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A Fibre Base Waste Fishnet SheetReplacement with Asbestos

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Abstract
Using fishnet as reinforcement in cement mortar sheets is one possibility. In a preliminary analysis, the mechanical characteristics of mortar with nylon fishnet reinforcement are assessed. Waste nylon fishnet is employed in this study as mortar reinforcement. The compressive strength of mortar has decreased as a result of the addition of nylon fishnet. Also, the adding together of nylon based fishnet enhances several mortar qualities, such as its capacity to support a load. The sheet reinforced with fishnet is cheap and eco-friendly. Even though more research is required, it looks that using nylon fishnet as reinforcement could improve load carrying capacity and flexural strength.

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I. INTRODUCTION

As an alternative to cement sheets made ofasbestos, this fishnet-reinforced sheet uses fishnet as its reinforcement. Since fishnet is an elastic material, the stress that develops when a load is placed on the sheet doesn't go above the permitted stress. When under operating load conditions, the stress and strain are linear. The issue at hand revolves around the disposal of waste fishnets, which are commonly discarded in oceans and waterbodies, posing a significant threat to marine life and ecosystems (Natarajan et al. 2022). Additionally, the use of asbestos, a known carcinogen, has been a cause for concern due to its detrimental health effects on humans when inhaled or ingested. However, the good news is that researchers and manufacturers (Sanjeev Salvi et al. 2021) have been actively working towards developing a sustainable replacement for fishnet sheets, without the use of asbestos. One promising alternative is a fiber-based material derived from recycled plastics and other environmentallyfriendly components (Mr Sahil Sanjeev Salvi 2020).

These fiber-based waste fishnet sheets offer several advantages over traditional fishnet materials. Firstly, they help combat marine pollution by utilizing discarded plastic waste as a raw material, thereby reducing the overall environmental impact. By repurposing and recycling plastics, this innovative solution contributes to waste reduction and promotes a circular economy (Sabale et al. 2023). Secondly, the fiber-based material is designed to be durable and long-lasting, ensuring it can withstand harsh marine conditions. This characteristic extends the lifespan of the replacement sheets, reducing the need for frequent replacements and decreasing resource consumption.

Moreover, the absence of asbestos in these fiber- based alternatives eliminates the health risks associated with exposure to the hazardous mineral. This aspect is of paramount importance in ensuringthe safety and well-being of workers involved in the production, installation, and maintenance of fishnet sheets (Salvi 2017).

1.1 About Nylon: -

The synthetic fibre nylon is produced from fuel. It was created in the 1930s as a silksubstitute. Nylon is prized for its light heaviness, extraordinary tensile strong point, longevity, and damage resistance. It degrades at a very gradual rate. Strong and lightweight synthetic fibre is nylon. An amine and an acid chloride are polymerised to create nylon thread. Two immiscible liquids' interface is where the thread is lifted. Wallace Carothers invited the creation of nylon on February 28, 1935. Many synthetic fabrics are made with nylon fibres, and solid nylon is utilised inengineering.

1.2 Selection of Materials

- Current research, we created a Fishnet sheet to serve as an asbestos cement sheet substitute.
- Also, we made a fishnet sheet sample. In the beginning, we choose materials like cement, fine agregate, and course aggregate and substituted them with earth, brick residue, black cotton earth, etc. We then performed various tests on it, like compression tests, and analysed the results to find that fishnet sheet is ineffective in terms of strength or load carrying parameters.
- In order to address this issue, we changed the materials, prepared the prototype once more, and conducted the test again. Upon analysing the results, we discovered that the fishnet sheet is moderately providing better results.

II. MATERIAL REQURIMENT

The following list includes various materials used in experimental research:

1) Cement: To prepare concrete, OPC 43 gradecement with initial setting times of 39 minutes and final settings of 432 minutes is used. Other physical and chemical characteristics of cement, such as its soundness, specific gravity, lime content, alumina content, and magnesia content, are those reported by the supplier.
2) Water: Organic, inorganic, and chemical contaminants such as sulphates, chloride, and other contaminants must be kept to a minimum in water used for cement mixing and curing. This is where municipal corporation-supplied potable water or fresh water from lakes and rivers are found to be satisfactory.
3) Fine gravel: Sand for fine aggregate is purchased from a local vendor. Sand's sieve analysis reveals that it complies with Zone-II of the IS code (IS 383). To make sure it's devoid of organic matter, etc., the sand is examined.

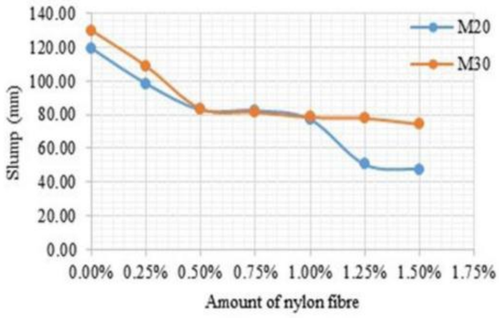
III. RESULTS AND DISCUSSIONS

When nylon fibres and water are combined to makecement concrete, it has been observed that thefibres tend to form a number of small lumps andare not distributed evenly. To achieve a uniformconsistency of fibres in cement concrete, theselumps must be broken up and thoroughly mixed. This section provides the outcomes of experimentaltests conducted on the various mixes listed in Table

1. The split tensile strength is also provided because fibres of all kinds are known to increase tensile strength.

A. ***Workability****:*

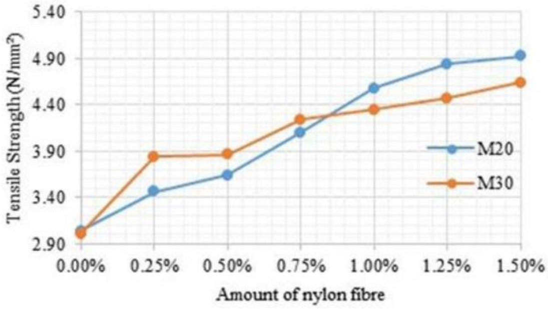
Table 2 displays the findings from slump tests conducted on various mixes. It was discovered thatconcrete with a high fibre content of 1% to 1.5% forms lumps and segregates, creating harsh concrete.



B. Compressive Strength:

Table 3 displays the results for mixes' compressive strength. Figures 3 and 4 show the results of the compressive strength tests performed on M20 and M30 concrete at 7 and 28 days, respectively.

As the concentration of nylon fibres is increased, it is evident that the compressive strength of both M20 and M30 concrete significantly increases. Only amounts of fibre close to 1% have an increase in strength before the strength starts to decline. This decrease in strength is primarily caused by the concrete's decreased workability, which causes segregation and uneven mixing.



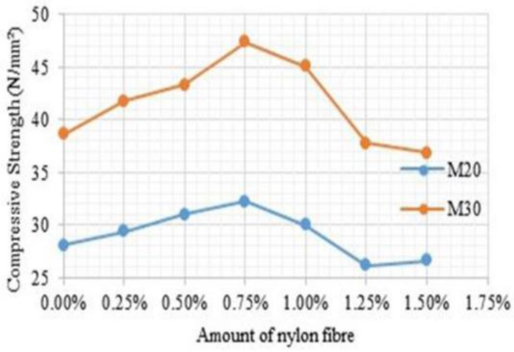


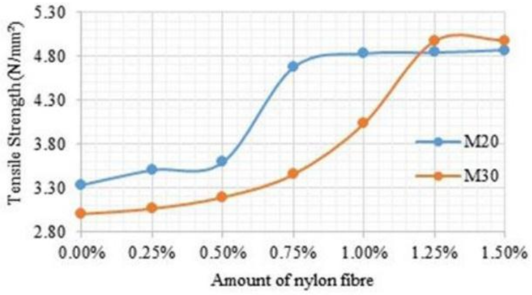
Fig. 2 also shows the slump test variation for mixes. As seen, the slump value increases as the amount of nylon fibres increases, becoming approximately 55–65%.

C. ***Tensile Strength****:*

Utilising fibres (of any kind) has several advantages, one of which is that they improve tensile strength. Split tensile strength tests on concrete mixtures are used to determine whether adding nylon fibre to concrete improves its tensile strength. Table 4 presents the findings.

Figures 4 and 5 depict the deviation in tensile strength of various concrete mixtures with changing amounts of nylon fibre. Based on these findings, it can be deduced that adding nylon fibre to concrete increases its tensile strength by 50%.

70%.



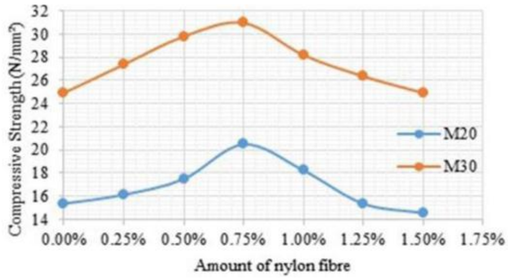


Table -1: Compressive Strength of Samples in N/mm^2

Designation	Compressive strength, N/mm² (7-days)	Compressivestrength, N/mm²(28-days)
S10	15.345	28.018
S11	16.123	29.400
S12	17.478	31.015
S13	20.456	32.256
S14	18.233	30.055
S15	15.345	26.167
S16	14.534	26.655
S20	24.912	38.644
S21	27.367	41.767
S22	29.789	43.333
S23	30.956	47.378
S24	28.189	45.088
S25	26.345	37.755

A. **Tensile Strength*:***

Utilising fibres (of any kind) has several advantages, one of which is that they increase tensile strength. Split tensile strength tests on concrete mixtures are used to determine whether adding nylon fibre to concrete improves its tensile strength.

Table -2: Tensile Strength of Samples in N/mm^2

Designation	Tensile strength, N/mm² (7-days)	Tensile strength, N/mm² (28-days)
S10	3.333	3.034
S11	3.500	3.456
S12	3.579	3.644
S13	4.677	4.100
S14	4.833	4.588

S15	4.844	4.834
S16	4.867	4.912
S20	3.000	3.011
S21	3.066	3.824
S22	3.199	3.876
S23	3.445	4.214
S24	4.023	4.315
S25	4.987	4.467

CONCLUSIONS

1. Environmental Aspect:

a) The challenge of disposing of spent fishnets is likely to be difficult in developing nations like India. Both the environment and people are in risk from it.

b) When compared to asbestos cement sheet, itreduces pollutants.

c) Placing used fishnets in a landfill may result in parasite breeding issues.

2. Structural integrity: The fishnet reinforced sheet has superior flexural integrity. After testing, wefound that the fishnet reinforced sheet's flexure strength is 3500 N/mm wide, compared to the AC sheet's 5250 N/mm width.

3. Economical

The price of nylon reinforced sheet is significantly less than that of A/C sheet. Nylon fibres, which are utilised in a variety of goods, must be properly disposed of in order to minimise environmental impact. The fibres are renowned for their power, toughness, and resilience. These characteristics, when applied in concrete, greatly raise the calibre of the material while resolving the disposal issue. In the current investigation, nylon fibres are added to concrete in mixed amounts, and the impact on the material's properties is assessed. The slump indicates that concrete with nylon fibre, which is comparable to other types of fibre, has lessworkability. However, the slump value is discovered to drastically decrease at 1% to 1.5% amount of fibre, and concrete was seen to be highly harsh. The compressive strength test exhibits the effect of decreased workability. It was discovered that the amount of nylon fibre improved the compressive strength. However, the compressive strength dramatically decreased at roughly 1% offibre, primarily because of lower workability.

A large proportion of nylon fibre was shown to boost the tensile strength of concrete by 60–70%, making it helpful in locations at which it is anticipated that minor tensile stress may be defeat, such as warmth stressors, creep etc.

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