To assess the strength of the concrete cube using self-curing compound

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ABSTRACT: To reach the requisite strength, curing becomes crucial for concrete. Instead of submerging or spraying concrete, we present the idea of self-curing concrete to achieve strength at an early stage. Water solvent polymers are used in concrete as self-curing compounds. The purpose of the current study is to evaluate the effects of Polyethylene glycol 400 on the compressive strength of concretes by adding it at various percentages up to 2% to the weight of cement. In this case, concrete grade M30 is utilised. It was discovered that the strength properties could be determined using 2% PEG 400 curing chemicals. The strength value slightly decreases at greater rates. The purpose is to assess how well water-soluble polymeric glycol works as a curing compound. In dry regions with insufficient access to water, the benefits of curative agents are useful.

Keywords: PEG400, water solvent polymers, strength characteristics, and self-curing concrete.

INTRODUCTION

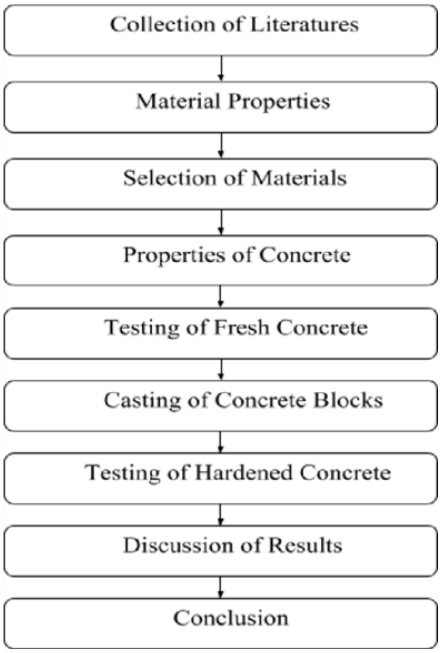
Moisture becomes necessary for cement to hydrate more efficiently and to self-desiccate less. By offering an appropriate internal or self-curing treatment, this requirement will be met. Concrete's quality is affected by the moisture content's evaporation as a result of exposure to the outside environment. Its velocity, temperature, water-to-cement ratio, humidity, and cement type are all influencing variables. Plastic contracts due to evaporation at first, and then contracts due to drying. Continuous evaporation takes place as a result of the chemical potential of water, or moisture content. The temperature of the cure is a significant element in the development of strength. This chemical reaction will be lessened by the polymers supplied, which also aids in maintaining its moisture content. At this time, using a self-curing admixture becomes crucial. This study will compare this to traditional concrete in an effort to determine how to make it stronger. Examine the effects of PEG 400 on the strengths and other characteristics of concrete.

OBJECTIVE

- Compares self-curing concrete's characteristics at different stages of hardening with those of ordinary concrete.
- Investigate the concrete's mechanical characteristics, such as its compressive strength at various PEG 400 content levels.
- Find the PEG 400 shrinkage-reducing admixture's ideal dosage for grade M30.
- In order to maximize performance, two different curing agents have been compared in this work.

METHODOLOGY

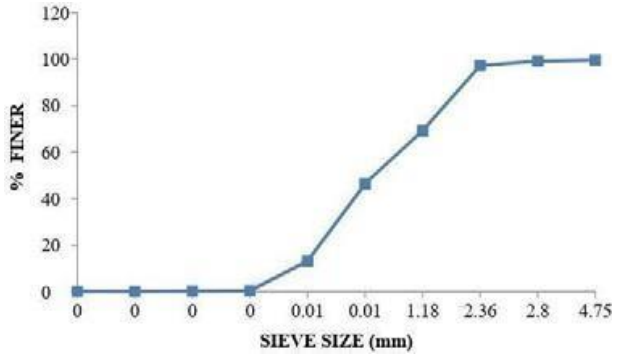
The general breakdown procedure:



TEST RESULT ON CEMENT

TEST	VALUE
Specific Gravity	3.15
Fineness	2.0%
Soundness	2mm
Standard Consistency Test	28%
Initial Setting Time	42min
Final Setting Time	7hr 30min

Distribution of Fine Aggregate's Grain Size:



COARSE AGGREGATE TEST RESULT

TEST	OBSERVATION
Specific Gravity	2.80
Bulk Density (Loose)	1440 kg/m^3
Bulk Density (Compacted)	1630 kg/m^3

RESEARCH METHODOLOGY

We'll use a methodical strategy to research the gaps found in the literature review. The proposed work's step-by-step process is as follows.

1. Concrete mix design in accordance with IS: 10262-2009.
2. Adding various PEG-400 chemical dosages in various percentages.
3. Concrete Cube Casting.
4. Examining the Cube Samples.

Test Specimen Specifics:

A total of 36 cube specimens with and without polyethylene glycol (PEG-400) will be constructed using cubes with dimensions of 150x150x150 mm. PEG-400 will be used to create cube specimens for concrete mixes of grades M30.

CONCRETE MIX DESIGN

The concrete of grade M30 has been constructed for this investigation in accordance with the design mix requirements of IS 10262:2009, as shown in the table.

Mix Proportion:

Mix Proportion for One Cum of concrete		
1	Mass of concrete	438 kg/m^3
2	Mass of water	197 kg/m^3
3	Mass of fine aggregate	808.55 kg/m^3
4	Mass of coarse aggregate	984.24 Kg/m^3
5	Water cement ratio	0.45

TEST RESULT AND DISCUSSION

It has been demonstrated that as the PEG-400 % rises, the slump and compaction factor also do.

SLUMP TEST

COMPATION FACTOR TEST

PEG 400 (%)	SLUMP M30 (mm)	COMPACTION FACTOR M30
0	50	0.71
1	72	0.76
1.5	95	0.78
2	119	0.81

SPECIMEN LABELS

Table containing the labels of several specimens:

Sl No.	Specimen Name	Specimen Label
1	Conventional concrete	NM
2	Concrete mixed (1% of PEG)	SCC (1)
3	Concrete mixed (1.5% of PEG)	SCC (1.5)
4	Concrete mixed (2% of PEG)	SCC (2)

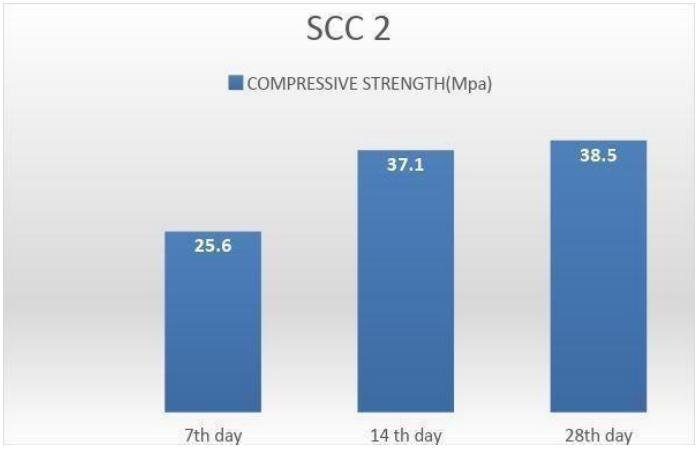
RESULT OF COMPRESSIVE STRENGTH TEST

Test Result of Compressive Strength on NC:

Result of the SCC's Compression test at 1% Replacement:

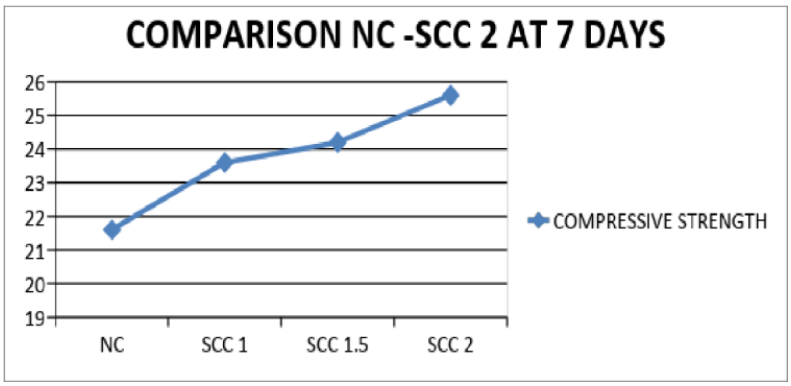
Result of the SCC's Compression Test at 1.5% Replacement:

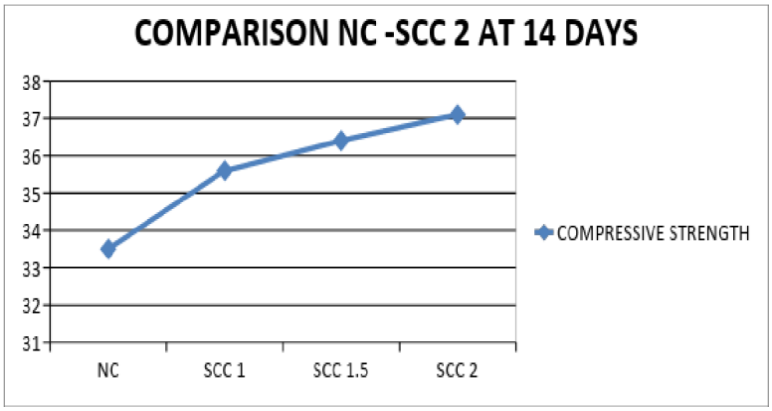
Result of the SCC's Compression Test at 2% Replacement:

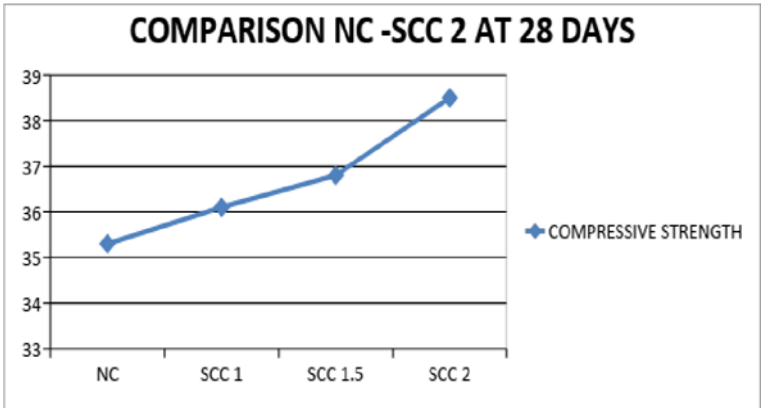


CONCRETE COMPARISON RESULTS

The outcomes of replacing water with polyethylene glycol in concrete to increase compressive strength. The outcome of replacing polyethylene glycol with 1%, 1.5%, or 2% compressive strength was calculated and compared to standard concrete.







CONCLUSION

According to the results, PEG 400 concentration raises the slump value of concrete, which is 17.3 for SC2 concrete. With an increase in PEG400 concentration, the slump value rises. Concrete that cures itself. It was discovered that the compressive strength was higher than that of regular concrete. SCC 2 samples had the maximum strength results. While compressive strength is 38.5Mpa. This is a more advantageous manner for SCC to be applied in desert regions than traditional concrete since it requires less water for curing. The value of concrete grade M30 having 2% PEG is equivalent to that of traditional concrete. This is the PEG dosage that has been optimized. By doing this, we can improve concrete's performance.

- PEG-400, a self-curing agent, was discovered to be efficient.
- Every grade of concrete was shown to have an ideal dose percentage needed to provide the highest strength.
- In addition, it was discovered that the ideal dose for M20 was 1% and for M30 it was 2%. Based on these findings, we may draw the conclusion that as the grade of concrete increases, the dosage of the self-curing agent must be increased for better outcomes.
- In comparison to conventionally cured concrete, the compressive strength of concrete with 1% and 2% PEG-400 dosage is greater.
- Since internally cured concrete does not require a curing procedure, 100% of the water used for curing can be saved.

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