International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

Plastic-Papercrete Roads

Akarsh K V
Dept. of Civil Engineering
Rao Bahadhur Y Mahabaleshwarappa Engg College
Ballari,India

***Abstract*— A large amount of non-renewable resources is consumed by the construction industry throughout the world. This paper describes the various aspects of utilization of papercrete and plastic waste in construction of roads. Papercrete will offer a way to turn "trash" paper into inexpensive roads that are quite strong, well-insulated and easily built. Fly ash, micro silica, steel slag, and plastic are some of the waste materials that can be used and also there has been an exponential growth in municipal plastic waste disposal especially in urban areas, use of plastic in road construction has gained importance these days.**

Keywords—Papercrete, plastic, lightweight, strength.

I. INTRODUCTION

Most of the paved roads in our country have granular sub base and bituminous base and wearing courses. Since the last decade, there is a large demand on construction material industry owing to the increasing population which is causing a chronic shortage of construction materials, This has become a major challenge to civil engineers to produce and use alternate materials. This study investigates the potential use of waste paper and plastic for producing a low-cost and light weight composite slab or a road construction material. Everyday tons of waste papers are discarded as landfill or dump sites than those recycled It is learnt that it takes about fifteen trees to make a ton of paper which means that 720 million trees are used once and then buried as landfills every year.

Plastic is a very versatile material. Papercrete is a recently developed construction material which consists of re-pulped paper fiber with Portland cement and also plastic which is a waste which is abundantly available can be used in papercrete which as much advantages. And plastic-papercrete slabs are the one which is the combination of plastic and papercrete which increases many characteristics of the slab. The Papercrete slabs are relatively low cost, light weight and more flexible and involvement of plastic in papercrete has many advantages the waste plastic taking the face of a devil for the present and the future generation. But the use of waste plastics in road construction is gaining importance these days as it increses the strength and load distribution mechanism. And also it as been proved that a valuable bitumen can be extracted from the plastic which can be used as the coating on the plastic-papercrete road slab and aggregates which as many advantages like load distribution and so on. The uses of plastic waste help in substantially improving the abrasion and slip resistance of flexible pavement and also allows to obtain values of splitting tensile. Many researches were conducted to use industry by products such as ash , silica of concrete. Flume, glass cullet, coir fibers, e-plastic waste in concrete to improve the properties so this paper suggests the use of plastic in papercrete to improve the use of waste materials in construction of roads.

II. LITERATURE REVIEW

In [1] the authors done research on papercrete and gave the results as light weight, low cost and as per the experimental results the compressive strength of papercrete decreases with more use of paper pulp in the concrete but the tensile strength.[2] related to this paper the authors done a experimental observation and gave the results as papercrete materials are fire resistant, lightweight, low cost and are os materials made by waste materials and this paper also gives the brief information about the wastage available abundantly in society. In [3] authors done research on papercrete and resulted that these papercrete materials are flexible, lightweight, lowcost, and couldnot contrast and expand. The paper also provides an idea about the curing of papercrete materials and also provides an brief information about papercrete history.

[4] presents research on the use of plastic in concrete which is a widely available waste product and they have tested and reported the compression and tensile strength of plastic in the concrete and concluded that plastic can be used in concrete but compression strength varies with the addition of plastic much plastic is used where load bearing is less. In regard of [5] paper Disposal of large quantity of plastic bag may cause pollution of land, water bodies and air so the use of plastic can be done in concrete which is the aim of this paper and in regard of the authors research they have concluded that tensile strength of concrete increses with adittion of powdered pieses of plastic bag in the concrete but the compression strength of the concrete is decresed by 10 percent.[6] the content in the paper visualizes that the lastic can stay without degrading for 4500 years and this paper provides the method of using the plastic in roads by using bitumen as a binding material the methodology use in the paper are Segregation, Cleaning process, Shredding process, collecting process. And this paper concludes that the use of plastic creates ecofriendly and the pavement strength also increases.[7] this paper suggest the construction of plastic road helps in the use of plastic which is an dangerous issue now a days and also gives an idea about the steps involved in disposal of waste. The methodology involved in this process is the dry process and the wet process. This paper mainly suggests the extraction of bitumen from the plastic which can be used as a coating on the papercrete roads.[8] in regards of this paper Plastic roads are found to perform better than ordinary roads and therefore use of plastic road construction has gained importance these days. Disposal of waste plastic bags has become a severe problem and waste plastics are

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

burnt for disposal which causes pollution to environment. It also gives idea about the "Plastic aggregate bitumen interaction model".[9] in the survey of this paper they have recorded that A new nature study estimates the world has 3.04 trillion trees. Almost 4 billion trees worldwide is cut down each year for making paper.so in this paper use of paper in concrete is demanded as the main aim. And they also visualized the papercrete brick after casting .And they have concluded that As per research the bricks should not absorb water more than 20%. Papercrete has a high fire resistance, good sound absorbent and thermal resistance.

III. METHODOLOGY

The methodology involves the use of plastic in papercrete. Primarily several steps as to be followed as mentioned below:

1. **Segregation**: Plastic waste collected from various sources is separated from other wastes

Figure 1: Plastic waste collection

2. **Cleaning process**: Plastic waste is cleaned and dried.

Figure 2: Cleaning and drying plastic waste

3. **Shredding process**: Plastics will be shredded or cut into small pieces.

Figure 3: Cut pieces of plastic waste

4. **Collection process**: The plastic waste retaining on 2.36 mm IS sieve is collected.

Figure 4: Pieces separated according to sieve size

After these steps papercrete is manufactured by the paper sludge usage in the concrete which is formed by the soaking of water as shown in figure 5 below.

Figure 5: Paper Sludge

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 04, April-2020

The papercrete is made on the basis of concrete mix design as plastic papercrete does not have any particular mix design steps and during the mix the small plastic pieces are added as 2%,5%etc based upon concrete mix.The plastic is also helpful in the extraction of bitumen which can be used as the coating on the surface of papercrete plastic slabs as shown below which has many advantages.

IV. ADVANTAGES AND DISADVANTAGES

The following are the advantages of the papercrete plastic roads:

- The dangerous waste such as plastic and paper which all cannot be decomposed can be used in the construction.
- The plastic-papercrete slabs are of lightweight, low cost, and there materials are easily and abundantly available.
- Use of paper and plastic in the concrete increases the tensile strength which is most essential for road construction.
- The valuable bitumen can also be extracted from the plastic which can be used for the top coating on the cc road.
- They are fire resistant.
- The bitumen coating on the cc road has many advantages such as :
  - ✓ It distributes the load uniformly.
  - ✓ The bitumen layer on the cc road improves the thermal conduction.
  - ✓ It acts like a protection layer for the cc road.
  - ✓ It provides a smooth movement of vehicles on the pavement.
  - ✓ Improves the pavement characteristics of the road.
  - ✓ The plastic can be used in two ways as it can be mixed in concrete and bitumen extracted from the plastic.

Disadvantages:

- The compression strength of the plastic-papercrete will be reduced due to addition of plastic based on percentages.
- The plastic-papercrete roads cannot be used for high load bearing roads but can be used for inter small city transportation and layout road construction

CONCLUSION

The studies can be further extended by addition of admixtures to make the concrete not to alter its strength considerably even with the addition of more percentage of plastic waste.it is conclude that the use plastic can be possible to increase the tensile strength of concrete. Addition of materials like coconut fibers or fly ash to improve compressive strength of papercrete .Modification or design of new of mix proportions to achieve optimum properties. This study will have a positive impact on the environment as it will reduce the volume of plastic waste and paper to be disposed of by incineration and land filling. It will not only add value to plastic waste but will develop a technology, which is eco-friendly.

REFERENCES

[1] G.B.Ramesh kumar and M. Chandu "PAPERCRETE – A SUSTAINABLE BUILDING MATERIAL" International Journal of Pure and Applied Mathematics Volume 119 No. 17 2018, 87-93
[2] Myriam Marie Delcasse, Rahul V, Abhilash C, Pavan M K, Gangadhar. "Papercrete Bricks - An Alternative Sustainable Building Material"Int. Journal of Engineering Research and Application ISSN : 2248-9622, Vol. 7, Issue 3, (Part -6) March 2017, pp.09-14.
[3] M.Manoj Kumar, G.Uma Maheshwari. "PAPERCRETE" International Journal of Science, Engineering and Technology Research (IJSETR) Volume 6, Issue 8, August 2017, ISSN: 2278 -7798.
[4] M Mahesh, B Venkat Narsimha Rao, CH. Satya Sri "Re-Use of Polyethylene Plastic Waste In Concrete" © 2016 IJEDR | Volume 4, Issue 4 | ISSN: 23219939
[5] Raghatate Atul M. "USE OF PLASTIC IN A CONCRETE TO IMPROVE ITS PROPERTIES" International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974.
[6] Azmat Shaikh, Nabeel Khan, Faisal Shah, Devendra Shukla, Gaurav Kale " Use of Plastic Waste in Road Construction" International Journal of Advance Research and Development. (Volume2, Issue5).
[7] Akhilesh Yadav, Ruchi Chandrakar " Construction of plastic roads: An effective way to utilize wastes" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 p-ISSN: 2395-0072 Volume: 04 Issue: 11 | Nov -2017
[8] Vatsal Patel, Snehal Popli, Drashti Bhatt, "Utilization of Plastic Waste inConstruction of Roads" Volume : 3 | Issue : 4 | April 2014 • ISSN No 2277 - 8179
[9] Rohit Kumar Arya, Rajeev Kansal. " Utilization of Waste Papers to Produce Ecofriendly Bricks" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064.