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EFFECT OF CURING CYCLE ON THE MECHANICAL PROPERTIES OF CONCRETE BY USING DIFFERENT ADMIXTURE

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Abstract:- Advancements in construction and chemical industry have paved a way for development of new curing techniques . Significant amount of research has been conducted to evaluate curing effectiveness and its effect on various concrete properties. This project synthesizes findings from the literature review and experimental investigation carried out as per ASTM standards to evaluate the compressive strength of concrete cubes at 28 days, effect on strength with the application of different curing period and admixture. Comparing the results of compressive strength of cubes with the replacement of cement by 20%, 10% and 9% by a fly ash, silica fumes and metakaolin with different curing cycle . An effort has been made here, to understand the efficiency of curing cycle adopted and are compared with conventional controlled mix concrete. Results indicate various effects of curing cycle on mechanical properties of concrete.

1.INTRODUCTION

Using mineral additives such as fly ash , silica fume and metakaolin has been proven to be an effective approach to improve concrete properties. With the increasing of the environmental concern, in recent years, the use of metakaolin , silica fume and fly ash as an optional additive has also raised more and more interests . As a supplementary cementitious material MK has the expected pozzolanic nature activated by tricalcium silicate (C3S) and tricalcium aluminate (C3A) . When used as a partial replacement for cement, MK reacts with portlandite (Ca(OH)2) to generate additional CSH gel which results in the increase of strength. It has also been shown that the sample containing 9% MK replacement displayed the best performance in terms of ultrasonic test. It was found that MK caused a considerable reduction in workability and reduced the setting time of cement paste. The study also showed that the use of MK (9%), silica fume (10%) and fly ash (20%) replacement had increased the compressive strength.

2. SCOPE OF RESEARCH: -

1)By the use of fly ash ,silica fume and metakaolin, the better strength will be achieved which will result in less amount of cement utilisation and long time work on this can prove more than 50% of cement can be replaced by doing the certain change which show how to use waste of coal power plant waste in huge amount.
2) As the result obtain from our project, we can decide the way of curing of concrete cubes in specific cycle so as to achieve required strength .
3)As mineral admixtures used in this project, these admixtures are by-product of coal plant and electric generation plant which are used in construction industry in future because of easy availability and less cost

3. LITERATURE STUDY:

3.1 Study of Partial Replacement of Cement by Silica fume. By - Lakhbir Singh, Arjun Kumar, Anil Singh.
Overview-The use of silica fume had major impact on industries, ability to routinely and commercially produce silica fume modified concrete of flow able in nature but yet remain cohesive, which in turn produces high early and later age strength including resistant to aggressive environments.The partially replacement of cement by silica fume the strength parameters.The results showed that partial replacement of cement with silica fume had significant effect on the compressive strength of cube and split tensile strength cylinder.
3.2 Use of Metakaolin as Pozzolanic Material and Partial Replacement with Cement in Concrete (M30). By - A.Kaur and V.P.S.Sran .
Overview-In this study partial replacement of cement with Metakaolin at 0%, 3%, 6%, 9% and 12% was done. Mix design was prepared **with** grade M30 concrete. The compressive strength and split tensile strength of concrete was

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achieved at 9% addition of Metakaolin. Earlier research also indicate that effect of blended Metakaolin on the properties of cement such as consistency, setting time, soundness remains within the acceptable ranges at different standards. It also solve ecological and environmental problems because cheaper production of Metakaolin and more durable.

3.3 The Effects of Steam Curing on Porosity of High Strength Concrete Containing Metakaolin. By - Ali Papzan, Taksiah. A. Majid.

Overview-Steam curing is an important technique for obtaining high early strength in precast concrete production hence, an experimental investigation was conducted to study the effects of steam curing on porosity of high strength concrete containing metakaolin. Four concretes mixes with 0, 5, 10 and 15% metakaolin replacement levels by weight of cement were prepared and exposed to steam curing periods of 0, 4, 8 and 16 hours. Steam curing at 55°C was implemented 3 hours after casting to avoid microcracking and increased porosity due to difference in thermal expansion of the concrete ingredients.

3.4 A experimental study of natural admixture effect on conventional concrete and high-volume class F fly ash blended concrete.

Overview-The present investigation is focused to introduce broiler hen egg as Natural admixture in concrete and study the effect of NAD on conventional concrete (CC) and class F fly ash(FA) blended concrete. Cement is replaced by FA at various levels (0%-55%) to its weight. The compressive strength and spitting tensile strength of concrete was determined to optimize NAD dosage in FA blended concrete to get the desired strength of M25 grade of CC. Studies revealed that 0.25% NAD dosage has very much significant effect on compressive strength and splitting tensile strength of all concrete mixes at all curing periods.

4. MATERIAL

The materials used for preparation of mortar are:
1) Binder such as cement.
2) Inert materials such as sand, crushed stones, etc.
3) Pozzolana such as fly ash, silica fume, metakaolin.

5. RESULTS

5.1 COMPRESSIVE STRENGTH

For controlled Mix

Table :- Compressive strength for controlled mix M-40

No. of days (Curing)	Sr. No	Compressive strength (N/mm^2)	Average (N/mm^2)
7 days	1.	30.22	28.14
	2.	26.66	
	3.	27.55	
14 days	1.	31.11	32.14
	2.	35.11	
	3.	30.22	
28 days	1.	42.00	40.21
	2.	40.88	
	3.	37.77	

Table :-Compressive strength for controlled mix M-40

No. of days (Curing)	Sr. No	Compressive strength at 28 days (N/mm^2)	Average (N/mm^2)
3 days	1.	33.33	35.70
	2.	36.00	

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	3.	37.77	
7 days	1.	40.22	40.15
	2.	41.10	
	3.	39.15	

For M-40 Mix (Cement is replaced by fly ash by 20%)

Table :- Compressive strength for controlled mix M-40 (Cement is replaced by fly ash by 20%)

No. of days (Curing)	Sr.no	Compressive strength (N/mm^2)	Average (N/mm^2)
7 days	1.	33.33	30.96
	2.	30.22	
	3.	29.33	
14 days	1.	40.88	38.51
	2.	37.77	
	3.	36.88	
28 days	1.	41.88	40.59
	2.	40.10	
	3.	39.80	

Table :- Compressive strength for controlled mix M-40 (Cement is replaced by fly ash by 20%)

No. of days (Curing)	Sr. No	Compressive strength at 28 days (N/mm^2)	Average (N/mm^2)
3 days	1.	40.00	38.66
	2.	39.11	
	3.	36.88	
7 days	1.	40.44	40.59
	2.	41.77	
	3.	39.55	

For M-40 Mix (Cement is replaced by silica fume by 10%)

Table :-Compressive strength for controlled mix M-40 (Cement is replaced by silica fume by 10%)

No. of days (Curing)	Sr. No	Compressive strength (N/mm^2)	Average (N/mm^2)
7 days	1.	29.77	28.58
	2.	27.55	
	3.	28.44	
14 days	1.	36.44	37.62
	2.	41.77	
	3.	34.66	
28 days	1.	40.10	40.56
	2.	41.00	
	3.	40.58	

Table:- Compressive strength for controlled mix M-40 (Cement is replaced by silica fume by 10%)

No. of days (Curing)	Sr. No	Compressive strength at 28 days (N/mm^2)	Average (N/mm^2)
3 days	1.	37.77	37.76

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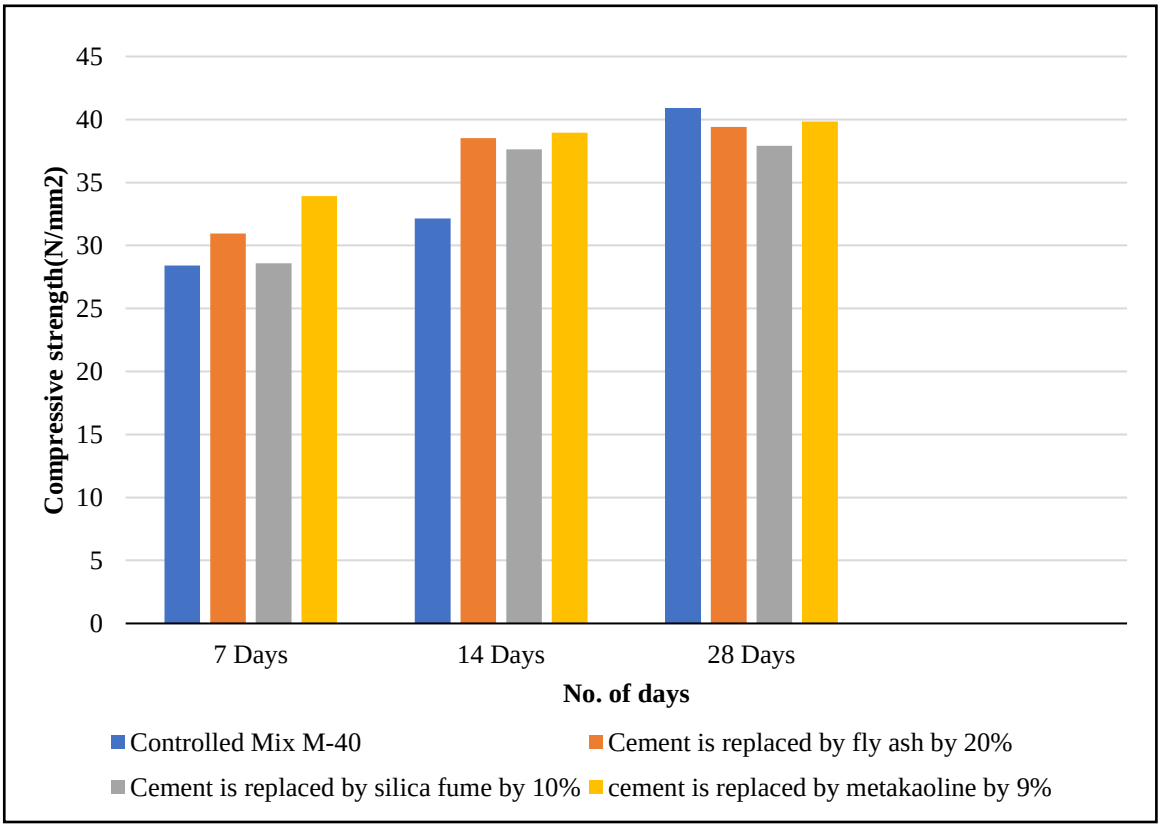
	2.	36.98	
	3.	38.54	
7 days	1.	39.50	40.49
	2.	40.88	
	3.	41.10	

For M-40 Mix (Cement is replaced by metakaolin by 9%)

Table :- Compressive strength for controlled mix M-40 (Cement is replaced by metakaolin by 9%)

No. of days (Curing)	Sr. No	Compressive strength (N/mm^2)	Average (N/mm^2)
7 days	1.	35.11	33.92
	2.	31.55	
	3.	35.11	
14 days	1.	42.66	38.95
	2.	33.33	
	3.	40.88	
28 days	1.	40.25	41.03
	2.	44.88	
	3.	37.98	

5.2 Graph
5.2.1 Graph No. 1
Compressive strength (At 7, 14 & 28 days of curing)



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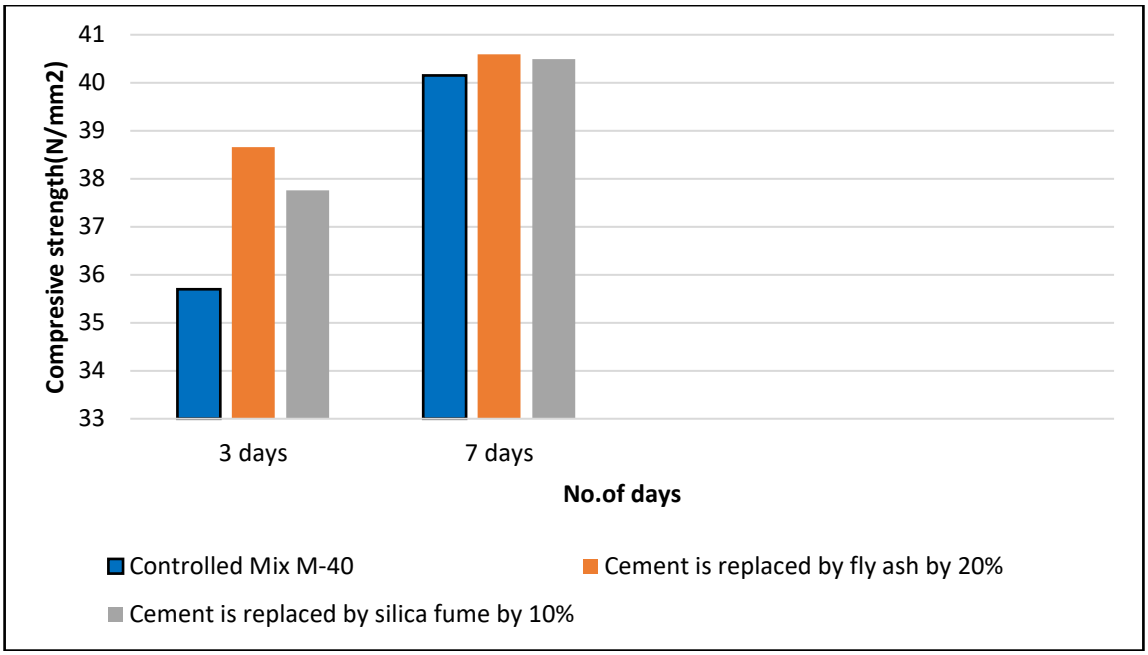

6. CONCLUSION:-

1. Different curing cycles do create an effort on concrete mix and its properties.
2. As compared to pure cement concrete mix, the material strength will be increases for concrete mix with mineral admixtures like fly ash, metakaolin, silica fume.
3. Higher strength is obtained with the addition of different admixture in the required proportion.
4. The addition of admixture decreases the slump test value.
5. Curing methods are important for concrete to achieve the full strength.
6. Among them concrete with metakaolin gives more strength.

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