

# Sustainable Divider for Roads

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**Abstract:** Traffic is a major problem in the modern era with the increase in population there is an increase in the number of vehicles, road users which end in congestion of traffic. The static road infrastructure is almost the same and unable to cope with changes like congestion, unpredictable travel time, delay and road accidents that taking a serious shape and due to this there is need to control the road traffic with help of traffic control optimizer. In spite of measures being taken to migrate and reduce traffic, it becomes major concerned faced by the metropolitan cities during the planning of cities it has emerged as one of the main challenges for developing cities. To find out appropriate measures there is the necessity of identifying the magnitude of traffic congestion. The construction of new road or widening of existing road is not feasible every time it will result in additional traffic congestion the total available space within the city for the construction of the road, railway, and other transportation is restricted. This study focuses on the implementation of movable traffic dividers to solve the traffic congestion problem in metropolitan cities.

**Index Terms** -Waste Plastic, Concrete, Moisture powder, Plastic melting machine, HDPE, Granules.

## I. INTRODUCTION

Sustainable divider are those which consider three principles i.e. Social, Environmental, Economic. The goal of sustainable divider is satisfaction of basic social and economic needs, both present and future, and the responsible use of natural resources, all while maintaining or improving the well-being of environment on which life depends. Plastics have become an inseparable and integral part of our lives. The amount of plastics consumed annually has been growing steadily. Its low density, strength, user-friendly designs, fabrication capabilities, long life, light weight, and low cost are the factors behind such phenomenal growth. Plastics have been used in packaging, automotive and industrial applications, medical delivery systems, artificial implants, other healthcare applications, water desalination, land/soil conservation, flood prevention, preservation and distribution of food, housing, communication materials, security systems, and other uses.

In today's world, the population is increasing continuously as the rate of birth increases proportional to the rate of death due to advanced progress in medical science. In developing countries like India due to lack of public transport system, people purchased a personal vehicle. In 2015 registration of vehicle touched all the time high of 1.96cr which means in actual almost 53,720 vehicle hits the road every day in India. As a vehicle on road is hitting daily, therefore, there is an increasing risk of road accidents. For the road, safety divider plays a vital role

By observing existing road divider after some time these existing dividers get damaged, their visibility gets reduced in the night time. Hence sustainable divider is more efficient, convenient, economical, eco-friendly and safe as compared to the existing divider

In a classic instance of solution converting into a problem, the road dividers have become the mayhem. The road dividers built to ease and streamline the turbulent vehicular traffic, are either smashed by the erring road users or not properly constructed. Interestingly, these dividers add to the traffic jam and at some locations, as these are raised inappropriately, thus inciting the misfortunes.

## II. LITERATURE REVIEW

**Narayan Priya (2001):** She analyzed plastic waste management in India its recycling process and technology used in it and reported that kind of recycling practice in India it's quite different what is practice rest of world. The purpose of this study is to change the color of plastic using plastic granules.

**Shah Priya (2001):** Shah Priya stated in their study "The Plastic Devil: Ecological Menace" that, the rate of recycling in India is extremely high. About 40 percent of the total plastics manufactured is sorted, collected and recycled as opposed to only 10-15 percent in developed countries. The types of plastics recycled in India is PVC (polyvinyl chloride) accounts for 45 percent, LDPE (low-density polyethylene) for 25 percent, HDPE (high-density polyethylene) for 20 percent, PP (polypropylene) for 7.6 percent and other polymers such as PS (polystyrene) for 2.4 percent. According to manufacturers, almost all these types of waste can be recycled up to four or five times. However, the quality of the recycle deteriorates as additives and virgin material are added to give it strength. The purpose of this study is to variate the LDPE and HDPE plastic material.

**Piyush Kunnappallil & Sruthijith K K (2002):** The paper examines the viability of the command-and-control approach and that of the market-based alternatives in addressing the environmental problems caused by plastics. The methodology adopted in this paper was the following. First, the composition and the life cycle of plastics were briefly discussed. Second, the benefits from plastics were elucidated and their inevitability in India established. Third, the ecological harms and health

hazards caused by plastics were elaborated. Fourth, the viability of command-and-control measures for addressing these harms and hazards was investigated. The purpose of this study is to investigate the harmful effects of plastic on the environment.

**Santanu Mandal (2011):** In his study “Porter’s Five Forces of Analysis of the Indian Plastic Industry” he has analyzed the plastic industry of India in terms of Michael E. Porter of Harvard Business School in 1979. So far as the Porter’s five forces analysis of this industry is concerned, bargaining powers of suppliers are low while that of buyers is high. Entry is difficult and it entails the incumbent to have significant capital to invest if it wants to enter this industry. On the substitute front, there are a lot of researches going on and recent anti-plastic campaigns have already given way to many new replacements for plastic as seen above, thereby indicating high threat from substitutes. On the internal rivalry context, the rivalry is high and firms often engage in price wars. It is easy for small firms to change prices and increase market share but the large ones find difficult to switch quickly. On the whole, plastics are essential for today’s standard of living and they help in improving the quality of life. It is expected that plastics will continue to grow dynamically. For this study, we studied that how to deal with plastic laws in the environment and variable cost of plastic which changes region to region.

**Khilesh Sarwe (2014):** This study presents the results of the addition of waste plastics along with steel fibers with an objective to seek maximum use of waste plastic in concrete. Two different categories of mix were casted in cubes (150mm x 150mm x 150mm), one with varying percentages of plastic wastes (0.2%, 0.4%, 0.6%, 0.8% and 1% weight of cement) and another mix of plastics waste/steel fibers (0.2/0.1, 0.4/0.2, 0.6/0.3, 0.8/0.4 and 1/0.5 % by weight of cement) to study the compressive strength at 7 and 28 days strength. The combined mix of plastic waste and steel fibers has shown more strength as compare to concrete mix prep only with plastic waste. He has reached to a conclusion that a plastic waste of 0.6% weight of cement, when used with steel fiber of 0.3 % (weight of cement), has shown the maximum compressive strength. This study has really focused on addressing the issue of reduced compressive strength with the addition of plastic waste. Steel fibers, when used along with plastic wastes, will affect all the properties of concrete but the researcher only focused on compressive strength property which is insufficient to give a clear picture of concrete behavior. By this study, we can increase the strength of plastic by adding steel fiber this study can act as a suggestion to increase the strength.

### III. RESEARCH METHODOLOGY

The materials used for casting the model were a concrete divider and waste plastic.

The method adopted for casting sustainable divider is injection melting machine. The materials were selected and taken into proportion was yellow color 1 kg: potassium chloride 100 gm: shredded plastic 25 kg.

After mixing process the mixture is inserted in the plastic melting machine at a temperature of 240° Celsius. The formwork was placed at the outlet of melting machine so that the melted plastic would be directly poured in the mould. During the pouring of mixture, some amount of yellow granules were also added for making the plastic even brighter. The concrete portion was out by 4 inches and the remaining portion was inside the mould and it was hung up by steel rod which was passing through a hole in formwork. Then oiling is done to formwork for proper removal of formwork. Plastic injection moulding is the most common method of producing parts out of plastic material. Part of the Fundamental Manufacturing Processes Video Series, this program was scripted by plastics industry expert, Irvin I. Rubin, and focuses on the injection moulding machine, the injection mould, and the injection machine controls to illustrate the injection moulding process.

The injection moulding machine segment covers in detail both the injection system and the clamping system. In step-by-step progression, the thermoplastic material is followed from its raw material state through the melting process and onto its injection into the mould. Throughout the sequence, various components of the injection machine are explained, including the reciprocating screw, and the various machine platens.

The injection mould segment details and defines mould terms as the molten thermoplastic material is formed, cooled, and ejected as a final part. (Kate and Jamale 2018) Also featured are common mould types including the two plates cold runner mould, three-plate cold runner mould, the hot runner mould, and the insulated runner mould. The injection machine controls segment features the functions of the various controls and the use of computers in mould design and construction.

This machine has three zones

1. Feed zone: The mixture is first allowed to pass through feed zone it has constant flight depth which forces the material together and feeds it to air.
2. Melt zone: The melt zone has a decreasing flight depth which reduces plastic volume this causes plastic molecules to rub harder against each other plasticizing the material
3. Metering zone: The metering zone has a constant flight zone is much smaller than feed zone so this section has the tip of the screw has a one way out which lets the material at the outlet.

### IV. RESULTS AND DISCUSSION:

1. Benefits:

1. According to test sustainable divider proves to be more efficient, durable, and economical as compared to existing road divider.
2. There is no necessity for street lights.
3. It reduces the painting cost:

Painting cost per day is 40-50 Rs per square feet or 400 Rs per labor. Every 6 months the existing divider is painted which increases cost.

4. At the time of rainy season, the divider gets dirty and increases the risk of road accident with the help of sustainable divider they do not let water or other dirt accumulate by allowing them to simply slide off and visibility is maintained.

5. We conducted a test in the dark without street lights to obtain the visibility of divider at a certain distance of 5 to 25 meter.

Example:

1. Difference between existing and sustainable divider.



Figure 1:-Sustainable divider



Figure 2:-Existing divider

2. Cost comparison:

As compare to red road barrier sustainable divider is way cheaper. Sustainable divider implies three main principles i.e. Social, Environmental and Economic which makes the divider eco-friendly. The plastic use is growing day by day which is increasing risk on nature to reduce the adverse effect on nature. We are using recycled plastic to decrease global warning.

Approximate cost of the sustainable divider is 1350

Cost of the concrete divider is 150 per piece

Cost of plastic used for sustainable divider is Rs.1200 per piece

The manufacturing cost of the sustainable divider is Rs.1350 which is more efficient and beneficial as compared to present divider.

## V. CONCLUSION

Sustainable divider proved to be more durable and efficient as compared to the existing divider. Waste plastic is used while casting sustainable divider which reduces the ill effect of plastic on the environment. The visibility of sustainable divider is more at night time as compared to the existing divider. As existing divider catch dirt usually it requires painting and cleaning for its maintenance purpose to reduce these cost sustainable divider plays a vital role as it does not require maintenance as compared to the existing divider. Accidents due to low visibility of existing road divider during night time can be prevented by using a sustainable divider. If cracked are occurred due to any accident then it can be repairing by heating.

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