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ECONOMIC ASPECT OF SELF CURING NORMAL VIBRATED CONCRETE

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Abstract — *Today concrete is most widely used construction material due to its compressive strength and durability. Depending upon the ingredients like cement, fine aggregate, coarse aggregate, and water mixed in specific proration to produce concrete according to its grade. Proper curing of concrete gives a proper strength to concrete. Vertical surface of structure (like column) and bottom surface of structure (like beam and slab) which are not cured properly so self curing is appropriate solution for such cases. Here cost is one of the most important factor which is affects any constriction project. We have attempted the cost difference between the normal vibrated concrete and self curing concrete with the use of polyethylene glycol. It is observe that the self curing concrete using PEG-400 give almost atpar strength than the conventionally normal vibrated concrete.*

Keywords-*Compressive strength, Normal vibrated concrete, Economic aspect, self curing, Conventional curing*

I. INTRODUCTION

Generally in large construction work tender is entrusted the company which has lowest quote, and this quotation is depends upon the material cost, labor cost, curing cost, equipment cost and its availability according to its region. Here in remote areas availability of fresh or potable water is scarce. Due to this, water charges are much more. The use of self curing agent PEG-400 is attempted during and mixed at the time of preparing the concrete. The strength of self curing concrete and conventionally cured concrete is observed and compare. It is observed that strength is almost equal and the economical aspect is discussed. Curing is the process of preventing loss of moisture from the surface, but self curing is create a condition of promotion for progressive and uninterrupted hydration of cement continuously for 28 days, due to this desired properties of cement may develops and also increase the workability of concrete [4].

Material properties

A) Cement:-Cement used in this experimental investigation is Ultratech 53 grade which is confirming by IS 12269-2013.
B) Fine aggregates:-The fine aggregates must pass through 4.75mm IS sieve as per IS 383-1970[7]. The source of sand is local from Khanpur district Anand.
C) Coarse aggregates:-The maximum size of aggregate is 20 mm conforming to IS 383-1970[7]. The source of coarse aggregates is local form Sevaliya district Anand.
D) Water:-Water used should be clean and it is free from oils, acids, salts and other chemicals.
E) Polyethylene glycol:-We used PEG-400 which is liquid type self curing agent, easily water soluble substance. Properties of PEG-400 are mentioned below.

Table 1:- Properties of polyethylene glycol

Chemical formula	$C_{2n}H_{4n+2}O_{n+1}$, Where n=8.2 to 9.1
Molar mass	380-420 g/mol
Density	1.128 g/cm^3
Melting point	4° to 8° C

Fig 1:-PEG 400

F) Steel fibre:- Steel fibre were made available from Stewols Private Ltd., Nagpur and have conformed to ISO 13270:2013. Properties of steel fibre are mentioned below.

Table 2:- Properties of Steel fibre [6]

Dimension	50mm*1mm
Shape	Hook end
Tensile strength	130 Kg/cm^2
Aspect	50

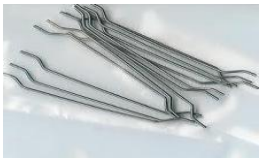


Fig 2:- Steel fibre

II. EXPERIMENTAL ANALYSIS

Here in this investigation M25 grade of concrete mix design is computed as per IS 10262-1982[5] and IS 456-2000. The compressive strength of normal vibrated concrete and of self curing concrete is computed. For self curing PEG-400 chemicals is used.

Table 3:- Mix design M25 Normal vibrated concrete[3]

Material	Weight (Kg/m^3)
Water	191.63
Cement	436
Fine aggregates	578
Coarse aggregates	1221

III. COMPARISON OF STRENGTH

Comparison of compressive strength between concrete with conventional curing and self curing:
9 cubes of 150mm*150mm*150mm size of cubes are used to determine the compressive strength of concrete. It is observed the compressive strength of conventionally cured concrete is 32.86 N/mm^2 while self curing concrete is 31.91 N/mm^2 which is 97.10% of more than the conventionally cured concrete.

Table 4:-Compressive Strength comparison

M25	Compressive strength(N/mm^2)	Percentage
CC	32.86	100
SC	31.91	97.10

As shown in table difference in compressive strength of self curing concrete is minor (all most equal) compare to the conventional curing, and in the self curing concrete we used 0.5% of PEG-400 as self curing agent and 1.0% of steel fibre to receive desired strength.

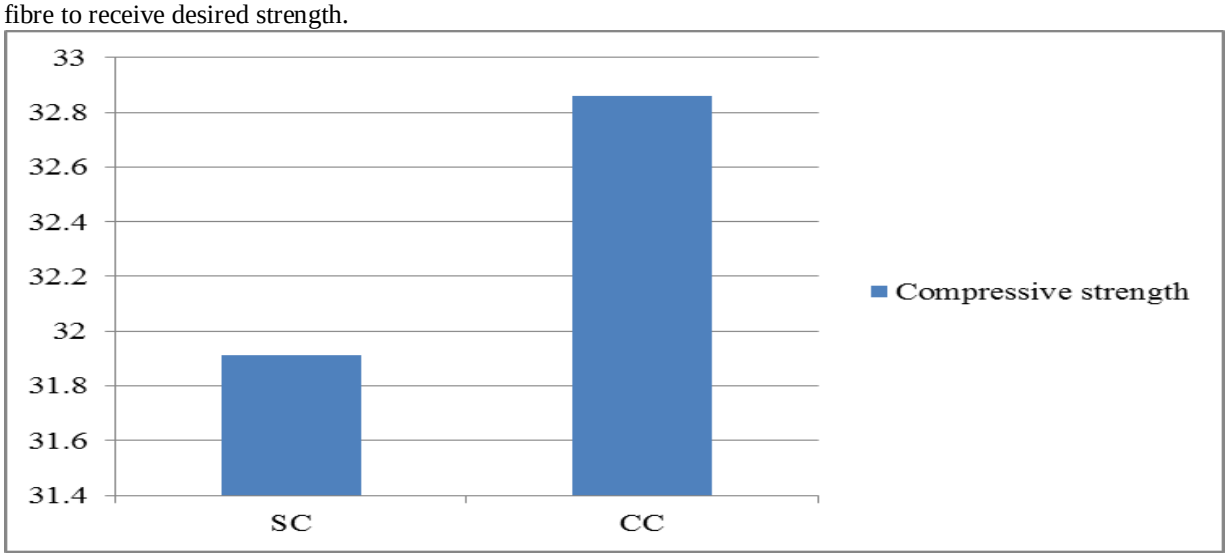


Fig 3:-Comparison of 28 days compressive strength of CC and SC

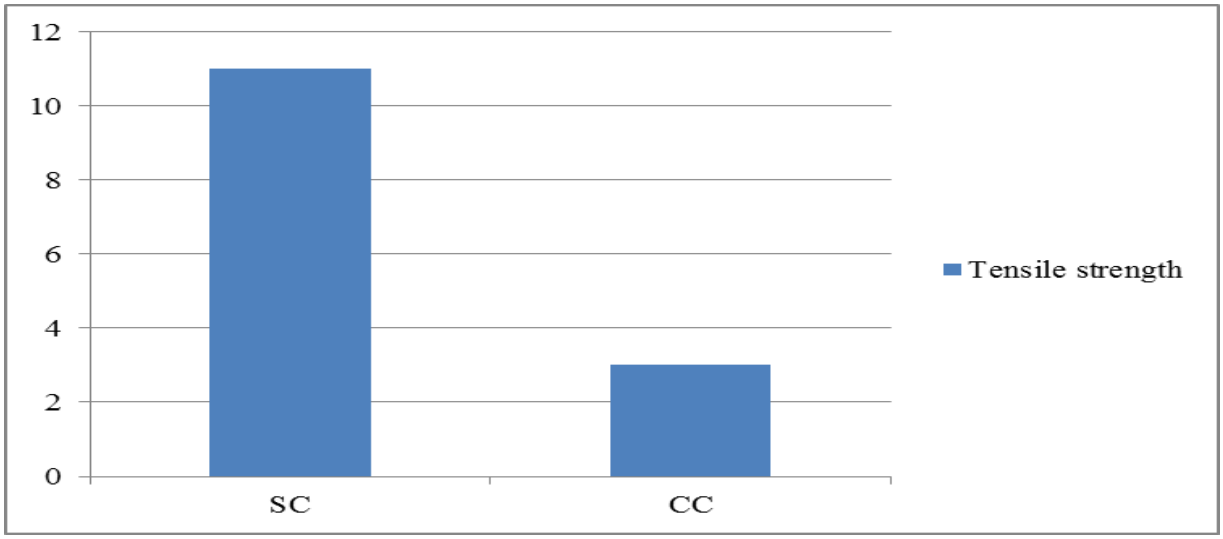
Comparison of tensile strength between conventional curing concrete and self curing concrete:

Split cylinder has a 150 mm diameter and 300 mm lengths are used to determine the tensile strength of concrete. It is observed the tensile strength of conventionally cured concrete is 3.0 N/mm^2 while self curing concrete is 11.02 N/mm^2 which is 367% of the conventionally cured concrete with the use of steel fibre.

Table 5:-Tensile Strength comparison

M25	Tensile strength(N/mm^2)	Percentage
CCC	3.0	100
SCC	11.02	367

As shown in table tensile strength of self curing concrete is very large compared to conventional curing and also steel fibre are used to increase the tensile strength.



"Fig 4:-Comparison of 28 days tensile strength of CC and SC"

IV. COST COMPARISON

RCC work for 1m^3

Table 6:- Material and labor cost [2]

MATERIAL	**COST (₹)**
[1]. Cement	2616
[2]. Fine aggregates	346
[3]. Coarse aggregates	610
[4]. Steel(2%)	7,065
[5] Binding wire	80
[6]. Sundries	5
LABOR	**COST (₹)**
[1]. Labor for mixing, placing, concrete, including curing	300
[2]. Cost of hiring mixture and vibrators	100
[3]. Labor bending, cutting, placing reinforcement	785
[4]. Labor for centering and shuttering	500
[5]. sundries	5
Total cost(material+labor)	**12,412**

As shown the above table cost of material and cost of labor for 1 m^3 RCC work for slab. This calculation is play an important role for comparison of self curing and conventional curing. As shown in table binding wire cost is assumed to

be a 1.0% of cost of steel as per specification, and also labor work is calculated per 1 m^3. Cost of materials like cement, fine aggregates, coarse aggregates, steel, and binding wire are calculated required material for 1 m^3.

Table 7:-cost comparison between self cured and conventionally cured concrete

MATERIAL	**SC(₹)**	**CC(₹)**
[1]. Cement	2616	2616
[2].Fine aggregates	346	346
[3]. Coarse aggregates	610	610
[4]. PEG-400	200	-
[5]. Steel fibre	400	-
[6]. Water for mix	37.23	37.23
[7]. Water for curing	-	161.53
[8]. Labor for curing	-	50
Total cost	**4209.23**	**3820.76**

As shown in table cost comparison between self curing and conventional curing in which self curing has 9.23% is more than the conventional curing concrete. But in the arid region where lack of availability of water than concrete is not achieved proper strength. But with the use of self curing technique gives 100% result than the conventional curing. Here cost of water for mix is calculated as the 0.3% of total cost of labor and material, and also water for curing is calculated as 1.3% of total cost of labor and material.

V. CONCLUSION

[1]. The cost of self curing is 9.23% is more than the normal curing.
[2]. However in arid region where scarcity of water is observed self curing technique is the better solution.
[3]. With use of self curing agent there is no compromise for compressive strength of concrete.
[4]. With use of steel fibre the tensile strength of concrete increase up to 367%.

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REFERENCES

[1]. Dr Pamnani Nanak j, “Relation between curing technique and early age compressive strength of self compacting concrete”, International journal of advance engineering and research development, ISSN 2348-6408,pp 15-22,march-2015.
[2]. Dr. R. P. Rethaliya, Professional practice and valuation, Atul prakashan, January 2014.
[3]. M S Shetty, Concrete technology theory and practice, S chand publication 2013.
[4]. Shikha tyagi, “An experimental investigation of self curing concrete incorporated with polyethylene glycol as self curing agent”, International journal of engineering and technology, ISSN 2395-0072, pp 129-132, sep-2015.
[5]. IS 10262-1982, “Concrete mix design”
[6]. ISO 3270-2013, “Steel fibre for concrete”
[7]. IS 383-1970, “Indian standard specification for coarse and fine aggregates from natural source for concrete”

