

EXPERIMENT AND INTRODUCTION OF RECRON 3S FIBRE AND PLASTIC FOR PRODUCTION OF CONCRETE SOLID BLOCKS AND PAVER BLOCKS

SATHISH G¹, VIDUTHALAI T²

1. M.Tech. in Environmental Engineering Student, Dept. of Civil Engineering, PRIST UNIVERSITY, TIRUCHIRAPPALLI CAMPUS India.

2. Assistant Professor, Dept. of Civil Engineering, PRIST UNIVERSITY, MAIN CAMPUS, THANJAVUR India.

Abstract: As we know that plastic excessive usage has created many problems. Despite creation of alternative ideas for plastics, it is used vigorously. From this we know that plastics cannot be totally banned. We have to create alternative methods to minimize the effects of plastics on our environment.

Waste plastic were collected from homes and RECRON Fibre 3S were collected from shopping malls. Most plastics are not biodegradable. They will stay in landfills until they are cleaned up. An important problem we are facing is dumping of plastic materials it causes lot of problems. In order to decrease the plastic waste, it can be used in construction field, plastic is inorganic in nature so it does not alter the chemical properties of concrete and also it does not affect the quality and consistency of concrete. The plastic can be as filler material in concrete as well as it can be used to improve the mechanical properties of concrete. Concrete is a composite material consists of Cement, Water, Fine Aggregate and Coarse Aggregate. High strength concrete was prepared of W/C 0.35 and the percentage of waste plastic replaced by 10% of cement, Fine aggregate and Coarse aggregate used in concrete. The sizes of cubes 150x150x150mm and cylinders 150mm dia. and length 300mm were casted.

This project is based on the concept the idea to make the utilization of plastics & RECRON Fibre 3S in manufacturing of Concrete blocks and concrete paver blocks. Buildings are constructed in large number and hence the demand for construction materials are increasing. So we have proposed a project to utilize the plastics and RECRON Fibre 3S in cement to make plastics cement paste which has better qualities than existing cement. It increases the strength of cement and other qualities.








Keywords: Plastic, RECRON 3S, Concrete Block, Paver Block

1. INTRODUCTION

Concrete masonry unit or concrete block is an important and common member in building constructions. Usage of plastic water bottles are increasing rapidly in India and this country is facing the challenge of overflowing of landfills and impacts of disposal of plastic water bottles. Moreover the plastic bottles can provide thermal insulation that can reduce the consumption of electricity for cooling which is highly important since India has subtropical dry hot climate. This project intends to study the possibility of using recycled plastic water bottles and RECRON 3S Fibre within the local concrete blocks and paver blocks for the purpose of building construction with the focus of verifying the compressive strength. Solid

concrete block is a significant kind of masonry units existing for the builders and its application for masonry construction is increasing continuously. Solid concrete blocks may be used as alternatives to solid blocks and traditional stones in construction and buildings. Due to its smaller weight and ease of transfer compared to solid blocks. Moreover, it provides an advantage of uniform quality as well as speeding in construction and the largest durability. On one hand economically, they are less expensive, and consume less cement and less involvement of labourers.

The following are the types of plastics available in market.

Plastic codes	Short Name	Scientific name	Used in
 PET	PET	Poly ethylene terephthalate	Water bottles , PET bottles
 HDPE	HDPE	High density polyethylene	Milk jugs, Detergent bags, oil bottles, toys
 PVC	PVC	Poly vinyl chloride	Cooking oil bottles, cables , pipes, floorings
 LDPE	LDPE	Low density polyethylene	Grocery bags , shopping bags, squeezable bottles, shrink wraps, films
 PP	PP	Polypropylene	Medicine bottles, cereal liners
 PS	PS	Polystyrene	Foam packaging, tea cups , ice cream cups
 OTHER	O	Others	Bakelite , Nylon, Melamine

Categorization of plastics Wastes

In addition, they can be used, in different places. Such as the interior walls, exterior walls bearing, and columns, the compound walls, and retaining walls etc. Several researches completed particularly to study the compressive behavior of concrete blocks mixed with other materials, commencing with 'High-Performance Concrete Masonry-Block Mix Design'.

The development of technology has brought many comforts to the ever increasing world population. Such progress, however, has also increased the demand for energy and, as a consequence, created massive environmental damage. A further danger to the environment is the growth of the consumer society, typified by convenience and disposability. The popularity of the plastic water bottle illustrates the escalating problems of consumption and waste. Out of the total waste produced 15-20 % is synthetic materials, including plastics, and 60% solid waste. However, only 30% of plastic can be disposed of by recycling, or by melting, incinerating and processing methods which emit environmentally destructive gasses into the atmosphere. Landfill is a popular method of waste disposal but this method comes at a high environmental cost. Landfill produces toxins that are released into the atmosphere or leach through the soil to contaminate ground and river water supplies and eventually the destruction of marine ecosystems. In addition, composting is not possible because the plastic used in water containers can take up to 700 years to decompose. As the demand for plastics increases, especially in the form of packaging, the petro-chemical industry continues with its contribution towards the greenhouse effect which is considered a major attribute to global warming. The properties of plastic bottles made from PET (Polyethylene Terephthalate) have been studied extensively. PET is a lightweight polymer, with a relatively low density, at about 15-60 kg/m³. If PET plastic bottle flakes are mixed with, or used to replace, the aggregates of general construction materials, such as mixing with concrete or forming solid blocks, it can make the building material lower in weight and density. Thus, producing a light weight but strong material that can be used in general construction such as building a wall. Rapid growth of construction industries requires a lot of building materials that utilizes natural resources either in their production plant or as the materials itself. More recently the world concern about the demands for construction

materials and the rate production of plastic that increases swiftly every year. In turn, both industries contribute in increasing the MSW. Since the rate of production is projected to double the value in every 10 years, a more sustainable and safer way is needed to be taken into action. Banning or minimizing plastic usage is not practicable to solve the problem as it is nearly impossible for different sectors to run efficiently without plastic. Mining of natural resources on the other hand is an energy waste process as only 900 million tons of raw materials is produced from 6000 million tons of waste generated. They may be different in constitution of raw materials but possess the same in contributing to various environmental threats. Hence, utilizing plastic waste in solid block production can solve both the MPW and demands for construction materials. Previous studies showed the possibility of using plastic waste in solid blocks application but the solid blocks produced are still lacking of durability as a safe construction material. The aim of this project is to review the application of plastic waste in solid blocks.

RECRON 3S FIBRE

- RECRON 3S fibre is a modified polyester synthetic fibre. It is generally utilized as secondary reinforcing material in concrete and soil to increment their performance.
- RECRON 3S sample utilized in experiment was of 12mm length and manufactured by Reliance Industries limited. Utilization of RECRON-3S as a reinforcing material is to increment the in sundry applications like cement predicated precast products, filtration fabrics etc.
- It withal provides resistance to impact, abrasion and greatly ameliorates the quality of construction during substratum, retaining wall design etc. RECRON-3S fibre is the most widely used includes laboratory testing of soil reinforcement.
- Currently RECRON-3S fibre is utilized to enhance the soil strength properties, to decrease the shrinkage properties and to surmount chemical and biological degradation.
- Residual strength is directly proportional to the fibre content. RECRON 3S is a state of art reinforcing material which is used to increase strength in a variety of applications like automotive battery, paper, filtration fabrics, and asbestos cement sheets, cement based pre-cast products and for improving quality of construction.
- A product of extensive R&D in Reliance industry limited (RIL) state-of-the-art Technology center.

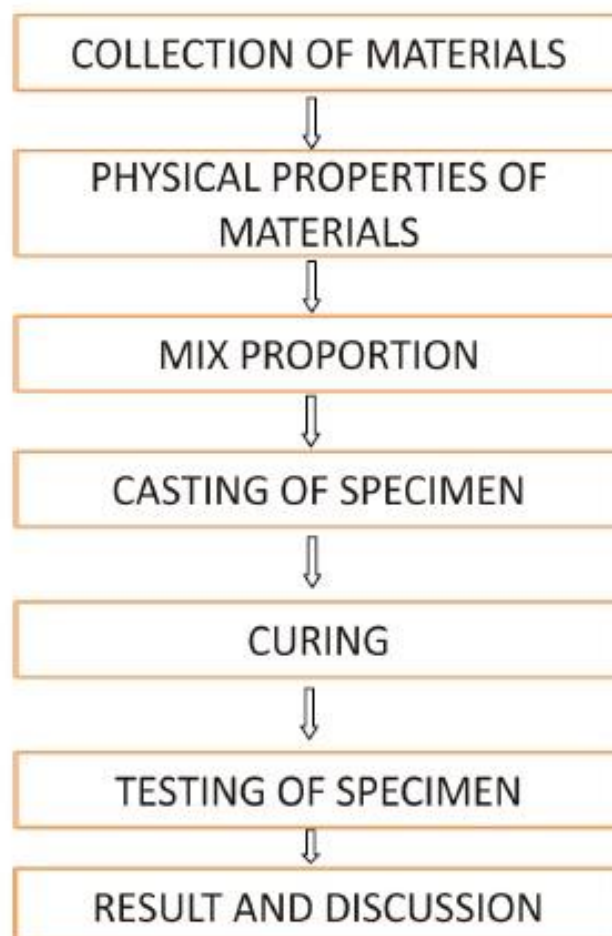


Figure 1.1 : RECRON 3S fibre

2. OBJECTIVE OF THE PROJECT

- To replace the plastic & RECRON fibre in place of fine aggregate.
- To increase the strength of the cement solid blocks & paver blocks by mixing it with definite proportions of plastic & RECRON fibre.
- To provide the low cost cement solid blocks & paver blocks in the market that may be affordable for common people.
- To make the high strength, low weight cement solid blocks & paver blocks.
- To increase the life of the cement solid blocks & paver blocks.
- To produce the energy efficient solid blocks & paver blocks than the common burnt solid blocks.
- To reduce natural resources in the manufacturing of cement solid blocks & paver blocks.
- To replace aggregates with waste materials.
- To minimize the cracks in the solid blocks & paver blocks by using plastic & RECRON fibre having better cohesion.

3. METHODOLOGY



4. EXPERIMENTS DONE

- Slump Test.
- Compacting Factor Test.
- Flow Test.
- Vee-Bee Consistometer Test.
- Kelly Ball Test

5. RESULTS AND DISCUSSION

5.1 Workability Test in Slump Cone

In this study, the value of slump decreases with the addition of RECRON 3S Fibre & plastic in concrete mix.

Sl. No.	1	2	3	4
RECRON 3S fibre Percentage & Plastic Waste	0	0.4	0.8	1.2
Slump (mm)	49	42	37	29

Table – Slump cone Value

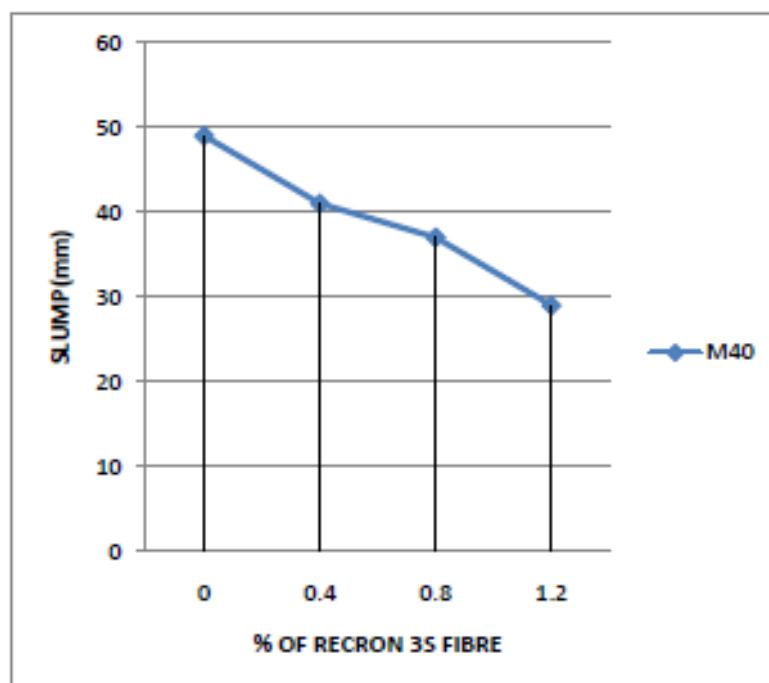


Figure 6.1: Slump Cone value

5.2. Workability Test in Compaction Factor

In this study, the value of compaction factor decreases with the addition of RECRON 3S Fibre & plastic in concrete mix.

Sl. No.	1	2	3	4
RECRON 3S fibre Percentage & Plastic Waste	0	0.4	0.8	1.2
Compaction Factor	0.84	0.80	0.78	0.75

Table 6.2: Compaction factor value

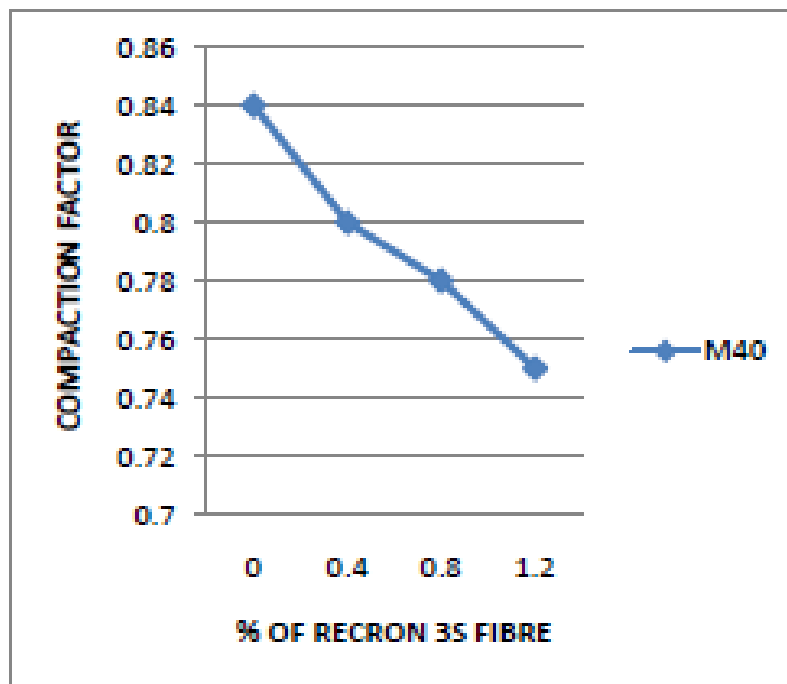


Figure 6.2: Compaction factor value

5.3 Compressive Test on Concrete

Compressive strength can be defined as the capacity of concrete to withstand loads before failure. Of the many tests applied to the concrete, the compressive strength test is the most important, as it gives an idea about the characteristics of the concrete. RECRON 3S Fibre & plastic waste are added in the concrete mix with different proportions of 0%, 0.4%, 0.8% and 1.2%. We casted cube in size of 150mm x 150mm x 150mm and test of the specimen occurred at the period of 7days, 14 days and 28 days. We took three specimens, preferably from different batches, were taken for testing at each selected period. As a result, addition of 0.8% of RECRON 3S fibre and 10% of plastic in concrete gives high compressive strength value.

Compression Strength Test			
Percentage of RECRON 3S Fibre and Plastic Waste	7 Days N/MM ²	14 Days N/MM ²	28 Days N/MM ²
0	28.59	34.61	43.45
0.4	29.02	36.11	44.71
0.8	30.25	37.42	45.30
1.2	29.53	36.72	44.86

Table 5.3: Compressive Test value

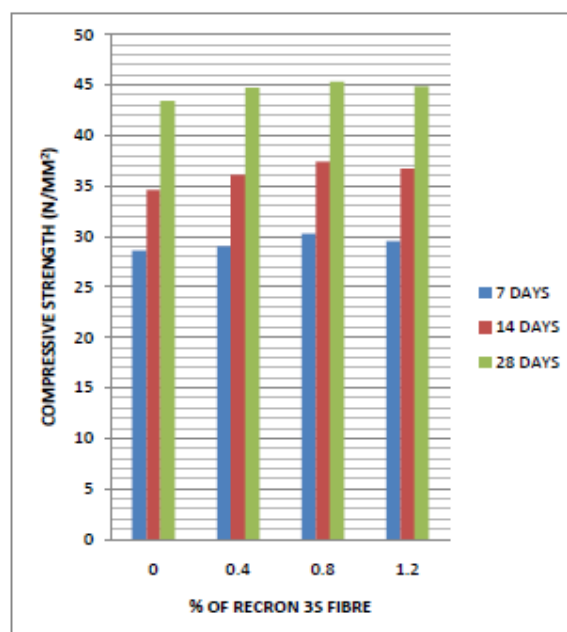


Figure 6.3 – Compressive Strength Value

5.4 Split Tensile Test on Concrete

A method of determining the tensile strength of concrete using a cylinder which splits across the vertical diameter. It is an indirect method of testing tensile strength of concrete. RECRON 3S Fibre & plastic waste added in the concrete mix with different proportions of 0%, 0.4%, 0.8% and 1.2%. We casted cylinder in size of 150mm x 300mm and test of the specimen occurred at the period of 7days, 14 days and 28 days. We took three specimens, preferably from different batches were taken for testing at each selected period. As a result, addition of 0.8% of RECRON 3S fibre and 10% of plastic in concrete gives high split tensile strength value.

Split Tensile Strength Test			
Percentage of RECRON 3S Fibre and Plastic Waste	7 Days N/MM ²	14 Days N/MM ²	28 Days N/MM ²
0	4.96	5.14	5.39
0.4	5.03	5.20	5.44
0.8	5.19	5.35	5.58
1.2	5.01	5.18	5.41

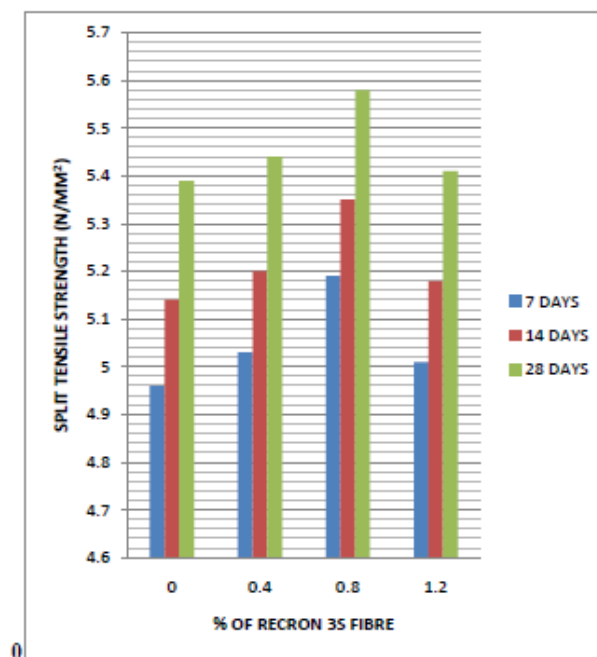


Figure 6.4 – Split Tensile Strength Value

5.5 Flexural Test On Concrete

Flexural strength is defined as the maximum stress at the outermost fiber on either the compression or tension side of the specimen. Flexural modulus is calculated from the slope of the stress vs strain deflection curve. RECRON 3S Fibre & plastic waste were added in the concrete mix with different proportions of 0%, 0.4%, 0.8% and 1.2%. We casted prism in size of 150mm x 150mm x 700mm and test of the specimen occurred at the period of 7days, 14 days and 28 days. We took three specimens, preferably from different batches, were taken for testing at each selected period. As a result, addition of 0.8% of RECRON 3S fibre and 10% of plastic in concrete gives high flexural strength value.

Flexural Strength Test			
Percentage of RECRON 3S Fibre and Plastic Waste	7 Days N/MM ²	14 Days N/MM ²	28 Days N/MM ²
0	3.78	4.16	4.60
0.4	3.81	4.22	4.68
0.8	3.86	4.31	4.75
1.2	3.79	4.20	4.66

Table 6.5: Flexural Test value

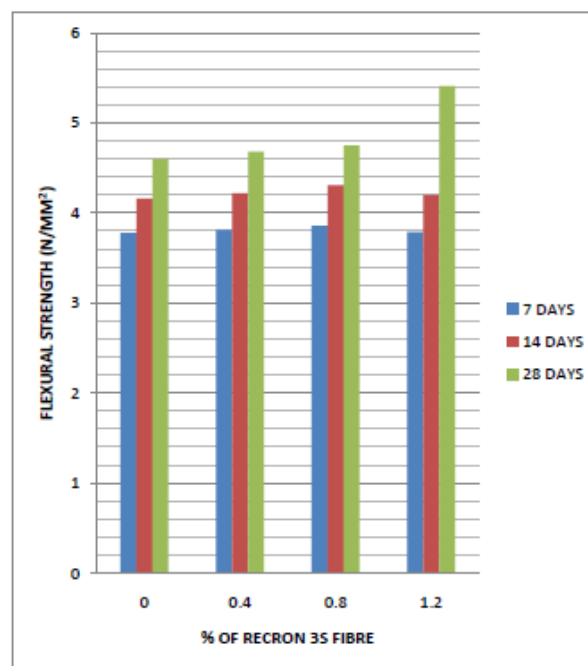


Figure 6.5: Flexural Strength Value

6. CONCLUSION

Plastic waste which is available everywhere can be used effectively in solid block & paver block making. By using plastic and RECRON 3S fibre in solid blocks & paver block, we can reduce the plastic waste in our environment and it also reduces environmental pollution. Plastic solid blocks & paver blocks reduces the usage of clay and they give an alternate option of solid blocks & paver blocks for much lesser cost.

Water absorption of plastic sand solid blocks & paver blocks will be very less. The use of PET & RECRON 3S fibre in plastic solid blocks & paver blocks has the potential to limit the amount of plastic being disposed of into the environment. Nowadays, PET is a good quality product and it biodegrades extremely slowly, having a serious negative impact on the environment. Systematic use of the smaller sized PET aggregate in the construction

industry could be a good solution to reducing this environmental impact. The following are the inferences of the tests.

- In Compressive Strength Test, we tested the cube for a period of 7days, 14days and 28days of each three specimens. It concludes that the addition of 0.8% of RECRON 3S fibre and 10% of plastic has high compressive strength value than other percentage mix value.
- In Split Tensile Strength Test, we tested the cylinder in the period of 7days, 14days and 28days of each three specimens. It concludes that the addition of 0.8% of RECRON 3S fibre and 10% of plastic has high split tensile strength value than other percentage mix value.
- In Flexural Strength Test, we tested the prism in the period of 7days, 14days and 28days of each three specimens. It concludes that the addition of 0.8% of RECRON 3S fibre and 10% of plastic has high Flexural strength value than other percentage mix value.
- The reason for adding RECRON 3S fibre in percentage of 0.4 and 1.2 gets low value compare to adding 0.8 in reinforced concrete due to water cement ratio value.

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