

DECISION SUPPORT MODEL USING MATLAB FOR THE SELECTION OF EQUIPMENTS IN HIGH RISE BUILDING CONSTRUCTION

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Abstract *Selecting a proper Construction Equipment depending upon the Rate of Investment of a Project is becoming a challenging task in the present existing Construction Industry due to the Technological Development which is leading to the broad array of available Equipment in the market, Therefore differentiating every criterion consciously by an expert is an important step to bring the higher satisfaction to the clients, which are taken into account during the selection of equipment for High-Rise Buildings, by ranking the factors influencing the selection. In order to overcome the difficulties and Challenges, Multiple Criteria Decision making have been proposed for selecting the appropriate Equipment by ranking the alternative. Therefore this study is targeted to select the Equipment according to the Major Factors influencing the overflow of Operational cost and Time Management in a Project, including the other main four criteria like (i) Economic Criteria, (ii) Technical Criteria, (iii) Environmental Criteria, (iv) Human And Social Criteria. Relative Important Index (RII) method is used to rank the factors for the proper selection of Equipment for High Rise Building Construction, according to the response giving by the Site Managers, Site Engineers, Technicians, Labors, etc., which is collected through Questionnaire Survey bases, and then the risk factors are Analyzed and Ranked based on the collected Questionnaire by using an (MATLAB).*

Keywords – Construction Equipment, Differentiating criteria, Equipment Selection, High-Rise Building, Ranking the Alternative, Questionnaire Survey, Factors Influencing, Operational cost and Time Management,

1. INTRODUCTION

The growing demand for accommodation has created a boom in the real estate sector, but has led to an alarming increase in high-rise buildings. With growing individual's incomes and moment of large numbers people to the urban areas in a country, therefore the demand for housing has come to upswing. Due to high construction costs and non-availability of land at preferred locations, people opt for apartments. These apartments offer many advantages such as round-the-clock security, back-up power supply, maintenance car-parking facilities and kids' play areas.

In India, the majority of such buildings are seen in the commercial capital Mumbai that is already overstretched. Talks are on about a proposed 320 m high India International Trade Centre here that will have 72 floors. Mumbai is also constructing the WORLD ONE tower with a 117 floors. The structure is expected to be completed by 2020/21. Therefore the challenges for the construction of High-Rise Buildings is more Increasing in some certain perspectives,

(1) Selection of equipment for a construction project is one of the major functions and decision-making process. (2) In case of complex and large-scale project, equipment selection, becomes very complex and challenging. (3) A wrong decision is likely to

have significant effects in terms of high cost and possible delays. (4) With growing incomes, priority for comfort and convenience, and an increasing demand for lifestyle homes, it's boom time for real estate folks.

2. LITERATURE REVIEW

1. Kyle A. Riding, Ph.D., P.E (2016) states that the pumping is one of the major placement techniques used in the concrete industry to deliver concrete from the mixing truck to the formwork. Although concrete pumping has been used to place concrete since the 1960s, there is still a lack of exact knowledge supported by research evidence as to what affects concrete pump ability and how pumping changes concrete properties. A three-phase research study was carried out to (1) investigate performance of pumped concrete in field conditions, (2) identify concrete properties affecting pump ability, and (3) assess the effects of pumping on the concrete air void system. In the first phase of the research program, six Kansas Department of Transportation (KDOT) project sites were visited, During the summer of 2015, and concrete was sampled before and after pumping.

2. Yufeng Wei (2015) states that the increasing height of urban buildings creates challenges in the vertical delivery of essential resources during construction phase, which makes the efficient use of construction hoists crucial in building construction. The inappropriate arrangement of temporary hoists can result in a loss of productivity, especially during peak-hours when a large number of specialty trades requires hoists simultaneously. To address this challenge, this paper introduces a discrete-event simulation model that can assist in examining the impact of different lifting strategies on workers' delay during peak-hours. The application of the proposed model in high-rise building projects shows a potential for

minimizing workers' idle time and increase labour productivity.

3. Moustapha Ahmed Bouh (2015) describes paper analyses the existing literature on material handling equipment selection through equipments and attributes aspects. It is found that the maximum material handling equipment types used by developed systems for resolving the selection problem is 50 equipment types. The greatest number of attributes used in one article is 42 attributes. However, system should be more robust and practical by being close to the reality of the selection problem. According to continuously growing market much more material handling equipment exist .Therefore more complete new classification of individual unit load material handling equipment types and attributes are provided. Equipment categories classes and types are clarified. Reasons of the necessity for new lists are discussed.

4. M.Waris et al (2014) states that onsite equipment and machineries is vital in achieving productivity and efficiency. Questionnaire survey on development of sustainable criteria for selection of onsite construction equipment. The selection of mechanized equipments are based on economic criteria, engineering criteria, environmental criteria, human and social criteria. These factors are correspondingly loaded with thirty eight items which form criteria based on socio-economic, engineering and environmental functions of sustainability. From that thirty eight items productivity, safety, ownership cost, operational cost and its efficiency this all ranked high among all. The outcome of this paper will directly benefit the contractors in selecting construction equipment in terms of techno-economic, socio-economic and environmental constraints.

3. OBJECTIVE OF THE STUDY

The objective of the study is:

- Identification of various equipment like concrete pump and hoists.
- Identifying the factors influencing the selection of equipment.
- Identifying advantages and disadvantage faced at site during execution of work by case study.
- Developing the decision support system for selecting the appropriate equipment for various site conditions.

4. SCOPE OF THE STUDY

The scope of this study is:

- This questionnaire will be helpful in selecting important factors in selecting equipment's from site survey and to get opinion from experts.
- This decision support system will help the project manager and others in selection of the equipment based on the constraints and the site condition.
- This result will decrease the time in selection of equipment and Cost will be saved in by choosing appropriate equipment.

5. WORK METHODOLOGY

- The study started with the introduction part, then followed by Literature study where the several factors that are affecting for the usage of Equipment for High-rise Buildings are analysed and listed out.

- Then the preparation of Questionnaire Survey are done, then the prepared Questionnaire is cross checked by the superiors and the distribution of Questionnaires are done.
- The finally the major factors that are influencing are taken into an account by using the Relative Importance Index (RII) method.
- Therefore, the selection of appropriate construction equipments are done with the help of computer systems (MATLAB).

6. FACTORS AFFECTING THE SELECTION OF EQUIPMENT

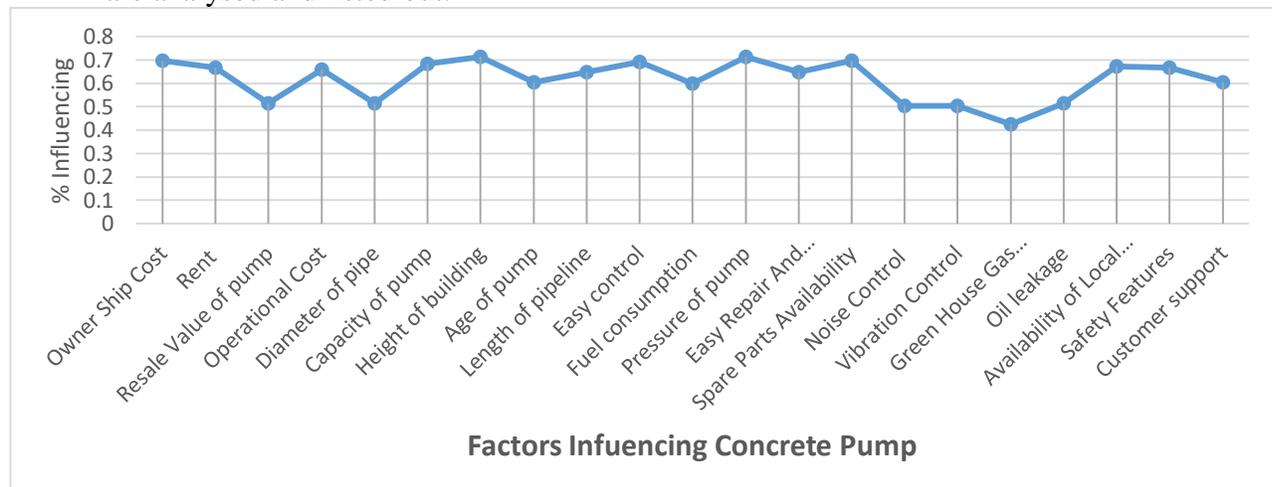
Factors are classified into four major categories Economic criteria, Engineering criteria, environmental criteria, Human and social criteria.

6.1 SURVEY RESULTS

The top factors form these surveys for concrete pump and hoist are identified by data analysis by excel.

6.2 CONCRETE PUMP

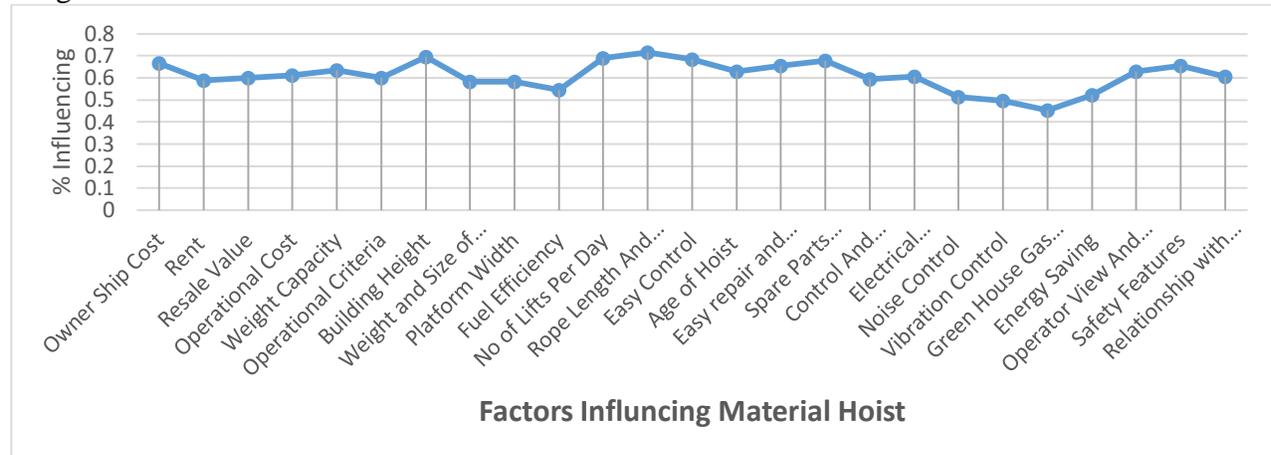
Capacity of pump, diameter of pipe, Height of building, Length of pipe line, and pressure of pump. These are top 5 factors in technical criteria selected by expert person in construction.



6.3 HOIST

Hoist lifting capacity, speed of hoist, brake, weight and size of material these are the

factors which ranked high in technical criteria by experts in construction industry.



7. CONCLUSION

The growing demand for accommodation has created a boom in the real estate sector, but has led to an alarming increase in high-rise buildings. So this project study will help the person who is caring out the high rise construction in selecting the appropriate equipment and the decision making support for project manager and others in selecting the equipment based on the constraints and the site condition. This result will decrease the time in selection of equipment and Cost will be saved in by choosing appropriate equipments.

The decision support system developed for the selection of concrete pump and hoist will be useful for contractors and owners to decide appropriate equipments based on their requirements.

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