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Implementation of Construction Management Strategies for Improving the Functionality of RMC Plants

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Abstract: Infrastructure development widely spreading across the India due to this the large amount ofconcrete required. But the mail limitation of fulfilling this need is labor availability and space foravailability for concreting. Many time due to negligence of labor the quality of concrete will not achievealso there is a shortage of space for cast in site construction in metro cities .for this reason the RMCconcrete use widely across the country .But these plants faces lot of problems because of theseproblems the functionality of plant hampers. To overcome this effective construction management isrequired. The Indian Construction industry has been traditionally labour oriented. The pace ofmechanization in the past was very slow due to the availability of cheap and abundant labour, lack ofcapital investment and highly fragmented nature of the construction sector. The liberalization of Indianeconomy started from 1989 and paved the way for large-scale investments in infrastructure, industrialand agriculture sectors. The mega projects required speed and quality of construction compatible withinternational standards. It led to partial mechanization of construction industry and advent of Readymixed concrete in India is the outcome of this development. The Ready Mixed Concrete in India oncommercial basis started in 1994 and has achieved about 2 conversion from the site-mixed concreteby the year 2001. It is heartening that the acceptability of Ready mixed concrete is increasing though at aslow pace. The entry of foreign firms and major Indian cement producers in this field are likely to providenecessary boost to this industry in the future. The growth prospects of Ready-mixed concrete areenormous, provided requisite support is given by the regulatory authorities, consumers and decisionmakers. n this Study the detailed study of RMC plant initially carried out then Divide the functions ofRMC plant in different sections then Prepare the detailed questionnaires for each section and circulatedon different RMC plants to understand difficulties facing while operating the RMC plants Then Preparethe detailed remedial plan for each section to overcome the difficulties. Also prepare the checklist foreach section for smooth functionality of RMC plant.

Keywords: Construction Industry Ready mix concrete, RMC plants, questionaries' survey, cost benefit analysis

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INTRODUCTION

RMC IN INDIA:

In India RMC was first initially was used in 1950 during the construction sites of Dams like Bhakra Nangal, Koyna. At the construction the transportation of concrete is done by either manually or mechanically using ropeways & buckets or conveyor systems.

RMC at Pune in the year 1991. However, due to various pit falls and problems this plant did not survive for long and was closed. Within a couple of months in the year 1993, two RMC plant were set up in Mumbai to commercially sell RMC to the projects where they were installed. Unitech Construction set up one plant at Hiranandani Complex and Associated Cement Companies set up another plant at Bharat Diamond Bourse Commercial Complex.

These plants were later allowed to sell RMC to other projects also. Thus RMC was successfully

established sometime after 1994 in India.RMC producers from outside India soon became interested in the Indian market and therefore two very well-known producers set their foot on the Indiansoil i.e. Fletcher Challenge Ltd. From New Zealand and RMC Ready Mix of UK.

SCOPE OF RMC IN INDIA

Though delayed, but not very much, there a ready mixed concrete industry is developing and expanding at a fast pace in the country on a large scale. Over the period, due impetus to this development has been provided by various front-line construction and cement companies as well as technological bodies. The World Bank's " India Cement industry Restructuring Project" under which a technical study report on the development of market for bulk cement in India was made in 1996, proved to be positive development towards modernization of cement distribution system in India, including setting up Ready mix concrete Plants. India and for gradual shift. From the traditional mode of transportation in bags to bulk transportation through setting up of ready mixed concrete plants in different parts of the country. The recommendation of the action plan provided a useful guidance towards expanding bulk cement market thus paving a way for installation or ready mixed concrete plants in India. According to Cement Manufacturers Association, RMC is being increasingly recommended for all major public construction work such as highways, flyovers. In cities like Bangalore and Chennai, even small house builders have started displaying a marked preference for RMC instead of cement. According to the experts, there is lot of scope for the development and growth of RMC in India. It can grow to consume 40-45 percent of cement by 2015 through setting up of RMC plants in various consumption centres. For the healthy growth of industry, RMC industry in India has to fine-tune its own practices to following practices elsewhere in the advanced countries where RMC industry has been operating successfully. European Ready Mixed Concrete Organization (ERMCO) has defined the broad objectives to be achieved in design, management and operation of RMC which remain same as that of designing, and execution of concrete construction projects. The marketing of RMC should no more be in terms of strength grades only, but a combination of strength durability classification as per the Concrete Codes which improves the sell ability of RMC in terms of the requirements of the projects. Appropriate environmental, safety and health regulations for the working force need to be kept in mind in the management and operation of RMC.

Problem Statement: Infrastructure development widely spreading across the India due to this the large amount of concrete required. But the mail limitation of fulfilling this need is labor availability and space for availability for concreting. Many time due to negligence of labor the quality of concrete will not achieve also there is a shortage of space for cast in site construction in metro cities .for this reason the RMC concrete use widely across the country .But these plants faces lot of problems because of these problems the functionality of plant hampers. To overcome this effective construction management is required.

OBJECTIVES

1) To study of RMC plant Functionality in details, and study the different management system for operation of RMC Plants.

2) To study of difficulties facing while operating the RMC plants in section wise by circulating the

questionnaires on different RMC plants.

3) To prepare the detailed remedial plan for each section to overcome the difficulties. Also prepare the checklist for each section for smooth functionality of RMC plant.

4) To identify the check list parameter for smooth functioning of RMC plant

METHODOLOGY

Step 1: By site visits on different RMC plants adjoining Pune city understand the RMC plant Functionality

Step 2: Divide the functions of RMC plant in different sections then Prepare the detailed questionnaires for each section and circulated on different RMC plants to understand difficulties facing while operating the RMC plants

Step 3: Prepare the detailed remedial plan for each section to overcome the difficulties. Also prepare the checklist for each section for smooth functionality of RMC plant.

Step 4: Prepare the check list for for smooth functioning of RMC plant

NEED OF EFFECTIVE RMC PLANT MANAGEMENT

i. Concrete demand by customer in developing area.

ii. Cost control on aggregate for size, shape and grading. Not exercised on a site

iii. Blocking of roads/approaches.

iv. Dust pollution.

v. Manual operation.

vi. Wastage materials.

vii. Quality assurance.

viii. Restricted space.

ix. Speed on construction site.

x. Economy management.

Method of Data Collection:

- Data collected by conducting the actual Site Survey of RMC plant of different area of Pune, The Interview taken of different expert on site the DELPHI technique is used and analysis of Information.
- Divide the functions of RMC plant in different sections then Prepare the detailed questionnaires for each section and circulated on different RMC plants to understand difficulties facing while

operating the RMC plants

- Prepare the detailed remedial plan for each section to overcome the difficulties. Also prepare the checklist for each section for smooth functionality of RMC plant.
- Prepare the Checklist of RMC plant for smooth functioning of RMC plant

Approach of Construction Management in RMC Plant:

After visiting the number of RMC Plants near to Pune, We can conclude the following points for smooth functioning of RMC plant

1. Quality Management System (QMS)

I. Every ready mixed concrete company has a Quality Management System (QMS) in place. The System may be relatively informal with minimal documentation or quite elaborate with a comprehensive Quality Manual (QM). The desired level of documentation for your company is dependent upon the size and complexity of your organization and the competence of your personnel.

II. Define representative quality activities that are addressed in your QM, which may include:

i. sampling and testing of concrete and concrete materials; plant and field control of concrete production;

ii. personnel training;

iii. user education efforts;

iv. company representation in industry and professional groups;

v. evaluation and procurement of new equipment and tools to improve quality; concrete mixture optimization;

vi. various promotional activities;

vii. research and development testing;

2. Management Responsibility

The quality objectives should be measurable and the method of measurement defined. Examples of quality objectives include:

I. Achieving and maintaining Company Certification; NABL Certification of all of our Concrete and Laboratory Technicians; achieving 90 percent on-time delivery; having a fleet of ready mixed concrete trucks with no single truck over five (5) years old;

II. Achieving and maintaining NABL Plant Certification for each of our ready mixed concrete plants;

III. Achieving 95 percent customer satisfaction;

IV. Maintaining plant standard deviations, based on general construction testing and designated mixes,

V. Tracking and quantifying the reasons and cost of rejected loads; quantifying the cost to the company for quality related problems and resolution

3. Customer Focus

I. Presentations to customers of your performance records on previous major or special projects, including records of dependable early strengths of concrete (as required in high-rise construction).

II. Demonstration of the scope and qualifications of your company's quality control organization, including reference to its participation in inspection and accreditation programs of outside agencies.

III. Proper procedures for sampling, handling, testing ready mixed concrete;

IV. Expanding markets and applications of ready mixed concrete, to include a wider us of concrete by owners, designers, and builders.

V. Documentation of plant and mixer inspection schedules and plant certification, if applicable. Assisting your customers with evaluating cost efficiencies and recommending quality by improvements in placing and finishing concrete.

4. Human Resources Management

I. Identify who in your organization is responsible for the distribution and maintenance of your Quality Manual. Provide an overview of the importance of your quality assurance/quality control (Technical Services) activities to your company.

II. Discuss your company's personnel training procedures and stress the importance of your key quality personnel achieving industry recognized certification at the state or national level. Describe the quality related training of your employees beginning with the interview process and continuing throughout their career with your organization. Present training opportunities within your company which may include the initial interview process, introductory training, on-the-job training, and continuing education.

5. Materials Management

I. Identify the component materials that your company uses in the manufacture of ready mixed concrete. Component materials may include, but are not limited to Portland cement, Fly ash, Slag, Silica Fume, Chemical Admixtures, Fine Aggregates, Coarse Aggregates, Fibers, Color, and water.

II. Explain your organizations selection process for component materials. The specific materials required may be necessitated by the project specifications or the mix design selected. The selection of individual component materials strictly on the basis of economy may result in higher mix costs and/or increased quality control expense. A poor quality cement may produce highly variable

concrete strengths and a fine aggregate subject to erratic changes in grading may cause unexplained water demand and a subsequent reduction in concrete strengths. While troubleshooting these problems, your Technical Services personnel may not be available for other critical assignments

6. Purchasing

Purchasing is an important aspect of the quality process. In order to produce quality ready mixed concrete it is important that you purchase consistent reliable component materials. In this Section, define your company's purchasing procedures and identify what purchased products are covered. Purchase agreements may include the following information:

I. Quantity of material or specific time period (It is recommended that time specific Purchase Orders not exceed one year)Material Pricing, Terms and Conditions. Specified method of delivery.

II. The material description and any specified standard requirement. Testing documentation required and frequency of testing. This may be Mill Test Reports, supplier certifications, Sieve Analysis, or Chemical Analysis. Current Material Safety Data Sheets (MSDS). Detail of technical support required from the supplier. Supplier's immediate disclosure of any non-conformance(s) of their product which may impact the quality of your company's product.

III. Acceptance testing procedures and methods of handling non-conforming materials. Other items to be addressed may include insurance certificates, specific operational requirements, or safety regulations that suppliers must follow. Authorized signatures should be obtained on the Purchase Agreement from the purchasing company and the supplier.

7. Order Processing and Dispatching Procedures

I. Identify the types of orders that your company receives and the methods by which you receive these orders. Orders for ready mixed concrete vary significantly. For major and unique projects a Proposal from sales and/or a Purchase Agreement from the customer, generally specifies the anticipated quantity and class of concrete (by mix number). Established customers often use the same concrete mixtures day after day. Small contractors and individuals often describe their performance requirements and ask dispatch personnel what designated concrete mixture meets their criteria.

8. Order Entry

I. As orders are received, the orders are recorded on the appropriate order entry form or entered directly into the dispatch software. Your company may use the Checklist for Ordering and Scheduling Ready Mixed Concrete or your own internal form. The minimum information required for entering an order is:

II. Name and address of the customer;

III. Individual placing the order and contact information (particularly a cell phone number); Date and

time the order was received;

9. Concrete Testing

I. The purposes for testing concrete include the evaluation of component materials; concrete mix proportioning; and quality control of your ready mixed concrete production.

II. This Section should describe your company's Technical Services or Quality Control /Quality Assurance organization and procedures for sampling and testing your concrete.

III. Ready mixed concrete is a simple, flexible, durable, and economical product with a multitude of applications.

SURVEY RESULTS OF IDENTIFICATION OF CRITICAL FACTORS

Introduction

The detailed questionnaires are circulated to experts those are associated with RMC Plant like RMC Engineer, Site Engineers ,Project Managers, Labour Contractors, Equipment Owner, Architects ,Estimators, Environmental Consultants etc to indentified the causes of Wastages of Construction Materials.

Study peoples characteristics

In general features of the study people were investigated. They include the field of work, classification of contractors, experience of respondents**,** number of employees, cost of executed projects during the last five years etc.

Field of work

Table Gives details that represents the highest field of work for respondents with 80 % RMC Engineer, 10 % of Site Engineers, 5 % of Equipment Owner and sewage and 5 % of others

Table 1 Field of company specialization

Company Work Field	% of Respondents
RMC Engineer,	80
Site Engineers	10
Equipment Owner	5
Others	5

Experience of Respondents

The 18.8 (19%) have experience from one to three years, 10.4 (10%) of respondents have experience from 3 to 5 years, the percentage 20.8 (21%) of the respondents firm have experience between 5 to 10 years at construction works and 50 % (24) of respondents who have experience more than 10 years.

Critical Factors:

Group No 1: From data analysis the critical factor is Selection of site for RMC plant

Remedial Measure: Site selection for RMC plant plays an vital role in construction and development areas. While selecting site for RMC plant, various criteria are to be considered. And also the impact of RMC plant on environment is to be taken under consideration.

Although the criteria for site selection for RMC plant are ideal, we consider the economical and suitable conditions for RMC plant.

- A centralized concrete batching plant can serve a wide area.
- The plants are located in areas zoned for industrial use, and yet the delivery trucks can service residential districts or inner cities.
- Local availability of material should be near to desired site location of RMC plant.
- To reduce impacts of noise pollution and dust pollution on nearby residential areas, site selected should be far away from residential zones.
- Transportation facilities for RMC plant in the desired site location should be taken under considerations.
- The RMC plant should be located in a such areas where it should balance residential zones and construction zone, and it works for 24 hours when required.
- Desired site location should be located in such areas where production should be maximum.
- Skilled labour should be easily available nearby the desired site location of RMC plant.
- Wastage of RMC plant should be easily disposed without affecting the areas nearby the desired site location.

Group No. 2: From data analysis the critical factor is Lack of Resource

Remedial Measure :RMC plant to run efficiently in desired site location, the resources required to run RMC plant are cement, aggregates, fly ash, ggbs, chemical admixture, water, etc. also these materials should be available nearby the RMC plant easily and it should be economic as to run RMC plant in efficient economic conditions. Process management concerned with planning, organizing, and controlling of the flow of materials to, though, and out of an organization in an integrated fashion. Any resources used directly or indirectly in producing a product are to be considered as the lifeblood and heart of manufacturing system in RMC plant. Various resources used in RMC plant should have consistent deliveries to the RMC plant so that there will not be delay in further processes in RMC plant manufacturing the product,

Group No. 3: From data analysis the critical factor is Lack of Supervision

Remedial Measure Supervision is the mandatory process in the manufacturing unit of RMC plant. Supervision is necessary for every activity in RMC plant. Supervision plays vital role in working of RMC

plant while production of concrete.

Supervision for labour work is also very important. Supervision carries out organizational work, planning in the production of concrete in RMC plant. Supervision is the act or function of overseeing something or somebody

A person who performs supervision is a supervisor .supervision is overseeing the work of staff. The person performing supervision could lack a formal title or carry the title supervisor or manager, where the latter has wider authority.

Generally, supervision contains elements of providing knowledge, helping to organize tasks, enhance motivation, and monitoring activity and results; the amount of each element is varying in different contexts

Group No4: From data analysis the critical factor is Waterproof Cement Silos.

Remedial Measure: Waterproof cement silos is the prime factor to run RMC plant in economic efficient condition. Cement is the ingredient used to manufacture concrete in RMC plant. Also cement is the most expensive ingredient used to manufacture concrete in RMC plant. Efficient use of cement in RMC plant to manufacture concrete is the most important factor. Cement silos free from moisture attacks are required for efficient economic use of cement in RMC plant. To run RMC plant efficiently, pumping of cement is the process for which waterproof cement silos is the most important factor.

Group No5: From data analysis the critical factor is Quality of water

Remedial Measure: Water with pH value less than 12.5 may be aggressive in there action because of, a reduction of the alkalinity of the pore fluid would, eventually lead to removal of the cementitious material. However, the rate of chemical attack will be function of the pH of the aggressive fluid and the permeability of concrete. When the permeability of concrete is less and the pH of the fluid is above 6, the rate of chemical attack is too slow. Again the chemical attack on concrete

Group No6: From data analysis the critical factor is providing admixture atomically

Remedial Measure Chemical admixtures is the material other than water, aggregate, cement that is used as an ingredient of concrete to control the setting time of concrete. Chemical admixtures are provided to increase or reduce the initial setting time of concrete. admixtures provided by automatically is more efficient than provided by manually. Sometimes admixtures provided by manually can be overdosed, to reduce such overdosed of concrete admixtures are provided by automatically is more effective and more feasible. At some places due to long distance of site is important to increase the initial setting time of concrete, for this it is important to add adequate quantity of admixtures in concrete without overdose. in case of admixtures provided by manually there is direct contact of person with the admixtures and it affect that person. Sometimes there is possibility of happening accident during the provision of admixtures. Some chances of making injury during manually provision of admixtures. Truck mixture required more time than plant mixtures.

Group No7: From data analysis the critical factor is Effective quality Management.

Remedial Measure: Quality assurance comprises administrative and procedural activities implemented in a quality system so that requirements and goals for a product, service or activity will be fulfilled. It is the systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention. This can be contrasted with quality control, which is focused on process output.

Group No8: From data analysis the critical factor is change in order

Remedial Measure

Economic order quantity (EOQ) is the order quantity of inventory that minimizes the total cost of inventory management.

Two most important categories of inventory costs are ordering costs and carrying costs. Ordering costs are costs that are incurred on obtaining additional inventories. They include costs incurred on communicating the order, transportation cost, etc. Carrying costs represent the costs incurred on holding inventory in hand. They include the opportunity cost of money held up in inventories, storage costs, spoilage costs, etc.

Ordering costs and carrying costs are quite opposite to each other. If we need to minimize carrying costs we have to place small order which increases the ordering costs. If we want minimize our ordering costs we have to place few orders in a year and this requires placing large orders which in turn increases the total carrying costs for the period.

CONCLUSION

We studied the RMC plant in detail and prepared the questionnaires which are the problems which are generally faced by various RMC plants, then we asked this questions to different staff members on RMC plant. By asking this question we analyze the different parameter and found out the critical parameters e.g. Selection of site, Resource management, Supervision, equipment's etc.

For the improvement in the productivity of RMC plant to achieve the significant profit the site location, material handling , material management ,order methods play very important role it it .Effective control on this parameter is must require so this profit margin and customer satisfaction can be increased .

Also at last we can conclude that to run the RMC plant the checklist is required at each stage, Effectively all under comes at construction management umbrella so the Implementation of Construction Management Strategies must for improving the producity of RMC plant.

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