



ORIGINAL RESEARCH PAPER

Engineering

TO STUDY ON EQUIPMENT AND TECHNOLOGIES USE IN ROAD WORK

KEY WORDS: Road Construction; Technologies; Efficiency; Construction equipment.

Vipul V. Chaware

PG Student, Department of Civil Engineering, Prof. Ram Meghe College of Engineering and Management, Badnera.

Parag S. Mahatme*

Assistant Professor, Department of Civil Engineering, Prof. Ram Meghe College of Engineering and Management, Badnera. *Corresponding Author

ABSTRACT

In India, there is not proper management practice for construction equipment's. It's important to have a proper management for cost of equipment, work schedule, and idle time and its efficiency. It is essential to know about the use of equipment correctly and match their capacities to specific project requirements. This review paper will analyse the heavy equipment used for road construction and techniques.

INTRODUCTION

For the road construction project, construction equipment plays vital role in addition to characteristic of general commodities. Reduce cost overrun and management helps for less complexity for different levels of projects. The construction equipment support for speed up the project proper use of construction equipment helps in cost of project. The construction equipment support for speed up. Proper use of construction equipment gives reduction in cost of project. Various type of equipment are used in road construction these varies from small to heavy equipment, as per their use in construction. A provision of large amount of money is used for construction equipment and machinery used for construction project. With the help of various type of machinery and equipment we can innovate new the new techniques for construction. Proper planning, selection, procurement, installation, operation, maintenance and equipment replacement policy plays an important role in equipment management for successful completion of project. Construction engineer know new techniques and equipment used in construction industry because of increase in used of construction equipment and machinery. While planning of project all factors should be taken into consideration. If not taken, it increase the overall cost of project.

Mithilesh V.V.S, Nagavinothini R

Department of Civil Engineering, SRM University, Chennai, India
 Indian construction industry, don't have a proper management practice for construction equipments. It's important to have a proper management for maintenance, work schedule, fuel consumption, and idle time. It is essential to know about the utilization of machine properly and match their capacities to specific project requirements. In the Indian construction industry, the time and cost of project is most important constraint for the success of project.

M. Waris a,†, Mohd. Shahir Liew a, Mohd. Faris Khamidi b, Arazi Idrus c Today's construction projects are highly mechanized and becoming more so every day. With the growing industrialization of construction work, the role of onsite equipment and machineries is vital in achieving productivity and efficiency. During the construction phase, selection of right equipment has always been a key factor in the success of any construction project. This decision is typically made by matching equipment available in the tasks at hand. Such analysis accounts for equipment productivity, equipment capacity, and cost. However, the emerging notion of sustainability in construction has emphasized energy conservation, efficiency, green environment, economy and human well-being. In this context, selecting the most appropriate equipment from the available options is highly challenging. Therefore, this paper aims to determine a selection criteria based on the fundamental concept of sustainability and provides an assessment framework.

Fuyong Tang Huanghuai University 46300

Abstract: With the continuous development of social economy ant

the accelerating process of urbanization, municipal road and bridges projects have also shown a trend of rapid development of cities and is also an important symbol of urban development. This article will analyse the municipal road and bridge concrete construction technology, put forward corresponding Measures.

FACTORS CONSIDERING THE SELECTION OF EQUIPMENT FOR SITE AND THEIR PROPER APPLICATION.

1. To know the latest heavy equipment used in road works.
2. The factors effecting the selection of heavy equipment in the road works.
3. To study factor affecting productivity of equipment on construction site.
4. To evaluate the equipment and suggest the possible.
5. To identify preventive measures for obstacles and suggestion which affect productivity of equipment on construction site.
6. Use the equipment as per their efficiency.

DEFINATION OF EQUIPMENT

Equipment may be mobile, semi-permanent, or permanent, intended for heavy work such as earthmoving, lifting containers or materials, drilling holes in earth or rock, or concrete or paving application.

EARTHMOVING EQUIPMENT

The earthmoving equipment market in India is estimated at about US\$ 1.4 billion. The predominant sub-segment in this is excavators, which account for just over half the market. Backhoes account for 26 per cent and loaders for another 5 per cent share. Prime driver for earthmoving equipment is mining activities and construction industry. Within these industries, the key demand drivers going forward are likely to be road construction, urban infrastructure, irrigation, real estate, Construction and mining.

EXCAVATORS

Excavators are extensively used in many roles such as digging of trenches and foundations, demolition, general grading/landscaping, heavy lifting (e.g. lifting and placing of large concrete pipes), river dredging, mining and brush cutting with hydraulic attachments. Excavators come in arrange of capacities and are usually classified on the basis of tonnage. The lower end excavators, referred to as mini excavators, find greater usage in urban infrastructure development and road development. The heavier duty excavators are used in mining and heavy construction. In India, the level of technology of the equipment manufactured is at par with international standards with some exceptions being the limited usage of electronic controls and hydraulic systems and engines adhering to the latest emission norms.

CONSTRUCTION EQUIPMENT & VEHICLES

Equipment in this category typically find multi- purpose application for various construction activities. Some of the construction equipment used are road rollers, concrete equipment, mixers, hot plant mixers, stone crushers, Compactors, pavers, pneumatic tyre

rollers (PTR), dumpers, tippers, trailers, and others. Compactors account for majority of the market share of road construction equipment. There are two main types of compactors - Tandem Vibratory Rollers (TVR) and soil compactors. These are used for compaction of asphalt and soil respectively primarily in road construction.

FACTORS AFFECTING EFFICIENCY OF ROAD CONSTRUCTION EQUIPMENT.

Proper Equipment Selection

Equipment is a critical factor in construction project. Rational selection of suitable equipment leads to profit for contractors. At the same time, miscalculation proper size and number of required equipment for the project may result in suffering from overhead costs and wastage of time. Therefore, contractor considers proper selection of earthmoving equipment a vital factor for any construction project (Remon F. Aziz and Yasser R. Aboel-Magd, 2015)[2].

Site Condition

The performance of excavator depends on site conditions also which includes the physical conditions of site such as topography and geology of the site, geotechnical characteristics of ground or rocks etc. Excavation might be tough for site containing hard soil. Rate of excavation may vary with respect to climatic changes also like temperature, rain snow etc.

Cycle Time

Cycle time is defined as the amount of time taken by machine to perform a repetitive segment of an operation, typically measured as the time it takes the machine to return to the same position. It is the time taken to complete one entire excavating process of an excavator which includes excavation time, time to swing to dumping position, dumping time and time to return to the digging position (Vishnu Lal M., 2013)[7].

Bucket Size

A bucket is a bulk material handling equipment provided at the end of the arm of an excavating machine. Selection of bucket size depends on the material to be excavated. The size of this bucket determines its capacity to excavate the material in one particular cycle. Thus, maximum capacity of bucket can save number of cycle and time required for excavation.

Angle of Swing

Angle of swing is a horizontal angle in between the position of excavator while excavating and the hauling unit where it dumps the material. It is one of the element of cycle time. If the angle of swing is more, the cycle time required will be more and vice-versa. Thus, keeping the angle of swing minimum can save the cycle time of excavator.

Repairs and Maintenance of Equipment

When it comes to construction equipment, regular maintenance is one of the most important factors in terms of cost and performance. Good maintenance will minimize maintenance and repair costs and maximize production and profits, with greatest impact on profit. It helps to control costs and service intervals, lengthens equipment life, minimizes downtime and adds resale value.

Operator's Skill

An operator plays a major role in working of any equipment. Proper use of equipment is what we need to obtain best result from the machine. A skilled or trained operator can handle the equipment in an effective manner providing maximum output from machine. Improper use equipment can cause damages to it and injuries to the operator as well. Thus, operator's skill is an important parameter to be considered.

ASPHALT PAVEMENT CONSTRUCTION OF BASE LAYER

The base course serves as a foundation for the paving. Depending on the stresses to be expected, the road comprises various layers of different thickness in order to withstand the most diverse weather

conditions and remain serviceable for many decades. The bottom layer essentially comprises an unbound mixture of coarse and fine crushed stone, as well as crushed sand, to achieve the desired load-bearing capacity and absorb traffic loads so that the underlying subgrade is not deformed. In many cases, a bound base course is overlaid over the unbound base course. Bitumen, cement or lime is predominantly used as binder. Mixes containing bitumen are referred to as hot-paved or cold-paved asphalt base courses, depending on whether the mix is hot or cold. The base course is said to be hydraulically bound when cement or lime is used as binder.

ASPHALT PAVING

Paving asphalt requires outstanding logistics. Care must always be taken to ensure that sufficient mix is available and that the material does not cool. Paver and roller form an irreplaceable team here. The first person in the paving team, however, is the truck driver who fills the asphalt into the paver's hopper. Two mutually independent conveyors transport the material through the machine to the rear, where it is uniformly distributed between paver and screed by two individually controlled rotating screw conveyors. When paving a standard mix, the temperature should always remain above 110 °C in order to ensure sufficient time for compaction. On modern pavers, the compacting systems in the screed can be actuated separately. Particularly the high compaction screeds achieve very good compaction. As a result, the rollers behind the paver require fewer passes to achieve the specified final degree of compaction.

ASPHALT COMPACTION

Compaction of the asphalt pavement should yield a uniform surface with the greatest possible skid resistance and ensure that the individual asphalt courses are firmly and durably interlinked to produce high stability and wear resistance, as well as enduring evenness. Rollers or compactors reduce the number of voids. This makes the asphalt more resistant to stress and extends its durability. Basically, compaction becomes more effective with increasing temperature of the paved mix. The most advantageous temperature range depends on the composition of the mix, the thickness of the pavement and the type of binder used.

The roller operator starts compaction at the tie-in points and follows the edge of the road from there. The pavement is pressed home in a further pass. Dynamic compaction is mainly used for the main compaction process. The drums vibrate horizontally (oscillate) or vertically (vibrate), thus significantly increasing the effect of compaction. The operation is completed by a final roller pass that will "iron out" any remaining irregularities in the asphalt pavement or surface to produce a perfect surface finish.

CONCRETE PAVEMENT

Concrete is a particularly durable material and eminently suitable for roads which have to withstand high loads. Slip form paving is a standard method that is primarily used to pave large roads and runways using inset technology. First of all, trucks unload the concrete in front of the paver. The slip form paver then spreads the concrete over the full paving width with its auger or spreading plough and forms the concrete profile for the roadway with the slip form mould. HF vibrators inside the slip form vibrate at high frequency, expelling air from the concrete and hence compacting it. At the same time, the paver can also insert dowel bars or tie bars in the fresh concrete. These bars reinforce the concrete. Slots are subsequently cut into the concrete pavement above the reinforcements. These slots ensure that the cracks which are invariably produced as a result of stresses and temperature fluctuations are diverted into the concrete pavement in a controlled manner. The roadway is levelled by finishing beams and super-smoothers. An entrained piece of sackcloth often ensures a non-skid surface texture. A curing unit is normally used to apply a dispersion to the fresh concrete so that the concrete cures uniformly.

EFFICIENCY OF CONSTRUCTION WORK AS PER TIME AND MONEY

1. If proper planning should be done money and time both are saved.

2. Use proper construction software for designing of project.
3. Use required software for scheduling which reduces the completion time.
4. Experience worker helps for both cost saving and time saving because of their experience.
5. Proper training should be given to all labor and employees for critical works which reduce the more time required for work and money also.
6. You should make yourself available to your crew so they know they can come to you with any problems that arise. They also need to hear what your expectations are as far as what you want to get accomplished next week or next month.
7. Motivate your employees and worker set clear performance measurements and consider attaching a small financial bonus for each one they achieve. It will also help with your communication with your team, making it that much more effective in terms of improving efficiency.

CONCLUSION

On site efficiency of equipment is less than efficiency given by the manufacturer of equipment, because manufacturers consider ideal working conditions for equipment and their proper maintenance. But on site working condition and maintenance is different due to heavy work load, vary in driving style of drivers of equipment, vary in climatic condition, vary in ground condition and also cost of equipment and their proper selection as per work. Therefore proper management of equipment is required in Indian construction industry to get the more output in less construction cost.

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