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Effect of Armocel - 200 Admixture on the Compressive Strength and Workability of Normal Concrete

Dr. Udeme Hanson Iron[1], Dr. Abidemi Ilori[2], Udofia, Odudu Ukere[3]
[1, 2, 3]Civil Engineering Department, University of Uyo

***Abstract:** This study centered on the determination of the compressive strengths of concrete when 0%, 0.4%, 0.8%, 1.2% and 1.5% of Armocel 200 admixture was added per 50kg of cementitious material. A total of 75 cubes of 150mm size were cast, 15 each for the different percentages of the admixture. Three cubes each from the different mixes were crushed at 1, 3, 7, 14 and 28 days. The aggregates used were analyzed for specific gravity and particle size distribution. Slump test was carried out on the fresh concretes. Results obtained showed that the addition of Armocel 200 admixture increased the workability of the concrete. Moreover the compressive strength of the concrete increased with the increase in the dosage of the admixture up to 0.4% at all the days of curing. However, at 0.8% dose of the admixture a reduction in strength was observed. A further strength increase was also observed with a further increase in the dosage of the admixture.*
***Keywords:** Admixture, Aggregate, Concrete, Armocel, Curing, Slump and Water/ Cement Ratio.*

I. INTRODUCTION

A. Background Of The Study

It is well recognized that concrete is one of the most versatile materials in Engineering works or construction in the world. It is produced in various forms or types like shotcrete, light weight concrete, high density concrete, mass concrete, vacuum concrete, rapid setting concrete, etc, in the construction of innovative concrete bridges, buildings, highways, airports runways, dams, pavements etc. Admixtures are ingredients other than Portland cement, water and aggregates that are added to concrete batch immediately before or during mixing to improve concrete quality, reduce water-cement ratio, and accelerate or retardate the setting time among other properties that could be altered to get specific results. They can be added to concrete to enhance its workability, improve resistance to thermal cracking and alkali-aggregate reaction, enable reduction in cement content and enhance strength.

There are two basic types of admixtures available – chemical and mineral. Examples of chemical admixtures include air-entraining admixtures, water-reducing admixtures, retarding admixtures, superplasticizers, accelerating admixtures and examples of mineral admixtures include fly ash, high reactive metakaolin, silicate fumes, slag etc.

B. Statement Of The Problem

It is a fact that to achieve a reasonable strength of concrete one needs a water-cement ratio between 0.6 and below. This water-cement ratio does not give the required workability of concrete for it to be transported and placed at the a required point; this make contractors, builders, engineers etc, to always increase the water-cement ratio in order for the concrete to be handled and placed easily. With the increment in the water-cement ratio, the concrete strength is greatly reduced, bleeding and segregation of concrete will occur with an increase in setting time of the concrete. To reduce the water/cement ratio while maintaining the workability of concrete, an admixture becomes a necessity. Incorporation of the admixture in concrete also influence the strength derived. Hence, there is need to investigate the different percentages of the admixture to be used in a given concrete mix in order to enhance the desired workability and the strength.

C. Objectives Of The Study

This study investigated the compressive strengths and workability of concretes with varying percentages of Armocel 200 admixture using the following objectives:

1) To determine the particles size distribution for both the fine and coarse aggregate used.
2) To determine the workability of concrete at different percentages of Amorcel 200 admixture
3) To determine the compressive strengths of concrete cubes at varying percentages of the admixture.

4) To compare the strengths of concretes containing admixture with those of concretes without admixture
5) To determine and compare the densities of the concrete.

D. Significance Of The Study

This findings of this study will be of immense benefit in the construction industry as it will enhance the use of Admixtures in the production of high compressive strength and workable concrete at a lower cost. As the admixture is known to accelerate the initial setting time without adversely affecting other properties of concrete; this attribute will help contractors to deliver their project on or before scheduled time.

II. LITERATURE REVIEW

Plasticized concrete is a concrete that are mixed with a particular type of plasticizer with the aim of increasing the workability and strength of the concrete. Moreover, for ease of placing and compaction, the easiest way of increasing workability is to increase the free water content, although nowadays, chemical plasticizers are available to assist (Golaszewski, 2004).

Concrete of good workability has advantages in that it permits easy and quick placement. A reasonably workable concrete can be obtained by using high cement content while maintaining the normal water cementitious ratio or by increasing the water contents while maintaining the same cement content. Both methods, however, lead to segregation, excessive shrinkage, undesirable heat development, and long-term detrimental effects. With the advent of Superplasticizers it has become possible to achieve a slump in excess of 200mm from an initial slump of about 50mm with dosages of from 0.3 to 0.6 percent. Within a few minute of addition of superplasticizers, concrete begins to flow easily and becomes self-leveling. It remains cohesive and does not have undesirable bleeding, segregation or strength loss characteristics. Such a concrete is either known as flowing concrete, self-compacting concrete, flocrete, soupcrete, liquid, fluid or collapse concrete. For best results high fine content should be used (Folliad and Berke, 2010).

A. Superplasticisers And Superplasticised Concretes

Superplasticisers are new generation concrete water reducers. When added to a concrete mix, they prevent the formation of clumps, dry materials that did not get mixed in properly and thus weaken the concrete (Noland, 2000). Adding superplasticisers to a concrete mix also reduce inter molecular friction in the mix, making it easier to place, work and finish. According to Jackson and Dhir (1988), superplasticisers also aid the production of high strength concrete by reducing the mix water content, and hence, water-cement ratio with sustained workability. Superplasticisers produce observable increase in concrete slump at low water cement ratio and also help in high early strength development. Furthermore, such concrete becomes self-leveling, cohesive and do not bleed or segregate undesirably (Ezeldin, 1991). One demerit of superplasticisers is that the flowing characteristics introduced by superplasticisers in concrete are retained only for a short duration of about 30minutes after addition of the superplasticisers (Jackson & Dhir, 1988). Thus, care should be taken to control the time difference between addition of superplasticisers and placement of concrete. Superplasticisers are broadly classified into four groups, namely: Sulphonated melamine-formaldehyde condensates (SMF), Sulphonated naphthalene-formaldehyde condensates (SNF), Modified lignosulphonates (MLS), and others, including sulphonic acid esters, carbohydrate. Variations exist in each of these classes. They are supplied either as solids, or as aqueous solutions. (Zhuang, 2009).

Tattersall (1979) observed that slump increased with percentage increase in superplasticizer at a constant water-cement ratio. Moreover he also observed increase in the strength of the concrete. Guennewig (1988) proved successfully that these materials can be used cost effectively for construction applications such as in hot-weather concreting, wall placements, bucked placements, slabs on grade, and pumped concrete. Hanna et al. (1989) developed a special apparatus, Rheo pump, in order to study the interaction between either a given superplasticizer with different Portland cements or the interaction of different superplasticizers with a given Portland cement. Hsu et al. (1999) also studied the effects of different time interval of naphthalene-based superplastizer addition in concrete and concluded that increase in addition time, gradually decreased the saturation of SNF and caused gradual decline in workability of concrete.

In recent researches, Ramachandran (1995) presented information on the properties and applications of superplasticizers in concrete, and mainly focused on the advantages of superplasticizers addition to concrete. Yamada (2001) discussed the errors in analytic methods used for the investigation of interaction mechanism between cement and superplasticizer and provided some chemical equations to overcome the errors that appear during application of superplasticizer to cement. Yaqub and Bukhari (2006) investigated the effect of size of coarse aggregate on the compressive strength of high strength concrete; the result was that for same water-cement ratio, the compressive strength increased with the decrease in the size of coarse aggregate. It was observed that minimum size of aggregate (10mm and 5mm) showed higher compressive strength than other sizes of aggregates used.

III. MATERIALS AND METHODS

A. Materials

The materials used in this study included Cement, Sharp sand (fine aggregate), Crushed granite (coarse aggregate), Water and Armocel 200 admixture. The cement used was LAFARGE Elephant Supaset of grade 42.5, a Portland Limestone Cement conforming to NIS 444-1 cement part-1: 2003, BS EN 197 part 1: 2011 and BS 12: 1996.

The sharp sand was gotten from Ibagwa beach in Abak, Akwa Ibom State, Nigeria while the coarse aggregate was crushed rock, obtained from Crushed Rock Industries Limited Quarry at Akamkpa in Cross River State, Nigeria. The aggregates conformed to American Standard (ASTM – C33/C33M) requirements. The Water used for the mixing of the concrete was clean pipe borne water obtain directly from the tap in the civil engineering laboratory of University of Uyo, Nigeria. The water conformed to the requirements of BS 3148: 1980; the same water source was used for curing the samples throughout the study.

The Admixture used was Armocel 200, a non-chloride Sulphonated Naphthalene Formaldehyde (SNF) based concrete and mortar set accelerator, ready-to use liquid admixture. ARMORCEL 200 is produced by ARMORSIL MANUFACTURING INCORPORATION 4636 Chestnut Street, Philadelphia, Pennsylvania.

B. Dosage Of Admixture Used

Based on the manufacturer's specification, the dosage of the Admixture used for the study was, 0%, 0.4%, 0.8%, 1.2% and 1.5% per 50kg of the cementitious material. The concrete with 0% percent admixture served as the control sample.

C. Tests On Aggregates

Sieve analysis and specific gravity tests were conducted on both the fine and coarse aggregates respectively.

1) Sieve Analysis: Sieve analysis was conducted on all the aggregates by passing each dried aggregate through a series of standard test sieves as given in BS 410:1976. The tests were carried out in accordance with the requirements of BS 812: Part 182: 1975. The samples were air dried for 24 hours (fine and coarse aggregates separately). The samples were weighed using an electronic weighing balance and the weight recorded (500g for fine aggregate and 1kg for coarse aggregate). For fine aggregate, the set of British Standard sieves were arranged in descending order of size from 4.75mm to 75µm with the pan at the bottom while for the coarse aggregate, the set of British Standard sieves sizes were also arranged in descending order of sieve size from 25mm to 4.75mm with the pan at the bottom. The samples were loaded onto the uppermost sieve and the sieves arrangement shaken vigorously with hand until no particle passed from one sieve to another. The materials retained on each sieve were weighed and recorded. Thereafter the percentage passing each sieve was computed.
2) Specific gravity test: The specific gravities of all the aggregates used were determined. The tests were performed in accordance with the requirements of BS 882: Part2: 1983.

D. Workability Test (Slump Test)

All fresh concrete mixes were tested for workability using the slump test in accordance to BS 1881 part 102, 1983 requirements. The apparatus used in the test were: Steel rule, Weighing balance, Slump cone (100mm diameter at the top, 200mm diameter at the bottom and height 300mm), Slump base, Steel Tamping rod (16mm diameter and 600mm long, both ends hemispherical), Trowel, Mixing pan, Spade and Scoop. The slump cone was held down on the slump base using the foot rest. The mould was filled with the prepared fresh concrete mix in three approximately equal layers. Each layer was tamped to its full depth with 35 strokes of the tamping rod in a uniform manner over the cross-section of the mould to allow the rod to penetrate through into the layer below. At the end of the 35 strokes in the last layer, the excess concrete was removed and the surface leveled with trowel. Thereafter, the slump cone was raised vertically upward from the concrete immediately and the empty slump cone placed beside the slumped concrete. The tamping rod was placed over the slump cone for it to also come over the area of the slumped concrete. The slump which was the difference between the height of the mould and that of the unsupported concrete was measured with scale rule.

E. Concrete Cube Preparation

This research utilized 1:2:4 concrete mix at a water/cement ratio of 0.55 with varying percentages of Armocel admixture of 0% 0.4%, 0.8%, 1.2% and 1.5% per 50kg of cementitious material. Five mixes were prepared and 15 cubes were cast from each mix making a total of 75 cubes. Batching of the concrete materials was done by weight and mixing was manually done using spade.

The interior of the 150mm cube moulds were oiled and filled with concrete in three approximately equal layers. Each layer was tamped thirty-five strokes with the tamping rod of 25mm square size.

The final layer was toweled smooth and labeled appropriately. The cubes were thereafter cured in a damp place for twenty four hours before demoulding. After 24 hours, the concrete cubes were removed from their respective moulds and cured in a water bath at room temperature of about 20 – 22^{0}C in accordance to BS 1883: Part 3 till the respective day for testing.

F. Testing Of Hardened Concrete

Controls digital compression testing machine was used for testing the crushing strengths of the concrete cubes at ages of 1, 3, 7, 14 and 28 days. The cubes were removed from the curing tank, excess water wiped off and their weights recorded. The smoothest parts of the cube were placed on the machine and load was then applied until the cube finally crushed. The peak load at failure was recorded as well as the compressive strength of the cube. The crushing strength was thereafter computed using equation 1 to compare with the machine values.

$$f_c = P/A \qquad [1]$$

Where
f_c = Compressive strength in N/mm^2
P = Peak load in Newtons (N) and
A = Cross sectional area of Cube in mm^2

IV. RESULTS AND DISCUSSION

A. Sieve Analysis Results

The results of the sieve analysis are presented in Tables 4.1, 4.2, for sand and coarse aggregates respectively. Moreover, Figs. 4.1 and 4.2 show the distribution of the particles of the sand and coarse granite respectively. The results showed that the sand particle sizes ranged between 75µm and 4.75 mm while the coarse aggregates sizes ranged between 4.75mm and 19mm with a maximum size of 19mm. The well graded particle distribution for both the fine and coarse aggregates indicated that they were suitable for concrete works.

Table 4.1: Fine Aggregate Particles Distribution

Sieve Sizes (mm)	Percentage (%) Passing
0.0	0.3
0.075	0.44
0.15	1.36
0.25	9.08
0.4	28.1
0.6	50.7
0.85	75.54
1.18	86.32
2.36	96.7
3.35	98.86
4.75	99.24

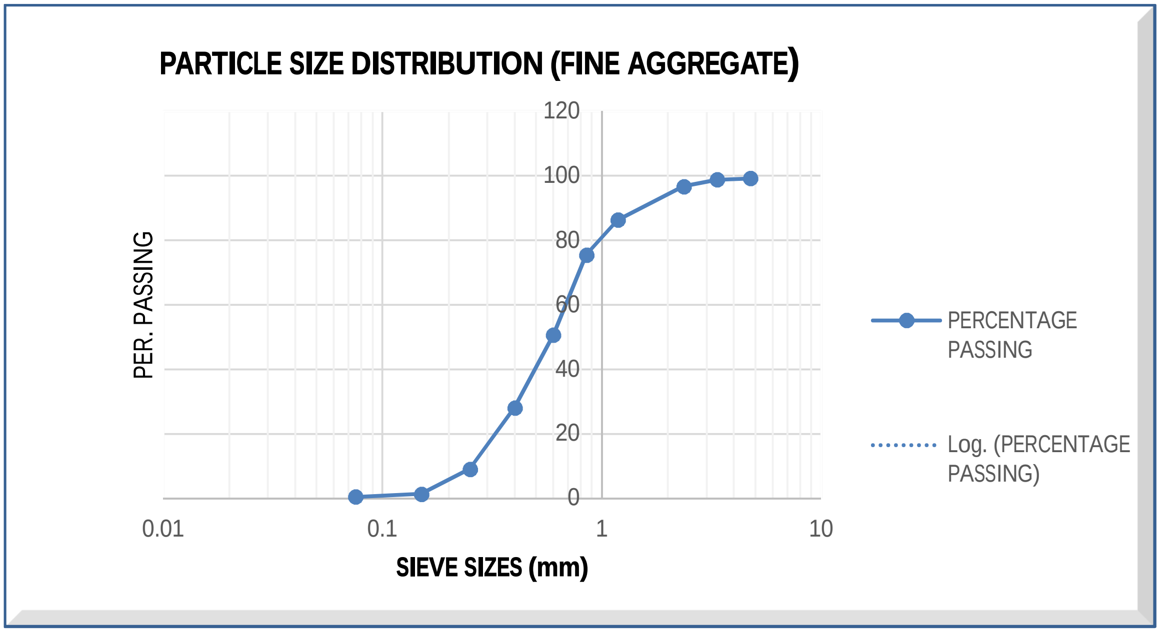

Figure 4.1: Fine Aggregate Particle Distribution

Table 4.2: Coarse Aggregate Particle Distribution

Sieve Sizes (mm)	Percentage (%) Passing
0.0	0.14
4.75	0.34
6.30	0.58
9.50	3.54
12.50	10.79
16.0	50.42
19.0	89.24
22.40	100
25.0	100

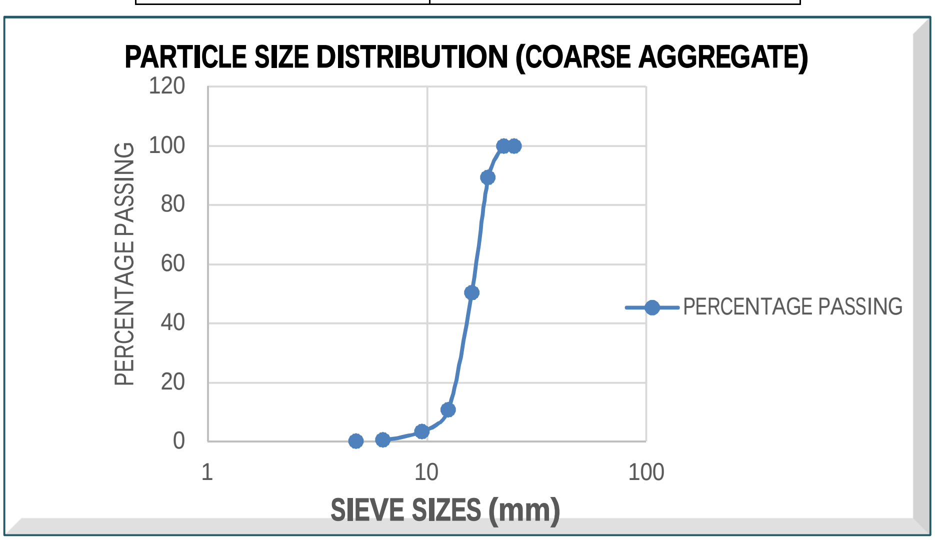

Figure 4.2: Coarse Aggregate Particle Distribution

B. Specific Gravity Test Results

From Table 4.3, the average specific gravity for coarse aggregate was 2.71 while that of the fine aggregate was 2.68, as presented in Table 4.4. IS 2386 Part 3: 1963, specifies that the specific gravity of aggregates used in construction works should range between 2.5 to 3.0. From the results, it was observed that both the fine and coarse aggregate have the required specific gravity needed for concrete works.

Table 4.3: Specific Gravity Test Result for Coarse Aggregate

Procedure	Test 1 (g)	Test 2 (g)	Test 3 (g)
Weight of Specific Gravity Bottle (M_1)	26.8	27.8	32.4
Weight of Specific Gravity Bottle with Fine Aggregate (M_2)	56.8	96.2	91.0
Weight of Specific Gravity Bottle with Fine Aggregate and Water (M_3)	98.1	173.0	169.6
Weight of Specific Gravity Bottle filled with Water (M_4)	78.9	130.2	132.8
Weight of Fine Aggregate ($M_2 - M_1$)	30.0	68.4	58.8
Weight of Water in full Bottle ($M_4 - M_1$)	52.1	102.4	100.6
Weight of Water used ($M_3 - M_2$)	41.3	76.8	78.8
Weight of Fine Aggregate Sample used $(M_4 - M_1) - (M_3 - M_2)$	10.8	25.6	22.0
Specific Gravity = $\frac{(M_2 - M_1)}{(M_4 - M_1) - (M_3 - M_2)}$	2.78	2.67	2.69
Average Specific Gravity	2.71		

Table 4.4: Specific Gravity Result for Sand Fine Aggregate

Procedure	Test 1 (g)	Test 2 (g)	Test 3 (g)
Weight of Specific Gravity Bottle (M_1)	216.3	362.8	373.1
Weight of Specific Gravity Bottle with Fine Aggregate (M_2)	538.8	1048.1	893.4
Weight of Specific Gravity Bottle with Fine Aggregate and Water (M_3)	889.2	1730.6	1667.5
Weight of Specific Gravity Bottle filled with Water (M_4)	693.6	1307.2	1328.5
Weight of Fine Aggregate ($M_2 - M_1$)	322.5	685.3	520.3
Weight of Water in full Bottle ($M_4 - M_1$)	477.3	944.4	955.4
Weight of Water used ($M_3 - M_2$)	350.4	682.5	774.1
Weight of Fine Aggregate Sample used $(M_4 - M_1) - (M_3 - M_2)$	126.9	261.9	181.3
Specific Gravity = $\frac{(M_2 - M_1)}{(M_4 - M_1) - (M_3 - M_2)}$	2.54	2.62	2.87
Average Specific Gravity	2.68		

C. Slump Test Results

Table 4.5: Slump Test Result

Percentage (%) Admixture	Slump (mm)
0.0	10
0.4	100
0.8	135
1.2	147
1.5	160

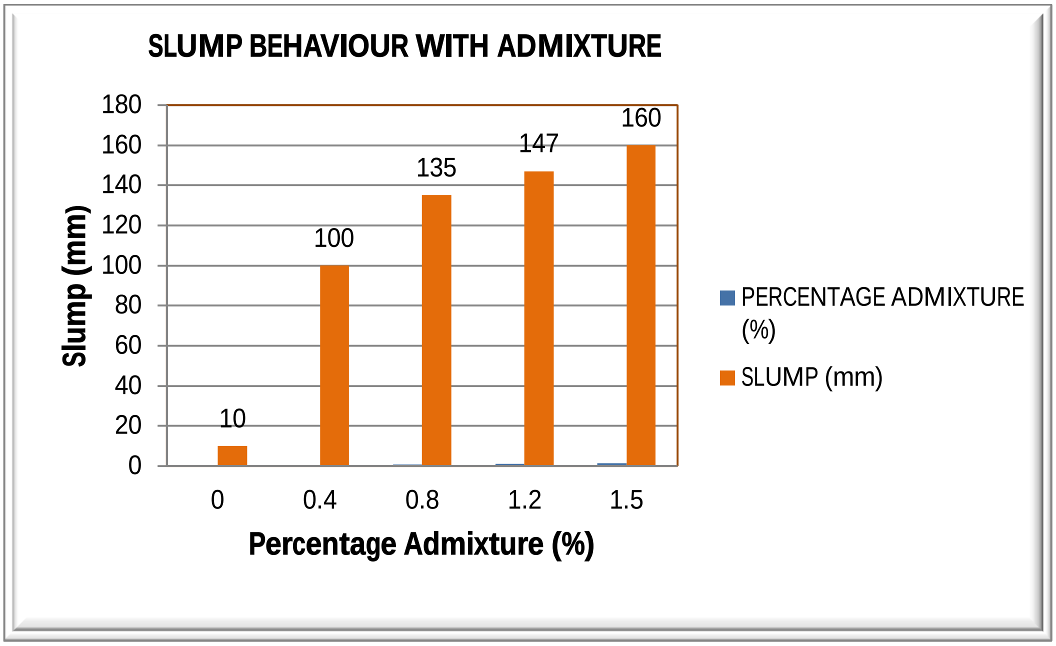

Figure 4.3: Variation of Slump with Percentage of Admixture

The slumps for all the concrete mixes are presented in Table 4.5 and Figure 4.3. At 0% Armocel admixture, the slump was 10mm while with 0.4% Armocel the slump increased to 100mm indicating 90% increase. Similarly with 0.8% Armocel, the slump increased to 135mm, 1250% increase from the control. At 1.2% admixture the slump increased to 147mm, giving 1370% increase from the control and then at 1.5% admixture, the slump increased to 160mm, 1500% increase from the control. The results thus showed that the slump increased with increase in the percentage of Armocel admixture in the concrete mix. Increase in slump translated to increase in workability of the concrete which makes for easy placement of the concrete. Therefore the workability of the concrete increased proportionately with increase in the amount of admixture at constant water/cement ratio.

D. Compressive Strength Test Result

The results of the compressive strength tests at ages 1, 3, 7, 14 and 28 days are presented in Table 4.6 and Figures 4.4, 4.5, 4.6, 4.7 and 4.8. The compressive strength of the concrete without Armocel (i.e. 0% Armocel - control) at day 1 was 15.18 N/mm^2 while that for the mix with 0.4% Armocel at the same age was 17.83 N/mm^2. This indicated 17.5% increment in strength from control. The mix with 0.8% Armocel at day 1 had a compressive strength of 10.81 N/mm^2 being 28.8% lower than that of the control. With 1.2% admixture, the compressive strength increased again to 18.57N/mm^2. The mix containing 1.5% admixture showed further increase of 32.6% from the control.

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At day 3, the compressive strength of the control specimen (0% admixture) was 24.53 N/mm^2. The mix with 0.4% Armocel gave strength of 23.26 N/mm^2, showing a decrease of 5.2% from the control specimen. 0.8% Armocel addition brought about a further decrease of 18.1% while 1.2% Armocel addition produced a compressive strength of 24.9 N/mm^2 showing an increase of 1.5% from the control. A further addition of 1.5% of Armocel admixture also gave an increase of 0.29% from the control.

At age 7 days, the compressive strength of the control stood at 26.10 N/mm^2. The mix with 0.4% of the admixture gave strength of 26.37N/mm^2, showing an increase of 1.03% from the control. 0.8% admixture showed a decrease of 14.2%. 1.2% of admixture produced a compressive strength of 26.77 N/mm^2 showing an increase of 2.6% from the reference specimen. 1.5% admixture also gave an increase of 9.4 % from the reference specimen.

Table 4.6: Summary of Compressive Strengths Results

% of Admixture	**Day 1**	**Day 3**	**Day 7**	**Day 14**	**Day 28**
0	15.18 $\pm$ 0.45	24.53 $\pm$ 0.71	26.10 $\pm$0.41	28.18 $\pm$ 0.78	28.59 $\pm$ 0.63
0.4	17.83 $\pm$ 0.59	23.26 $\pm$ 0.53	26.37 $\pm$ 1.03	28.44 $\pm$ 1.02	30.00 $\pm$ 0.95
0.8	10.81 $\pm$ 0.30	20.09 $\pm$ 0.37	22.40 $\pm$ 0.29	24.14 $\pm$ 1.00	29.67 $\pm$ 1.16
1.2	18.57 $\pm$ 0.39	24.90 $\pm$ 0.98	26.77 $\pm$ 0.15	30.60 $\pm$0.87	31.85$\pm$0.61
1.5	20.13 $\pm$ 0.44	24.60 $\pm$ 0.53	28.55 $\pm$ 0.37	30.82 $\pm$ 0.87	32.26 $\pm$ 0.40

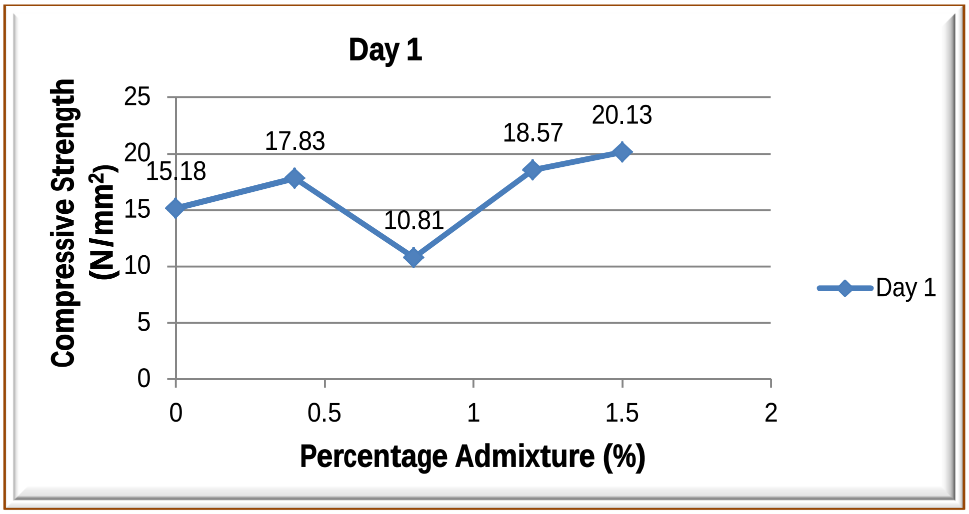

Figure 4.4: Compressive Strength at Day 1

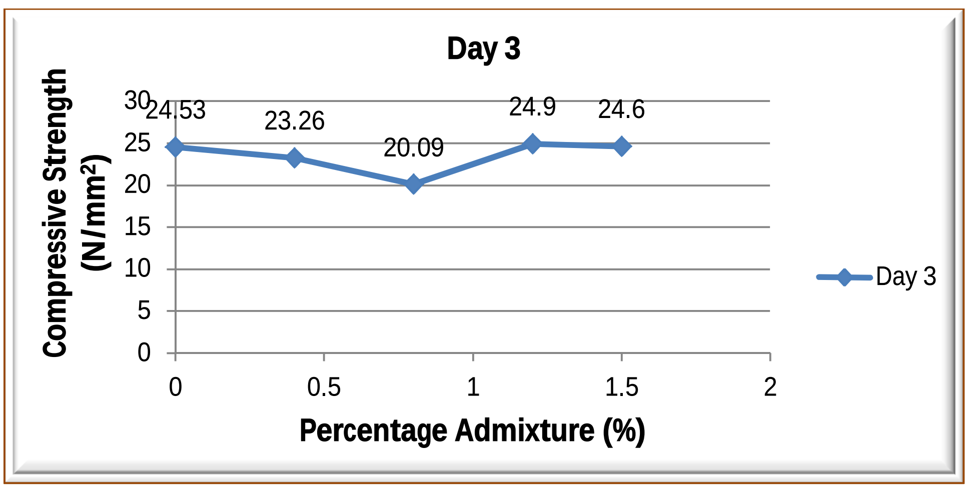

Figure 4.5: Compressive Strength at Day 3

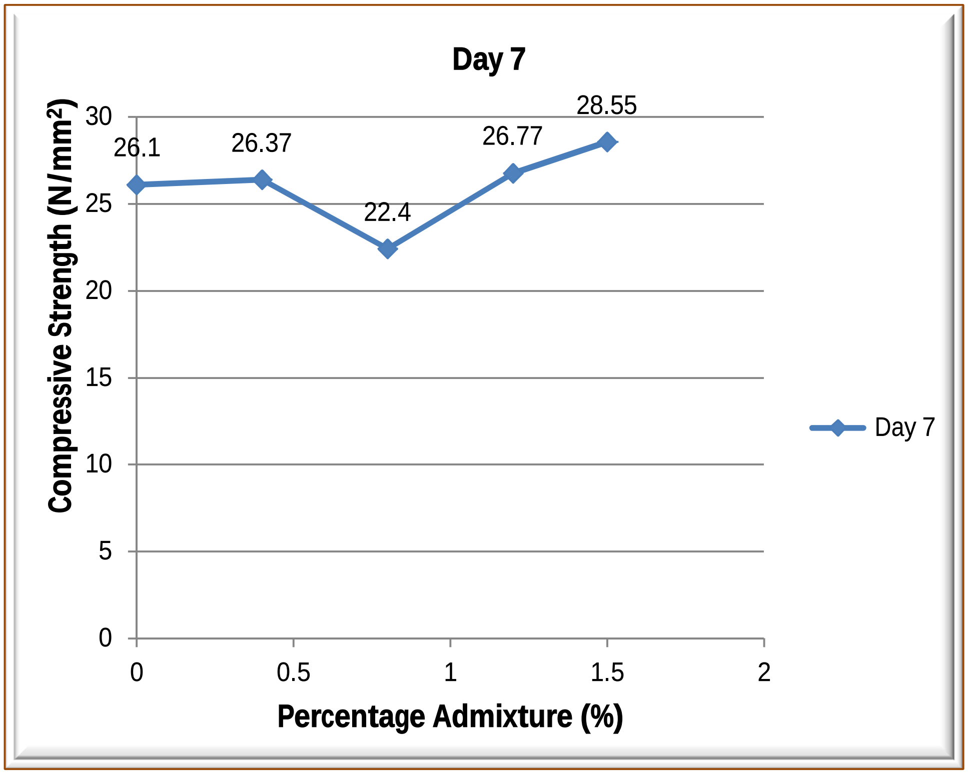

Figure 4.6: Compressive Strength at Day 7

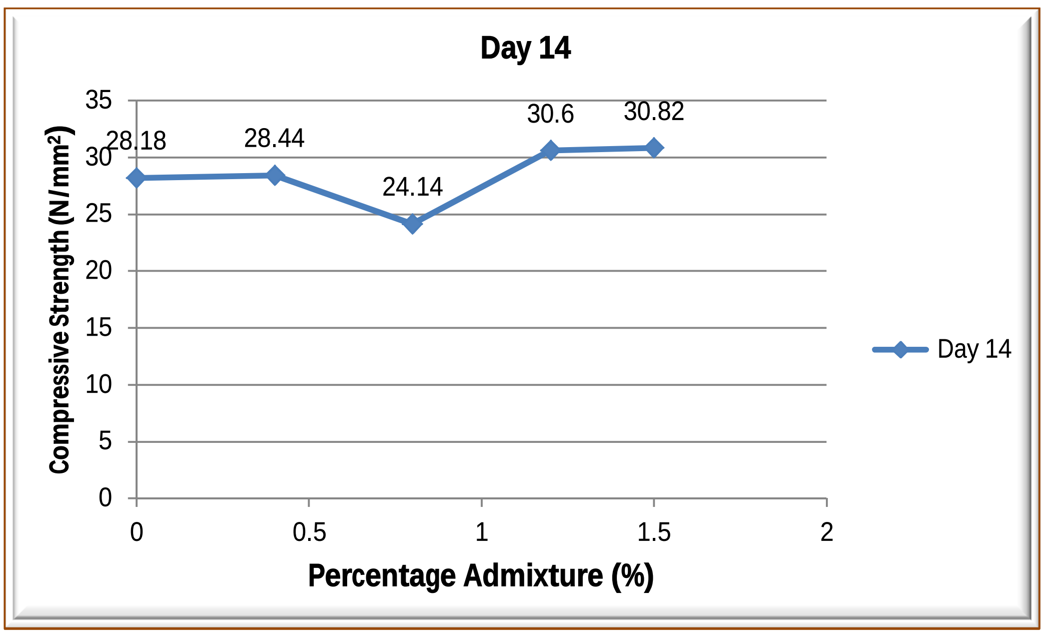

Figure 4.7: Compressive Strength at Day 14

At age Day 14, the compressive strength of the reference specimen increased to 28.18 N/mm^2. The mix of 0.4% Admixture gave strength of 28.44N/mm^2, showing an increase of 0.92 % from the reference specimen. 0.8% admixture shows a decrease of 14.2%. 1.2% of admixture gives compressive strength of 30.60 N/mm^2 showing an increase of 8.6% from the reference specimen. 1.5% admixture also gave an increase of 9.4 % from the reference specimen.

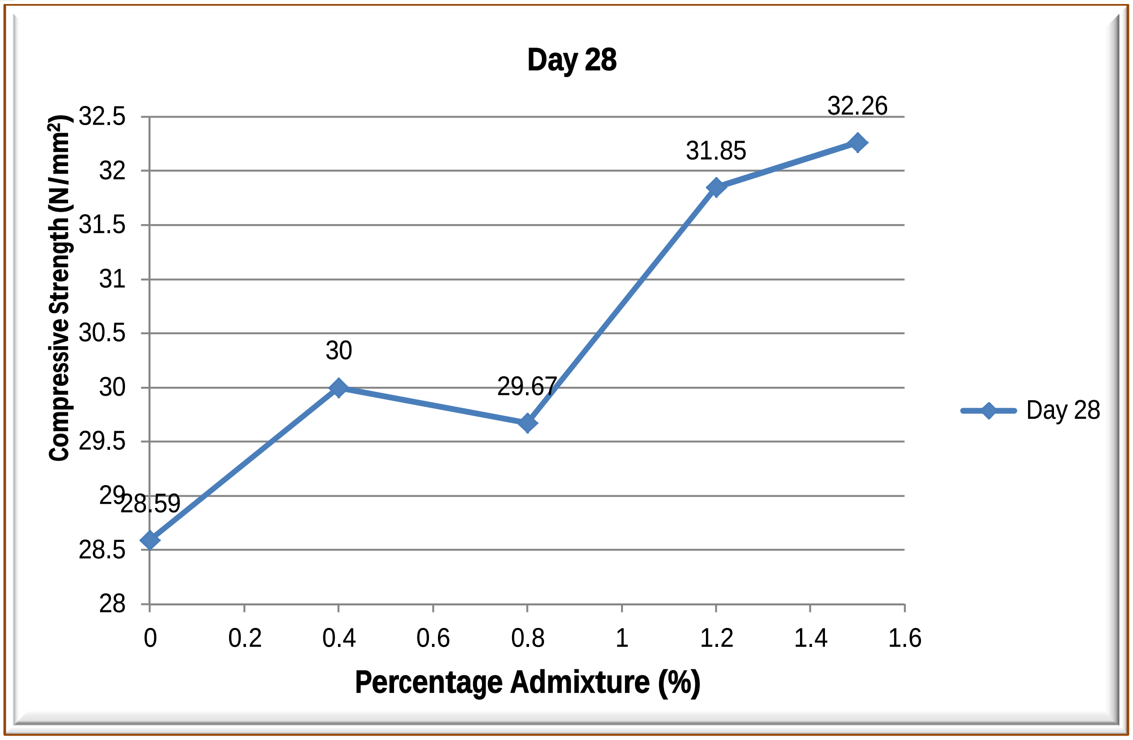

Figure 4.8: Compressive Strength at Day 28

At age Day 28, the compressive strength of the reference specimen increased to 28.59 N/mm^2. The mix of 0.4% Admixture gave strength of 30.0N/mm^2, showing an increase of 4.9 % from the reference specimen. 0.8% admixture shows an increase of 3.8%. 1.2% of admixture gives compressive strength of 31.85 N/mm^2 showing an increase of 11.4 % from the reference specimen. 1.5% admixture also gave an increase of 12.8 % from the reference specimen.

Finally, addition of 0.8% admixture reduced the compressive strength by 28 % in Day1, 18.1% in Day 3, 14.2% in Day 7, 14.3% again in Day 14 with respect to the reference specimen. The decrease in compressive strength occurred due to the losses observed by addition of more admixtures which increased the workability and caused the defects in concrete like bleeding.

E. Density Of Concrete Cubes

Table 4.7: Densities of Concrete Cubes

% of Armocel	Day 1		Day 3		Day 7		Day 14		Day 28	
	Weight (kg)	Density (kg/m^3)	Weight (kg)	Density (kg/m^3)	Weight (kg)	Density (kg/m^3)	Weight (kg)	Density (kg/m^3)	Weight (kg)	Density (kg/m^3)
0	8.15	2415	8.22	2436	8.28	2453	8.35	2474	8.40	2489
0.4	8.59	2545	8.43	2498	8.30	2459	8.60	2548	8.42	2495
0.8	8.04	2382	8.22	2436	8.16	2418	8.20	2430	8.80	2607
1.2	8.24	2441	8.39	2486	8.20	2430	8.38	2483	8.41	2492
1.5	8.50	2519	8.42	2495	8.50	2519	8.32	2465	8.41	2492

At age day 1, the density of the control specimen (0% admixture) was 2415 Kg/m^3. The mix of 0.4% Admixture gave density of 2545 Kg/m^3, showing an increase of 5.4 % from the reference specimen. 0.8% admixture showed a decrease of 1.4%. 1.2% of admixture gave a density of 2441Kg/m^3 showing an increase of 1.1% from the reference specimen. 1.5% admixture also gave an increase of 4.3 % from the reference specimen.

At age Day 7, the density of the reference specimen was 2453 Kg/m^3, giving an increase of 1.6% from the previous. The mix of 0.4% Admixture gave density of 2459 Kg/m^3, showing an increase of 0.25 % from the reference specimen. 0.8% admixture shows a decrease of 1.45%. 1.2% of admixture gives density of 2430 Kg/m^3 showing a decrease of 1.0 % from the reference specimen. 1.5% admixture gave an increase of 2.7 % from the reference specimen.

At age Day 28, the density of the reference specimen was 2489 Kg/m^3. The mix of 0.4% Admixture gave density of 2495 Kg/m^3, showing an increase of 0.24 % from the reference specimen. 0.8% admixture showed an increase of 4.7 %. 1.2% of admixture gave a density of 2492 Kg/m^3 showing an increase of 0.12 % from the reference specimen. 1.5% admixture addition also gave an increase of 0.12 % from the reference specimen. It was observed from the result that 0.8% admixture that had the least density for Day 1, 3, 7 and 14 has the highest density of 2607 Kg/m^3 in Day 28 followed by 0.4% admixture.

V. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

Based on the results of the study conducted, the following conclusion can be made:

1) For a given mix proportion, the compressive strength of the control and that of the admixture increased considerably with age.
2) When 0.4% of the admixture was added, the compressive strength of the concrete increased considerably above that of the control in days 1, 3, 7, 14 and 28.
3) At the addition of 0.8% admixture, the compressive strength of the concrete decreased below the control at day 1, 3, 7 and 14.
4) At the addition of 1.2% and 1.5% admixture, the compressive strength further increased above that of the control.
5) The slump increased correspondingly with increase in the percentage of admixture added, showing greater workability than the control.
6) The highest density was recorded at 0.8% admixture at 28 days.

B. Recommendations

Based on the results of this research, the following recommendations were made:

1) The use of Armorcel admixture should be highly encouraged in concrete production in order to achieve the higher strengths desired.
2) The recommended doses of the admixture by the manufacturer should strictly be adhered to in order to achieve the required result.
3) The workability of concrete enhanced with the addition of admixture with constant water/ratio. However, the rate of increase diminishes with its addition beyond 0.4 % of admixture dosage. This factor needs to be investigated in future, to determine optimum dosage of admixture if water/cement ratio is maintained at constant value.
4) Further research should be carried out on the compressive strength of concrete using another types of admixture to really confirm its behavior compared to the Armocel 200 admixture.
5) Further investigation should be carried out on other mix proportions and water/cement ratios to confirm the results of this investigation.

REFERENCES

[1] Golaszewski, J., and Szwabowski, J. 2004. Influence of superplasticizers on rheological behaviour of fresh cement mortars. Journal of Cement and Concrete Research, 34(2), 235–248.
[2] Han, V., Ros, S., and Shima, H. (2013). “Effects of sand content, superplasticizer dosage, and mixing time on compressive strength of mortar.” ACI Materials Journal, 110(1), 23–31.
[3] Hsu, K.C., Chiu, J., and Tseng, Y.C. 1999. Effect of addition time of a superplasticizer on cement adsorption and on concrete workability, Cement & Concrete Composites, 21, 425-430.
[4] Khatib, J.M., and Mangat, P., S. 1999. “Influence of superplasticizer and curing on porosity and pore structure of cement paste”. Cement and Concrete Composites, 21(5), 431–437.
[5] Masahiro, O., Makoto, H., and Okamura, H. 2007. Effect of Superplasticizer on Self Compactability of Fresh Concrete. Journal of the Transportation Research Board, 1574, 37-40.
[6] Ramachandran, V.S. 1995. Concrete Admixtures Handbook: Properties, Science & Technology. ed. 2.
[7] Yamada, K., and Hanehara, S. 2001. Interaction mechanism of cement and superplasticizers - The roles of polymer adsorption and ionic conditions of aqueous phase. Concrete Science and Engineering, 3(11), 135-145.
[8] Yaqub, M. and Imram Bukhari (2006). Effect of Size of Coarse Aggregate on Compressive Strength of High Strength Concrete. University of Engineering and Technology Taxila, Pakistan, 31st Conference on our World in Concrete and Structure: 16-17, August, 2006, Singapore.
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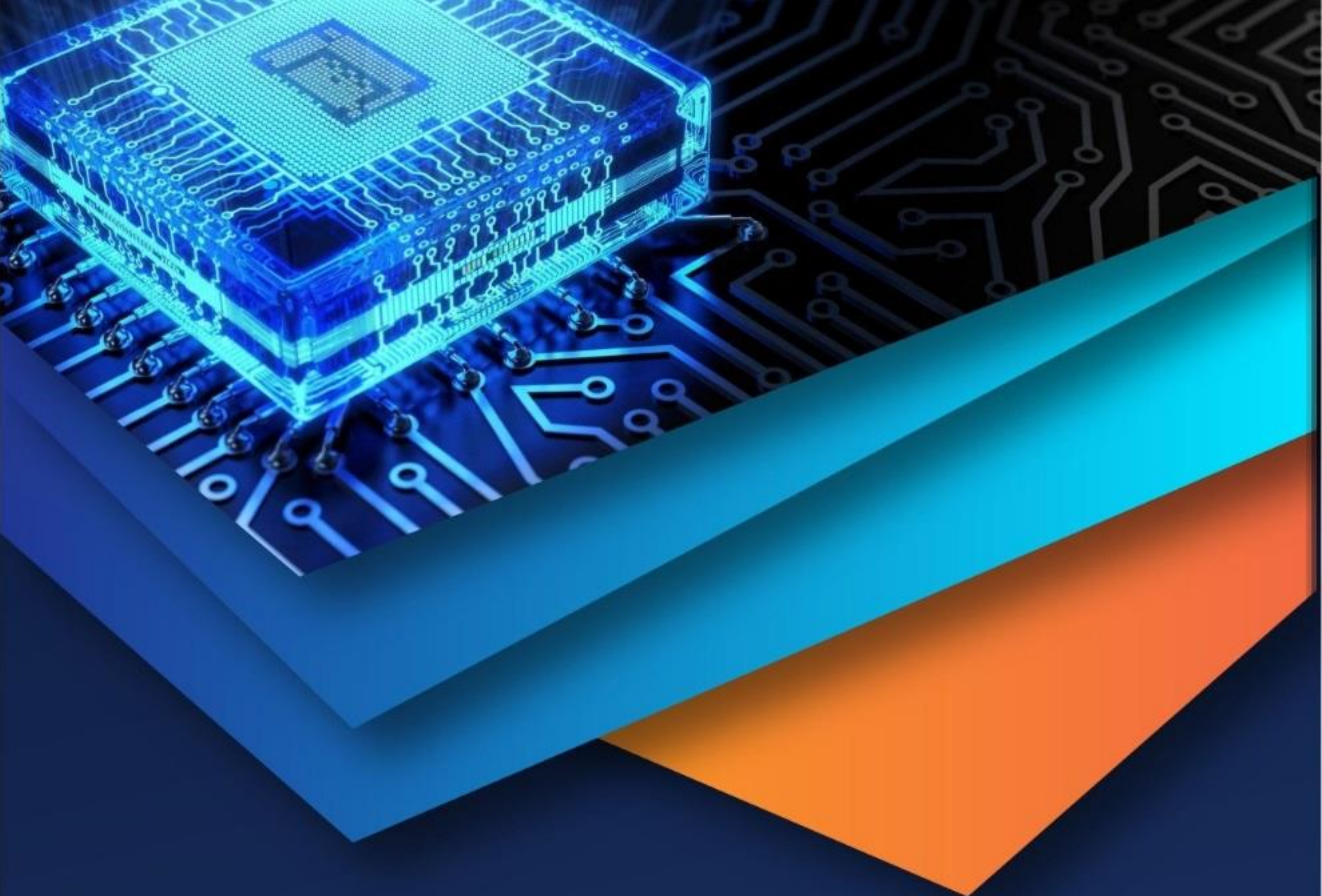

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