Planning and Selection of Construction Equipments required in Bhosari Flyover Project, Pune, India

Komal V. Deshmukh[1], Prof. U. R. Saharkar[2]

[1]PG Scholar, D. Y. Patil Institute of Engineering & Technology, Ambi, Pune, Maharashtra, India
[2]Assistant Professor, D. Y. Patil Institute of Engineering & Technology, Ambi, Pune, Maharashtra, India

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Abstract- Planning and selection of Construction Equipment plays a vital role in the success of any construction company. The improper and ineffective planning and selection procedure subjects to major losses to the construction companies. The demand for Equipment is increasing rapidly, as it saves the manpower it is becoming costly day by day. The cost is the most important factor for any project. In planning and selection of equipments, costs should be taken care of and should be managed effectively. The aim for Construction Equipment Planning is to identify construction equipment required to execute project task, to forecast the types and number of equipments as per the date wise requirement, to effectively imply the planning strategies in order to fetch out the best results for the construction Industry. And this paper deals with the application of strategies and factors which results into effective planning and selection of the construction equipment.

***Key Words*:** Planning and Selection, Construction Equipment, Construction Industry, Effective Planning

1. INTRODUCTION

The most important facet of construction planning is the construction Equipment, which varies with the degree of mechanization on a project, the cost of this equipment may range from 10 to 30% of the total cost of a construction project. Effective planning and selection of proper type, size and maker of equipment is crucial when it comes to attain the construction targets and especially to keep the construction costs low. For developing countries like India, the correct planning and utilization of this equipment is of utmost importance in view of keeping the cost of projects as low as possible. To welcome the foreign investment in India, the strengthening of our infrastructure facilities, particularly in roads are in India is very necessary. In road projects Equipments are playing a major role within it. Without the help of proper equipment planning, it is very difficult to complete a project in successive manner. As the capital investment on the purchase/rental/lease and operation of plant and equipment is very high, it has to be managed so as to ensure minimum operating, maintenance and repair cost, maximum productivity and returns on investments made. So, for the success of a construction company, planning effectively and managing comfortably of the equipment resource is very important.

2. AIM AND OBJECTIVE

We have the following objectives.

[1] The primary objective of the research study is to understand the strategies that go into planning and selection of equipments in the construction of the project in general.

[2] To analyze various parameters on which the planning and selection of the equipments is dependent.

[3] An attempt is made to analyze the planning and selection in case study, comment on and then comparing it with the best practices. Suggestions and recommendations for improvements for any such project in future are also provided.

3. RESEARCH TOOLS USED

We have used the following tools for our research work. The research tools are as follows:

1. Past work done on the topic and related topics.
2. Technical data provided by the manufacturer.
3. Records maintained by the Planning divisions of Construction companies.
4. Records maintained by the Mechanical/ Equipment divisions of Construction Company.
5. Case study of Bhosari Flyover Project, Pune.

4. CASE STUDY – BHOSARI FLYOVER PROJECT, PUNE

4.1 DETAILS OF THE FLYOVER PROJECT

The project consists of design and construction of four lane divided flyover with construction of slip roads on both sides. The flyover consists of 26 spans with 2 unit of 4 spans continuous and 6 units of 3 spans continuous. Central median is 1.2 mts wide. Total width of superstructure is 19.7 mts. The total length of viaduct portion is 1040.00 mts including four obligatory spans. The span length is 40 mts. The approaches are with Reinforced Earth Wall structures. Length of approaches on Pune side is 269.14 mts and towards Nashik side is 226.42 m. Minimum camber to be provided 2.5% & super elevation where required shall be as per actual design subject to maximum 4% for design speed of 80 Kmph with maximum super elevation of 4%.The flyover is having 1 in 33 grade with suitably designed summit/valley curves.

- Length of Flyover (via duct portion)- 1040 m
- Total Length of Flyover - 1535.56 m
- Overall width of Flyover - 19.7 m
- Clear Carriageway of Flyover - 17.5 m
- Foundation - Open Foundation
- Sub Structure - RCC piers and abutments.
- Super Structure - PSC Segments
- Bearings - POT cum PTFE
- Expansion Joint - Modular/Strip Seal
- Approaches - Reduced Earth Wall
- Slip Road - On the either Side of Flyover

4.2 MOBILIZATION OF MACHINERIES & EQUIPMENTS

1. Electricity from MSEB will be provided for total project duration.
2. Hydra of 12 T capacities for handling of various materials will be deployed at site.
3. 01 no. Bar bending set, 01 no. bar cutting machines are planned for fabrication works.
4. Adequate water pumps for curing and dewatering will be deployed as per the site condition.
5. EOT crane of required capacity for shifting of Segment moulds and reinforcement cage as well as for shifting of segments at casting yard.
6. Tractor Trolley for shifting of fabricated steel/ shuttering and other miscellaneous material.
7. Required vehicles for staff and labour movement.
8. Pre-stressing equipment (through Specialized Agency).
9. Water Tanks at site for curing.
10. Batching Plant will be setup at Casting Yard to have a better quality control, still keeping the provision of RMC as and when required to supplement the work.
11. Shuttering and scaffolding for casting of foundation sub-structure and super-structure.

4.3 FACTORS TO BE TAKEN ACCOUNT WHILE PLANNING & SELECTION OF EQUIPMENTS

1. Reconnaissance survey of local factors and site conditions affecting the performance of the equipment should be made.
2. Clear identification of items of works to be done by equipments may be decided upon.
3. General strategy to tackle different operations must be worked out.
4. The sequence of construction operations should be determined.
5. Knowledge of the output that can be achieved from the set of equipments. Once this output on actual job conditions is known, the requirement can be calculated by simple arithmetic of dividing the total quantity of work to be done by the production of the machine in the time required for the completion of work. Therefore, it is very essential to assess the performance of different kinds of equipments in actual job condition.
6. There should be the Task consideration i.e. Daily Forecast of planned production, quantity of work and time allowed for consideration.
7. There should be no site constraints like distance, space restrictions, local resources, no lack of availability of man power, materials and machines.
8. There should be an Operating Reliability. We should take note of the Engine efficiency, operating skills and handling, availability of fuels, lubricants and other materials, equipment components.
9. There should be an ease in maintenance, availability of spares, after sales repair services.
10. Commercial Considerations i.e. buy second hand or new equipment, rent equipment, hire equipment, hire purchase equipment, purchase on lease.

4.4 COSTS INVOLVED WITH EQUIPMENTS

Ideal equipment should deliver a balance of productivity and cost that achieves the desired production at lowest possible cost i.e. ideal machine performance + lowest possible hourly cost/ higher possible productivity.

Costs involved with equipment i.e. owning and operating costs are an important measures in determining suitable equipment for job. To calculate these costs a contractor must have a fair idea of how much it will cost him per hour or per unit output town and run equipment. Knowledge of the hourly cost of owning and operating is essential for selection decision.

Hourly owning costs and operating costs for any given machine can broadly differ because they are influenced by many factors such as:

(1)-Cost of equipment delivered to owner

(2)-Conditions under which it is used

(3)-Number of hours it is used per year

(4)-Number of years it is used

(5)-Maintenance and repairs for the equipment

(6)-Demand for 2nd hand equipment

(7)-Selvage value of equipment

4.5 PLANNING & SELECTION OF EQUIPMENT

The type of equipment selected depends on type of work, amount of work, soil of condition and type of material to be handled. The number and size of equipment depends on amount of work, working days available, number of shifts, availability of labour etc.

Along with planning of selection of the equipment, planning of equipment operation, its relation with other jobs under execution etc. should be done properly. If proper planning of the operation of equipment, and its surrounding environment is not done properly, availability of equipment for actual production or its use will be less. Many a times due to lack of knowledge of equipment, either equipment lies idle or work is not taken from equipment of his capacity. Arrangements must be made for its repairs and maintenance. Topographical condition where the equipment is to be used should be considered properly while selecting and planning execution operation of equipment. Proper records of operation of equipment must be maintained. This record must give an idea about the production, usage, break-down hours, amount spent on repairs etc. those records help in cost accounting.

4.6 FINDINGS FROM THE CASE STUDY

These are some important findings from the case study. It is as follows :

1. There is only 1 no. of excavator is required for six months of initial duration. It would have been hired in spite of purchasing. It was purchased by the company.
2. There are two no. of dumpers are required at site. From analysis, 1 dumper is required for project duration of 20 months and another is required for peak time of excavation of foundation during initial 6 months. So. 1 dumper should have been hired and another should have been purchased rather than company owned 2 dumpers from previous project. It would have reduced the operating cost of another dumper.
3. From analysis there are 2 no. of transit mixtures are required at site in peak durations. Company had 2 transit mixtures owned from previous project. If, the cumulative peak time in total project is 4 months then 1 transit mixture could have been hired and another purchased.

3. CONCLUSIONS

It can be concluded from the analysis that while calculating the cost considerations in the industry ownership cost, operating cost should be calculated with reference to the Rs. per operating hour. At each interval of the project cost and output per unit capital deployed should be calculated. That will give you the clear picture of value one obtained from the equipment. Value is calculated by the productivity per cost of equipment and other expenses.

In industry, all the points which have been covered will give the clear idea of buying of equipments and it will make significant view that where the capital should be spent for work.

The Equipments need to be classified accordingly before their planning. It will be helpful in operating cost evaluation and level of details to be stored, while in documentation.

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