

Public Perception and Acceptance Analysis of Oobleck Speed Breaker

Mr. P. G. Borate¹, Mr. Tejas Dilip Kulkarni², Mrs. S.S. Jadhav³,
Mr. Akash Vijay Nawadkar⁴, Mr. Aniket Jaywant Jagdale⁵,
Mr. Sameer Shashikant Shinde⁶

^{1,3}Assistant Professor, Department of Civil Engineering Yashoda Technical Campus Satara, Maharashtra, India

^{2,4,5,6}Department of Civil Engineering Yashoda Technical Campus Satara, Maharashtra, India

Abstract:

Speed humps are the traffic calming devices and are extensively used to reduce traffic speed on local streets. Conventional speed breakers are made up from concrete or asphalt. Apart from traffic calming these have many disadvantages like wear & tear of vehicle components, noise pollution, health issues like back pain, distress experienced by driver etc.

To overcome these limitations non-Newtonian fluid Speed humps are thought of better alternative. This paper aims to represent public perception and acceptance analysis of oobleck breaker through data collected from survey of more than 1000 vehicles & 220 recorded responses including two-wheeler, three-wheeler and four-wheeler normal as well as heavy loaded vehicles.

Keywords: Non-Newtonian fluid, speed breaker, road safety, viscosity, durability, simulation, Public Perception, etc.

1. Introduction:

Public perception is simply the type of information obtained from a public opinion survey. That is, “public opinion” is merely the aggregate views of a group of people who are asked directly what they think about particular issues or object. In engineering, what the public knows and thinks can have important implications for the design and the success of the various systems and activities and that are loosely termed industrial ecology. Analysis in the context of non-Newtonian fluid speed breakers and public perception studies is crucial for several reasons few are listed below:

Effectiveness Evaluation: Analysis helps determine the effectiveness of Non-Newtonian fluid speed breakers in comparison to traditional speed breakers. By analyzing factors such as vehicle speed reduction, road safety improvement, and wear and tear on vehicles, authorities can assess whether these innovative solutions are delivering the desired results.

Cost-Benefit Analysis: Understanding the cost implications of implementing non-Newtonian fluid speed breakers compared to conventional ones is essential. Analysis can help ascertain whether the potential benefits, such as reduced maintenance costs or fewer accidents, outweigh the initial investment required for installation.

Public Perception: Analyzing public perception towards Non-Newtonian fluid speed breakers is vital for

their successful adoption. This involves understanding factors such as perceived effectiveness, safety concerns, and overall satisfaction among road users. Such analysis can inform policymakers about the acceptance level of these unconventional solutions and help tailor communication strategies accordingly.

Safety Assessment: Analyzing the safety aspects of Non-Newtonian fluid speed breakers is paramount. This includes assessing their impact on vehicle stability, braking distance, and potential hazards for vulnerable road users such as pedestrians and cyclists. Through thorough analysis, authorities can ensure that these speed breakers enhance road safety without introducing new risks.

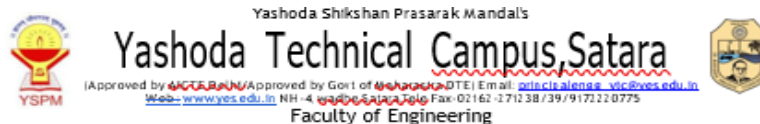
Environmental Impact: Analyzing the environmental implications of Non-Newtonian fluid speed breakers is essential in promoting sustainable transportation solutions. This involves assessing factors such as energy consumption during production, material recyclability, and potential pollution from fluid leakage. By conducting comprehensive analysis, policymakers can ensure that these innovations align with environmental goals.

2. Survey:

To carry out public perception study rigorous survey for about 15 days was carried out in moderately populated area of city. The oobleck speed breaker was installed with the help of metal strips and nut bolts at such a location that we can grab good volume of vehicles of each category and at the same time we can request driver to answer questions from our survey sheet and note down their response without disturbing remaining traffic & pedestrians.

To note down responses questionnaire of eleven questions was developed. Out of eleven questions eight questions were regarding problems regarding conventional speed breaker. These questions addressed views concerning safety, durability, visibility, discomfort, vehicle damage, noise pollution & vibrations. The drivers were asked questions regarding their experience when their vehicle traverse over speed breaker and rate this new speed breaker according to their perception as good, average or poor. Remaining three questions were general questions about necessity of speed breakers and acceptance of new speed breaker and response to them was noted as yes or no.

During 15 days more than 1000 vehicles passed over the speed breaker out of which 220 responses were tabulated for further analysis. For each question chart is created to graphically represent the overall response of survey. The questionnaire developed is shown below in figure no. 1 whereas tabulated Responses are represented in table no 1 below



CIVIL ENGINEERING DEPARTMENT

Name Of Driver: _____ Date: _____
 Type Of Vehicle: 2-Wheeler / 4-Wheeler

Sr. No.	Questions	Good	Average	Poor
01	Rate your experience regarding walking, cycling, or driving in the vicinity of the speed breaker(s)?			
02	Tell your experience when your vehicle passes over the speed breaker at low speeds?			
03	Compare this non-Newtonian speed breaker to traditional speed breakers in terms of adaptability to traffic flow?			

04	In terms of durability, rate non-Newtonian speed breakers compared to traditional speed breakers?			
05	Rate about discomfort or vehicle damage experienced due to the speed breaker?			
06	Rate experience regarding increase in noise or vibration from vehicles passing over the speed breaker(s)?			
07	Rate your experience about this Non-Newtonian Speed Breaker regarding visibility?			
08	Rate experience about change in your behaviour as driver or other drivers' behaviour since the installation of the speed breaker(s)?			

Sr No.	Question	Yes	No
01	Did this speed breaker cause any problems for your vehicle?		
02	Can this speed breaker be used in daily life?		
03	Do you believe the speed breaker(s) are necessary to improve road safety?		

Do you have any suggestions or recommendations for improving the design or placement of the speed breaker?

Table 1: Recorded responses

Sr. No.	Name of Person	Vehicle Type	Rate your	Rate your	Compare this	In terms of	Rate about	Rate experience	Rate your	Rate experience	Did this	Can this	Do you
1	Dadaso Hariba Yamagar	bike	good	good	good	good	average	poor	good	poor	No	Yes	Yes
2	Datta Vitthal Yamagar	bike	good	average	good	average	poor	poor	average	poor	No	Yes	Yes
3	Dattatray Changdev Salunkhe	bike	average	good	average	good	poor	average	good	poor	No	Yes	Yes
4	Haridas Pandhurang Metkari	bike	good	good	good	poor	average	average	poor	average	No	Yes	Yes
5	Ajinkya shaha	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
6	Prashant Borate	bike	good	average	good	good	poor	poor	poor	poor	No	Yes	Yes
7	Sayali Jadhav	bike	good	good	good	good	good	poor	good	poor	No	Yes	Yes
8	Amak suhas kamble	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes

9	Sadashiv govind jagadale	bike	good	good	average	average	poor	poor	good	poor	No	Yes	Yes
10	Krishna Ayappa Katare	bike	good	poor	good	good	good	poor	average	poor	No	Yes	Yes
11	Mahadev Anil Nanaware	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
12	Sanjay Ragu Yamagar	bike	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
13	Santosh Baba Yamgar	bike	good	good	good	good	average	poor	good	poor	No	Yes	Yes
14	Sayappa Deuba Yamagar	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
15	Shalan Ramchndra Yamagar	bike	average	good	good	good	poor	poor	average	poor	No	Yes	Yes
16	SHASHIKANT CHANNAPPA CHAGULE	bike	good	average	good	good	poor	poor	good	poor	No	Yes	Yes
17	SHIVAJI SHATRUGHAN GAIKWAD	bike	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
18	Vikas Bapu Lengare	bike	poor	good	good	good	poor	poor	good	poor	No	Yes	Yes
19	Vikas Ganpat Yamagar	bike	average	good	good	good	good	poor	average	poor	No	Yes	Yes
20	Abhijit Bajrang Bhosale	bike	good	good	good	poor	poor	average	good	average	No	Yes	Yes
21	ASHOK SITARAM SHIRKE	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
22	Balasaheb Ramchandrar Atole	bike	good	good	good	good	poor	poor	poor	poor	No	Yes	Yes
23	Kisan Kerba Lawand	bike	good	good	good	good	average	poor	good	poor	No	Yes	Yes

24	Akshay Hindurao Shinde	bike	good	good	average	average	poor	poor	good	poor	No	Yes	Yes
25	Gulabrao Balu Kolekar	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
26	Hanmant Tatyaba Kolpe	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
27	JITENDRA HINDURAO PAWAR	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
28	Sagar Suresh Shinde	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
29	Suraj Dipak Shinde	bike	good	good	good	good	poor	poor	average	poor	No	Yes	Yes
30	Swati Santosh Sonawale	bike	poor	good	good	good	poor	poor	good	poor	No	Yes	Yes
31	DASHRAT AAMBADAS SATHE	bike	good	good	average	good	poor	average	good	poor	No	Yes	Yes
32	Manish Mane	bike	average	good	good	poor	good	poor	good	poor	No	Yes	Yes
33	Nitin Patil	bike	good	good	good	good	poor	poor	average	poor	No	Yes	Yes
34	Pratik Sathe	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
35	Kishori Dhondiba Madne	bike	good	average	good	good	average	average	good	poor	No	Yes	Yes
36	NIKHIL ABASO BHICHUKALE	bike	average	good	good	average	poor	poor	good	poor	No	Yes	Yes
37	Hanmant Mugutrao Gaikwad	bike	good	good	average	good	poor	poor	poor	poor	No	Yes	Yes
38	Ankush Yadav	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
39	BHIMRAV DATTU GHANAVAT	bike	good	good	good	good	poor	poor	good	average	No	Yes	Yes

40	Chandrabai Balu Jadhav	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
41	Parvati Ganpat Ahiwale	bike	goo d	goo d	goo d	goo d	poo r	poo r	ave rag e	poo r	N o	Y es	Y es
42	popat dhondiram banakar	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
43	SOPAN BUVASO DANGE	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
44	Vinay Kirtivan Shinde	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
45	Shivaji Vithoba Torase	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
46	Subhash Dagadu Madake	bike	ave rag e	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
47	Vilas Vishnu Torase	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
48	Vilas Shirinang Shelar	bike	goo d	goo d	goo d	goo d	goo d	poo r	goo d	poo r	N o	Y es	Y es
49	Shobha Dattary Jagdale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
50	Mahendra Janardan Salunkhe	bike	goo d	ave rag e	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
51	Jaysing Dashrath Salunkh	bike	ave rag e	goo d	goo d	ave rag e	poo r	poo r	goo d	poo r	N o	Y es	Y es
52	Dadaso Vishnu Adake	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
53	Abhishek Hanumat Gholap	bike	goo d	goo d	ave rag e	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
54	Aditya Jagannath Sabale	bike	goo d	goo d	goo d	goo d	poo r	poo r	ave rag e	poo r	N o	Y es	Y es
55	Bapurao Yashwant Mahadik	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
56	Bapu Vithoba Torse	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es

57	Hirachand Dashrath Kale	bike	ave rag e	goo d	goo d	goo d	poo r	poo r	goo d	ave rag e	N o	Y es	Y es
58	Dastgir Husen Mulani	bike	goo d	goo d	ave rag e	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
59	Rajaram Baba Mahadik	bike	goo d	ave rag e	goo d	goo d	ave rag e	poo r	goo d	poo r	N o	Y es	Y es
60	Sagar Mohan Shinde	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
61	Sanjay Dashrath Kale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
62	Namdev Santu Jadhav	bike	goo d	goo d	goo d	poo r	poo r	poo r	goo d	poo r	N o	Y es	Y es
63	Popat Narayan Kale	bike	poo r	goo d	goo d	goo d	poo r	poo r	poo r	poo r	N o	Y es	Y es
64	Suresh Sahebrao Ingle	bike	goo d	goo d	goo d	goo d	poo r	ave rag e	goo d	poo r	N o	Y es	Y es
65	Pradip Mahadev Jagadale	bike	goo d	goo d	ave rag e	ave rag e	poo r	poo r	goo d	poo r	N o	Y es	Y es
66	Suraj Vijay Thorat	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
67	Ashok Govind Shirsagar	bike	ave rag e	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
68	Dilip Hanmant More	bike	goo d	goo d	goo d	goo d	poo r	poo r	ave rag e	poo r	N o	Y es	Y es
69	Bharat Tatu Khatal	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
70	Sagar Sanjay Torse	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
71	Minakshi Dhairyashil Ingle	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
72	Chaitnaya Kisan Jagadale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
73	Shobha Pravin Jagadale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es

74	Swati Rajendra Bhosale	bike	good	average	good	good	poor	poor	good	poor	No	Yes	Yes
75	Nanaso Sarjerao Shigte	bike	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
76	Snehal Sanjay Waghmode	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
77	Satish Bajirao Waghmode	bike	good	good	good	average	poor	poor	average	poor	No	Yes	Yes
78	Sourabh Shamrao Hande	bike	good	good	good	good	good	poor	good	poor	No	Yes	Yes
79	Sandip vishwanath Waghmode	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
80	Akkatai Ramchandra Mote	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
81	Ananda Bhau Mote	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
82	Nana Hariba Sule	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
83	Rupali Nitin Kokare	bike	good	good	good	good	average	poor	poor	poor	No	Yes	Yes
84	Shashikala Rajaram Waghmode	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
85	Madhukar Nagu Waghmode	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
86	Bapurao Dada Waghmode	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
87	Sima Tanaji Waghmode	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
88	Shekhar Sakharam Khatal	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
89	Jaya Dhanaji Torse	bike	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
90	Pramod Yadavrao Bhosale	bike	good	average	good	good	poor	poor	good	poor	No	Yes	Yes

91	Vijay Bandu Waghmode	bike	goo d	goo d	goo d	goo d	poo r	poo r	poo r	poo r	N o	Y es	Y es
92	Shubham Dilip Khatal	bike	ave rag e	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
93	Sunita Nanaso Waghmode	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	ave rag e	N o	Y es	Y es
94	Santosh dhondiram shirsat	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
95	Sayaji Ramchandra waghmode	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
96	Shamrao Hariba Waghmode	bike	goo d	goo d	goo d	poo r	poo r	poo r	goo d	poo r	N o	Y es	Y es
97	Shubham anil kale	bike	ave rag e	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
98	Amol mohan jagadale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
99	Baalkrushna dagadu lokhnde	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
100	Sarika vaibhav torse	bike	goo d	goo d	goo d	goo d	poo r	poo r	ave rag e	poo r	N o	Y es	Y es
101	Dayanand vithal jadhav	bike	goo d	goo d	goo d	ave rag e	poo r	poo r	goo d	poo r	N o	Y es	Y es
102	Sudhakar Dinkar Kamble	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
103	Magabul husen Mulani	bike	goo d	goo d	ave rag e	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
104	Vasant Baburao Jadhav	bike	goo d	goo d	goo d	goo d	goo d	poo r	poo r	poo r	N o	Y es	Y es
105	Shivdas Sarjerao Satre	bike	poo r	goo d	goo d	goo d	poo r	poo r	goo d	ave rag e	N o	Y es	Y es
106	Janardhan sambhaji kale	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es
107	Vasant Hariba Waghmode	bike	goo d	goo d	goo d	goo d	poo r	poo r	goo d	poo r	N o	Y es	Y es

108	Dadaso Shirang Waghmode	bike	good	good	good	good	average	poor	good	poor	No	Yes	Yes
109	Usha Tanaji madane	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
110	Sanjay Subhash Jagadale	bike	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
111	Dhanyakumar Shrimant Waghmode	bike	good	good	good	good	poor	poor	average	poor	No	Yes	Yes
112	Manohar Tukaram Hambire	bike	good	poor	good	good	poor	poor	good	poor	No	Yes	Yes
113	Sachin Lalaso Yadhav	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
114	Dadaso Pandharinath Humbire	bike	good	good	good	good	poor	poor	good	average	No	Yes	Yes
115	Balutai Suresh Waghmode	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
116	Sunita Rahul Salunkhe	bike	good	good	good	poor	poor	poor	good	poor	No	Yes	Yes
117	sujit ithape	bike	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
118	Ranjan Shaha	bike	good	average	good	good	average	poor	good	poor	No	Yes	Yes
119	pramod patil	bike	good	good	good	good	poor	poor	good	average	No	Yes	Yes
120	shankar mane	bike	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
121	prashant pawar	bike	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
122	saurabh hande	bike	average	good	good	poor	poor	poor	good	poor	No	Yes	Yes
123	Samadhan Namdev Metakari	bike	good	good	good	average	poor	poor	average	poor	No	Yes	Yes

12 4	Shahaji Revappa Salagar	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
12 5	Shrirang Nana Bandgar	Rikshaw	good	good	good	average	poor	average	good	poor	No	Yes	Yes
12 6	Somanath Ramchandra Lavate	Rikshaw	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
12 7	Tanaji Chandrakant Kolekar	Rikshaw	average	good	good	good	average	poor	good	average	No	Yes	Yes
12 8	Vandana Balkrishna Khadatare	Rikshaw	good	good	good	good	poor	average	average	poor	No	Yes	Yes
12 9	Vandana Sambhaji Dange	Rikshaw	good	average	good	average	poor	poor	good	poor	No	Yes	Yes
13 0	Vikas Mahadev Chaugule	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
13 1	Vittal Sukhadev Shejal	Rikshaw	good	good	good	good	average	poor	good	good	No	Yes	Yes
13 2	Ushabai Kerappa Kamble	Rikshaw	good	good	average	average	poor	poor	good	poor	No	Yes	Yes
13 3	Jayappa Kerappa Kshirasagar	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
13 4	Digambar shankar Kokre	Rikshaw	average	good	good	good	poor	poor	good	average	No	Yes	Yes
13 5	Sanjay Kondiba Thorabole	Rikshaw	good	good	poor	good	good	average	good	poor	No	Yes	Yes
13 6	Datta Hanmant Lavate	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
13 7	Arjun Gopal Chaugule	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
13 8	Kaseling Sadashiv Bandgar	Rikshaw	good	good	good	poor	poor	poor	good	poor	No	Yes	Yes
13 9	Balaji Bhairavanth Chavan	Rikshaw	good	average	average	good	poor	poor	good	poor	No	Yes	Yes

140	Shrihari Nivrutti Sirsat	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
141	Jyoti Kiran Kadam	Rikshaw	good	good	good	good	poor	poor	average	poor	No	Yes	Yes
142	KIRAN DASHRATH RANAWARE	Rikshaw	average	good	good	good	poor	average	good	poor	No	Yes	Yes
143	KISAN VAMAN KADAM	Rikshaw	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
144	uttam tatyaba bhandwalkar	Rikshaw	good	good	good	good	poor	poor	good	average	No	Yes	Yes
145	Pramod Popat Kapse	Rikshaw	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
146	Eknath Uttam Devkar	Rikshaw	poor	good	good	good	average	poor	good	poor	No	Yes	Yes
147	Sandip Vitthal Sakhare	Rikshaw	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
148	PRALHAD KHANDERAO DESHMUKH	Rikshaw	good	good	good	good	poor	average	good	good	No	Yes	Yes
149	Prashant Chandrkant Chinchkar	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
150	Kundlik Vishnu Pawar	Rikshaw	good	good	good	poor	poor	poor	good	poor	No	Yes	Yes
151	Tanaji Dadaso Jadhav	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
152	Laxman Appaso Nimbalkar	Rikshaw	average	good	good	good	poor	average	good	poor	No	Yes	Yes
153	Vitthal Mahadev Agavane	Rikshaw	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
154	YUVRAJ HANMANT THOPTE	Rikshaw	good	average	good	good	average	poor	average	poor	No	Yes	Yes
155	Popat Kisan Pisal	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes

156	RAJENDRA VITHTHAL GODASE	Rikshaw	good	good	average	good	poor	average	good	average	No	Yes	Yes
157	Santosh Balasaheb Yadav	Rikshaw	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
158	Santosh Dipak Yadav	car	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
159	RAMESH SITARAM SHIKRAKE	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
160	LAKSHAMAN TATYABA KOLVADKAR	car	average	good	good	average	poor	average	good	poor	No	Yes	Yes
161	Nilesh Dattatray Bankar	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
162	Nirmla Dhanjay Pawar	car	good	average	good	good	poor	poor	good	average	No	Yes	Yes
163	Pramod Bhauso Shinde	car	average	good	good	good	poor	good	good	poor	No	Yes	Yes
164	Sarika Sandip Dhekale	car	good	good	average	good	poor	poor	average	poor	No	Yes	Yes
165	Satish Baban Morkane	car	poor	good	good	good	good	poor	good	poor	No	Yes	Yes
166	DNYANADEV KISAN MULIK	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
167	Bashir Lalabhai Sayyad	car	good	good	poor	good	poor	poor	good	good	No	Yes	Yes
168	Vaibhav Subhash Jagadale	car	good	good	good	good	poor	average	good	poor	No	Yes	Yes
169	Tejas Tanaji Pawar	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
170	Anand Pandit More	car	average	good	good	poor	poor	poor	poor	poor	No	Yes	Yes
171	Alaka Ashok Nale	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
172	Baba Sadhu Nale	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes

173	Dattatray Rajaram Shendage	car	good	good	good	good	average	poor	good	average	No	Yes	Yes
174	Ganesh Rajesh Nale	car	good	good	good	good	poor	average	good	average	No	Yes	Yes
175	Kiran Jijaba Nale	car	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
176	Sahebrao Ganapat Nale	car	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
177	Vijaykumar Chandrakant Nale	car	good	average	good	good	poor	average	good	poor	No	Yes	Yes
178	Kundalik Dnyanu Gaikwad	car	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
179	Sikandar Mulla	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
180	patang vithoba patil	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
181	Chandrakant Bhimrao Kadam	car	good	good	good	good	poor	average	good	poor	No	Yes	Yes
182	SUKHADEV ARVIND KADAM	car	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
183	Ankush Sahebrao Nale	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
184	Ashok Suryakant Jathar	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
185	CHANDRAKANT JADHAV	car	average	good	good	good	average	poor	good	average	No	Yes	Yes
186	Laxman Udhav Nagalbone	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
187	Mayur Santaji Shinde	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
188	Prakash Dagadu Shingade	car	poor	good	good	good	poor	poor	good	poor	No	Yes	Yes

189	Vishal Jagnath Jagtap	car	good	average	good	good	poor	poor	poor	poor	No	Yes	Yes
190	Vitthal Maruti Shinde	car	good	good	poor	good	poor	poor	good	poor	No	Yes	Yes
191	Babasaheb Bhanudas Khadge	car	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
192	Mohan Ramchandra Bogane	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
193	ANITA BALASO MAGAR	car	good	good	average	good	poor	average	good	poor	No	Yes	Yes
194	Akshay Kisan Surve	car	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
195	Jayram Subhash Surve	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
196	Nagnath Shankar Surve	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
197	Namadev Hariba Surve	car	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
198	Prathamesh Krushnadev Dasharath	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
199	Amol Bharat Chavan	car	good	good	good	good	poor	average	good	poor	No	Yes	Yes
200	Mahesh Popat Surve	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
201	Sunil Ramchandra Vyavahare	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
202	Anil Ramchandra Vyavahare	car	good	good	good	good	poor	poor	average	poor	No	Yes	Yes
203	Dasharath Jagannath Pawar	car	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
204	UMESH BABAN DHUMAL	car	good	average	good	good	poor	poor	good	poor	No	Yes	Yes

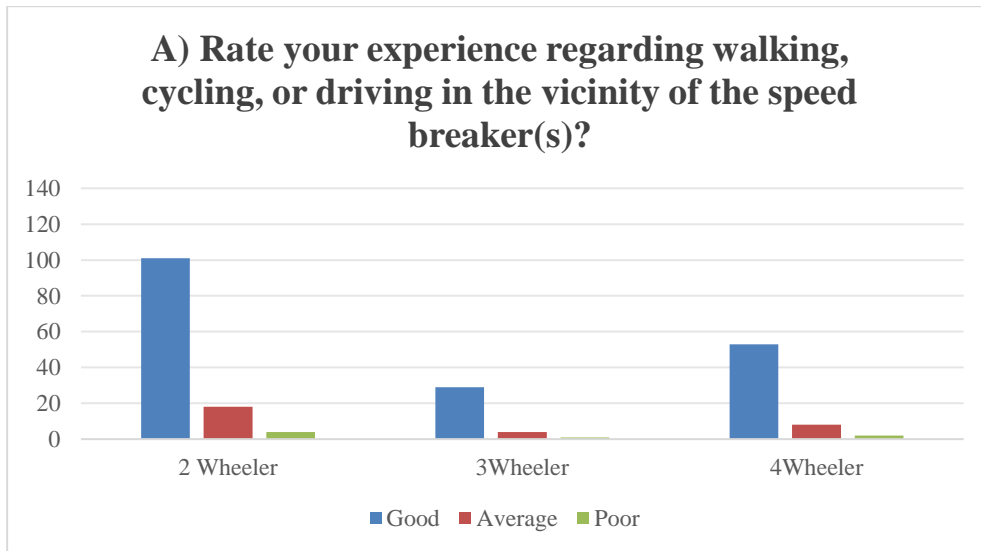
205	Shirmant Ananda Jadhav	car	good	good	good	good	poor	average	good	poor	No	Yes	Yes
206	Rani Suresh Kharat	car	good	good	good	average	poor	poor	good	poor	No	Yes	Yes
207	Chandrakant Bhausaheb Gujar	car	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
208	Ranjana Dattatray Chinchakar	car	good	good	good	good	poor	poor	good	average	No	Yes	Yes
209	Amol Bhimrao Mulik	car	good	good	good	good	good	poor	good	poor	No	Yes	Yes
210	Sanjay Shivaji Surve	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
211	Yogesh Aba Hirave	car	good	good	average	good	poor	poor	good	poor	No	Yes	Yes
212	Anil Dagadu Surve	car	average	good	good	good	poor	poor	good	poor	No	Yes	Yes
213	Pradipkumar Bhimrao Rajage	car	good	good	good	average	average	poor	good	poor	No	Yes	Yes
214	Tanaji Bapu Chavan	car	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
215	Dayaneshwar Vitthal Hirave	car	good	good	good	good	poor	good	average	poor	No	Yes	Yes
216	Laxman Bandu Hirave	Pick up	good	average	good	good	poor	poor	good	good	No	Yes	Yes
217	Ganesh Anandrav Mulik	Tractor	good	good	good	good	poor	average	good	poor	No	Yes	Yes
218	Narayan Tukaram Hirave	Tractor	good	good	good	good	poor	poor	good	poor	No	Yes	Yes
219	Santram Hausrao Jadhav	Eicher	average	good	average	good	poor	poor	good	poor	No	Yes	Yes
220	Amar Balaso Taware	Tata ACE	good	good	good	good	poor	poor	good	poor	No	Yes	Yes

Analysis of data

A. Driving in the vicinity of the speed breaker with low speed

Most of the drivers found it exiting the driving over the oobleck speed breaker. As drivers didn't require to apply breaks to reduce speed for traversing over speed breaker, they just had to maintain constant design speed, their response was good. Few drivers who tried to traverse speed breaker at high speed experienced a jerk.

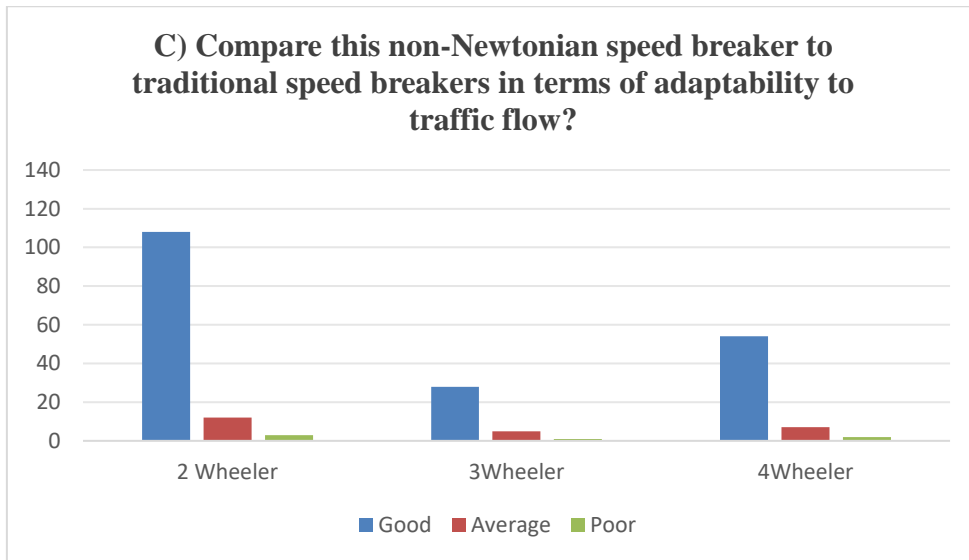
Rate your experience regarding walking, cycling, or driving in the vicinity of the speed breaker(s)?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	101	18	4
3Wheeler	29	4	1
4Wheeler	53	8	2



B. Adaptability to traffic flow

More than 1000 vehicles passed over speed breaker within 15 days. These vehicles included bikes, scooters, cycles, auto rikshaws, light weight four wheelers like cars and heavy weight vehicles like truck, tempo etc. this shows adaptability to traffic flow.

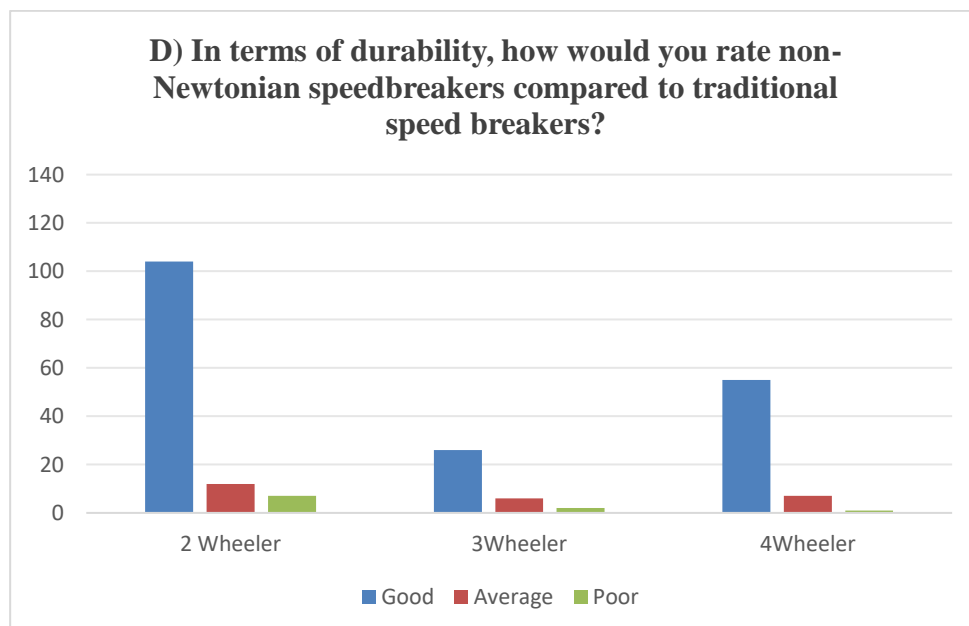
How will you compare this non-Newtonian speed breaker to traditional speed breakers in terms of adaptability to traffic flow?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	108	12	3
3Wheeler	28	5	1
4Wheeler	54	7	2



C. Durability of speed breaker

More than 1000 vehicles including bikes, scooters, cycles, auto rikshaws, light weight four wheelers like cars and heavy weight vehicles like truck, tempo etc passed over speed breaker within 15 days. No damage, cracks or spilling out of material was observed.

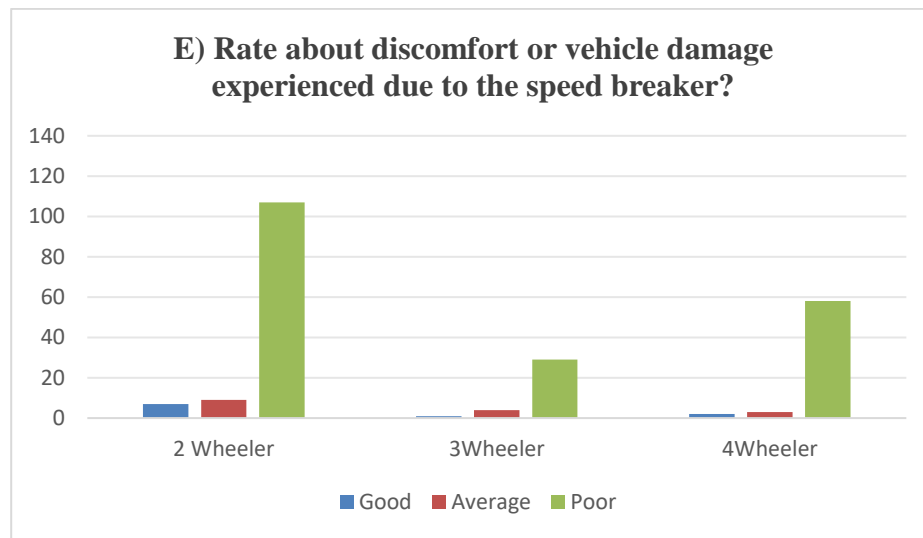
In terms of durability, how would you rate non-Newtonian speed breakers compared to traditional speed breakers?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	104	12	7
3Wheeler	26	6	2
4Wheeler	55	7	1



D. Discomfort or vehicle damage

When a constant speed less than design speed is maintained, vehicle passes smoothly over speed breaker without any discomfort. Also, even if ground clearance of few cars is less, there is no wear and tear car components as hump gets adjusted with low speed of vehicle. Most of the drivers rated experience as poor.

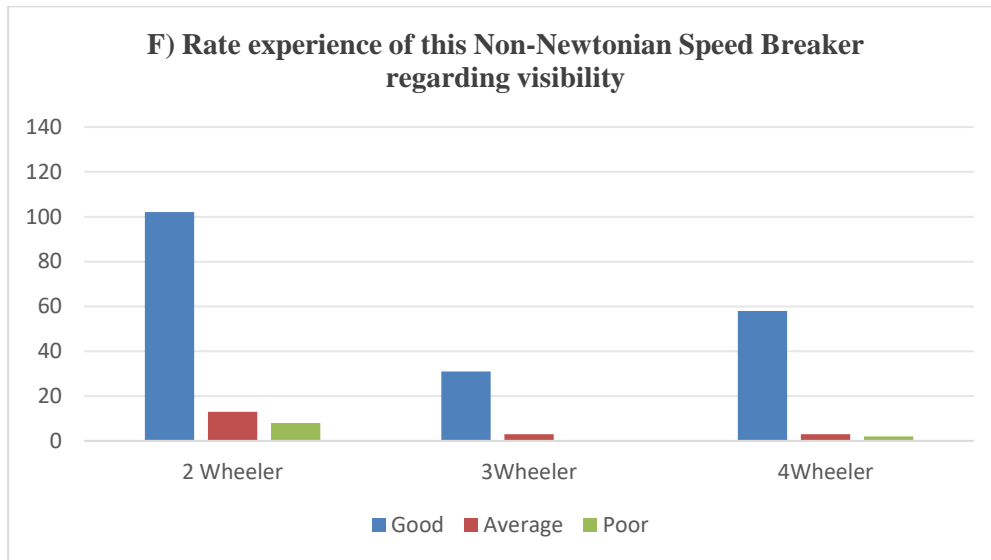
Rate about discomfort or vehicle damage due to the speed breaker?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	7	9	107
3Wheeler	1	4	29
4Wheeler	2	3	58



E. Visibility:

As the speed breaker is painted with black and neon yellow strips it is visible from considerable distance at the time of night also.

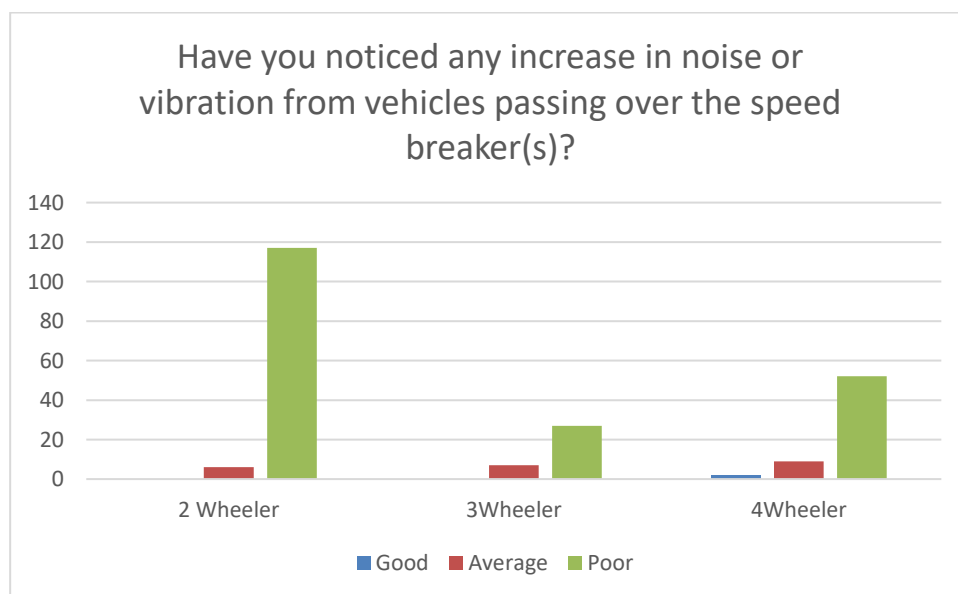
How do you rate this Non-Newtonian Speed Breaker regarding visibility?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	102	13	8
3Wheeler	31	3	0
4Wheeler	58	3	2



F. Increase in noise or vibration

If speed is maintained below design speed no noise and vibrations are created as no need to apply breaks to reduce speed. Hence most of the drivers reported increase in speed and vibrations as poor

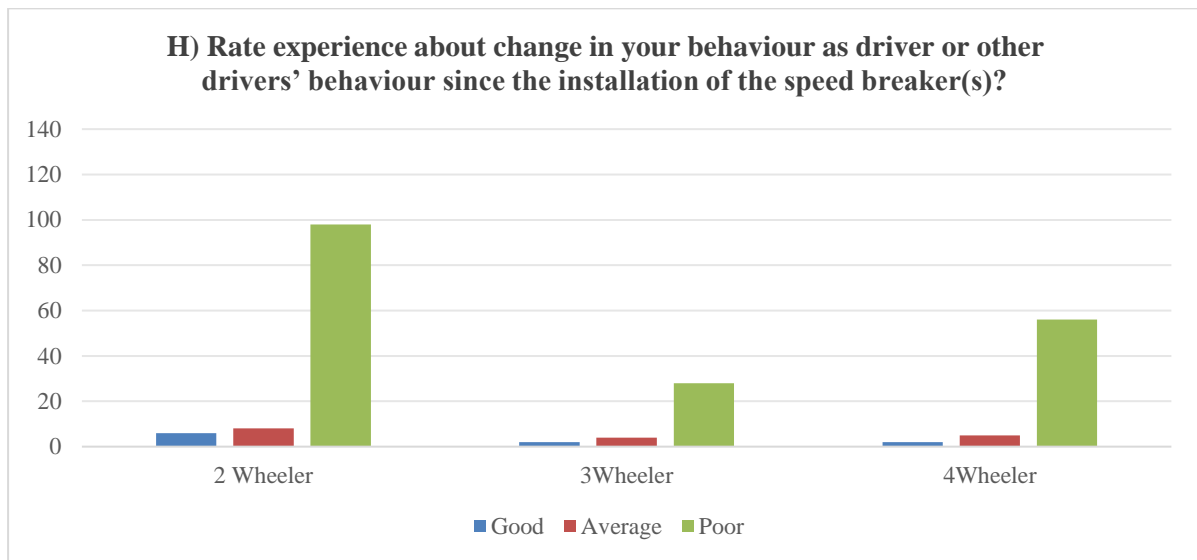
Have you noticed any increase in noise or vibration from vehicles passing over the speed breaker(s)?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2 Wheeler	0	6	117
3 Wheeler	0	7	27
4 Wheeler	2	9	52



G. Changes in drivers’ behaviour

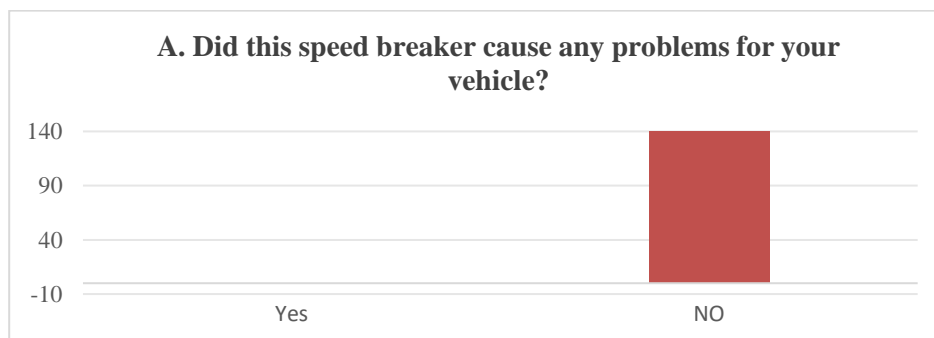
No change in drivers’ behavior was observed as less fatigue is produced. Hence this criterion was recorded as poor

Have you noticed any changes in your behaviour as driver or other drivers’ behaviour since the installation of the speed breaker(s)?			
Response →	Good	Average	Poor
Vehicle Type ↓			
2Wheeler	6	8	98
3Wheeler	2	4	28
4Wheeler	2	5	56

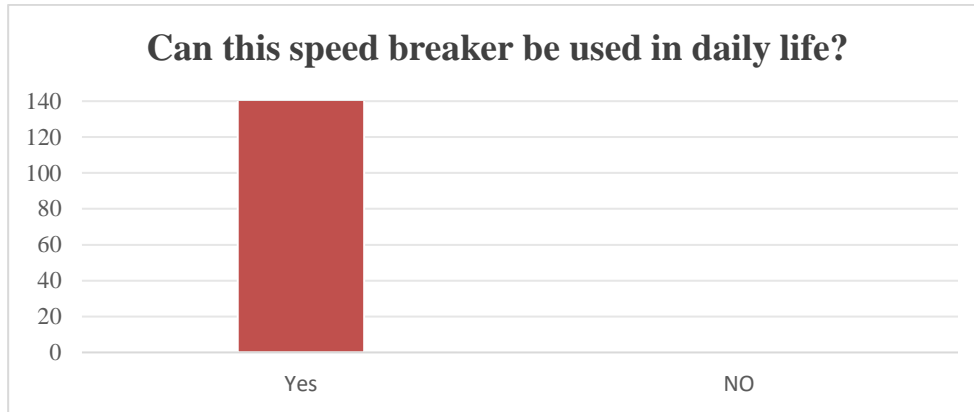


H. Acceptance analysis

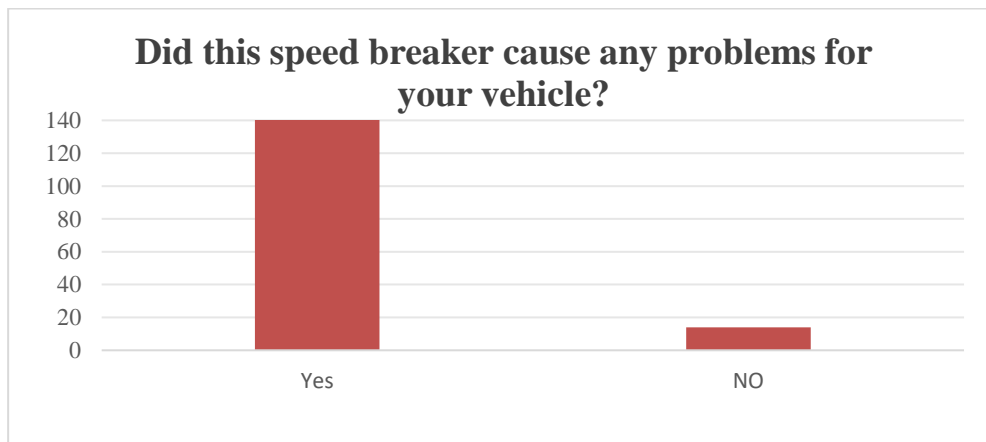
Did this speed breaker cause any problems for your vehicle?	
Yes	NO
0	220



Can this speed breaker be used in daily life?	
Yes	NO
220	0



Do you think speed breakers are necessary?	
Yes	NO
206	14



3. Conclusion

1. From the study done on the behavior of oobleck it was found out that the speed breaker works fabulously on the actual site.
2. As oobleck is used as a speed breaker material it helps to reduce the shock absorption capacity.
3. We are on the conclusion that, the discomfort or vehicle damage due to speed breaker non-Newtonian (oobleck) is low.
4. We have noticed that the noise or vibration from vehicle passing over the speed breaker as comparative to conventional was less.
5. Non-Newtonian speed breaker can be used in daily life.

4. Future scope

Public perception study and analysis showed that oobleck speed breaker can be effectively used to

overcome shortcomings of traditional speed breaker which includes reduction in wear & tear of mechanical components of vehicles noise reduction. reduction in health issues related to back pains, driver's fatigue etc. yet to accept these on actual field some aspects need keen attention Few aspects are written below

1. Environmental Impact analysis of various non-Newtonian fluid samples to be used as speed breaker material should be conducted to check whether considered materials are environmental friendly or not.
2. Study the effect of non-Newtonian fluid speed breakers on vehicle dynamics by analyzing the changes in vehicle speed, suspension behavior and overall stability as vehicles pass over the speed breakers.
3. Experimental Study of various Non-Newtonian Fluids by Conducting laboratory experiments to measure relevant properties of these fluids under different loading conditions and different speed limits.
4. Preparing a prototype and testing the same for varying conditions of load, density and velocity

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4. 4644
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