

A Review Paper on the Crucial Factors that Influencing RMC Delivery Operation

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Abstract:- The delivery process of ready-mix concrete (RMC) is a critical component in construction projects, influencing the quality, efficiency, and timeliness of concrete placement. This abstract explores the various factors that impact the RMC delivery process, ranging from logistical considerations to concrete properties and customer requirements.

Key factors affecting RMC delivery include the distance to the construction site, traffic conditions, weather, regulatory constraints, batching plant operations, order volume, customer specifications, concrete mix design, truck capacity, and communication channels among stakeholders. Each of these factors can significantly influence the success of RMC delivery, posing challenges and opportunities for optimization.

Keywords:- RMC Delivery Process , Factors, Scheduling Problems, ,Route, Distance, Traffic, Optimization

I. INTRODUCTION

Ready mixed concrete (RMC) produced in batch plant is a widely used material in construction industry. Along with its advantages it introduces new type of problems related to RMC delivery from the batch plant to the construction site. Delivery is one the key factors for the effectiveness of the inexpensiveness of the whole process. Late arrival of vehicles to the construction site may cause interruptions in concrete placement and idle time of machinery and workers. On the other hand, arrivals of vehicles with short interarrival times result in vehicles queuing on site with idle times of vehicles. Minimization of the idle times of vehicles is not only in the interest of batch plant but also contractor since many vehicles queuing in the construction site is problematic due to limited space, environmental issues and noise mainly in urban areas. Furthermore, RMC must be placed within certain time from the loading in batch plant otherwise it loses its quality and hardens.

In practice, RMC delivery planning is mainly determined by batch plant manager who estimates the vehicles needed for the order and their dispatching interval according to the quantity and delivery time of the concrete specified in the order. Its task is to plan the whole process optimally to ensure utilization of machinery and workers of the batch plant and construction site as well.

This planning process is rather difficult because Several factors can influence the delivery process of ready-mix concrete. Here are some key ones are :

- **Distance to Site:** The distance between the batching plant and the construction site affects transportation time and costs. Longer distances may require more logistical planning and can increase the likelihood of delays due to traffic or other unforeseen circumstances.
- **Traffic Conditions:** Traffic congestion, road closures, and accidents can all impact the delivery schedule. Planning deliveries during off-peak hours or using alternative routes can help mitigate these issues.
- **Weather Conditions:** Adverse weather, such as heavy rain, snow, or extreme heat, can affect the quality of concrete and the safety of transportation. Extreme temperatures may require special additives or adjustments to the mix design.
- **Traffic Regulations:** Local regulations regarding vehicle weight limits, travel times, and noise restrictions can impact delivery schedules and routes. Compliance with these regulations is essential to avoid fines or delays.
- **Batching Plant Operations:** The efficiency of the batching plant, including equipment maintenance, staff availability, and production capacity, can influence the timeliness of deliveries.
- **Order Volume and Frequency:** The size and frequency of orders from construction sites affect batching schedules and truck availability. Large or frequent orders may require more coordination and planning.
- **Customer Requirements:** Specific customer requirements, such as delivery times, mix designs, and site conditions, must be considered when scheduling deliveries.

- **Concrete Mix Design:** The composition of the concrete mix, including the type and proportions of ingredients, affects its workability, strength, and setting time. Adjustments may be necessary based on project requirements and environmental factors.
- **Truck Capacity and Availability:** The number and capacity of available trucks impact the delivery schedule. Maintaining a fleet of well-maintained vehicles is crucial to ensure reliable service.
- **Communication and Coordination:** Effective communication between the batching plant, truck drivers, and construction site personnel is essential for smooth delivery operations. Clear instructions and real-time updates help minimize delays and errors.

Delays in the delivery of ready-mix concrete (RMC) can have significant effects on the quality of the concrete. Here's how:

- **Setting Time:** Ready-mix concrete has a limited window of time, known as its "setting time," during which it remains workable and can be placed and finished properly. Delays in delivery can cause the concrete to start setting prematurely, leading to difficulties in handling and placing the material. This can result in poor consolidation, reduced strength, and compromised durability of the finished structure.
- **Loss of Workability:** Extended delays can cause the concrete mix to lose its desired workability, making it difficult to achieve proper consolidation and finish. Concrete that becomes stiff or unworkable during transit may require additional water or admixtures to restore its plasticity, which can negatively impact its strength, durability, and long-term performance.
- **Segregation and Bleeding:** Prolonged agitation and handling during transportation can contribute to segregation, where the coarse aggregates separate from the mortar matrix, leading to uneven distribution of materials and reduced concrete quality. Additionally, delays can exacerbate bleeding, causing excess water to rise to the surface of the concrete mix. Both segregation and bleeding can compromise the uniformity, strength, and durability of the finished concrete.
- **Temperature Effects:** Concrete temperature plays a critical role in its setting and curing process. Delays in delivery can expose the concrete mix to fluctuations in temperature, especially during extreme weather conditions. Concrete that is subjected to freezing temperatures before placement may suffer from frost damage and reduced strength, while exposure to high temperatures can accelerate setting and increase the risk of thermal cracking.
- **Quality Control Issues:** Extended delays can hinder quality control efforts, as it becomes challenging to monitor and maintain the consistency and properties of the concrete mix during transit. Variations in mixing, handling, and transportation conditions can lead to

inconsistencies in concrete quality, affecting its strength, durability, and performance.

Overall, delays in RMC delivery can compromise the quality of the concrete and increase the risk of construction defects and structural failures. To mitigate these risks, it is essential to implement effective scheduling, transportation, and quality control measures to ensure the timely and reliable delivery of high-quality concrete to construction sites.

II. OBJECTIVES

Construction is a dynamic, competitive, ever changing and challenging industry. This research was aimed at identifying the major crucial factors that influencing RMC delivery operation .To achieve the aims, objectives has been identified as following:

- To study on factors involved in delivery operation of ready-mix concrete.

III. SCOPE OF WORK

The scope of the research is mainly focused on literature review and a questionnaire survey. The questionnaire survey would be designed based on the crucial factors that influencing RMC delivery operation .

IV. TOOLS FOR STUDY

A questionnaire shall be prepared for collecting data from Site Engineers, Drivers, Owners and Workers of ready-mix concrete plant.

V. NEED FOR STUDY

To identify the crucial factors that influencing RMC delivery operation. To improve the factors and bring suggestion to improve the RMC delivery operation .

VI. LITERATURE REVIEW

Baker and Ayechev (2003) Explain why using genetic algorithms to solve the vehicle routing problem (VRP) is a good idea. Even though their constructed genetic algorithm functions well, it seems preferable to see the algorithm more as a way to broaden their investigation of the solution space. It is competitive with other contemporary strategies in this regard for the VRP (vehicle routing problem).

Feng et al. (2004) explains the features of the RMC sector and looks at the factors affecting the RMC delivery technique . To find the optimal dispatching plan that minimizes the time that RMC trucks must wait on constructors and fully satisfies the demands of various construction sites for RMC deliveries, a model that combines simulation and Genetic Algorithms (GA) was ultimately developed.

Naso et al. (2007) Concentrated on the RMC delivery issue in order to identify severe time restrictions and the complex nature of the supply schedule. Following the development of a comprehensive model, He introduced a novel meta-heuristic approach that combines constructive heuristics and hybrid genetic algorithms. The suggested methodology was demonstrated with a case study created using industry data.

Walke et al (2012) had found that RMC industry is exposed to multidimensional risks from all directions. These risks must be addressed properly so that RMC industry shall gain credibility, confidence of the customers and shall have expected profit margins. The risk sources pertaining to RMC industry are internal as well as external. This paper proposes a simple yet effective procedure for qualitative analysis of risks having internal and external sources related to ready mix concrete plants. Once the risks are qualitatively analyzed, the appropriate response strategies can be adopted to treat these risks.

Sudeshna Wawhal et al (2017) had found out that placing is a major on-going operation on construction projects in many countries. Evaluating the productivity of a ready mix concrete batch plant is one of the most challenging tasks of a plant manager and engineer, since it involves lot of uncertainties, thus risks. Delivering ready-mixed concrete (RMC) efficiently to construction sites is a practical concern and one of the most challenging tasks for RMC batch managers.

VII. METHODOLOGY

After reading a number of books and journals, it was determined that the indicators of RMC supply performance should be looked at from the perspectives of suppliers and contractors in order to address the issue of low operational performance. This was based on the theory that RMC delivery operations can be very profitable if they are tracked effectively. Personal interviews and questionnaire surveys are used to identify issues that impact RMC delivery.

VIII. FACTORS IDENTIFICATION

Traffic Conditions, Weather Conditions, Traffic Regulations, Batching Plant Operations, Order Volume and Frequency, Customer Requirements, Concrete Mix Design, Truck Capacity and Availability, Communication and Coordination.

IX. CONCLUSION

In conclusion, the delivery process of ready-mix concrete (RMC) is influenced by a variety of factors that can impact its quality, efficiency, and effectiveness. Factors such as distance to the site, traffic conditions, weather, regulations, batching plant operations, order volume, customer requirements, concrete mix design, truck capacity, and communication and coordination play crucial roles in determining the success of RMC delivery.

Addressing these factors requires careful planning, coordination, and proactive management to ensure timely and reliable delivery of high-quality concrete to construction sites. By understanding and effectively managing these factors, RMC suppliers can optimize their delivery processes, minimize delays, and meet customer needs and project deadlines effectively. Additionally, prioritizing quality control measures and adhering to industry standards and best practices can help maintain the integrity and performance of the concrete throughout the delivery process.

REFRANCES

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