

A Study on Negative Impacts of Use of RMC in Major Construction Projects and Proposing Effective Measures for Adoption

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ABSTRACT: Ready Mix Concrete is continuously growing industry in India. This industry is exposed to risks during preparation, transportation and utilization of RMC. It is important to address these risks, so that industry shall gain confidence of the customers, and shall have expected profit margins. Proposed paper presents a negative impacts caused during preparation, transportation and utilization of RMC plants in India. Unless the risks are addressed properly, the RMC industry in India shall not gain confidence of customers and will also cause reduction in profit margins. The risk causes can be categorized into internal risk causes and external risks causes. Thus, the risks related to RMC plants can be classified as internal as well as external risks. Internal risks and External risks cannot be avoided completely; yet, suitable strategies can definitely be adopted to manage these risks. This paper proposes an approach to mitigate risks in RMC plants in Indian context. Once risks are identified, mitigation measures can be adopted to treat the risks related issues. This shall help in achieving the objectives of RMC business in terms of production and supply cost.

KEYWORDS: Ready Mix Concrete, risk mitigation.

I. INTRODUCTION

IS 4926-2003 (Bureau of Indian Standard 2003) defines Ready Mix Concrete (RMC) as “Concrete delivered at site or into purchaser’s vehicle in the plastic condition and requiring no further treatment before being placed in a position in which it is to be set and hardened”. Ready Mix concrete is preferred over site mix concrete because it is environmental friendly. It is a solution to a messy and time consuming manufacturing of concrete at construction sites. It offers solutions to customer’s specific problems, ensures customer satisfaction and provides uniform quality. It also eliminates the need to store materials used to manufacture concrete at project sites. Currently, RMC is a matured industry both in Europe and USA. The data from National Ready Mix Association (March, 2007) indicate that RMC is a \$ 30 billion industry in USA, with annual output of 351 million cubic Meters. In these countries, nearly 75% consumption of cement is through the RMC route (National Ready Mix Concrete Association), R.C.walke. (2012) The main objective of project is to identify the factors involved in preparation, transportation and utilization of RMC and to find out the risks involved in preparation of RMC based on the risk involved various mitigating measures will be adopted. The reliability of project is to make Ready Mix Concrete free from negative impacts caused by RMC so that the RMC industry in India shall gain confidence of the customers and shall increase the profit margins. The main hypothesis of these paper is to find out the risk involved in RMC plants based on the risk involved various mitigating measures will be adopted.

An Approach for Ready Mix Concrete Selection for Construction Companies through Analytic Hierarchy Process” by (Ashish.H 2013) has developed a framework of criteria which contributes for Ready Mixed Concrete selection. As Ready Mixed Concrete selection is a multi-criteria decision making problem, Analytic Hierarchy Process is suggested for the solution. Mohamed Marzouk, Ahmed Younes (2013) in his article “A simulation based Decision Tool for Transportation of Ready Mix Concrete” presents a simulation tool which is applied to ready mix concrete operation to analyse the utilization and assignment of production and transportation.

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II.MIX DESIGN

Mix design is very important step. The various quantity is decided the tested or received material is supplied to the laboratory where mix design is done. This laboratory is approved or authorized to do the mix design (Hanumant P. et. ol). To investigate and predict the behavior of concrete made from two of the locally most common types of cement CEM I 32.5 R & CEM I 42.5 N, experimental and numerical techniques will be presented in this study (Mostafa A.M.Abdeen, HossamHodhod). Data collected from 3 different RMC plant located in Chennai, the grade of concrete used are listed in table 1.

Table 1

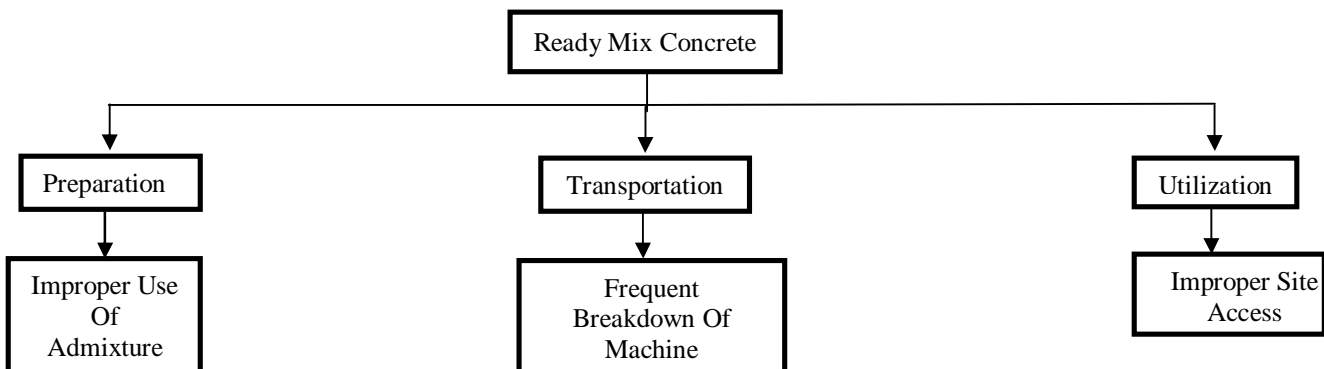
Specification of M30 and M35 grade of concrete

Grade	Ratio	Ingredients
M30	1:1:3	Cement: 380 kg/m ³ , 20mm jelly: 654 kg/m ³ , 12mm jelly: 436 kg/m ³ , River sand: 760 kg/m ³ , Total water: 187 kg/m ³ , Admixtures: 0.7%, Concrete density: 2420 kg/m ³
M35	1:1.6:2.907	Cement: 410 kg/m ³ , 20mm jelly: 632 kg/m ³ , 12mm jelly: 421 kg/m ³ , River sand: 735 kg/m ³ , Total water: 200 kg/m ³ , Admixtures:0.7%, Concrete density: 2400 kg/m ³

- Average production per day - 100 to 150 m³
- Capacity of transit mixer - 6m³
- Loading time for 6m³ transit mixer - 7.5 minutes
- Silos capacity - 100 metric tons
- Max & Min distance from Plant to site - Up to 100 kilometres
- Min & Max speed of vehicle - 30 to 60 kmph
- Min & Max quantity of concrete In transit mixer - 3m³ to 6m³
- Raw materials used are 20 mm, 12 mm aggregate, river sand, crusher sand

III. FACTORS INFLUENCING RMC PLANT

The following flowchart shows the factors influencing RMC plants in Chennai based on the factors various mitigating measures has been identified.



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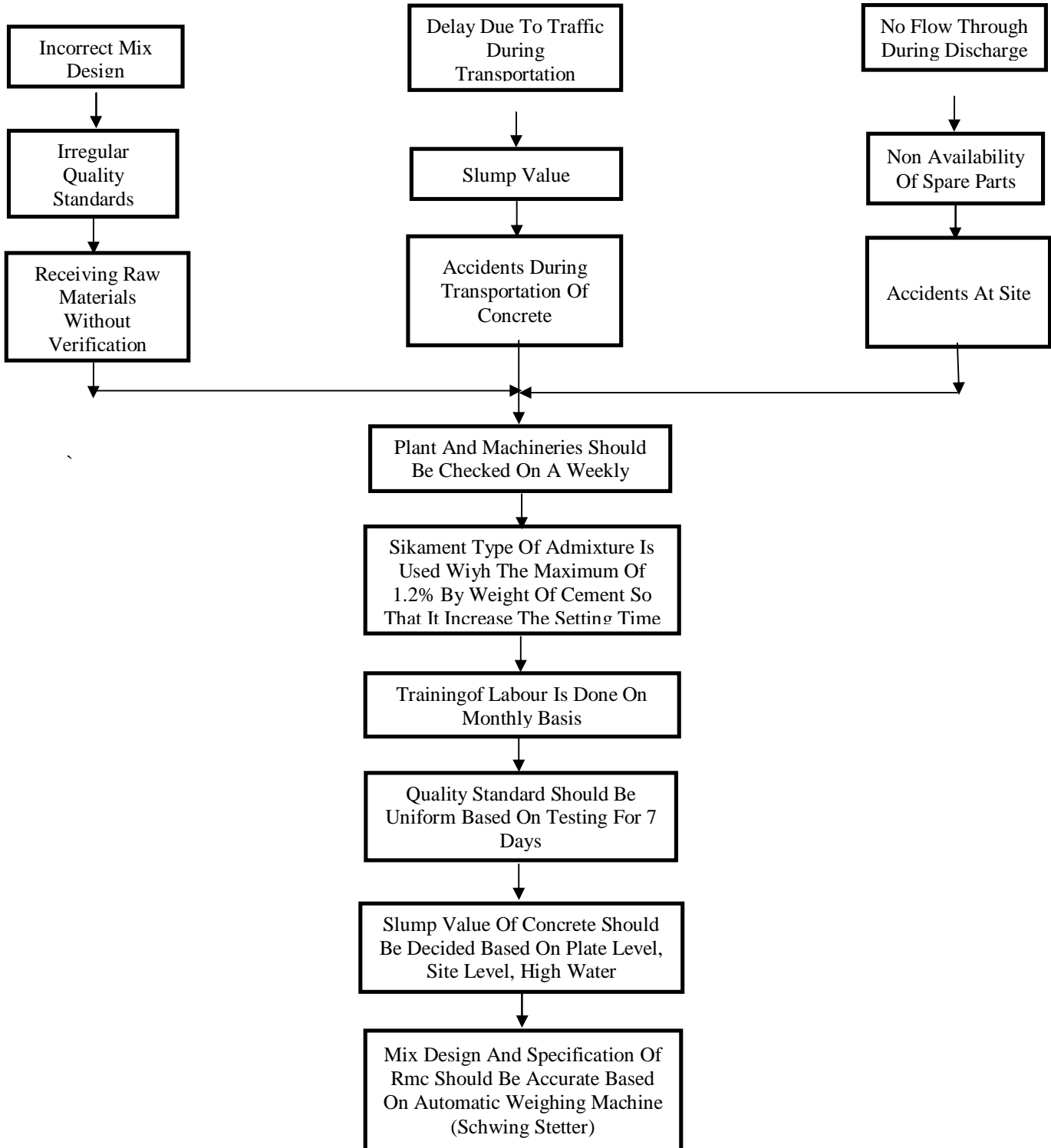


Fig 1: Factors influencing RMC plants

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3.1 IMPROPER USE OF ADMIXTURE

Inappropriate use of admixture is a result of lack of expertise training in concrete technology among the skilled labour. Inappropriate use of admixture also affects pumping and dispersion of concrete and hence should be properly addressed. The techniques of admixture should be thought to labour to avoid inappropriate use of admixture. Proper supervision team should be setup for checking admixture proportion in batching plant.

3.2 RECEIVING RAW MATERIALS WITHOUT VERIFICATION

Identify the component materials that your company uses in the manufacture of RMC. Component materials may include, but are not limited to Portland cement, fly ash, slag, chemical admixture, fine aggregate, coarse aggregate and water. The materials required based on the project specification or the mix design selected. The material selected should be based on economy so that it reduce the material expenses.

3.3 DELAY IN TRANSPORTATION ON MATERIALS:

The concrete delivery process begins when the transit mixer leaves the plant and ends when the truck returns to the plant or other designated facility. For tracking transit mixer we use computer software fleet management system. Fleet management system is fully integrated with the concrete batch computer software. All the transit mixers are equipped with GPS (Global Positioning system) which link to the fleet management software.

3.4 FREQUENT BREAKDOWN OF MACHINE:

The equipment should be checked on a weekly basis so that to avoid breakdown of equipment. The breakdown of a equipment continuous to be one of the most widespread covers within this context, together with construction. Inspect the dust collection system on accordance with the manufacturer's recommendations. For aggregate provide physical separation of aggregates.

3.5 NON AVAILABILITY OF SPARE PARTS:

Proper maintenance avoids the need for replacement of machinery spare parts and hence the problem of no availability of spare parts can be overcome to some extent possible. Monitor the high bin indicators, anti overfill device and pressure sensors for correct operations. Monitor transfer devices, turn head limit switches, and full bin signals for correct operations. In case of chemical admixtures confirm that admixture storage containers are properly identified with the chemicals stored within.

3.6 NO FLOW THROUGH PIPES DURING DISCHARGE:

Concrete pump failure due to internal and external failures. Internal factors such as mechanical failures, improper maintenance, wear and tear of rolling stocks, engine failures etc or due to external reasons such as pumping unsuitable mixes through concrete pump. In order to avoid such failure due to external factors the mix is proportioned in such a way that it is able to bind all the constituent materials together under pressure from the pump and thereby avoiding bleeding and segregation.

The following fishbone diagram shows the cause of reduced productivity of RMC plants in Chennai.

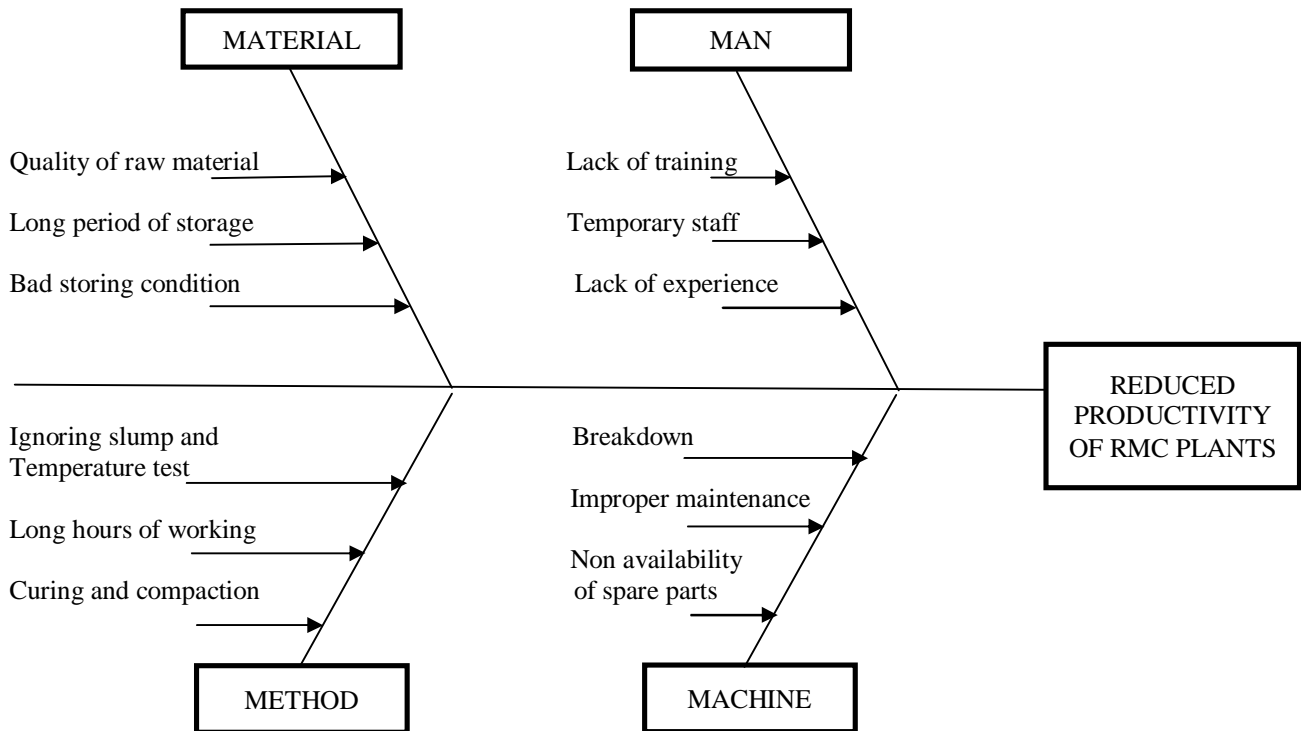


Fig 2: Fishbone Diagram for cause for reduced productivity of RMC

IV. CONCLUSION

The proposed project presents the negative impacts caused during preparation, transportation and utilization of RMC. The information is gathered through the interviews and discussion with the team of key personnel working in RMC plants in Chennai. A list of negative impacts has been prepared based on the data collected and according to those negative impacts mitigating measures has been listed down so that RMC industry will be free from risk and it will increase the production and supply cost of RMC plant in Chennai.

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