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A Comparative Study on Local and Industrial Chemical Additives on Strength Properties of Sancrete Blocks

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ABSTRACT : *This study aimed at comparing the effects of both industrial and local additives on the strength of sancrete blocks. The chemicals that were used as additive in the experiment are: KS-770 (industrial) and Soda Ash (local). The experimental method involves materials sampling, physical observation, specimen preparation, and laboratory determination of stresses. Effects of the two additives were physically observed, results were collected, collated, analysed and effects discussed accordingly. Results showed that the compressive strength and the density of the blocks increase with passage of curing days. It was observed that addition of 10% of both additives maintained the compressive strength of the resulted bricks as suitable for load bearing blocks. It was interestingly noted that addition of 10% soda ash additive gave the highest compressive strength value of 3.86 N/mm^2 at 28 days when compared with the conventional mix which gave compressive strength value of 3.49 N/mm^2 and KS-770 additive which gave 3.25 N/mm^2. It can therefore be concluded that Soda ash (local) additive has a better quality out-put in terms of strength, weight and density. Soda ash, when it is used appropriately, is therefore recommended as sancrete blocks' compressive strength enhancer.*

KEYWORDS: *Sancrete blocks, Water, soda ash additive, KS-770 additive, Compressive strength*

I. INTRODUCTION

Sancrete blocks comprise of natural sand or fine aggregate, water and bonding agent called cement. Water is required to produce a workable plastic mix, so as to enhance and keep its shape after formation. It is also known that strength of any sancrete blocks depends upon many factors among which water plays an important role (Okeniyi et al, 2012). Sandcrete blocks are used predominantly in partition or load bearing walls. They transmit structural loads from the overlaying structural element down to foundations for stability. For this reason, sandcrete blocks are globally considered appropriate and very adaptable in the building materials industry. (Alohan O, 2013) Many manufacturers in an attempt to keep its price low, and since cement as a binder is the most expensive inevitable input into the production of Sancrete blocks, they reduce cement, which results in a block that starts behaving more like loose sand. The urge to reduce cost without adverse effect on the quality and quantity of sancrete block produced has compelled many researchers to investigate the use of chemical additives in sancrete blocks. Some of these additives have been observed to impart significant improvement on its strength, durability and workability. Researchers in different countries have reported that the compressive strengths of sandcrete blocks are always far below the recommended values in the codes.

A research conducted by M. Abdullahi in 2005**,** which investigated the strength characteristics of sandcrete blocks in Bosso and Shiroro areas in Minna, revealed that the compressive strength of the sandcrete blocks produced in the areas mentioned above is below standard recommended by Nigerian Industrial Standard (NIS) 87: 2000. He further stressed that compressive strength of individual blocks was between 0.11 N/mm^2 and 0.75 N/mm^2 and the average compressive strength of the blocks were between 0.14 N/mm^2 and 0.66 N/mm^2. Also, Okeniyi et al, 2012, investigated the effect of one industrial chemical additive known as KS770 and another local called Soda ash (named Eyin aro in Yoruba language) for production of structural bricks. The results obtained showed that Soda ash (local) additive made positive impact on the bricks in terms of quality, strength, weight and density and KS770 being concrete chemical plasticizer adversely increased clay moisture content, hence can only be used at reduced quantity of water to yield higher compressive strength compared to non chemical one.In the same direction of focus, this study aimed at comparing the effects of both industrial and local additives on the strength of sancrete blocks. The chemicals that were used as additive in the experiment are: KS-770 (industrial) and Soda Ash (local). KS-770 is a brownish liquid industrial chemical, chloride free, water reducing and superior plasticizing. It was originally designed to aid high strength in concrete and sandcrete blocks. It is packaged in 5, 20, 25 and 50 litres of plastic jars. Also available is the bulk packaging of 200 litres metal drum. Characteristically, experience reveals remarkable effectiveness on concrete and sandcrete works to extent of over 10% reduction in water-cement ratio (Okeniyi et al, 2012). Local Soda Ash is popularly

known as 'Eyin Aro' by the Yoruba speaking people of Nigeria. It is a brownish liquid and a by-product of the locally filtered ash of the burnt cocoa pad in the making of the black soap. The experimental method involves materials sampling, physical observation, specimen preparation, and laboratory determination of stresses. Effects of the two additives were physically observed results were collected, collated, analysed and effects discussed accordingly.

II. MATERIALS AND METHODS

The properties of sancrete blocks depend majorly on factors like material constituents, their mix, presence of admixtures or additives as well as manufacturing process. Thus, materials used and method of manufacture adopted in this research are presented.

2.1. Materials

Cement: The cement used is the ordinary portland cement (OPC) from the West African Portland Cement Company, Ogun State, Nigeria with properties conforming to BS 12 (British Standards Institution, 1971).
Water: The water used was free of impurities to enhance the setting time and strength of sancrete blocks. Water is required to produce a workable plastic mix, so as to enhance and keep its shape after formation.
Sand: Sharp river quartzite sand that is free of clay, loam, dirt and any organic or chemical matter was used. It was sieved with the 3.35 mm zone of British standard (BS) test sieves.
Industrial additives (KS-770): This chemical was used as additive in the experiment. It is a brownish liquid industrial chemical, chloride free, water reducing and superior plasticizing. It was originally designed to aid high strength in concrete and sandcrete works. It is packaged in 5, 20, 25 and 50 litres of plastic jars. Also available is the bulk packaging of 200 litres metal drum.
Local additives (Soda Ash Liquid): This chemical also was used as additive in the experiment**.** Local Soda Ash is popularly known as 'Eyin Aro' by the Yoruba speaking people of Nigeria. It is a brownish liquid and a by-product of the locally filtered ash of the burnt cocoa pad in the making of the black soap.

2.2. Methods

Grading of aggregates: The grading of an aggregate defines the properties of different sizes in the aggregate. This grading has a considerable effect on the workability and stability of the mix. Wet sieving analysis which is in accordance with BS 1377 (British Standards Institution, 1990) was used. The particle size distribution curve of the sand used in this study is shown in Figure 1.

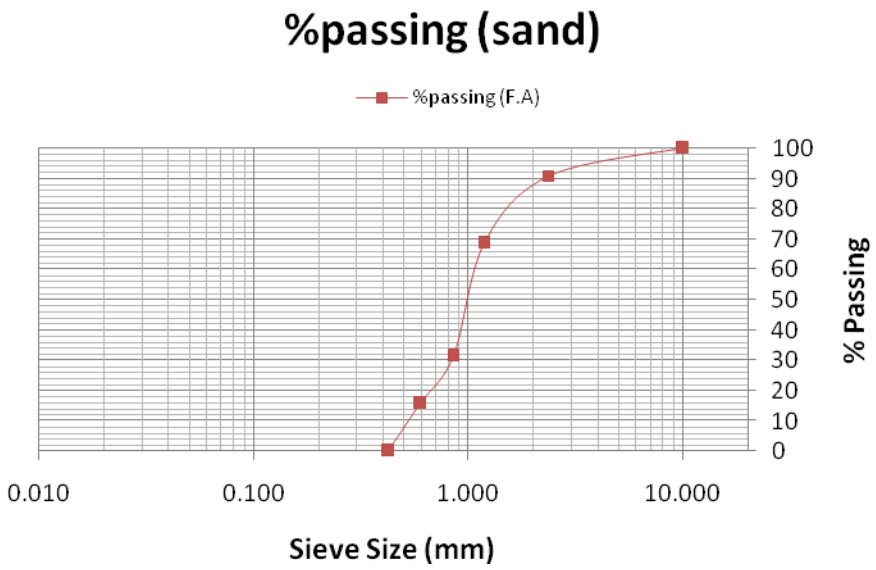


Figure 1. The particle size distribution curve of the sand

Manufacture of sandcrete blocks

The blocks (all hollow) are manufactured with the use of a vibrating machine. The standard mix proportion of 1:6 cement-sand ratio was used in this investigation. The size of the block produced is 225 x 225 x 450 mm. According to Okeniyi et al, 2012, the additives have remarkable effects on concrete and sandcrete blocks to extent of over 10% reduction in water-cement ratio, thus, the chemicals were used at 10% to the

volume of water required for control sample. In the manufacture of the blocks, hand mixing was employed and the materials were turned over a number of times until an even colour and consistency were attained and vibrated via vibrating machine. Water is added through a fire hose and it was further turned over to secure adhesion.

Table 1.0: Classes of Block Specimens

Block Samples	Designation
Control	SC0
Samples with KS-770 as Additives	SKS10
Samples with Soda ash as Additives	SSA10

It was then rammed into the machine moulds, compacted and smoothed off with a steel face tool. After removal from the machine moulds, the blocks were left on pallets under cover in separate rows, one block high and with a space between 2 blocks for the curing period. They were kept wet during this period by watering daily. Testing for compressive strength was then carried out at ages 7, 14, 21 and 28 days. On the average, three specimens were tested at each age for control, soda ash additive and KS-770 additive. Effects of the two chemicals on compressive strength of sancrete blocks were assessed and results collected, collated and analysed and effects compared and discussed accordingly.

III. RESULTS AND DISCUSSION

3.1 Result

Slump Test

Table 2.0: The result of the slump tests for different samples of sancrete blocks

Blocks Samples	Sample 1	Sample 2	Ave. Slump	Type of Slump
SC0	6	6	6	TRUE
SKS10	10	12	11	TRUE
SSA10	4	5	4.5	TRUE

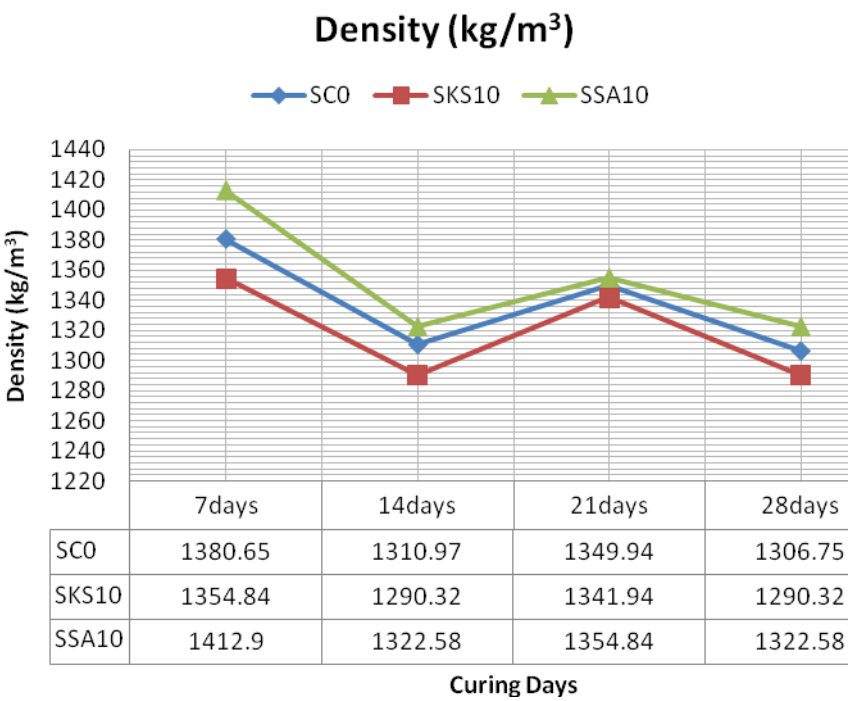
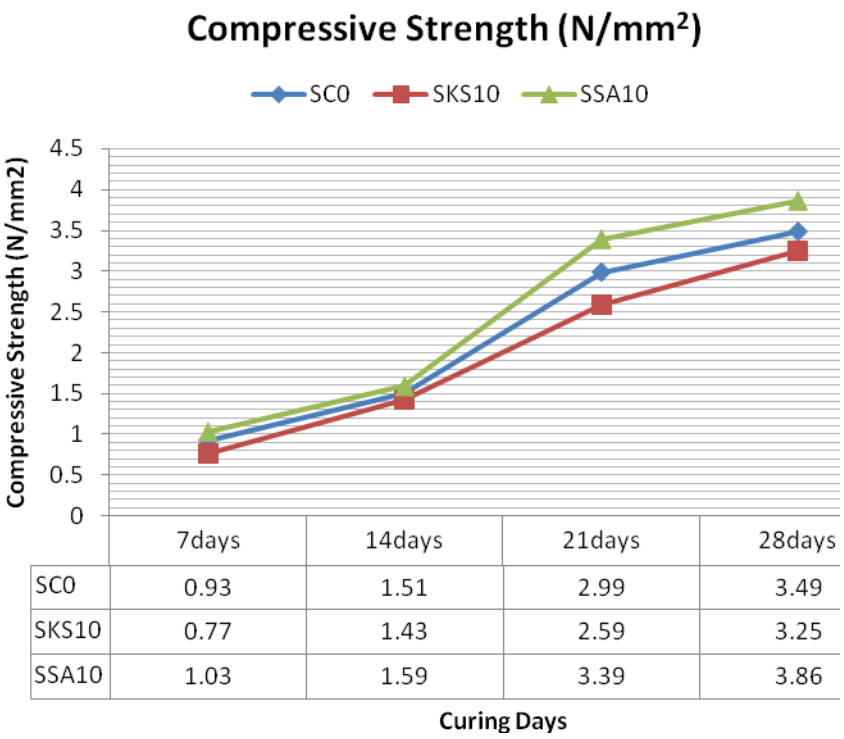


Figure 2.0: Average Density of sancrete blocks



	7days	14days	21days	28days
SC0	0.93	1.51	2.99	3.49
SKS10	0.77	1.43	2.59	3.25
SSA10	1.03	1.59	3.39	3.86

Figure 3.0: Average Compressive strength of sancrete blocks

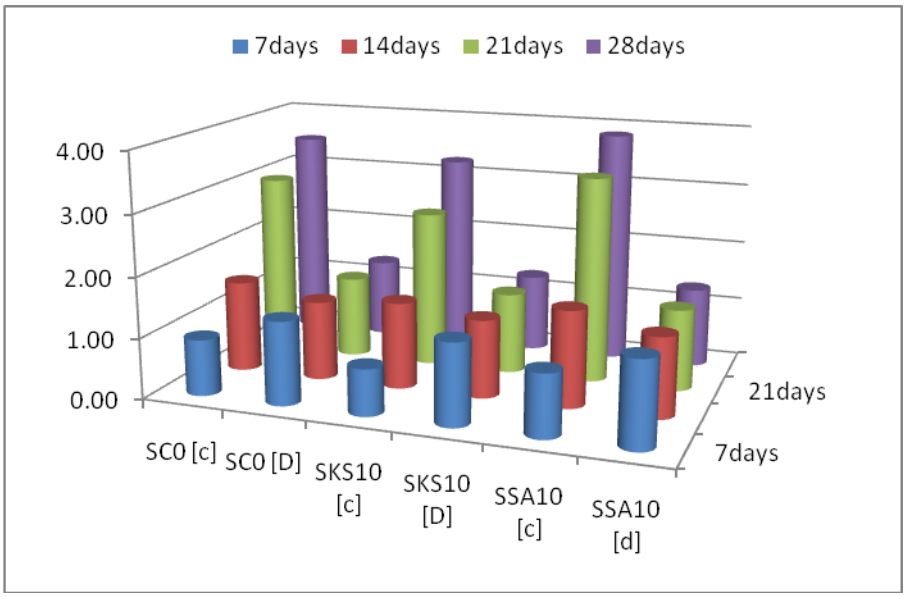


Figure 4.0: Average Compressive strength and Density Compared.

3.2 Discussion

Cube specimens were tested in the laboratory to assess its compressive strength. Also, change in volume and weight were noted to calculate density accordingly. The particle size distribution of the sand used was shown in figure 1. The S-shaped curve of sand shows that it is well graded and therefore suitable for the production of sancrete blocks. Results of the compressive test showed that the compressive strength and the density of the bricks increase with passage of curing days. It was also observed that addition of 10% of both additives maintained the compressive strength of the resulted bricks as suitable for load bearing bricks. It is very fascinating to note that addition of 10% soda ash additive gave the highest compressive strength value of 3.86

N/mm^2 at 28 days when compared with the conventional mix which gave compressive strength value of 3.49 N/mm^2 and KS-770 additive which gave 3.25 N/mm^2.

IV. CONCLUSION

This study on the results of the compressive strengths of sandcrete blocks carried out to compare effects of the two chemical additives in the production of sancrete blocks reveals positive impact. Soda ash (local) additive has a better quality out-put in terms of strength, weight and density. It yields highest compressive strength at reduced weight and minimum density. KS770 is also not without its own quality compared with normal brick production.

REFERENCES

[1] Abdullahi, M. (2005). Compressive Strength of Sandcrete Blocks in Bosso and Shiroro Areas of Minna, Nigeria. AU J.T. 9(2): 126-132.
[2] Alohan, Omoregie (2013). Optimum Compressive Strength of Hardened Sandcrete Building Blocks with Steel Chips. *Buildings* 2013, *3*, 205-219; doi: 10.3390/buildings3010205.
[3] British Standards Institution (1990). Methods of testing for soils for Civil Engineering purposes. London. pp. 1377.
[4] British Standards Institution (1971). Ordinary and rapid-hardening Portland cement. London. BS, 12: 2.
[5] NIS 87, 2. (2000). Standard For Sandcrete Blocks. *The Nigerian Industrial Standard*. Lagos, Nigeria: Standard organization of Nigeria, Lagos.
[6] Okeniyi, A. G., Adeniji, S. O., Dahunsi, B. I. O. (2012). Effects of Chemical Additives on the Production of Structural Brick for Construction Works. Journal of Chemical, Mechanical and Engineering Practice, Vol. 2 No. 3, 18-23.
[7] Oyekan, G. L., Kamiyo, O. M. (2011). A study on the engineering properties of sandcrete blocks produced with rice husk ash blended cement. Journal of Engineering and Technology Research Vol. 3(3), pp. 88-98.