

Planning and Selection of Heavy Construction Equipment in Civil Engineering

Mr. Nilesh D. Chinchore *, Prof. Pranay R. Khare**

*(Department of Civil Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India.)

** (Department of Civil Engineering, Savitribai Phule Pune University, Pune, Maharashtra, India)

ABSTRACT

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 of number and 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.

Keywords - Construction Equipment, Equipment Operation, Planning and Selection, Project Task, Timely Project Completion

I. INTRODUCTION

The infrastructure development is an important aspect for the overall development of country. India is considered as the hub for service industry for which the infrastructure development plays an important role. The major problem frequently faced by contractor in the selection of most suitable equipment. Under given conditions, one of the largest elements of investigation of contractor would be own and operating cost of plant and equipment. The capital investment on purchase and/or rental/lease, and operation of the plant and equipment being very high, it has to be managed so as to ensure maximum return on investment, productivity and minimum operating, maintenance and repair cost. Thus appropriate selection and planning is essential for successful completion of project and to secure maximum profit out of it. The type of equipment selected usually depends upon the characteristics of material to be handled. Whether to use wheeled equipment or track equipment; whether to use dragline excavator or power shovel, are some of the typical questions that are to be answered by the planner of construction equipment.

II. PROPER PLANNING

Modern highway construction projects are complex in nature and success of a project depends greatly on proper and scientific planning. Before starting any project its planning is done with great

care, as the efficiency of the whole project largely depends upon its planning. While planning each and every detail should be worked out in anticipation and should be considered carefully. Planning of a construction project involves deciding about the extent of mechanization, equipment planning, and execution planning etc. while planning a highway project equipment manager should be carefully decided the extent of mechanization so as to minimize the cost of project.

III. SELECTION

Proper selection of equipment for a highway construction project is of vital importance for its speedy and economical completion. Problem of equipment selection has become more complicated, because large variety of equipments are being manufactured now-a-days. For selection of equipment, a considerable experience in the operation and maintenance in the field is essential. Records kept for operation, maintenance and actual output obtained under comparable conditions of previous projects will greatly help in taking decision for equipment selection. With the undertaking of new projects and the retirement of old machinery and equipment, it becomes necessary to acquire new construction equipment. In this stage, sufficient knowledge base of current brands and products is necessary. It is also important to determine what sort of equipment and capacity is needed.

In fact, selection of equipment for the project is one of the key decisions in planning and executing a construction project, which affects how the work will be done, the time required to complete the work, and the cost that will be accrued. Generally, an equipment manager is responsible of selecting the equipment, whereas it is the responsibility of the construction planning group to select equipment. Nevertheless, both the inventory of equipment in hand and the standard equipment policy play an important role in equipment selection. Therefore, final decision on the equipment required for the projects is generally given by equipment managers, project managers, and construction planning group together. Often, the decision making process can create tensions in the firm. Once the selection of equipment is made, a choice has to be made whether to buy, rent, or lease it. These decisions are given based on the economic standing and strategy of the firm, and the nature and frequency of equipment use.

IV. SOURCING INFORMATION

The contractor may decide on the choice of the manufacture based on its own past experience of from experience of other. A different kind of information is needed to be collected before selecting a particular manufacturer. Trade catalogues and advertisement in trade journals are important source of information for evaluation and sourcing of equipment. The information collected about equipment should include-

- Name of manufacturer
- Model number
- Engine type, horse power and speed
- Machine dimensions
- Type of controls
- Operating pressure
- Fuel consumption
- Type of transmission
- Weight
- Warranty periods
- Maintenance details etc.

V. COMMON FACTORS AFFECTING SELECTION OF EQUIPMENT

Every equipment has certain factors those are in common and which are taken into consideration while selecting equipment. They are listed as follows-

- Scope of work to be carried out- since the first concern is getting the job done, the time frame within which the work is required to be carried out, the specification of work and the methodology adopted will be of primary concern
- Use of available- for a work where full utilization of new equipment for its entire

working life is not foreseen and its utilization on

- Further project is uncertain it may be desirable to utilize existing old equipment even though its operation would be somewhat more expensive. The depreciation cost of new machine is likely to be high and this would rise the owing cost of the machine and consequently unit cost of work. Economic should be worked out.
- Suitability for job conditions-the equipment selected should suit the demands of the job conditions. Climate of region and working conditions should be kept in view while selecting the type of equipment.
- Uniformity in type- it is desirable to have minimum number of types so that there is uniformity in the type of equipment on a project. It is desirable to select common type of engine for different machine such as excavators, dump trucks, tractor and scrapers purchased on the projects.
- Size of equipment :- while large size of machines are capable of giving large outputs on full load, the cost of production is usually greater than that of smaller units if worked out on part loads. Large size of equipment requires corresponding large size of matching equipment. And shutting down of one primary unit may result in making several other equipment idle. Transportation and shipment are usually difficult and expensive. However large equipment's are more study and suitable for tough working conditions. It is also desirable to have equipment of same size on the project. If there are standbys the cost of smaller equipment as standby may be less that of larger size of equipment.
- Use of standard Equipments :- standard equipments are commonly manufactured and are commonly available and are moderately priced. The spare parts of standard equipment are easily available and less expensive. After the work is over, it is generally easier to dispose of standard equipment.
- Unit cost production :- the economics is one of the most important considerations in selection of equipment. While working out owing cost all items of expenses, such as freight, packaging and forwarding, insurance, erection and commissioning etc. should be included with the price paid to supplier.
- Country of origin :- when imports are unavoidable, it is preferable to import from

a soft currency than from a hard currency area, if equipment quality is available.

- Availability of spare parts :- Down time for want of necessary spare parts commonly accounts for long idle periods during working life of equipment, especially of imported equipment. Availability of spare parts at reasonable cost during the entire working life should be assured while selecting a particular type of equipment.
- Versatility – the equipment selected should be if possible, be capable of performing more than one function and should have feature of inter convertibility as far as possible.
- Selection of manufacturer: - it is desirable to have equipment of the same manufacturer on a project as far as possible and to have minimum number of different makes of equipment. The quality of local dealers is also important.
- Suitability of local labor :- available operators and technicians should be able to handle selected equipment.
- Technical consideration :- the efficient performance of any piece of equipment and its service life are conditioned by following factors :
 - a. Strength
 - b. Rigidity
 - c. Vibration stability
 - d. Resistance to wear
 - e. Heat resistance
 - f. Reliability
 - g. Maintainability

A balance between reliability, investment cost and operating cost should be found since a policy of selecting the lowest priced equipment can often lead to higher life cycle costs.

VI. CONCLUSION

Equipment plays an important role in today's infrastructure projects as they are more demanding and highway projects are need to be completed in stipulated time with best quality. Proper selection and planning of equipment is very important for timely completion of project, within plant cost and for increasing profit, margin. 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 has got good exposure of execution of work and who knows the factors that affect the output of equipment.

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.

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