a safety device used to calm traffic. It's a hump-like place across the street. The circle has a wider range than most cars. According to the Revised Guidelines for the Provision of Speed Breaker Speed Control of Traffic on Highways [1], a properly designed speed divider must meet the following requirements. 1. There should be no motor vehicle damage or severe injury to drivers and passengers as they pass at a specified crossing speed. 2. The hump should not cause excessive noise or cause dangerous vibrations in nearby buildings or affect other local residents. 3. In addition to the speed set by the driver the driver must face increasing levels of discomfort depending on the tent exceeding the design speed.

There are 4 types of speed breakers which are: -

1. Speed bumps = Speed bumpers silently silence traffic. They can reduce the speed of vehicles to 40 km / h on the roads and 8 to 16 km / h in the parking lot. Speed bumps are usually 1 to 3 in length and 7-15 cm in height. 2. Speed hump = Also called road hump or undulations, speed humps appear on local roads or connected roads, playgrounds and school grounds often use these in traffic man agement. They are usually 10-14 feet in length and are usually 7 to 10 cm high. The hump profile can be circular, parabolic, or sinusoidal. The speed hump typically slows traffic to 16-24 km / h.

2. Speed cushions = Speed cushions include tire cuts that allow larger vehicles to pass uninterrupted, while reducing speed of passing vehicles. Speed cushions run one side of the driveway from the center line, with a wide gap provided for emergency wheel-based emergency vehicles to avoid its disruption to the pillow. It is about 7 ′ ′ wide, 10 ′ ′ wide and 3 ′ ′ long to a narrow traffic of up to 40 kmph.

3. Speed Tables = Speed tables are part of a highway, with a ramp on both sides. Ramps painted with white arrows to make it clear to motorists. Speed tables are taller than speed humps, 3–3.5 inches long and 22 feet high. The average speed of traffic on the road where speed tables are located is found to be 15 km / h.

Figure 1: Speed bump

Figure 2: Speed cushions

Figure 3: Speed tables

Fig4:- Speed Hump

COMPARISON BETWEEN CONVETIONAL SPEED BREAKER AND NON-NEWTONIAN FLUID SPEED BREAKER

Characteristics Of Breaker	**Conventional Speed Breaker**	**Non- Newtonian Fluid Speed Breaker**
Nature	Permanent	Mobile
Sensitivity	Not Sensitive To Speed Of Vehicle	Sensitive
Speed Restriction	Slow- Every Condition	Slow– Only When It Over Speeding
Fuel Efficiency Of Vehicle	Decrease	Increase
Installation Method Requirement	Technical Skilled Labour	No Technical Skilled Labour
Installation Cost	High	Low
Maintenance Cost	High	Low
Medical Problem Arise	Spinal Damage Or Aggravate Chronic	Not Damaged
Traffic Noise Pollution	Increase	Decrease

3. MATERIALS

3.1 Building materials

a) Non Newtonian Fluid

Non-Newtonian fluid is a liquid that does not obey Newton's law of viscosity, i.e. a constant viscosity without pressure. In non-Newtonian liquids, viscosity may vary if forced to be more or less solid. For example, ketchup becomes a liquid when stirred and thus is not a Newtonian liquid. Many solutions include salt and non-Newtonian soluble polymers. Generally, the viscosity of a gradual deterioration in the pressure (shear or hardness) of a non-Newton liquid depends on the degree of shear. Some non Newtonian liquids have an independent shear viscosity, however, they still show normal differential pressure or other non-Newtonian behavior. The relationship between pressure and shear level in the line in Newtonian fluid, which exceeds the source, the consistency of the measurement is the coefficient of viscosity. The relationship between shear pressure and shear rate is different from non-Newtonian fluids. The liquid can show even time-dependent viscosity. Therefore, the continuous coefficient of viscosity cannot be determined. In a liquid dispenser the concept of viscosity is often used to indicate the cutting characteristics of a liquid, not enough to describe a non-Newton liquid.

i) Acrylic

Acrylic is a fast-drying liquid made of pigment hanging emulsion of acrylic polymer. Acrylic is soluble in water, but becomes water resistant when dry. Depending on how much the liquid is diluted with water, or converted into acrylic gels, mediums, or pastes, the finished acrylic may look like water colors, gouache has its own unique features that are not accessible to other media. Acrylic is often used for arts or art classes in schools because it does not require chemicals, and it is simply washed with water.

Fig: Non Newtonian Fluid

ii) Oobleck

Oobleck is a liquid substance that acts as a suspension of corn and water starch which can act as a solvent or liquid depending on how much pressure you put. When you hold the oobleck in your hand, and it sounds like a solid ball in the palm of your hand after releasing the pressure. After that, it will come out of your fingers. Materials that act as a non Newtonian liquid because their flow areas are not defined by a constant viscosity. The name Oobleck comes from the 1949 children's book, Bartholomew and the Oobleck, by Drs. Seuss.

Fig: Oobleck

b) Kevlar

Kevlar is a heat-resistant and strong synthetic fiber, related to other aramids such as Nomex and Technocrat. Kevlar replaces steel on race wheels. It is usually thrown into ropes or sheets of cloth that can be used as such or as an ingredient in components of composite materials. Kevlar is used on bicycle tires and running sails for bulletproof vests, due to its strong rigidity and weight at this rate it is 5 times stronger than steel.

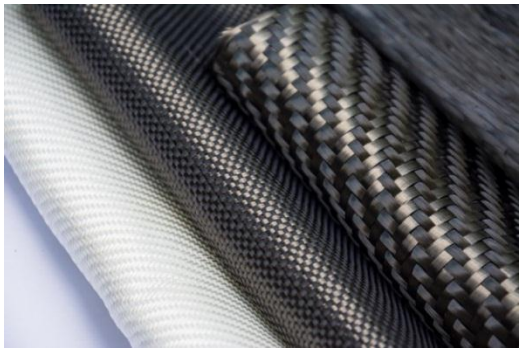

Fig :- kevlar

c) Synthetic rubber

Synthetic rubber is any synthetic elastomer. These are mainly polymers composed from petroleum byproducts. Synthetic rubber, like natural rubber, applies to the automotive industry in tires, door and window profiles, plumbing, belts, mounting, and flooring.

Figure 6: Synthetic rubber

ADVANTAGES

- Installation costs are low.
- Low weight.
- Reduce noise pollution.
- Compatible with nature.
- Quick installation.
- You do not need skilled workers etc.

DISADVANTAGESS

- Be sensitive to the immediate effect on it.
- Does not follow Newton's law of viscosity.
- It is not self-proportional to cutting.
- Used for high internal use.

APPLICATIONS

• Economics.
• Suitable for parking in supermarkets, toll tall, signals etc. Liquid breaker used in France, Villanueva de Tapia, Spain and with interest from Israel and Germany.
• Reduce air pollution and noise.
• Increase fuel efficiency to some degree.
• Low maintenance costs.
• The emergency response time of the vehicle is not affected

THE RESULT AND THE END

1) Non-Newtonian fluid speed breaker helps to increase the efficiency of motor fuel to a large extent.

2) Vehicles should not be completely parked when traveling from a speed bump, reducing traffic congestion.

3) Installation costs and repair costs of non-Newtonian fluid speed breaker are relatively low as compared to a standard speed breaker.

4) It does not injure parts of the car's mechanical components, such as throttle cutters and steering system if the car is following a speed limit.

5) Setup is fully mobile and can be installed within an hour.

6) The installation process does not require a person with technical expertise.

7) It helps to reduce traffic noise.

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