

Sustainable Approach to Efficiency in Production and use of Ready-Mixed Concrete in Construction Firms in Abia State

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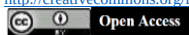
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ABSTRACT

There are variations to the quality of concrete produced on various batches of concrete produced in any site especially those manually mixed in site. These variations have an effect on the quality of concrete and hence the quality of the finished product. Ready-mixed concrete which are concrete that is batched for delivery from a central plant produces a more uniform quality of concrete than those mixed on site. However, the construction firms in Abia State are reluctant in adopting the technology of ready-mixed concrete in its construction projects despite benefits accruable to its usage. This study aims at formulating sustainable and efficient approach in the production and usage of ready-mixed concrete with a view to improving it efficiency through accessing the level of practices, understanding the constraints and thereafter developing a suitable framework. The methodology involves the use of well-structured questionnaire and analyzed with relative importance index. Findings show that small sizes of projects, poor round network and changes due to transit time are some factor affecting its adoption by firms. In conclusion, ready-mixed concrete technology should be adopted more to enable the estimated 17 million housing deficit gap closed.

1. Introduction

1.1 Background of the Study

The construction industry is all important and indispensable to the economic development of a nation. [1] From the Residential buildings, Commercial and Industrial buildings to road, drains and bridges construction and similar infrastructure are captured in the construction industry. Construction projects also consume a lot of physical material and make use of physical tools and machineries, they involve several stakeholders and are labour intensive. [2] One of such materials is the concrete. Concrete, due to its versatility and durability is the World's most used construction material. Concrete can either be mixed on site or ready-mixed at a batching plant and transported to the site. Ready-mixed concrete is one of the advancement in concreting to enhance industrialization of the construction industry. Ready mixed concrete means concrete that is batched from a central plant instead of being mixed on the job site. According to [3], the major phases of ready-mixed concrete production can be divided into five phases. The phases include manufacturing of raw materials, operation of the RMC batching plant, delivery of RMC using transit mixer truck and construction operation at the site. According to [4], Ready-mixed concrete is becoming very common in the Nigerian construction industry and there is need to study that influence on site dispatch time of ready-mixed concrete. More construction firms are using this technology due its accruable benefits. [5] revealed that 60-70% of all contemporary built structure are made of this material owing to the increasing requirement for quality in concrete mix design aimed at achieving of quality product, it is manufactured in a fully controlled environment with the help of specialized batching plant. The mix is then delivered to construction sites where they are required by ready-mixed concrete trucks so as to maintain its quality. Ready mixed concrete eliminates need for storage place for basic materials for concrete on site, reduces labour, time used in concreting and reduces wastages. [6] revealed that for every 1m³ of concrete mixed on site for use, 1.55% of it is wasted. Wastages of construction materials in some sites results from the way such material are handled on sites.

[7] opined that materials may deteriorate during storage or be stolen, also extra expenses may be incurred if material required for a particular activity is not available.

Concrete production and use involves various forms of technology in its production and use. The basic types of technology in concrete placing are the pre-cast, cast-in-site and Ready-mixed concrete.

Precast concrete are concrete that are in the factor with a specific specification and then taken to site at the point of assembly. Cast-in-situ are concrete made on site and placed in the particular location the concrete is positioned to set. Ready-mixed concrete is concreted mixed and bathed in a central mixing plant and transferred in its fresh state to the site.

Similarly, concrete has broad types, however basic types include plain concrete Reinforced concrete and pre-stressed concrete. Concreting involve several activities in Building construction usage, its transportation, Batching. Mixing, placement, compaction, curing. All these areas need careful examination.

Concrete is composite material which is composed of fine and course aggregate bonded together by a binder (cement) and water. It is strong in compression and has a good fire resisting property. It can be formed into various shapes and sizes. However, quality control of concrete and variations in quality of different batches calls for need for a uniform mix, which ready- mixed concrete can provider.

In Nigeria Current prices per cubic meter

C20/M20 – N158,00 (Blinding, non- structural/ slabs)

C25/M25- N164,000 (Foundation, pile, Caps, Ground Beans)

C30/M30 – N172,000 (Suspended Slabs, Columns, Beans)

C35/ MB – N172, 000 (Heavy Concrete structures.

Pump mobilization is N2,000 per day and pumping charge is N8,500 per m2

Minimum order is 10 cubic meters with within Lagos and parts Ogun State.(8)

Many developed countries have experienced an increase in demand for RMC and yet there is scanty knowledge on the environmental impact of on-site delivery operations of RMC. [9]. RMC production and delivery to site significantly contribute to the global emission.

In the course of this study, various areas of concreting using RMC will be analyzed to determine the level of practice and awareness and bottlenecks to it use to enable measures to be advanced to encourage its use as it has numerous advantages in our quest in reducing the deficit of infrastructure in the country.

1.2 Statement of the Problem

Concrete is a major component of must buildings and similar infrastructure facilities because of its veracity in use. Unlike earlier days the construction industry have become highly complex due to technological developments, globalization uncertain economic conditions, social procure, political instability and so on [10]. The need for quality of concrete cannot be over emphasized the ready- mix concrete is in high consistency and meets the engineering requirements [11]

In this recent times, there has been increase in building collapse attributed to poor quality of concrete. Ready –mix concrete has the advantage of better quality's of concrete yet and quality control yet its use on Abia is slow paced. Productivity also improves with the use of ready-mix concrete. Findings of [12] shows that irrespective of placing method, with the use of ready- mixed concrete increases productivity by $1.1\text{m}^3/\text{hr}$ for every 10m^3 .

However, despite the obvious advantage of RMC here are barriers to its use. This work tend to under study these barriers and proffer measures that can encourage use of RMC in construction sites.

1.3 Aim

This study is aimed at appraising the use and production of Read-mixed Concrete by construction companies in Abia State, Nigeria with a view to enhancing efficiency in using RMC in construction projects.

2.0 Materials and Methods

The study area is Abia State, situated in the South-Eastern part of Nigeria. Survey Research Design was adopted for the study, which involved collection of data through questionnaires' administration. The population of the study was professionals in the Construction Industry in Abia State. The sample frame consisted of 25 construction firms. Random Sampling technique was employed to select a sample of 48 professionals from the 25 firms to which questionnaires were administered and 40 of them were retrieved and used for analysis representing 83%.

3.0 Theory

Ready-mixed Concrete (RMC) is an essential construction material consumed on all components of a building from the inception to completion and therefore utilized on enormous quantities. [13].

Concrete grades ranges from C10 and C20 for non-structural works C25 to C50 for structural works apart from comparative strength, additional durability requirement such as water proofing low-heat, sulphate resistance are some other characteristics. Advantages of Ready-mixed Concrete include elimination of storage place for basic materials at site, less wastages, reduction of labour, reduction in time, less pollution.

4.0 Results and Discussion

Table 1 shows that 48 questionnaire were administered to the respondents out of which 40 were duly completed and returned representing 83%.

Table 1.

S/n	Questionnaires	Frequency (no)	Percentage (%)
	Returned	40	83
	Unreturned	8	17
	Total	48	100

Table 2. Respondents Profile

		Frequency (No.)	Percentage (%)
Highest Educational Level	(a) OND	2	5
	(b) HND	4	10
	(c) B.Sc	30	75
	(d) M.Sc	4	10
	(e) Ph.D	-	-
	Total	40	100
Profession	(a) Architect	10	25
	(b) Builder	10	25
	(c) Civil Engineering	15	37.5
	(d) Quantity Surveyor	5	12.5
	Total	40	100%

Source: Field Survey (2026)

Table 2 shows the respondents profile, it can be observed that the majority of the respondents with the highest frequency are B.Sc Holders 75%, while M.Sc is 10%, HND is 10% and none has Ph.D. It shows that the respondents are knowledgeable and have the ability of providing the professional requirement for achieving the aim of the research.

Table 3: Working Experience of Respondents

Table 3 shows that (37.5% of respondents have working experience of 6 – 10 years and the least percentage 5%) have a working experience of 0 – 5 years. Therefore, the respondents can be said to have adequate knowledge and experience in use of Ready-mixed concrete in sites.

Table 4

Ranking of constraints to the production and use of Ready-mixed concrete in construction sites.

Constraints to the Use of Ready-mixed Concrete	Rank						
	1	2	3	4	5	RII	Rank
Few Ready-mixed Concrete Companies	10	10	10	10	0	0.50	6
Delay in supplies due to poor road network.	0	8	22	8	2	0.62	3
Inadequate formwork and placement arrangement which should be in advance.	8	16	12	4	0	0.46	8
Cost Effect (Relatively more expensive).	0	8	10	16	6	0.7	1
Size of Project (Most projects are small projects).	6	2	18	4	10	0.65	2
Traffic delay during transit on Concrete which results in setting of concrete.	0	8	24	8	0	0.6	4
Loss of workability due to transit time.	2	10	20	8	0	0.49	7
Location of Construction Site	16	10	14	0	0	0.39	9
Inadequate scheduling of Concrete works to cover duration of project.	8	6	22	4	0	0.51	5

Source: Researchers' Field Survey 2026.

From the Table 4, it shows the it relatively more expensive than on-site concrete. The cost implication is same as the most common reason reluctance in the use of ready-mixed concrete. The small size of projects in Aba was another reason for non-use of ready-mixed products as most project are small in size. So economically, it may not be viable for the client to embark on. This aligns with (14) on low-scale of project inhibiting use of ready-mixed concrete.

Other factors include poor roads, inadequate scheduling and small size scale of projects and its locations.

5. Discussion of Findings

Contractors, architects, engineers and builders made a case of poor road network as one of the most discouraging reason for few RMC times in Abia.

However, there are alternative routes in most cases aid movement. Similarly [15] recommended that ready concrete companies should ensure that the transit mixes pass the best route to avoid delays as a result of traffic. [16] recommended that construction companies should follow relevant standard rules and regulations for concrete works.

5.2 Sustainable Approaches to Ready-mixed use and production

1. **Use of Digital Technology in Precise Ordering:** One of the key disadvantages in ready-mixed concrete production is over-ordering. The use of digital technology in measuring should be adopted to reduce wastages.

2. **Use of Admixtures:** The use of water-reducing admixtures to improve durability and improve the strength of concrete will go a long way to encourage the use of ready-mixed concrete (RMC) and reduce wastage and improve quality.

3. **Production of Concrete Products:** A deliberate use for synergy between the production of the RMC and products should be prioritized to ensure left over materials are converted to concrete products such as interlocking blocks, tiles, kerbs and similarly products will save-guard the material instead of dumping it.

4. **Supplement the use of cement with risk husk ash, ply ash:** These materials lower carbon emission.

5. The specification for ready mixed concrete can be designed to meet an exact specification of a construction project in each batching. Variations such as using various enhancing admixtures, increasing or reducing the paste volume, water- cement ratio and controlling the maximum course aggregate particle size and volume.

5.3 Recommendations and Conclusions

Ready-mixed concrete is becoming very common in the Nigerian construction industry and measures should be taken in the right direction at this stage to maintain a level of standardization.

This study has succinctly identified constraints to the use and production of Ready-mixed Concrete.

In a busy commercial city like Aba, Abia State the bad road and poor road network causes a lot of traffic gridlock.

- i. Proper scheduling of materials is also one area construction firms seems to be lagging behind.
- ii. Standard organization of Nigeria and other regulatory bodies should put in more effort in quality control of Building material especially concrete.
- iii. Similarly, professional bodies should participate more in regulations and monitoring of building projects and similar infrastructures.
- iv. International standards and requirements to should be enforced by regulatory authorities.

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