Earth Moving Equipment (Dumper and Excavator) Management in Mining Project

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Abstract — To minimize the cost of earthmoving equipment by optimize the time and cost of earthmoving activities. This was developed to optimize various decision-making variables (i.e., capacity, number, and speed). The optimization results emphasize the ability in creating a wide variety of optimal solutions to minimize time and cost objective functions during earthmoving activities for a wide range of possible equipment combinations. Earthmoving activity is considered one of the most critical elements in construction projects. The overall cost of earthmoving activity during construction projects can account for more Than 30% of the total cost. Moreover, earthmoving equipment emits enormous carbon, which has adverse environmental effects. A mathematical model is needed to optimize the selection of the equipment types (i.e., Dumper and excavators) and the numbers of each type to be employed on a particular project, based on the work capacity of each unit, the number of units, and the speed at which each unit travels.

Keywords: Optimize, Minimization

I. INTRODUCTION:

The cost of construction is an important factor in all projects whether the construction project is to bilinear (i.e., concept, design, procurement, construction) or fast-track (i.e., design/build); whether a construction contract is unit price, lump sum, or cost-plus. The equipment and profit are important factors that impact construction costs. To determine the economic service life of earthmoving and transportation equipment, the mathematical models are available. Presents the capability to quantify, the significant costs of downtime and lack of availability by a model. A little thought and innovation applying in the model should make it possible to understand the philosophy, as well as the methodology used for quantification. Concentrated on the management of heavy construction equipment, which is a tough task.

It was revealed how a second-order polynomial expression was selected as the optimum and it can be used to identify best economic decisions of the cumulative cost model developed by Vorster examined the importance and magnitude of costs by equipment failure. Developed a maintenance plan for improving safety and efficiency of Excavator and heavy equipment's. Stated future of management which likely to be happens. The information output can be used by both managers and no managers in the firm to make decision and to solve the problem. Accordingly that as the contractor's with large investments in equipment have a great impact on the profitability of the firm with equipment policy and equipment management system. Studies with professional experts in the equipment management field. (a) To record observations and knowledge, and (b) to evaluate the performance of the equipment. By effective equipment maintenance, companies have found effective way to increase profit margins most construction firms are tends to concentrate on maintenance efforts of unscheduled breakdowns and emergency repairs this eventually tends to concentrate on maintenance department overtime, the production losses and in expediting parts for repairs. Thus, the equipment's are largest assets of construction companies. The purpose of this study is to find out how construction equipment affects the effectiveness of construction operations and to analysis the traffic flow. However, till date, limited work has been published related to these especially in planning for equipment utilization.

II. LITERATURE REVIEW

To optimize the time and cost of earthmoving activities. This was developed to optimize various decision-making variables (i.e., capacity, number, and speed). The optimization results emphasize the ability in creating a wide variety of optimal solutions to minimize time and costobjective functions during earthmoving activities for a wide range of possible equipment combinations. For example, in equipment combination 1 (i.e., 320D2 and 725C), the providedoptimization saved 14.3% and 2% for time and cost objectives, respectively, by providing a solution of using two 320D2 excavators and three 725C Trucks with the speed of 42 km/h. Furthermore, in equipment combination 2, substantial savings in time and cost were shown. The time and cost reductions were 14.4% and 17.89%, respectively, by providing a solution using two 320D2 excavators and three 725C trucks with a speed of 39 km/h, which saved 316632 Rupees (a 13.6% cost saving). These optimization results show that appropriate equipment selection plays a critical role in time and cost savings. The proposed newspaper also deals only with excavation and soil transfer from a construction site to dumping. Also, the safety and quality objectives could be considered the main objectives and the time and cost objectives.

It studies the prevention of vacuum created by the lack of proper material handling at construction sites. It is on the analysis of factors that affect the effective material management in building construction projects. Materials management is an important tool and factor in project management and control to improve productivity in construction projects. In order to execute a building project effectively,it is important to have the right materials in the right place at the right time. Many researchershave shown that construction materials and equipment can make up more than 60-70% of the total cost for a typical construction project. Improper handling and maintenance of materials on site can adversely affect project cost. Materials management practices need to be implemented on construction industry

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projects. A properly implemented materials management program can achieve a timely flow of materials and equipment for employment, resulting in better planning, increased labor productivity, better scheduling and lower project costs. In addition, proper maintenance of the material component improves the productivity and cost efficiency of a project and helps in completing construction projects on time and efficiently. One of the major problems of delay in construction projects is maintenance of materials and equipment. Therefore, it is necessary to study and implement material management practices in all construction industries. However, this review focuses on the various content managementmethods adopted on paper sites and discusses the advantages and disadvantages of content management on construction sites. It studies the prevention of vacuum created by the lack of proper material handling at construction sites. It is on the analysisof factors that affect the effective material management in building construction projects. Materials management is an important tool and factor in project management and control to improve productivity in construction projects. In order to execute a building project effectively,it is important to have the right materials in the right place at the right time. Many researchershave shown that construction materials and equipment can make up more than 60-70% of the total cost for a typical construction project. Improper handling and maintenance of materials on site can adversely affect project cost. Materials management practices need to be implemented on construction industry projects. A properly implemented materials management program can achieve a timely flow of materials and equipment for employment, resulting in better planning, increased labor productivity, better scheduling and lower project costs. In addition, proper maintenance of the material component improves the productivity and cost efficiency of a project and helps in completing construction projects on time and efficiently. One of the major problems of delay in construction projects is maintenance of materials and equipment. Therefore, it is necessary to study and implement material management practices in all construction industries. However, this review focuses on the various content managementmethods adopted on paper sites and discusses the advantages and disadvantages of content management on construction sites.

In the construction project, time and cost are the most important factors to be considered in the planning of every project. The aim is to finish the projects on time, within budget and to achieve other project objectives. Time loss is costly and it creates a problem which is related to costs. It increases cost with increasing in a time of particular activity. Due to this, the total budget of the project gets collapsed.so Time-cost optimization is essential for construction projects. The objective of time-cost optimization is to determine the optimum project duration corresponding to the minimum total cost. Good project management in construction must vigorously pursue the efficientutilization of labor, material and equipment. The use of new equipment and innovative methods has made possible wholesale changes in construction technologies in recent decades.The selection of the appropriate type and size of construction equipment often affects the required amount of time and effort and thus the jobsite productivity of a project.

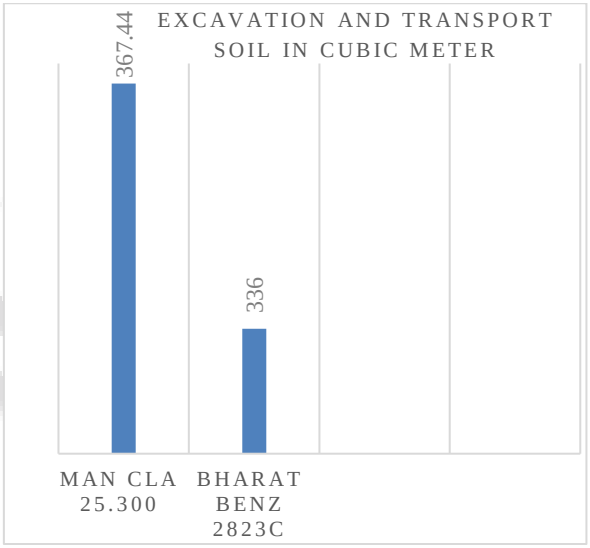
III. METHODOLOGY

This study is aimed at research, study on an optimization of Equipment (Excavator and Dumper) at Mining site. Further, the structural methodology is structured as below:

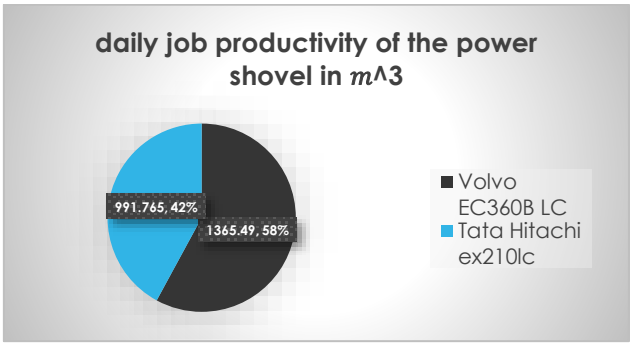
1) Selected the CPP Project Topic
2) Identified the problem related equipment management
3) Identity equipment's (excavator, dumper)
4) Practical observation on site
5) Observe time required for excavation and transferring to dumper
6) Observe time required for one cycle of dumper
7) Calculate total time required from excavating to dumping
8) Calculate the numbers of dumper required at a time
9) Find out safety precaution to be taken on site
10) Maintenance management 0f equipment
11) Conclusion and recommendations

IV. RESULTS

A. Daily productivity of dumper in m^3.



B. Daily productivity of Excavator m^3.



C. Optimize existing operation of Dumper and Excavator.

The number of trucks required is:

P_h = Daily productivity of dumper
P_e = The job productivity of the power shovel
N_h = Number of dumper required

$$N_h = \frac{(1.1)(P_e)}{P_h}$$

$$N_h = \frac{(1.1)(5358)}{580.92} = 10.14$$

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Implying that 11 Dumpers should be used.

D. Safety precaution to be taken on site.

1) Safety protocols followed on site.

1) Training and Education
2) Personal Protective Equipment (PPE):
3) Equipment Maintenance:
4) Emergency Response Plan:
5) Work Permits
6) Safety Audits:
7) Hazardous Material Handling:
8) Communication:

2) Different causes of hazards or accidents related to use major equipment.

1) Lack of proper training
2) Equipment malfunction or failure
3) Lack of communication or coordination
4) Inadequate inspection and maintenance
5) Inadequate emergency preparedness

3) Precaution to be taken to reduce site accidents

1) Train Workers
2) Use Protective Equipment
3) Follow Safe Work Practices
4) Regular Equipment Inspections
5) Post Warning Signs
6) Use Proper Ventilation
7) Provide Adequate First Aid
8) Regular Safety Audits
9) Emergency Response Plans

4) Safety audit

There are different types of safety audits that can be conducted at mining sites, depending on the specific needs and objectives of the audit. Some examples include:

1) Compliance audits
2) Risk assessments
3) Behavioral safety audits
4) Management system audits
5) Emergency preparedness audits

5) Safety training

1) Identify potential hazards
2) Develop safety procedures
3) Train workers on safety procedures
4) Provide safety equipment.
5) Conduct regular safety audits
6) Encourage a culture of safety

6) Maintenance management of equipment.

List of maintenance for each equipment

Here are some general maintenance tasks that are typically required for excavators and dumpers used at a mining site:

1) Daily inspections
2) Lubrication
3) Cleaning
4) Fluid checks
5) Filter changes

7) Costing

1) Volvo EC360B LC Excavator maintenance cost is daily maintenance is 9930 Rs and monthly maintenance is 10279.5 Rs.
2) Tata Hitachi ex210 Excavator maintenance cost is daily maintenance is 11330 Rs and monthly maintenance is 10277.5 Rs.
3) Bharat Benz 2823c dumper maintenance cost is daily maintenance is 5200 Rs and monthly maintenance is 4432.5Rs.
4) MAN 2823c Dumper maintenance cost is daily maintenance is 6000 Rs and monthly maintenance is 7977.5Rs.

8) Documentation

Documentation is essential for the maintenance of major equipment at a mining site. The following are some of the critical documents required:

1) Equipment manuals
2) Maintenance log
3) Inspection reports
4) Repair orders
5) Parts inventory Training records
6) Safety manuals

9) Compare Maintenance Cost for Different Equipment

1) As Per Comparison maintenance cost of MAN 2823c dumper is 4345 Rs More than Bharat Benz 2823c dumper.
2) As Per Comparison maintenance cost of Tata Hitachi ex 210lc Excavator is 1398 Rs More than Volvo EC360B LC Excavator.

10) Training of operators

The specific training required for operating major equipment will vary depending on the type of equipment involved. However, some general guidelines for training requirements are as follows:

1) OSHA Certification Safety and Health Administration (OSHA).Manufacturer's Training
2) On-The-Job Training
3) Continuing Education

V. CONCLUSION

This paper study reported all the technical and also the economic aspects related to Earth moving equipment such as dumpers and excavators play a vital role in mining operations. They help in the excavation of materials, transportation, and dumping at the desired location. Efficient management of these equipment is crucial for ensuring the smooth functioning of mining sites. Proper maintenance, timely repairs, and effective utilization of these machines can lead to increased productivity and reduced downtime. Daily job productivity of the Excavator Volvo EC360B LC 991.765m^3 and Daily job productivity of the Excavator Tata Hitachi ex210 lc **is** 1365.49 m^3. Daily job productivity of the MAN CLA 25.300 367.44 m^3 Dumper and Bharat Benz 2823c productivity is 336 m^3. Optimize Existing Operation of Dumper Implying that 11 Dumpers should be used. Safety protocols followed on site (Training and Education, Personal Protective Equipment (PPE) Equipment Maintenance, Emergency Response Plan, Work Permits, Safety Audits, Hazardous Material Handling, Communication) Different causes of hazards or accidents related to use major equipment.(Lack of proper training, Equipment malfunction or failure Lack of communication or coordination, inadequate inspection and maintenance, inadequate emergency preparedness.)

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