To Study the Optimization of Construction Machinery use for Construction Project
A Short Review

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Abstract— **The largest share of investment in all developing countries finds its way into construction. In India construction industry is growing rapidly. So to maintain optimum utilization of equipment is necessary. Construction equipment plays a significant role in the execution of modern high-cost time-bound construction projects. Optimization of equipment contributes to economy, speed and timely completion of a project. Equipment is a capital investment and the contractors must apply time value analytical formula to the process of machine utilization.**

The scope of this study is restricted to RMC and Hydraulic Excavator; considering the extensive use of these equipments in modern construction project, wide spread area of factors affecting the hourly output and the time limit for such a study. And different practices of improving the productivity of construction for the Indian scenario. With the help of literature review.

Keywords—Equipment Planning; Factors affecting,

I. INTRODUCTION

The construction industry is best described as an amalgam of wide varieties of economic activities ranging from house building and repair to major engineering works. Drawing the boundaries of construction industry is an arduous task but an operational definition which recognizes the construction industry to include firms and individuals involved in planning, design, the supply of building materials, plant, equipment, transport and other services relating to the procurement of physical infrastructure and services. Thus, the construction industry is a very diversified and dynamic industry. However, this definition reflects the attributes of an effective and functioning construction industry that is well integrated with the wider economy.

II. SCOPE OF STUDY

The assessment of equipment performance needs experience. The equipment capability to perform an assigned task under a given situation can best be determined from the on-site actual trials or it can be accessed from its past performance records of operation under similar site conditions. The main factors which affect the performance of equipment / plant and for which allowance must be made when estimating output are of two types,

1. Factors affecting hourly output
2. Factors affecting overall output

The scope of this paper is to evolve output with regard to factors affecting hourly output. Output can be defined as the average output given by particular equipment where as the output norm is the maximum output the equipment can achieve with the same job conditions. For planning purpose we will be depending on the output of equipment rather than output norms. The norms can be used for increasing the production or for introducing incentive scheme for workers.

Earth moving work being an important activity for any kind of civil projects, the output study of Hydraulic Excavator becomes a role model for other earth moving machinery. The soil condition is the most predominant factor for production in case of excavator and same is the case with dozer, scraper, clamshell, dragline etc. Now a day's hydraulic backhoe excavators are extensively used for earthwork excavation and pipe laying works. More importantly the earthwork is the first activity for any project and other activities are dependent on this. Here the planning managers will have to allocate the resources to complete the particular sector of earthwork in optimum time Again these excavators are used at mining and quarrying works. The factors affecting the output of excavators are numerous and such a study can help in identifying the factors and for assuming realistic production figures.

Concrete Batching plants are a necessary for large construction projects involving huge concreting volume. The ready mix plants are acquiring more popularity now a days, meeting the concrete requirements for commercial and residential projects coming up in town areas. These plants can give well mixed, consistent quality of concrete in less time compared with conventional drum mixers. The study of actual output given by these plants can give a realistic picture

compared to what manufactures has specified as the output. Regarding batching plants, the factors affecting the output are rather manageable as requirement of concrete at site, arrangement for transporting the concrete to placing point etc. Here also the factors affecting the output can be compared with other plants used for general construction projects.

III. OBJECTIVE OF STUDY

The construction industry is basically depending on the labors output. But now a day as the construction industry is growing at a very fast rate and plays a vital role in the development of the nation. This requires the optimum use of the construction equipment's in the execution.

IV. LITERATURE REVIEW

A. HYDRAULIC EXCAVATORS

This is a basic earthmoving machine which can be used for different works with different types of front & back attachments. A basic shovel has the means of propulsion of the machine, of revolving the superstructure around and of operating the head attached to it. Hydraulic excavators are classified by digging motion of the boom and stick to which the bucket is attached. It consists of the following,
1. Basic component providing locomotion and power.
2. Revolving superstructure and mounting. Mounting are of three types,
   i) Crawler mounted
   ii) Wheel mounted
   iii) Truck mounted
3. Attachments to suit the work in hand.

Hydraulics is heart of excavator. Available hydraulic power is important, rather than engine power. Higher engine power only makes it possible to maintain the available hydraulic power at high altitudes. Hydraulic power is a function of pressure and flow rate. Hydraulic power is used to operate digging attachment-boom, stick and bucket-swing gear and track drive. This is achieved either by independent power supply, parallel type power supply or series type power supply.
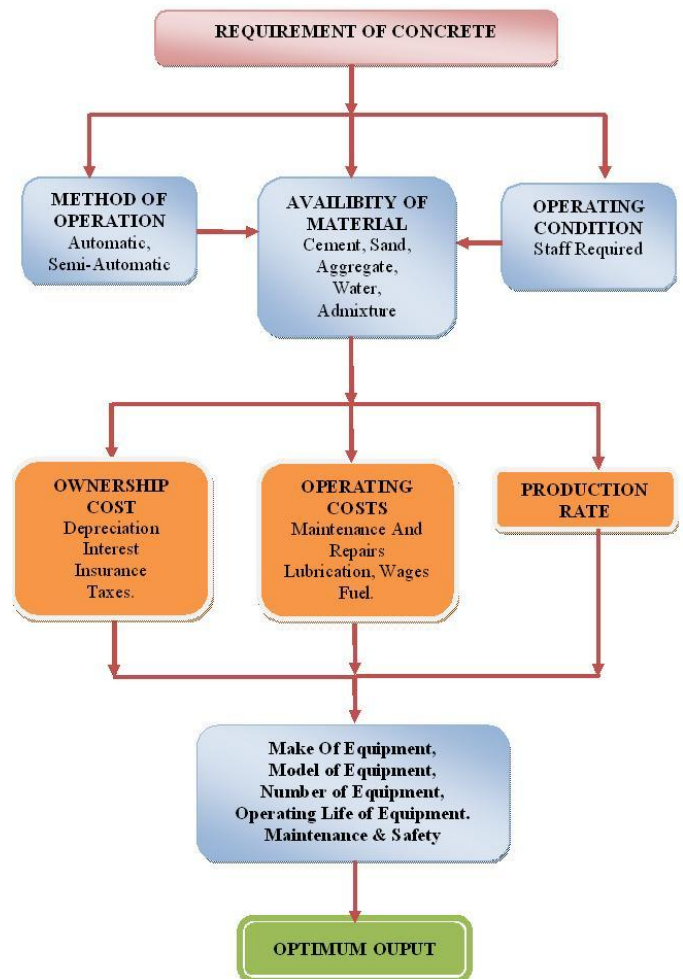
B. READY MIX CONCRETE PLANT

Batching Plants may be static as well as mobile. Permanent or static plants take a considerable amount of time for erection. Portable plants can be easily transported or hauled, but time may still be required to prepare for the move. Mobile plants are furnished with their own wheels, so that tractor may be connected to the plant to tow it along the road from one site to another. Concrete batching plants, used for manufacturing controlled concrete, may be divided into types based on several criteria. They may be classified as central mix, transit mix or dry / wet batch plants depending upon the application. They may be mass concrete, paving, ready mix or concrete product plant depending on ultimate use for which the plant is intended. They may be also classified on the basis of their mobility as permanent, portable or mobile.

The aggregate may be put into a stockpile or directly in a storage bin by the use of belt conveyor, bucket elevators, or clamshell buckets. Cement is usually placed into a watertight storage silo or bin by pneumatic pumping or by a screw conveyor and bucket elevator. Water and the liquid admixtures are pumped to a storage vessel. Aggregate bucket elevators may be used to charge the aggregate storage. These are normally used only when space is not available for a belt conveyor. The control provided now days is usually fully automatic.

Showing Conceptual Diagram For R.M.C

Control system vary from the simple hand-lever type to the highly sophisticated electronic controls with which the operator merely selects the mix design, selects the number of cubic meter desired and pushes the start button. This control system then produces the material required for the concrete and records the weight of each material as well as the time, date mix, identification number, truck number and any other information which is required. Automatic controls normally

produce more consistent and more reliable results than manual control

Growth of Construction Equipments by value 1940-2000
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Table I Showing Growth of Construction Equipments

SR.No	Year	Machines (Nos.)	Value (Crores)
1.	1940	2	0.0074
2.	1945	2	0.0040
3.	1950	95	0:421
4.	1955	238	1.62
5.	1960	934	12.04
6.	1965	2197	38.71
7.	1970	643	21.06
8.	1979	16048	297.54
9.	1984	N.A.	408.44
10.	1998	N.A.	6600.00
11.	1999	N.A.	8000.00
12.	2000	N.A.	9870.00

Government, though belatedly, has assigned the topmost priority for development of infrastructure in the country and the result is the launching of numerous ambitious projects such as Golden Quadrilateral and North – South and East-West Corridor under National Highways Development Project (NHDP), Pradhan Mantri Gram Sadak Yojana (PMGSY) and the River Interlinking to name a few. Besides, Government has taken initiatives for private sector participation, loan assistance from external agencies, like, World Bank, Asian Development Bank, Japan Bank for International Cooperation.

This goal can be achieved only by mechanized construction as only modern high performance construction machinery can ensure process control in real time for achieving end product quality conforming to design specifications. For speedy construction works to complete the project within a fixed time frame, deployment of adequate and appropriate machinery has to be ensured. Moreover, mechanized construction aims at technology up gradation.

According to Seung C. ok & Sunil K.Sinha, Estimating equipment production rates is both an art and a science. An accurate prediction of the productivity of earthmoving equipment is critical for accurate construction planning and project control. Owing to the unique work requirements and changeable environment of each construction project, the influences of job and management factors on operation productivity are often very complex. Hence, construction productivity estimation, even for an operation with well-known equipment and work methods, can be challenging. This study develops and compares two methods for estimating construction productivity of dozer operations (the transformed regression analysis, and a non-linear analysis using neural network model). It is the hypothesis of this study that the proposed neural networks model may improve productivity estimation models because of the neural network's inherent ability to capture non-linearity and the complexity of the changeable environment of each construction project. The comparison of results suggests that the non-linear artificial neural network (ANN) has the potential to improve the equipment productivity estimation model.

According to Russell S. Jeffrey, Recently, constructability has received considerable attention from researchers and practicing engineers. Constructability has been defined as the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives ("Constructability" 1986). This paper discusses the evolution of constructability and how programs have been developed to bring design and construction closer to the level of integration once achieved by the master builder. There is a great deal of discussion among industry professionals as to how constructability is related to total quality management and value engineering. This paper conceptually describes these interrelations. In addition, the paper presents a framework to measure costs and benefits related to constructability. By providing owners with this framework, the parameters will be visible and defined, thus removing skepticism as to the measurement process as well as enabling more consistent and uniform results to be obtained. Additionally, these standardized parameters may facilitate developing a means to measure company and industry performance.

V. CONCLUSION

Construction equipment plays a significant role in the execution of modern high-cost time-bound construction projects. Large scale construction activities like road making, construction of railway routes, canals, irrigation works, power generation dams, development of building sites, airports & harbors are clear indicators of growth of a developing country, But in our country population is more even though construction industry are suffering from the labour problems.

Equipment is an economic investment and the contractors must apply time value analytical formula to the process of machine utilization. The proof of how well the planners understands the work and co-ordinate the use of companies equipment is in the bottom line when the contract is completed – at a profit or loss. The most important aspect of estimating and building a construction project is determining production and cost and controlling both during the progress of work.

This study emphasizes the vital role of construction equipment in construction industries to optimize the profit by reducing the labour hours and also aimed to identifying the best practices of improving the productivity of construction for the Indian scenario. With this aid planning would be more systematic, logical and efficient as resource allocators and managers would be aware of output for particular equipment

VI. ACKNOWLEDGEMENT

VII. REFERENCES

[1] Chitkara, K. K(2002)., "Construction Project Management – Planning, Scheduling and Controlling", Tata McGraw Hill Publishing Co. Ltd., New Delhi, Fourth Reprint, pp.12.

[2] Aggarwal,S., (2003), "Challenges for Construction Industries in Developing Countries," Proceedings of the 6th National Conference on Construction, 10-11 November 2003, New Delhi, CDROM, Technical Session 5, pp.8.

[3] Singh Jagman,(2001)"Heavy Construction – Planning, Equipment and Methods", Oxford and IBH Publishing Co. Pvt. Ltd., Second Edition,pp.14.

[4] Deodhar, S. V.(2001), "Construction Equipment and Job Planning", Khanna Publisher, Second Edition,pp.191.

[5] Monitoring Construction Equipment for Automated Project Performance Control by Rafael Sacks, Ronie Navon.

[6] Optimisation Design Of Working Tools Shape FOR A CONCRET MIXING EQUIPMENT WITH PALETTES By DEBELEAC CARMEN.

[7] Construction Machinery Cab Vibro-acoustic Analysis And Optimisation by L.Bregant, G.Miccoli, M.Seppi1.