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Research Article

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Modeling Fly Ash and Water Cement Ratio Influence on High Compressive Strength of Concrete

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Abstract
This paper monitors the behaviour of compressive strength influenced by variation of water cement ratios and fly ash as partial replacement for cement. The study has express the pressure from this material from water cement ratios and fly ash on the designed mixed for high strength concrete, the study generated various compressive strength base on mixed proportions, this were applied to determine strength development at different mix proportion, such application generated compressive strength values numerically and analytically, this application was applied to compare the strength rate at every twenty four hours and that of seven days interval, the growth rate variation from the water cement ratios was applied to determine the mixed proportion to be applied that will always generate better strength, pending on the level of applied impose loads, furthermore, the study monitor increase rate of fly ash as partial replacement against the percentage dosage of fly ash content, these observed strength at optimum growth were recorded at 25%, variation increase on compressive strength from water cement ratios were between [0.23,0.40 and 0.50] it was observed that water cement ratio of [0.23] obtained the maximum strength compare to [0.40,and 0.50], the study applying modeling and simulation were subjected to model validation, and both parameters developed best fits correlations, the study has express various rate these material can develop strength applying modeling and simulation.

Keywords: Modeling, Fly Ash, Compressive, and Concrete

Introduction
Concrete materials are known to be a useful material for construction of infrastructures, it also has good compressive strength that is to fire , but the tensile strength is just about 10% of tensile strength, while that of compressivestrength are responsible researchesrecently aimed at improving the overall strengths of concrete [1-4]. Experts in recent years have been able to develop any alternative over the year's modern structural development, because developing nations are mostly built in concrete. Concrete has been known as artificial stone-like material applied for numerous constructional purposes, this are produced through the mixture of cement and various aggregates. Concrete are also known as a composite material, which is made up of filler and a binder. Concrete as the most widely used man-made construction materials is second only to water as the most utilized substance on the planet [5-7]. In most instance in Nigeria the most overriding construction material is concrete but it is surprise that most collapse structures structural concrete. Numerous experts such as identified all the application of substandard materials, particularly concrete, these are one of the leading causes of building collapse in Nigeria [8-11]. It has been observed that, concrete strength are mainly influenced by the water cement ratio; these are workability is influenced by aggregate to water ratio including the cost of aggregate cement ratio [12,13]. This development of concrete strength pass from plain concrete, reinforced concrete, precast concrete, pre-stressed concrete to level of contemporary concrete. MeanwhilePlain concrete produced from Portland cement, coarse and fine aggregate and water is normally called the first generation of concrete while that of the steel bar–reinforced concrete are known as the second generation concrete [2,14]. Concrete versatility of continues to experienced increase, the quality definitely varies based of different variables such as quality of constituent materials (cement aggregates, water and admixtures), skill of the productions, including management placement process and environmental issues [3,15-17]. Shetty (2006) explained that in concrete, aggregates including its paste are the major factors that influence the strength of concrete [18]. Abdullah, (2012) in his dimensions express that the strength of the concrete at its interfacial zone is essentially depends on the integrity of the cement paste and the nature of the coarse aggregate [19].

Theoretical Background

$$\frac{dc}{dx} + A_{(x)} C_{(d)} = K_{(x)} C_d^{\ n}; n \geq 2 \qquad (1)$$

Where $U_{(x)}$ and $K_{(x)}$ are function of y
Divides (1) through by C_d^{-n} , we obtained

$$C_d^{-n}\frac{dc}{dx}+A_{(x)}C_d^{1-n}=K_{(x)} \quad ....(2)$$

Let $\beta = C_d^{1-n}$ ....(2b)

Differentiate (2b) wrt x gives this implies that;

$$\frac{d\beta}{dx}=(1-n)C_d^{-n}\frac{dc}{dx} \quad ....(3)$$

$$C_d^{-n}\frac{dc}{dy}=\left(\frac{1}{1-n}\right)\frac{d\beta}{dx} \quad ....(4)$$

Put equation (2) and (4) into equation (1) and multiply through by (1-n) yields

$$\frac{d\beta}{dx}+(1-n)U_{(x)}\beta=(1-n)K_{(x)} \quad ....(5)$$

Let $U_{(x)}=\frac{K_{(x)}}{2}$ ....(6)

Substitute (6) into (5) gives:-

$$\frac{d\beta}{dx}+(1-n)\frac{K_{(x)}}{2}\beta=(1-n)K_{(x)} \quad ....(7)$$

Simplifying (7) and integrate both sides of the yielded equation gives:

$$\beta=2-D\exp\left[-2(1-n)\int K_{(x)}dx\right] \quad ....(8)$$

But $\beta = C_d^{1-n}$

Hence equation (8), becomes:-

$$C_d^{1-n}=2-D\exp\left[(2n-2)\int K_{(x)}dx\right] \quad ....(9)$$

$$C_d^{1-n}=D\exp[(2n-2)K_{(x)}X] \quad ....(10)$$

Materials and method

Experimental Procedures: Compressive Strength Test Concrete cubes of size 150mm×150mm×150mm were cast with and without copper slag. During casting, the cubes were mechanically vibrated using a table vibrator. After 24 hours, the specimens were demoulded and subjected to curing for 1-90 days and seven day interval to 28 days in portable water. After curing, the specimens were tested for compressive strength using compression testing machine of 2000KN capacity. The maximum load at failure was taken. The average compressive strength of concrete and mortar specimens was calculated by using the following equation

Compressive strength (N/mm^2) = Ultimate compressive load (N)
Area of cross section of specimen (mm^2)

Results and Discussion

Table 1: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m^2	Experimental Values of Compressive Strength KN/m^2
7	20.44	19.0447
8	23.36	22.0593
10	26.28	28.0783
11	29.21	31.0827
12	32.12	34.0837
13	35.04	37.0813
14	40.88	40.0755
15	43.81	43.0663
16	46.72	46.0537
17	49.64	49.0377
18	52.56	52.0183
19	55.48	54.9955
20	58.41	57.9693
21	61.32	60.9397
22	64.24	63.9067
23	67.16	66.8703
24	70.08	69.8305
25	73.11	72.7873
26	75.92	75.7407
27	78.84	78.6907
28	81.76	81.6373
29	84.68	84.5805
30	87.61	87.5203
31	90.52	90.4567
32	93.44	93.3897
33	96.36	96.3193
34	99.28	99.2455
35	102.21	102.1683
36	105.12	105.0877
37	108.04	108.0037
38	110.96	110.9163
39	113.88	113.8255
40	116.81	116.7313
41	119.72	119.6337
42	122.64	122.5327
43	125.56	125.4283
44	128.48	128.3205
45	131.41	131.2093
46	134.32	134.0947
47	137.24	136.9767
48	140.16	139.8553
49	143.08	142.7305

50	146.01	145.6023
51	148.92	148.4707
52	141.84	151.3357
53	154.76	154.1973
54	157.68	157.0555
55	160.61	159.9103
56	163.52	162.7617
57	166.44	165.6097
58	169.36	168.4543
59	172.28	171.2955
60	175.21	174.1333

Table 2: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m^2	Experimental Values of Compressive Strength KN/m^2
7	19.1447	19.9671
8	22.1593	22.8911
10	28.2783	28.7391
11	31.2827	31.6631
12	34.2837	34.5871
13	37.2813	37.5111
14	40.1755	40.4351
15	43.1663	43.3591
16	46.1537	46.2831
17	49.1377	49.2071
18	52.1183	52.1311
19	54.9956	55.0551
20	57.9696	57.9791
21	60.9597	60.9031
22	63.9367	63.8271
23	66.8723	66.7511
24	69.8335	69.6751
25	72.7883	72.5991
26	75.7427	75.5231
27	78.6937	78.4471
28	81.6473	81.3711
29	84.5825	84.2951
30	87.5223	87.2191
31	90.5567	90.1431
32	93.5897	93.0671
33	96.3293	95.9911
34	99.3455	98.9151
35	102.3683	101.8391
36	105.0877	104.7631
37	108.3337	107.6871
38	110.9163	110.6111
39	113.8355	113.5351
40	116.7333	116.4591
41	119.6437	119.3831
42	122.5527	122.3071
43	125.4483	125.2311
44	128.5215	128.1551
45	131.2293	131.0791
46	134.2947	134.0031
47	136.9777	136.9271
48	139.8653	139.8511
49	142.7345	142.7751
50	145.5423	145.6991
51	148.5717	148.6231
52	151.4357	151.5471
53	154.2973	154.4711
54	157.1555	157.3951
55	159.9123	160.3191
56	162.7627	163.2431
57	165.6197	166.1671
58	168.5543	169.0911
59	171.3955	172.0151
60	174.2333	174.9391

Table 3: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m^2	Experimental Values of Compressive Strength KN/m^2
7	10.22	10.2188
8	11.68	11.6788
9	13.14	13.1388
10	14.61	14.5988
11	16.06	16.0588
12	17.52	17.5188
13	18.98	18.9788
14	20.44	20.4388
15	21.91	21.8988
16	23.36	23.3588
17	24.82	24.8188
18	26.28	26.2788
19	27.74	27.7388
20	29.21	29.1988
21	30.66	30.6588
22	32.12	32.1188
23	33.58	33.5788
24	35.04	35.0388
25	36.51	36.4988
26	37.96	37.9588

27	39.42	39.4188
28	40.81	40.8788
29	42.34	42.3388
30	43.82	43.7988
31	45.26	45.2588
32	46.72	46.7188
33	48.18	48.1788
34	49.64	49.6388
35	51.11	51.0988
36	52.56	52.5588
37	54.02	54.0188
38	55.48	55.4788
39	56.94	56.9388
40	58.42	58.3988
41	59.86	59.8588
42	61.32	61.3188
43	62.78	62.7788
44	64.24	64.2388
45	65.71	65.6988
46	67.16	67.1588
47	68.62	68.6188
48	70.08	70.0788
49	71.54	71.5388
50	73.11	72.9988
51	74.46	74.4588
52	75.92	75.9188
53	77.33	77.3788
54	78.84	78.8388
55	80.31	80.2988
56	81.76	81.7588
57	83.22	83.2188
58	84.68	84.6788
59	86.14	86.1388
60	87.61	87.5988

Table 4: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m^2	Experimental Values of Compressive Strength KN/m^2
7	10.3188	10.3371
8	11.6798	11.7975
9	13.3388	13.2579
10	14.5998	14.7183
11	16.2588	16.1787
12	17.5288	17.6391
13	18.9798	19.0995
14	20.5388	20.5599
15	21.8998	22.0203
16	23.5588	23.4807
17	24.8388	24.9411
18	26.6788	26.4015
19	27.7588	27.8619
20	29.3988	29.3223
21	30.7588	30.7827
22	32.3488	32.2431
23	33.6788	33.7035
24	35.4588	35.1639
25	36.5988	36.6243
26	37.9688	38.0847
27	39.5288	39.5451
28	40.8798	41.0055
29	42.5388	42.4659
30	43.8988	43.9263
31	45.4588	45.3867
32	46.7588	46.8471
33	48.4788	48.3075
34	49.6588	49.7679
35	51.3988	51.2283
36	52.6588	52.6887
37	54.4188	54.1491
38	55.5788	55.6095
39	56.9488	57.0699
40	58.5988	58.5303
41	59.8688	59.9907
42	61.4288	61.4511
43	62.7888	62.9115
44	64.5388	64.3719
45	65.6998	65.8323
46	67.5588	67.2927
47	68.6388	68.7531
48	70.4788	70.2135
49	71.6388	71.6739
50	72.9989	73.1343
51	74.4598	74.5947
52	75.9388	76.0551
53	77.5788	77.5155
54	78.8488	78.9759
55	80.4988	80.4363
56	81.7598	81.8967
57	83.4188	83.3571
58	84.7788	84.8175
59	86.3488	86.2779
60	87.6888	87.7383

Table 5: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m²	Experimental Values of Compressive Strength KN/m²
7	20.44	18.34
14	27.69	30.32
21	30.66	32.15
28	31.19	34.23

Table 6: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m²	Experimental Values of Compressive Strength KN/m²
7	19.38	19.414
14	28.24	26.0948
21	30.66	33.5204
28	40.81	41.6908
35	51.11	50.606
42	61.32	60.266
49	71.54	70.6708
56	81.76	81.8204
60	87.62	88.526

Table 7: Predictive and Experimental Values of Compressive Strength at Different percentage of Fly Ash Content

Curing Age	Predictive Values of Compressive Strength KN/m²	Experimental Values of Compressive Strength KN/m²
5	16.01	15.85
10	32.22	32.677
15	49.82	49.504
20	66.43	66.331
25	83.04	83.158

Table 8: Predictive and Experimental Values of Compressive Strength at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m²	Experimental Values of Compressive Strength KN/m²
7	13.85	11.2553
14	20.44	21.3871
21	23.39	30.4115
28	40.88	38.3285
35	49.45	45.1381
42	51.51	50.8403
49	53.66	55.4351
56	57.23	58.9225
60	61.32	60.4181

Table 9: Predictive and Experimental Values of Compressive Strength at Different percentage of Fly Ash Content

Fly Ash Content %	Predictive Values of Compressive Strength KN/m²	Experimental Values of Compressive Strength KN/m²
5	14.61	14.59
10	29.21	29.21
15	43.81	43.83
20	58.41	58.45
25	73.11	73.07

Table 10: Compressive Strength Variation of Various water Cement Ratio at Different Curing Age

Curing Age	Predictive Values of Compressive Strength KN/m² [0.23] Water Cement Ratio	Predictive Values of Compressive Strength KN/m² [0.50] Water Cement Ratio
7	9.80507633	6.3
8	11.20580152	7.2
9	12.60652671	8.1
10	14.0072519	9
11	15.40797709	9.9
12	16.80870228	10.8
13	18.20942747	11.7
14	19.61015266	12.6
15	21.01087785	13.5
16	22.41160304	14.4
17	23.81232823	15.3
18	25.21305342	16.2
19	26.61377861	17.1
20	28.0145038	18
21	29.41522899	18.9
22	30.81595418	19.8
23	32.21667937	20.7
24	33.61740456	21.6
25	35.01812975	22.5
26	36.41885494	23.4
27	37.81958013	24.3
28	39.22030532	25.2
29	40.62103051	26.1
30	42.0217557	27
31	43.42248089	27.9
32	44.82320608	28.8
33	46.22393127	29.7
34	47.62465646	30.6
35	49.02538165	31.5
36	50.42610684	32.4
37	51.82683203	33.3
38	53.22755722	34.2

39	54.62828241	35.1
40	56.0290076	36
41	57.42973279	36.9
42	58.83045798	37.8
43	60.23118317	38.7
44	61.63190836	39.6
45	63.03263355	40.5
46	64.43335874	41.4
47	65.83408393	42.3
48	67.23480912	43.2
49	68.63553431	44.1
50	70.0362595	45
51	71.43698469	45.9
52	72.83770988	46.8
53	74.23843507	47.7
54	75.63916026	48.6
55	77.03988545	49.5
56	78.44061064	50.4
57	79.84133583	51.3
58	81.24206102	52.2
59	82.64278621	53.1
60	84.0435114	54
61	85.44423659	54.9
62	86.84496178	55.8
63	88.24568697	56.7
64	89.64641216	57.6
65	91.04713735	58.5
66	92.44786254	59.4
67	93.84858773	60.3
68	95.24931292	61.2
69	96.65003811	62.1
70	98.0507633	63
71	99.45148849	63.9
72	100.8522137	64.8
73	102.2529389	65.7
74	103.6536641	66.6
75	105.0543893	67.5
76	106.4551144	68.4
77	107.8558396	69.3
78	109.2565648	70.2
79	110.65729	71.1
80	112.0580152	72
81	113.4587404	72.9
82	114.8594656	73.8
83	116.2601908	74.7
84	117.660916	75.6
85	119.0616412	76.5
86	120.4623663	77.4
87	121.8630915	78.3
88	123.2638167	79.2
89	124.6645419	80.1
90	126.0652671	81

Table 11: Compressive Strength Variation of Various water Cement Ratio at Different Curing Age

Curing Age	0.23	0.3	0.4
fcu7	12.77461373	9.453989503	6.128172701
fcu8	14.59955855	10.80455943	7.003625944
fcu9	16.42450337	12.15512936	7.879079187
fcu10	18.24944819	13.50569929	8.75453243
fcu11	20.07439301	14.85626922	9.629985673
fcu12	21.89933783	16.20683915	10.50543892
fcu13	23.72428265	17.55740908	11.38089216
fcu14	25.54922747	18.90797901	12.2563454
fcu15	27.37417229	20.25854894	13.13179865
fcu16	29.1991171	21.60911886	14.00725189
fcu17	31.02406192	22.95968879	14.88270513
fcu18	32.84900674	24.31025872	15.75815837
fcu19	34.67395156	25.66082865	16.63361162
fcu20	36.49889638	27.01139858	17.50906486
fcu21	38.3238412	28.36196851	18.3845181
fcu22	40.14878602	29.71253844	19.25997135
fcu23	41.97373084	31.06310837	20.13542459
fcu24	43.79867566	32.4136783	21.01087783
fcu25	45.62362048	33.76424823	21.88633108
fcu26	47.44856529	35.11481815	22.76178432
fcu27	49.27351011	36.46538808	23.63723756
fcu28	51.09845493	37.81595801	24.5126908
fcu29	52.92339975	39.16652794	25.38814405
fcu30	54.74834457	40.51709787	26.26359729
fcu31	56.57328939	41.8676678	27.13905053
fcu32	58.39823421	43.21823773	28.01450378
fcu33	60.22317903	44.56880766	28.88995702
fcu34	62.04812385	45.91937759	29.76541026
fcu35	63.87306867	47.26994752	30.64086351
fcu36	65.69801348	48.62051744	31.51631675
fcu37	67.5229583	49.97108737	32.39176999
fcu38	69.34790312	51.3216573	33.26722323
fcu39	71.17284794	52.67222723	34.14267648
fcu40	72.99779276	54.02279716	35.01812972
fcu41	74.82273758	55.37336709	35.89358296
fcu42	76.6476824	56.72393702	36.76903621
fcu43	78.47262722	58.07450695	37.64448945
fcu44	80.29757204	59.42507688	38.51994269

fcu45	82.12251686	60.77564681	39.39539594
fcu46	83.94746167	62.12621673	40.27084918
fcu47	85.77240649	63.47678666	41.14630242
fcu48	87.59735131	64.82735659	42.02175566
fcu49	89.42229613	66.17792652	42.89720891
fcu50	91.24724095	67.52849645	43.77266215
fcu51	93.07218577	68.87906638	44.64811539
fcu52	94.89713059	70.22963631	45.52356864
fcu53	96.72207541	71.58020624	46.39902188
fcu54	98.54702023	72.93077617	47.27447512
fcu55	100.371965	74.2813461	48.14992837
fcu56	102.1969099	75.63191602	49.02538161
fcu57	104.0218547	76.98248595	49.90083485
fcu58	105.8467995	78.33305588	50.77628809
fcu59	107.6717443	79.68362581	51.65174134
fcu60	109.4966891	81.03419574	52.52719458
fcu61	111.321634	82.38476567	53.40264782
fcu62	113.1465788	83.7353356	54.27810107
fcu63	114.9715236	85.08590553	55.15355431
fcu64	116.7964684	86.43647546	56.02900755
fcu65	118.6214132	87.78704539	56.9044608
fcu66	120.4463581	89.13761531	57.77991404
fcu67	122.2713029	90.48818524	58.65536728
fcu68	124.0962477	91.83875517	59.53082052
fcu69	125.9211925	93.1893251	60.40627377
fcu70	127.7461373	94.53989503	61.28172701
fcu71	129.5710821	95.89046496	62.15718025
fcu72	131.396027	97.24103489	63.0326335
fcu73	133.2209718	98.59160482	63.90808674
fcu74	135.0459166	99.94217475	64.78353998
fcu75	136.8708614	101.2927447	65.65899323
fcu76	138.6958062	102.6433146	66.53444647
fcu77	140.5207511	103.9938845	67.40989971
fcu78	142.3456959	105.3444545	68.28535295
fcu79	144.1706407	106.6950244	69.1608062
fcu80	145.9955855	108.0455943	70.03625944
fcu81	147.8205303	109.3961642	70.91171268
fcu82	149.6454752	110.7467342	71.78716593
fcu83	151.47042	112.0973041	72.66261917
fcu84	153.2953648	113.447874	73.53807241
fcu85	155.1203096	114.798444	74.41352566
fcu86	156.9452544	116.1490139	75.2889789
fcu87	158.7701993	117.4995838	76.16443214
fcu88	160.5951441	118.8501538	77.03988538
fcu89	162.4200889	120.2007237	77.91533863
fcu90	164.2450337	121.5512936	78.79079187

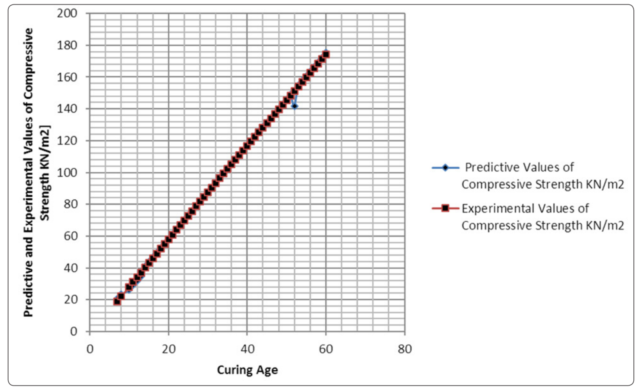

Figure 1: Predictive and Experimental Values of Compressive Strength at Different Curing Age

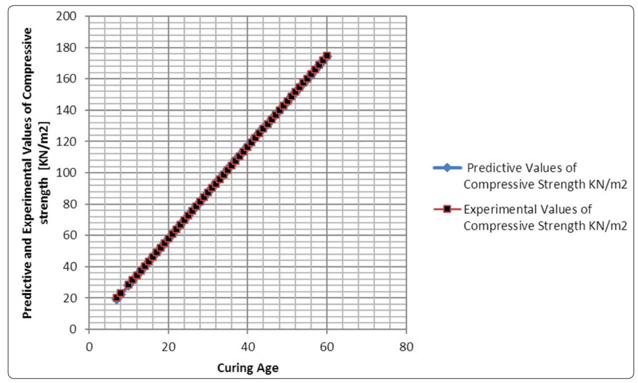

Figure 2: Predictive and Experimental Values of Compressive Strength at Different Curing Age

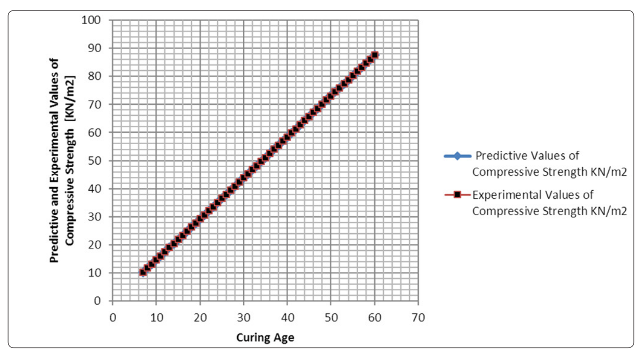

Figure 3: Predictive and Experimental Values of Compressive Strength at Different Curing Age

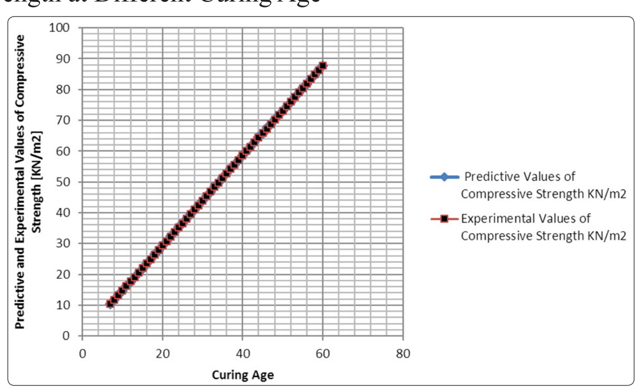

Figure 4: Predictive and Experimental Values of Compressive Strength at Different Curing Age

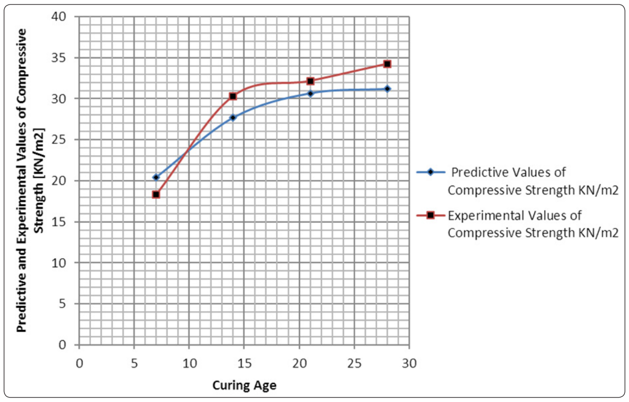

Figure 5: Predictive and Experimental Values of Compressive Strength at Different Curing Age

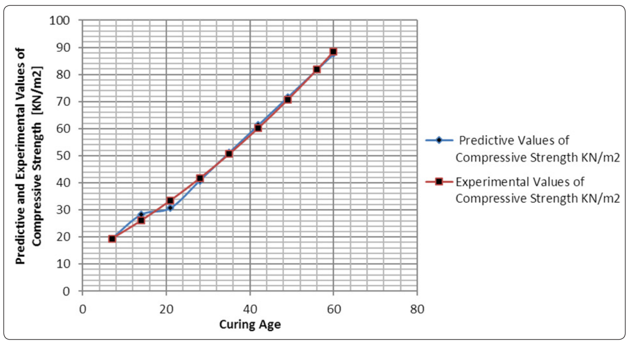

Figure 6: Predictive and Experimental Values of Compressive Strength at Different Curing Age

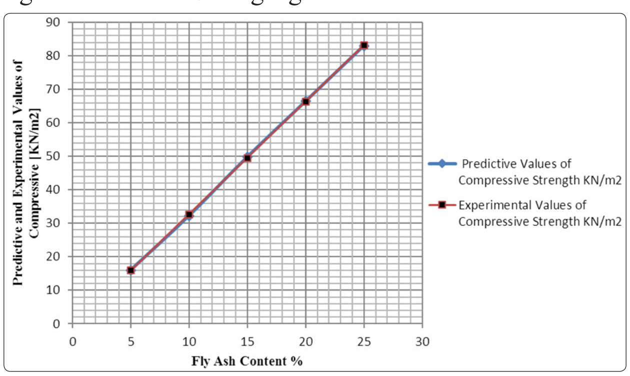

Table 7: Predictive and Experimental Values of Compressive Strength at Different percentage of Fly Ash Content

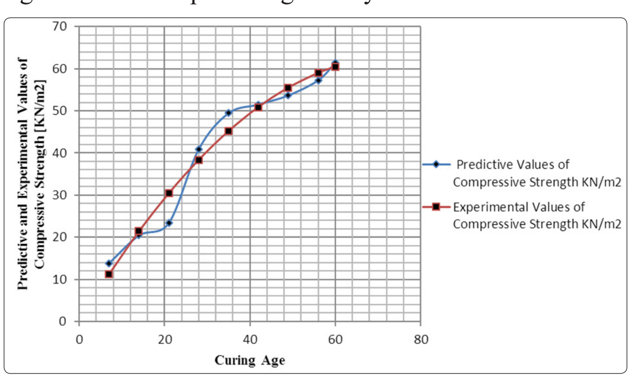

Figure 8: Predictive and Experimental Values of Compressive Strength at Different Curing Age

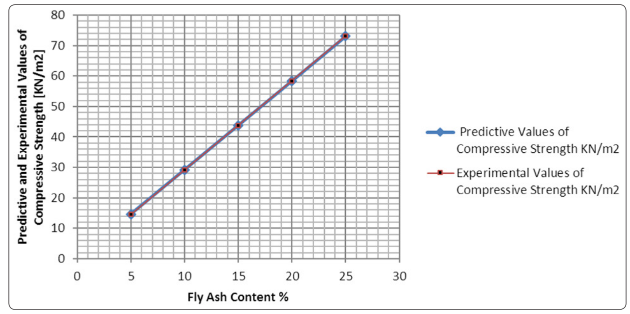

Table 9: Predictive and Experimental Values of Compressive Strength at Different percentage of Fly Ash Content

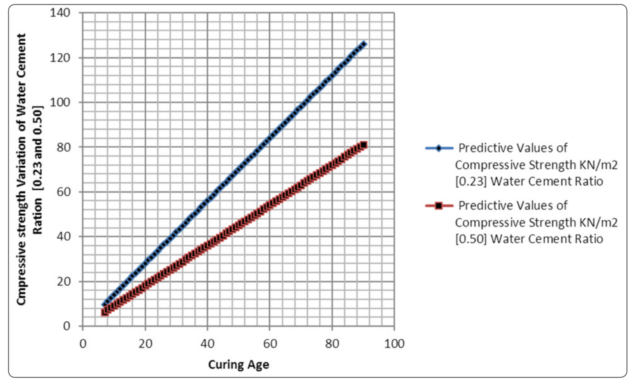

Figure 10: Compressive Strength Variation of Various water Cement Ratio at Different Curing Age

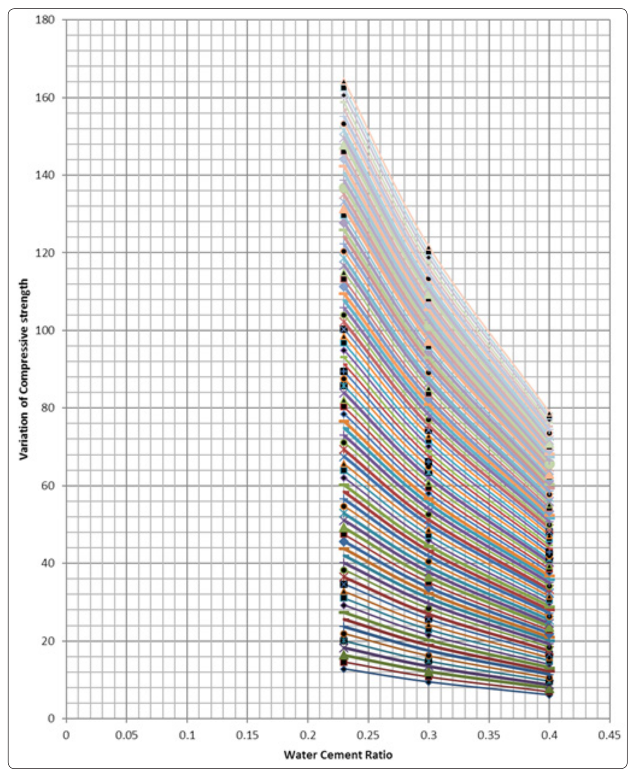

Figure 11: Compressive Strength Variation of Various water Cement Ratio at Different Curing Age

Figure 1-11 explained the behaviour of fly ash and water cement ratios on growth rate of compressive strength, linear trend were observed from figure 1-4 thus the experimental values developed best fit correlation, While figure 5 experienced gradual increase to the optimum values with slight fluctuation, similar condition were experienced where gradual increase and slight fluctuation were expressed to the optimum values recorded at twenty eight days of curing age. Figure 6 observed slight vacillation with gradual increase and slight curve to the optimum values recorded at sixty days of curing age, similar condition were observed on figure seven where linear increase were experienced to the optimum level recordedat the highest dosage of 25%. while figure eight in like manner observed gradual growth with respect to the dosage to the maximum growth rate recorded at 25%, but the growth rate observed slight vacillation, figure eight obtained similar condition on its growth level, where fluctuation were experienced in accordance with the dosage percentage to the optimum rate recorded 25%, while figure nine experienced linear trend under exponential condition with respect to the dosage of the addictive thus the optimum rate where observed at 25%. The study also monitored the variation effect of water cement ratio, figure ten between 0.40-0.50 water cement ratios observed variation in growth rate, 0.40 strength development were higher than that of 0.50 with respect to the curing age at ninety, this is where the optimum strength were recorded, figure eleven observed various strength developed influenced by variation of water cement ratios, these were monitored just like figure ten, similar result were experienced, 0.23 water cement ratio generated the optimum develop strength at ninety days of curing age. These figures were compared with experimental values for model validation and both parameters generated best fits correlation.

Conclusion

The study has monitor the influenced from water cement ratio and integration of fly ash substance for high strength development. These were generated by modeling the system to generate results that will be compared with experiment values produced from different designed mix, These concept has generated high strength concrete as observed from its compressive strength, linear growth rates and slight cured growth increase were experienced in most of the figures, these were monitored with respect to the curing age up to ninety days, while the dosage of the fly ash were monitored also with respect to percent of the substance, the application observed the behavior of the material including variation of strength developed, it was observed from the simulation that the highest compressive strength were experienced at 25% dosage, water cement ratios was also monitored to determine its effect on compressive strength growth rate, the study observed increase in strength between 0.23 and 0.40 as compared to water cement ratio of 0.50 with respect to curing age of ninety days. These expression from the study has explained the behaviour of water cement ratio and fly ash as partial replacement for cement, these condition has definitely provide the plate form to compare the reaction of this substance with the behaviour of water cement on design mixed proportion for strength development. Simulation parameters were compared with experimental values, and both parameters developed best fits correlations.

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