

Experimental Investigation of Textile Wastes used in Concrete

Mr. S. Manishankar¹ C. Sathiyaraj²

¹Assistant Professor ²PG Student

^{1,2}Department of Civil Engineering

^{1,2}Mahendra Engineering College, India

Abstract— In the study, the textile wastes consist of polyester and viscose taken from the textile and apparel manufacturers. These wastes were cut into 2 to 6cm lengths and mixed with Portland cement according to the textile-to-cement ratio of 1%,2%,3% and 4% by the cement weight. Water was added corresponding to 0.40 water-to-cement ratio. The composites were cured in water and then tested for compressive, flexural and split tensile strength test at the age of 3, 7 and 28 days respectively. Upto 3% of textile waste give more split tensile strength and flexural strength compare to conventional concrete.

Keywords: Textile Wastes, Flexural Strength Test, Coarse Aggregate

I. INTRODUCTION

Concrete is one of the most widely used construction material in the world. It can be cast in diverse shapes. Concrete is a composite material formed by the combination of cement, sand, coarse aggregate and water in a particular proportion in such a way that concrete produced meet the needs as regards its workability, strength, durability and economy. Although fabric wastes are commonly recycled into practical goods, they do not stay usable long enough before they return to being wastes once again. This is a big drawback since the price of raw materials such as cotton and the cost of processing textiles are very expensive. Hence, implementing textiles as part of building material are most welcome especially in this era when waste recycling is the most discussed issue world-wide. This will not only minimize the total amount of textile waste being dumped in the landfill. But will also eliminate the pollution threats exposed by the process. The objectives of this research are as stated below:

- To utilize textile waste as cementitious composites.
- To evaluate the Physical properties of textile waste cementitious composites.
- To suggest suitable applications of textile waste cementitious composites.
- To study the strength of composite concrete by the adding fabric.
- To compare the results made of composite concrete with conventional concrete.

A. Materials Used

| PROPERTIES | VALUE |
|----------------------|---------|
| Compressive strength | 53 mpa |
| Specific gravity | 3.15 |
| Initial setting time | 30 min |
| Final setting time | 600 min |

Table 1: Cement (Is 12262,Is 4031 : 1968)

| PROPERTIES | VALUE |
|------------------|---------------------------|
| Fineness modulus | 4 |
| Specific gravity | 2.4 |
| Size | Passing through 20 mm and |

| | retaining in 10 mm sieve |
|------------------------|--------------------------|
| Water absorption ratio | 0.50% |

Table 2: Coarse Aggregate

B. Textile Waste

The common textile wastes material are fleece, flannel, cotton, nylon denim, wool, viscose, polyester, linen. Among the above materials viscose and polyester are disposed of very largely and having less water absorption.

The physical properties of polyester wastes are

| | | |
|---------------------|---|--------|
| Tenacity | : | 6g/den |
| Elongation at break | : | 15-30% |
| Elastic modulus | : | 90 |
| Specific gravity | : | 1.38 |
| Melting point | : | 250°C |

The physical properties of viscose wastes are

| | | |
|---------------------|---|-------------------------|
| Tenacity | : | 2.82 g/den |
| Elongation at break | : | 13% |
| Moisture regain | : | 12% |
| Melting point | : | 150°C |
| Tensile strength | : | 2.2g/d(gram per denier) |

The textile waste cuttings are trimmed into average lengths between 2 and 6 cm.

II. MIX PROPORTION

| WATER | CEMENT | FINE AGGREGATE | COARSE AGGREGATE |
|----------------------|----------------------|----------------------|-----------------------|
| 214Kg/m ³ | 477Kg/m ³ | 612Kg/m ³ | 1189Kg/m ³ |
| 0.40 | 1 | 1.3 | 2.4 |

A. Quantity of Material Required for Casting of Cube

| Percentage of textile waste | Amount Of textile waste (kg) | Amount of cement (kg) | Amount of fine aggregate (kg) | Amount of coarse aggregate (kg) | Amount of water (lit) |
|-----------------------------|------------------------------|-----------------------|-------------------------------|---------------------------------|-----------------------|
| 0 | 0 | 1.6 | 2.06 | 4.01 | 0.72 |
| 1 | 0.016 | 1.6 | 2.06 | 4.01 | 0.72 |
| 2 | 0.032 | 1.6 | 2.06 | 4.01 | 0.72 |
| 3 | 0.048 | 1.6 | 2.06 | 4.01 | 0.72 |
| 4 | 0.064 | 1.6 | 2.06 | 4.01 | 0.72 |

III. RESULTS AND GRAPH



Fig. 1: Compressive Strength Test

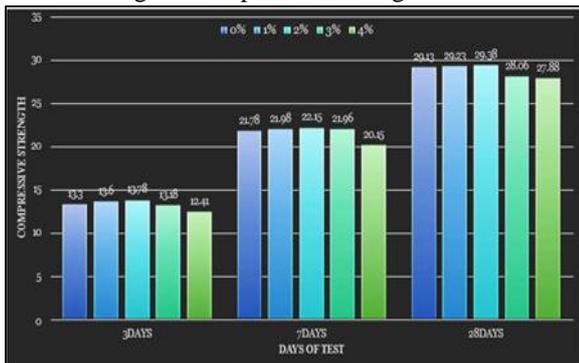


Fig. 2: Compressive Strength Test Result

| S.NO | TYPES OF SPECIMEN | 3DAYS (mpa) | 7 DAYS (mpa) | 28 DAYS (mpa) |
|------|-----------------------|-------------|--------------|---------------|
| 1 | Conventional concrete | 1.064 | 1.82 | 2.88 |
| 2 | 1% | 1.098 | 1.96 | 3.10 |
| 3 | 2% | 1.13 | 2.08 | 3.28 |
| 4 | 3% | 1.18 | 2.13 | 3.42 |
| 5 | 4% | 1.12 | 1.81 | 3.18 |

Table 3: Split Tensile Strength Test

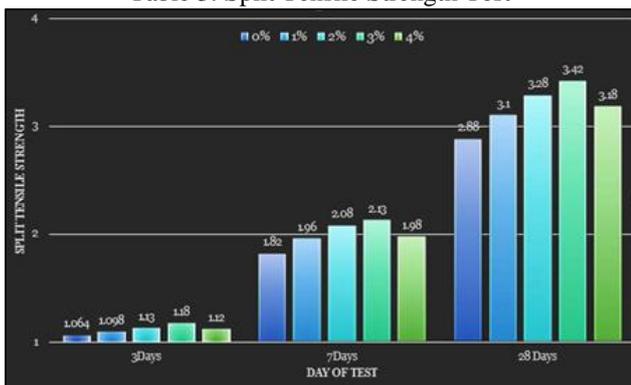


Fig. 3: Split Tensile Strength Test Result

| S.NO | TYPES OF SPECIMEN | 3DAYS (mpa) | 7 DAYS (mpa) | 28 Days (mpa) |
|------|-----------------------|-------------|--------------|---------------|
| 1 | Conventional concrete | 3.94 | 4.61 | 4.87 |
| 2 | 1% | 4.2 | 4.91 | 5.2 |
| 3 | 2% | 4.32 | 5.02 | 5.32 |
| 4 | 3% | 4.41 | 5.12 | 5.47 |
| 5 | 4% | 4.1 | 4.89 | 5.01 |

Table 4: Flexural Strength

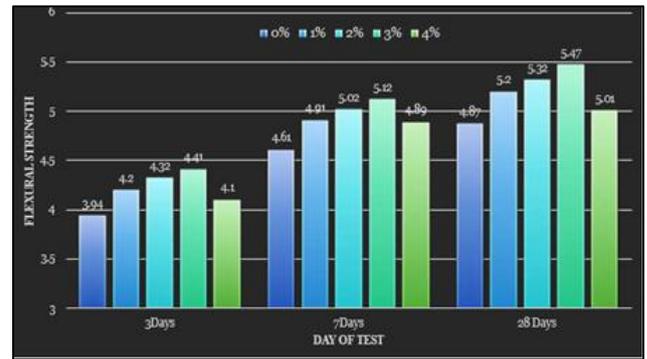


Fig. 4: Flexural Strength Test Result



Fig. 5: Flexural Strength Test

Compressive strength of cube has increase up to 2% with addition of textile waste.
Flexural strength of prism has increase up to 3% with the addition of textile waste.
Split tensile strength of cylinder has increase up to 3% with addition of textile waste.

IV. CONCLUSION

The concrete ingredients such as cement, fine aggregate & coarse aggregates chemical and physical properties was successfully studied. Textile waste in the concrete generally increases the strength of the concrete The compressive strength, flexural strength and split tensile strength test of concrete at 3,7 and 28 days has determined and discussed. When we increase the addition of textile waste the volume of concrete also increases and occupies more space and hence the strength of the concrete decreases.

REFERENCES

- [1] IS:383-1970, Specification for Coarse and Fine aggregate from natural sources for concrete (Second revision).
- [2] IS:10262: 2009, Recommended guidelines for concrete mix Design, BIS. New Delhi, India, 2009.
- [3] IS:456-2000, Specifications for plain and reinforced concrete.
- [4] IS:516-1959, method of test for strength of concrete Bureau of Indian standards. New Delhi, India
- [5] IS:5816-1999, method of test for splitting tensile strength of concrete BIS New Delhi.
- [6] IS:9399-1979, "Specification for apparatus for flexural testing of concrete". BIS New Delhi.