



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 5, May 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Experimental Investigation on Self Curing Concrete

Gnana Venkatesh.S¹, Nesamani.A², Sathiyamoorthi.S², Madhan kumar.S²

Assistant Professor, Nandha Engineering College (Autonomous),Tamilnadu, India¹

UG Final Year Students, Nandha Engineering College (Autonomous),Tamilnadu, India²

ABSTRACT: Self-curing concrete have a internal curing capability by the some self curing agents. In this experiment is done by two type of self curing agents Polyethylene glycol(PEG-400),Polyvinyl alcohol (PVA).mostly a normal concrete required water to mixing and curing inn construction fields. In usage of self-curing concrete reduces the high amount of water usages in construction works. Most of the desert and areas of water scarcity building works are need a self curing type concrete. Because they are take small amount of water only in mixing stage. In this project the strength and capability of self curing concrete by two type of self curing agents are tested. In a proportion of the self curing agents are added in 1%,2%,3% in weight of cement. The high strength of self curing concrete is attain in Polyethylene glycol (PEG-400) in 1%, comparing to normal conventional concrete in grade of M30.

KEYWORDS: Polyethylene glycol-400, Polyvinyl alcohol, strength of self curing concrete.

I. INTRODUCTION

In construction of buildings concrete is a main part of a building and give extra support to the entire structure. Normally a concrete is required a high amount of water to in stage of mixing of concrete and curing of concrete. But the self curing concrete has a ability of curing from internally to a several years. The self curing agents are observe and stock the water by itself then the water content are curing the concrete the water by slowly. Comparing to the normal concrete the self curing concrete is have a more strength than the normal concrete in grade of M30.

II. MATERIAL USED AND PROPERTIES

CEMENT:

Ordinary Portland cement grade53 is used in this experimentation of self curing concrete.

Table 1: properties of cement

S NO	DESCRIPTION	TEST RESULT
1	Grade used	53
2	Specific gravity	3.15
3	Fineness	6%
4	Normal consistency	33
5	Initial setting time	30 min
6	Final setting time	10 hrs



FINE AGGREGATE:

Locally available M-sand is used in this experimentation.

Table 2: properties of fine aggregate

S NO	DESCRIPTION	TEST RESULT
1	Specific gravity	2.72kg/m ³
2	Water absorption	3%
3	Fineness modulus	3.32

COARSE AGGREGATE:

Locally available 20mm aggregate is used in this experimentation.

Table 3: properties of coarse aggregate

S NO	DESCRIPTION	TEST RESULT
1	Specific gravity	2.80kg/m ³
2	Fineness modulus of Coarse aggregate	4.42%

WATER

Water is the main part of the concrete. In this experimentation our campus usage water is used.

Table 4: properties of water

S NO	DESCRIPTION	TEST RESULT
1	Appearance	Clear
2	pH value	7.3
3	Turbidity	Low

POLYVINYL ALCOHOL

Polyvinyl alcohol is a powder condition self curing component. This is melt in hot water and it is change its condition to a jelly form.

Table 5: properties of polyvinyl alcohol

S NO	DESCRIPTION	TEST RESULT
1	Appearance	Powder form
2	Odour	Mild odour
3	Solubility	Soluble in hot water

POLYETHYLENE GLYCOL

Polyethylene glycol is a liquid conditioned self curing component. It is a water soluble chemical. It is non-toxic to the environment and easy to use.



Table 6: properties of polyethylene glycol

S NO	DESCRIPTION	TEST RESULT
1	Appearance	Clear liquid
2	Odour	Mild odour
3	Solubility	Soluble in water
4	Density range	1.126-1.128

MIX PROPORTION FOR SELF CURING CONTENT

Table 7: mix proportion of self curing contents

MIX	POLYETHYLENE GLYCOL (% OF CEMENT WEIGHT)	POLYVINYL ALCOHOL (% OF CEMENT WEIGHT)
1	0%	0%
2	1%	1%
3	2%	2%
4	3%	3%

DESIGN OF CONCRETE MIX

Table 8: design of concrete mix of M30

MATERIAL	kg in m ³
Water	197
Cement	437
Fine aggregate	650
Coarse aggregate	1144
Self curing component 1% weight of cement	4.37

FRESH CONCRETE SLUMP TEST

Table 9: Fresh concrete slump test

SI NO	DESCRIPTION	SLUMP VALUE IN mm
1	Conventional concrete	0mm
2	PEG-400 1%	90mm
3	PEG-400 2%	85mm
3	PEG-400 3%	90mm
4	PVA 1%	85mm
5	PVA 2%	80mm
6	PVA 3%	85mm

HARDENED CONCRETE TEST RESULTS:

1.)COMPRESSIVE STRENGTH TEST:

a.)POLYETHYLENE GLYCOL MIX CONCRETE

Mix ratio	% of polyethylene glycol	7days N/mm ²	14days N/mm ²	28 days N/mm ²
M30	0	17.78	21.34	27.50
	1	20.75	27.78	31.78
	2	18.66	26.47	30.42
	3	17.66	25.38	29.50

Table 10: Compressive strength test of PEG-400

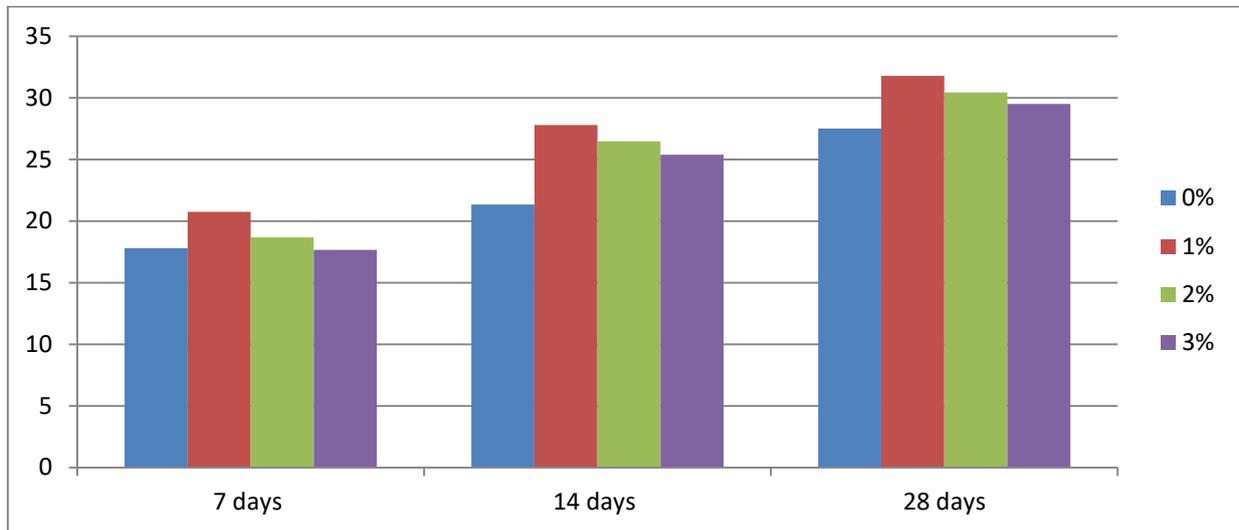


Chart 1: Graphical representation of compressive strength for PEG-400

b.)POLYVINYL ALCOHOL MIX CONCRETE

Mix ratio	% of polyvinyl alcohol	7days N/mm ²	14days N/mm ²	28 days N/mm ²
M30	0	17.78	21.34	27.50
	1	20.73	26.98	31.50
	2	13.33	20.13	28.40
	3	8.88	15.76	23.60

Table 12: Compressive strength test of PVA

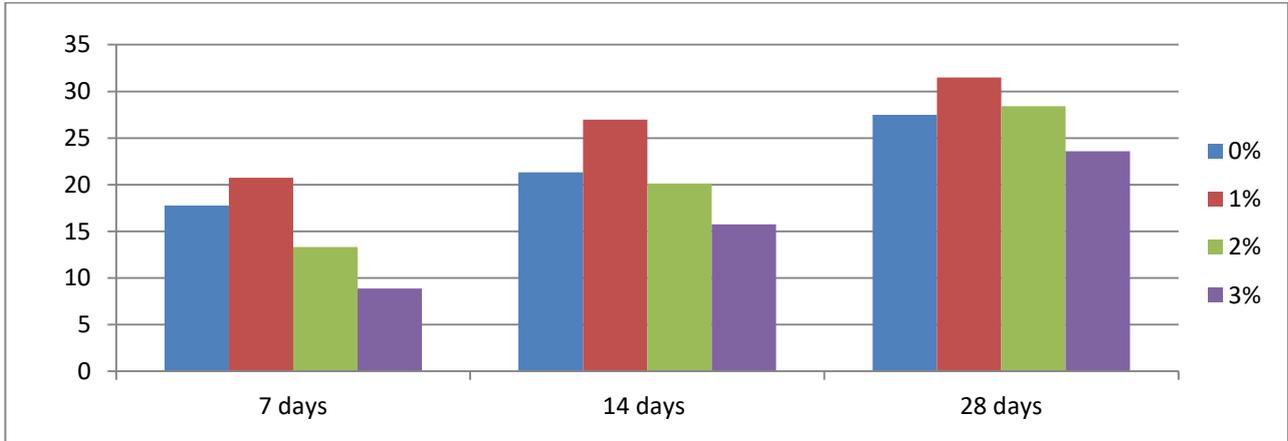


Chart 2: Graphical representation of compressive strength for PVA

2.) SPLIT TENSILE STRENGTH TEST

a.) POLYETHYLENE GLYCOL MIX CONCRETE

Mix ratio	% of polyethylene glycol	7days N/mm ²	28 days N/mm ²
M30	0	2.51	3.50
	1	2.62	3.70
	2	2.40	3.20
	3	2.23	2.96

Table14: Split tensile strength test for polyethylene glycol

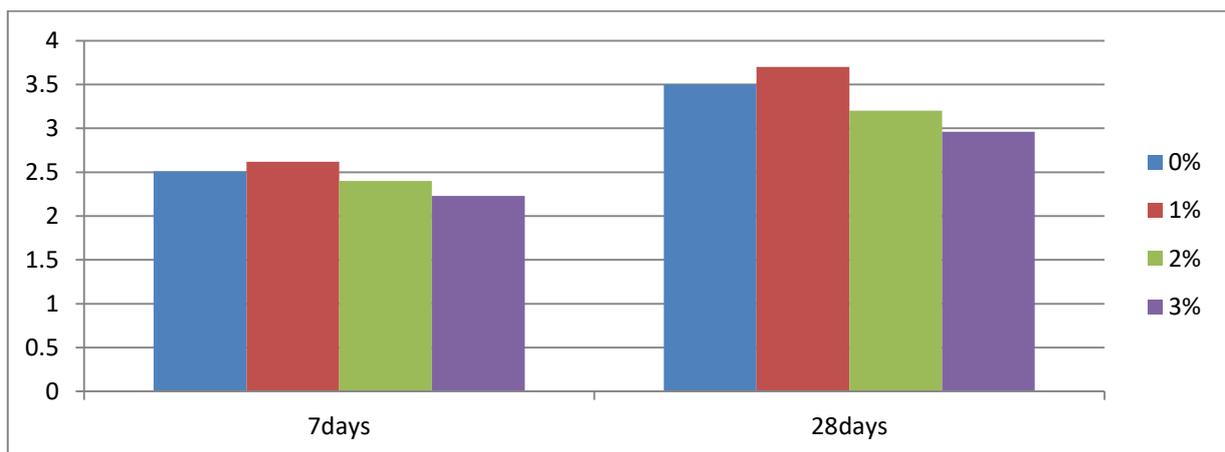


Chart 3: Graphical representation of split tensile strength for PEG-400

b.) POLYVINYL ALCOHOL MIX CONCRETE

Mix ratio	% of polyvinyl alcohol	7days N/mm ²	28 days N/mm ²
M30	0	2.51	3.50
	1	2.74	3.76
	2	2.43	3.32
	3	2.12	3.00

Table16: Split tensile strength test for polyvinyl alcohol

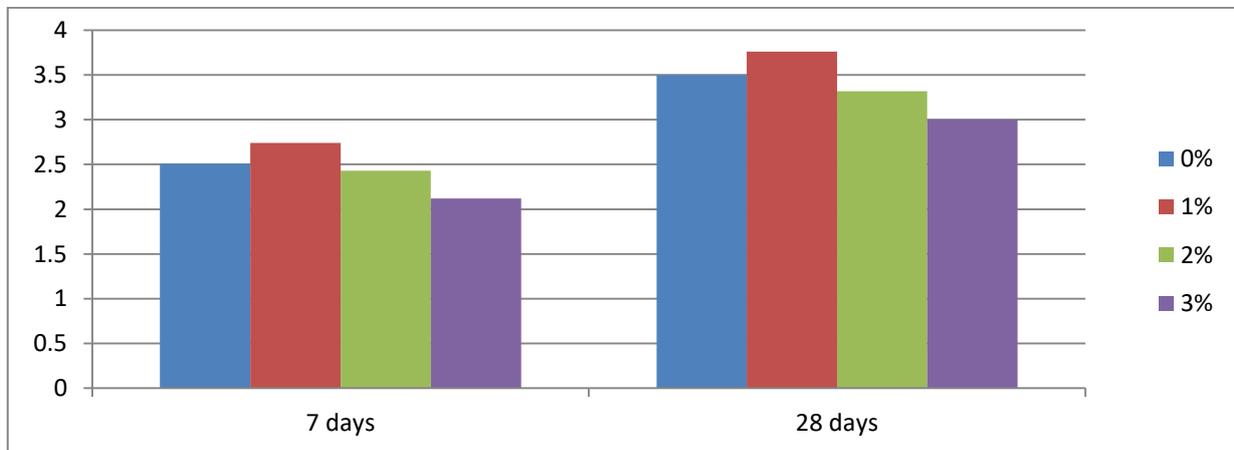


Chart 4: Graphical representation of split tensile strength for PVA

3.) FLEXURAL STRENGTH TEST

a.) POLYETHYLENE GLYCOL MIX CONCRETE

MIX PROPORTION	FLEXURAL STRENGTH (Mp _a) (7days)	FLEXURAL STRENGTH (Mp _a) (28days)
MIX1(CONVENTIONAL)	2.14	2.41
MIX2(1% PEG)	2.53	3.34
MIX3(2% PEG)	2.37	3.08
MIX4(3%PEG)	2.26	3.11

Table 18:Flexural strength test results for PEG

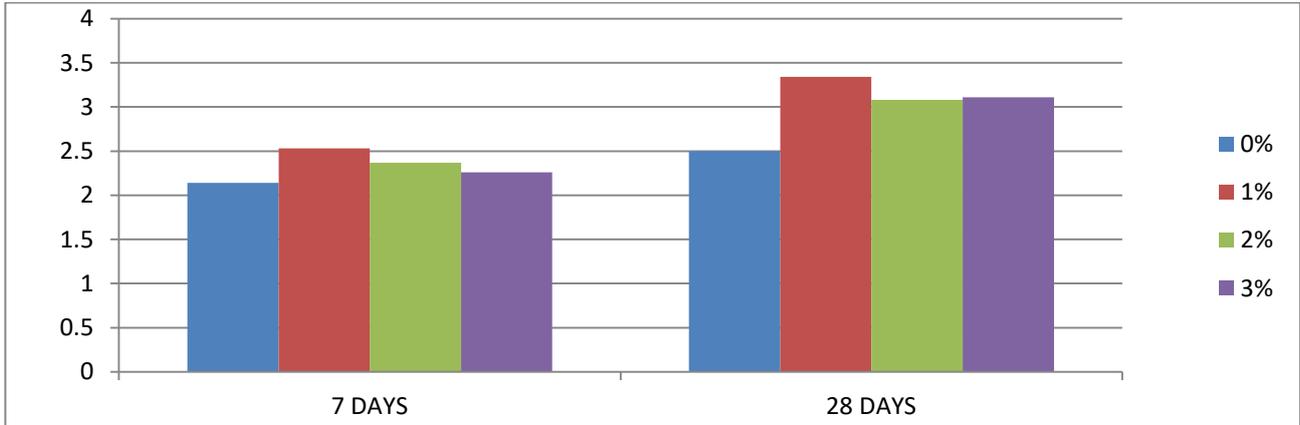


Chart 5: Graphical representation of flexural strength for PEG

b.) POLYVINYL ALCOHOL MIX CONCRETE

MIX PROPORTION	FLEXURAL STRENGTH (Mpa) (7days)	FLEXURAL STRENGTH (Mpa) (28days)
MIX1(CONVENTIONAL)	2.14	2.41
MIX2(1% PVA)	2.55	3.28
MIX3(2% PVA)	2.37	3.08
MIX4(3%PVA)	2.16	2.89

Table 20: Flexural strength test results for PVA

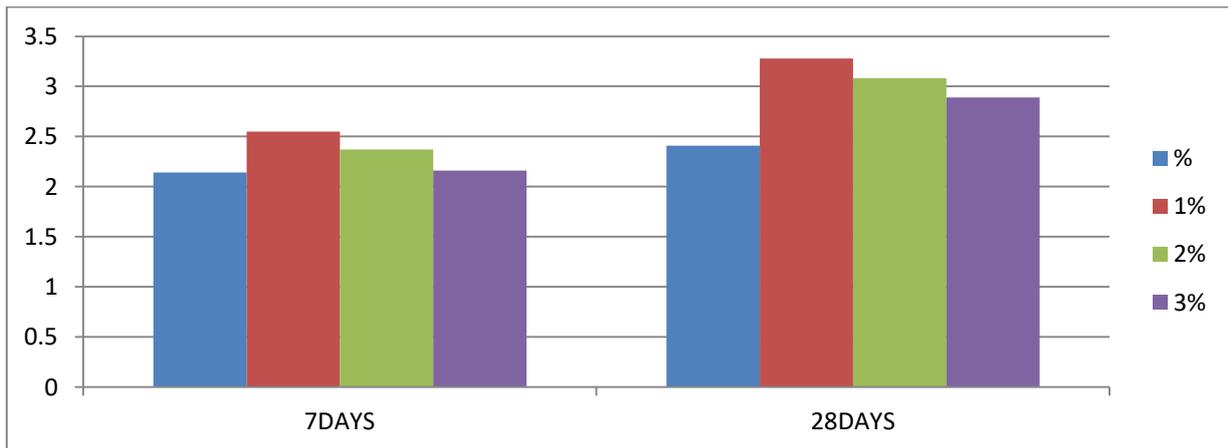


Chart 6: Graphical representation of flexural strength for PVA

III. RESULT

- Polyethylene glycol has a good strength abilities in all kind of tests.
- In the experimentation of two kind of self curing agents Polyethylene glycol gives more workability and best strength results and also cheap in rate to compare with the other concrete ingredients.
- Polyvinyl alcohol are also gives strength like conventional concrete.

- But when comparing to the other chemical content is having more capability to the environment.

IV. CONCLUSION

- The optimum dosage of Polyethylene glycol and polyvinyl alcohol for maximum strength (compressive test, split tensile test, flexural strength test).
- The slump values are also gives a good slump readings.
- 1% of the polyethylene glycol and polyvinyl alcohol is give a good strength to the concrete in M30 grade.
- Strength of self curing concrete is gives higher strength when compared with conventional concrete.
- Its not require the water to curing.
- Workability is improved when adding the self curing contents.
- The cost requirement of water is lower than conventional concrete projects.
- Overall cost of material is normal but the water requirement is not needed for curing so we can control the cost of water.
- Max strength is attained in the 1% of the polyethylene glycol is get 36.66N/mm² strength in compressive strength.
- 1% of the chemical contents are give strengths in concrete mixes.
- In comparing of two chemicals poly ethylene glycol was give more strength than polyvinyl alcohol.
- In the end of the strength test the polyethylene glycol has gain more strength than the polyvinyl alcohol.
- Self-curing concrete (SCC) is the answer to many problems faced due to lack of suitable curing.

REFERENCES

- [1] M.Geetha and Dr.R.Malathy (2017) “Strength Development Of Self Curing Concrete With Respect To Age Using Bio Materials As Admixtures”, Indian Concrete Institute, JOURNAL, Vol 17 ,January-March 2017, No.4
- [2] M.Geetha and Dr.R.Malathy “Strength And Durability Properties Of Different Grade Concrete By Using Polymeric Materials As Self Curing Agents”, Journal Of International Science And Technology, ISSN:0975-5462,Vol 3, Issue1
- [3]M.ManojKumar and D.Maruthachalam (2013) “Experimental Investigation on Self-curing Concrete”, International Journal of Advanced Scientific and Technical Research, Issue 3 volume 2, March-April 2013, ISSN 2249-9954.
- [4]El-Dieb “Self-curing concrete” Water retention, hydration and moisture transport“Construction and Building Materials”21 pp.1282-1287, 2007
- [5]M.S.Shetty “CONCRETE TECHNOLOGY”, 3rd Edition, S. Chand & Company Limited, Delhi, 1992
- [6]Ambily P S and Rajamane N P (2007) , ‘Self curing concrete – an introduction Part 1’, Masterbuilder, Vol. 9, pp. 116-123.
- [7]Ambily P S and Rajamane N P (2007), “Self curing concrete – an introduction”, New Building Materials and Construction World, Vol. 13, pp. 74-86.
- [8]Bentz, D.P., and Stutzman, P.E., “Curing, Hydration, and Microstructure of Cement Paste,” ACI Materials Journal, 103 (5), 348- 356, 2006.
- [9]Magda I. Mousa, Mohamed G. Mahdy, Ahmed H. AbdelReheem, Akram Z. Yehia, “Physical properties of selfcuring concrete (SCUC),” HBRC Journal.
- [10s] SRM thesis of “Experimental study of self curing concrete” by Sathish kumar A.P,2014
- [11] Dr. B. Ramesh Babu, A. Bharath Kumar, G. RaghuYadav “Analysis of Self Curing of Concrete” Vol. 6, Issue 1, January 2017
- [12]K.V.S.Gopalakrishnasastry, “Self-curing concrete with different self-curing agents” (2018)
- [13] N. Y. ELWakkad, KH. M. Heiza, Prof Dr Aqialelady “Review on – Self-Curing Concrete” 25 March(2019)
- [14]VaseemAkram.N 1 , Balachandiran.P2 “experimental study of self curing concrete by using polyvinyl alcohol” Volume 9, Issue 3, March-2018
- [15]Stella Evangeline “Self curing concrete and its Inherit properties” Vol. 4, Issue 8(Version 7),August 2014
- [16]A Sreenivasa Kumar, Dr. T Suresh Babu “ Effect of self curing compound on strength and durability of M25 Mix concrete” Volume-1, Issue-5, September 2015
- [17] k. Nithya, K.RAnjitha , P kumar “ Experimental Study on self-curing concrete” Volume: 04 Issue: 03 | Mar -2017
- [18] T. A Sajana Khader1, T.S Shabana “Experimental Investigation on the Mechanical Properties of Self Curing Concrete Using Sodium Lignosulphonate and Polyvinyl Alcohol” Vol. 7, Issue 3, March 2018
- [19] Daliya joseph, Belamin Xavier “ Effect of self curing agents on mechanical properties of concrete” Vol. 5 Issue 09, September-2016
- [20] INDIRAJITH A.J. & VISHNU . A “ Self curing concrete – case study” (2016)



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details