

Planning and Selection of Heavy Construction Equipments in Civil Engineering

PRITAM KHANDVE¹, PALASH MURKUTE², SHIVRAJ SWAMI³, PRANAV KHARE⁴

Dr. D. Y. Patil School of Engineering and Technology, Charholi (Bk.), Pune – 412105

Abstract- Any enterprise cannot operate on its own. Even a contractor can neither build nor operate on itself. Therefore, it has to be manned by the people who form the backbone of the enterprise, and it is their candid performance on which the success of the whole enterprise depends. Their knowledge and skills are to be scrutinized and analyzed so as to fit the right person in the right place.

A large percentage of construction site accidents involve the negligence of someone other than a co-employee or employer. Many subcontractors may be involved and responsible for your damages. There are a variety of circumstances in which a construction worker can be injured. There are many causes for construction site accidents, including negligent and dangerous construction site practices.

Key Words: Construction, Planning, Civil, Engineering, Equipment.

1.1 INTRODUCTION

Construction equipment planning and selection plays crucial role for the success of construction firms. Inadequate manual processes of equipment planning and selection and the subjective decisions of equipment managers usually result in major losses in construction firms. An indispensable item of resources, it produces output at accelerated speed, enables completion of task in limited time. Equipment saves manpower, which is becoming costly and more demanding day by day. Equipment improves quality, productivity and safety. Construction equipment planning aims at identifying construction equipment for executing project tasks, assessing equipment performance capability, forecasting date wise requirement type of equipment and finally participating in the selection of equipment to be acquired. To derive full benefits from the equipment, there should be proper selection and good planning of its operations. This paper deals with the planning and selection procedure for equipment adopted by a company to achieve its objective of timely project completion

1.2 OBJECTIVES

Considering various activities carried out during construction of tunnel, the objective of this thesis is to describe and evaluate various methods and management techniques for efficient selection and planning of construction equipment, by studying particular case.

1.3 METHODOLOGY

The first step of study is to identify different components of a construction work and to study construction procedure of it. This will give very clear idea about different equipment that is used for construction work and their application. The second step is to study existing literature available on the selection and planning of equipment and factors affecting the same. The third step is to study selection and planning procedure followed by particular construction firms engaged in construction of a specific construction project and evaluating the same.

1.4 FIELD APPLICATION

1. Planned construction equipment lead to handle any job and makes smart use of technology and services to improve your jobsite efficiency.

2. Selection of Equipment also matters in construction. eg. The long reach excavator or high reach excavator is a development of the excavator with an especially long boom arm, that is primarily used for demolition. Instead of excavating ditches, the long reach excavator is designed to reach the upper stories of buildings that are being demolished and pull down the structure in a controlled fashion.

3. Dragline Excavation Systems are heavy equipment used in civil engineering and surface mining. In civil engineering the smaller types are used for road and port construction. The larger types are used in strip mining operations to move overburden above coal, and for tar-sand mining.

4. Proper Selection of Equipment matters a lot. The old method to apply Gypsum manually took hours of labor and also had poor durability due to manual errors. Now with

automation in this field, application through machine is gaining wide spread popularity as its not only faster but also cheaper in long run as very less labor is required.

5. More over the results are much more stronger and durable If planning and selection of equipment is done well.

1.5 Types Of Construction equipment Depending on the application, construction machines are classified into various categories.

1. Earthmoving equipments
2. Construction vehicles
3. Material handling equipments
4. Construction equipments

1.6 Information Collected From Site

1. Main site location- the rose society , dr. d. y. patil road opposite the main gate of college
2. Initial point of loading – vadgaonshinde
3. Distance between initial point and main site location is 6-7 km

1.7 The information collected about equipment should include

1. Model number
2. Horse power
3. Engine speed
4. Fuel consumption
5. Weight Of Material
6. Distance of each cycle
7. Time required
8. Capacity
9. Type of control
10. Maintenance details

1.8 Data Collected for JCB Back Hoe

Horse power - 75 HP
 Engine running speed - 30 km / hr
 Fuel consumption - 4 to 5 litre/hr
 Material in bucket - 300 kg
 Material in loader bucket - 1000 – 1200 kg
 Time required to load
 The material - 25 to 30 Mi for 3 brs
 Working Speed Of Engine - 12 To 15 RPM
 Type Of Control - Manual
 Maintenance Charges - 20k / month
 Rate Per Hour - 650 to 700
 Fuel tank capacity - 120 litre

1.9 The time required for completing one cycle sing formulas

- The Time Required For One Cycle Can Be Calculated By The Given Formulas. Time For One Cycle = Load Time + Haul Time+ Dump Time + Return Time.
- Load Time Can Be Calculated As, Load Time = Number Of Buckets X Bucket Cycle Time.
- Haul Time Can Be Calculated As, Haul Time = Haul Distance / mph X Haul Speed.
- Dump Time as, Average Dump Time Is Taken From 1.5 To 2 Minutes.
- Return Time Calculated As, Return Time = Return Distance / 88mph X Haul Speed.

2.0 RESULT

Working cycle

Step-1

Initial point (where we excavate & load the material). Location – vadgaonshinde (which is 7 km away from final point) by using jcb as an excavator we excavate the material like soil, murum etc.

it takes 20 to 25 minutes to load the material into dumpers , and 15 to 20 minutes to load the material into tractors.

Step-2

final point (where we dump or unload the material). location – survey no 286 , the rose society, opposite d. y. patil main gate.

this step includes the travelling from initial point to final point and unloading of material at final point.

it takes 20 to 25 minutes to travel this distance of 7 kms. As the vehicles are loaded with material & it takes 3 to 5 minutes to dump or unload the material at final point.

Step- 3

It is last step of this working cycle.

This step includes travelling back to the initial point from final point.

it takes 15 to 20 minutes to cover the distance of 6 – 7 km as vehicle is totally empty.

2.1 CAMPARISON

As compared to tractor, dumper is more economical as far as the speed , carrying capacity, fuel consumption and rates are concerned.

dumper – tractor –
 speed 60 to 80 kmph 40 to 50 kmph
 Carrying capacity – 3 brass 0.90 brass
 Fuel consumption – 4 liter/km 4-5 liter

Comparison between the equipments based on type of soil

Sr. no	Items of comparison	Power shovel	backhoe	dragline	clamshell
1)	Excavation in hard soil	Poor	Good	Not Good	Poor
2)	Excavation in wet soil	excellent	poor	Moderately good	Moderately good
3)	Cycle time	short	Shortly more than power shovel	More than power shovel	More than power shovel
4)	Loading efficiency	Very good	good	Moderately good	Precise but slow

CONCLUSION

Man, Money And Machinery these are very important parts of construction industry. Equipment plays an important role in today’s infrastructure projects as they are more demanding in highway projects, big projects are need to be completed in given time with most economical way and best in quality. Proper selection and planning, sheduling of equipment is very important for timely completion of project, within plant cost and for increasing profit, margin and for development of firm. Selection and planning needs to exercise very seriously as it is one of the factors that affect the progress of work. Planning of equipment depends upon nature and quality of work and time available for completion. Planning of equipment needs to be done by a well experienced person, who got expertise in that area, who has got good exposure of execution of work and who knows the factors that affect the output of equipment. capital investment means risk, this risk should be managed while procuring equipments. Selection is a process in which the equipment that is most suitable for a particular job is found out. And decision is made regarding the make of the equipment to be procured.

REFERENCES

- [1]Miquel Casals, Nuria Forcada, Xavier Roca, “A Methodology To Select Construction Equipment,” Polytechnic University of Catalonia, Department of Construction Engineering, C/Colum 11, Edifici TR-5, 08221 Terrassa, Barcelona, Spain, miquel.casals@upc.es.(ISARC2003)
- [2]Masoud NavazandehSajoudi, ohammadaliKazerooniSadi, Arham Abdullah, MohammadrezaKasraei, HodaRezaie, “Evaluation of Factors Affecting on Construction Equipment Acquisition Methods in Malaysia,” 2011 International Conference on Information and Finance IPEDR vol.21, 2011.
- [3] Paper on " International Journal Of Optimization In Civil Engineering" Int. J. Optim. Civil Eng., 2012; 2(2):235-246 (P. Valli*, † and C. Antony Jeyasehar)
- [4] Mr. Nilesh D. Chinchore, Prof.Pranay R. Khare, “Planning and Selection of Heavy Construction Equipment in Civil Engineering,” International Journal of Engineering Research and Applications, ISSN: 2248- 9622, Vol. 4, Issue 12(Part 1), December 2014, pp.29- 31.
- [5] Remon F. Aziz, Yasser R. Aboel-Magd, “Suitably Selection for Earthwork Equipment In Egyptian Sites,” International Journal of Education and Research Vol. 3 No. 1 January 2015
- [6] Information Paper On"Technology Development ProspectsFor The Indian Power Sector" (Uwe Remme, Nathalie Trudeau, Dagmar Graczyk and Peter Taylor)
- [7] Yuki Sakaida, Daisuke Chugo, Kuniaki Kawabata / HayatoKaetsu, Hajime Asama, “The Analysis of Excavator Operation by SkillfulOperator,”ISARC2006.
- [8] Construction Equipment Management(2006), “Planning and Selection of Equipment”, Centre for Distance Education, NICMAR, Pune.
- [9] Deodhar, S. V.(2001), “Construction Equipment and Job Planning”, Khanna Publisher, Second Edition.
- [10] Singh Jagman, (2001)“Heavy Construction – Planning, Equipment and Methods”, Oxford and IBH Publishing Co. Pvt. Ltd., Second Edition.
- [11] S.C.Sharma, “Construction Equipment and its Management”(Delhi, Khanna Publishers, 2010)

[12] S.Seetharaman, Construction Engineering and Management(Delhi, Umesh Publications,2002)

[13] Paper on A methodology to select construction equipment Miquel Casals, Nuria Forcada, Xavier Roca

[14] Information Paper On Technology Development Prospects For The Indian Power Sector (Uwe Remme, Nathalie Tru deau, Dagmar Graczyk and Peter Taylor)