**CHAPTER ONE**

**Introduction**

Today contractors undertake many types of construction activities that require different  
types, sizes, and groupings of equipment for earth moving, excavating, and lifting. There is  
a piece of equipment for practically any work activity, large or small. Construction equipment  
today is specifically designed by the manufacturer to perform certain mechanical operations  
that accomplish a work activity. Working capacity is a direct function of the size of the  
machine and the power of the motor. These simple relationships exist — the larger the  
machine, the more power required for the operation, the greater the production capacity,  
and the greater the cost to own and operate.

Construction equipment management means getting the most out of the equipment for the least amount of money, for the longest amount of time, so that the amount of money spent on the equipment is justified by how much money it generated. This is achieved through effective construction equipment management.

Construction Equipment Management can be referred as the planning, implementationand monitoring of construction equipment's to:

* enhance their optimum utilization as a resource,
* increase their efficiency or productivity of inputs to or products of the construction process.
* harmonize, standardize and enhance quality of their outputs for inputs or as a final product in the construction process;

The cost of equipment in a project varies from 10-30% of the total cost of the project. It depending upon the extent of mechanization. In modern fully mechanized project the cost of equipment goes up to 30%. But in small project mostly use manpower as an economical in this condition cost of construction equipment decrease to 10% of the total cost of the project.

The proper planning, selection, procurement, installation, operation, maintenance and equipment replacement policy plays an important role of equipment management for the successful completion of project.

Equipment manager’s main task is to reduce downtime, achieve optimum equipment utilization and increase production at minimum cost. His should be coordinate with various wings of the organization in discharging his job which include:

* Equipment planning
* Balancing
* Selection of equipment and its utilization
* Personnel selection and training
* Financial planning
* Preventing maintenance
* General supervision.

Thus equipment management integrated and continuously interacts with human, technical, financial and production system in order to achieve top efficiency and cost effectiveness.

**Extent of mechanization**

Extent/ degree of mechanization on the project will depend on:

* Man power/Availability of skilled and unskilled labor: any type of manpower required to the execution the work of the project. So that first decided and whether this type of manual labor is cheaply and sufficiently available or not.
* Completion period /Speed of completion: completion period pays a deciding role about the extent of mechanization. since less the completion period required more mechanization
* Nature of work: nature of work includes adverse weathers, climate condition, topography, toughness, handling of a large quantities of construction material for the long distance.
* Availability of money: since cost of equipment is too high and to be spent initially, it needs large investment at the beginning. Therefore, availability of money is a main factor in deciding the extent of mechanization.
* Availability of indigenous equipment: after sale service, repair facilities are also considered where equipment’s manufactured in our own country are not available.
* Project size

**Needs of mechanization on construction project**

The need for construction equipment's can be directly related to human need and its requirement for mechanization.

Benefits of mechanization

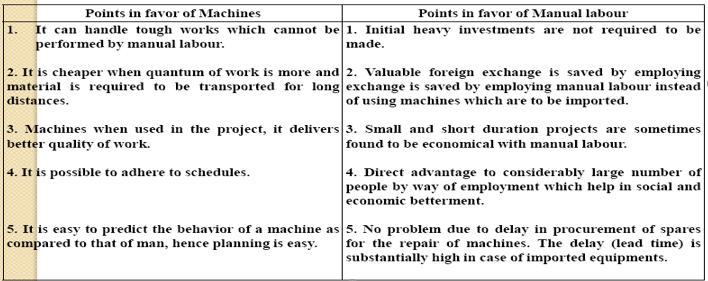
* Use of appropriate equipment eliminates human errors and ensures superior quality of work constantly
* Speedy construction avoids time and cost overruns.
* Certain construction not possible by manual methods
* To realize works beyond human power
* Large Scale Operations being possible
* Reduced work time, Reduced manpower, Improved operating safety
* Uniformity and improvement

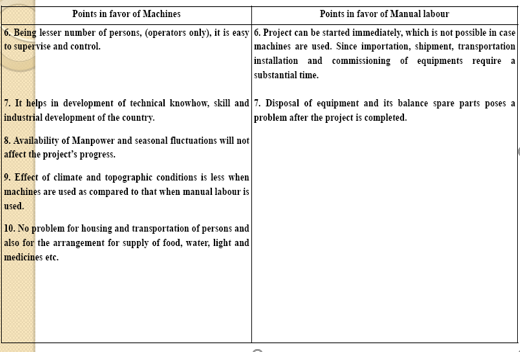
Disadvantage of mechanization

* Large capital requirement,
* increasing work management for equipment
* training and operation and maintenance requirement
* Not considerably a large number of people by the way opportunity of employment for the society.

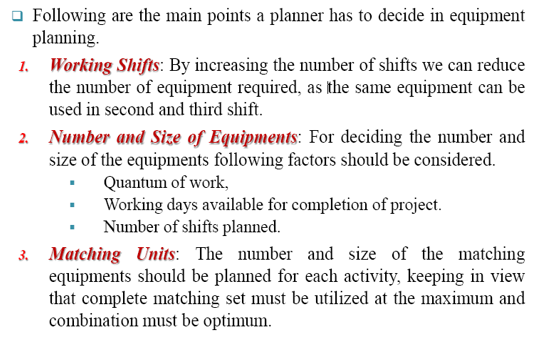
**Use of machine Vs manual labor**

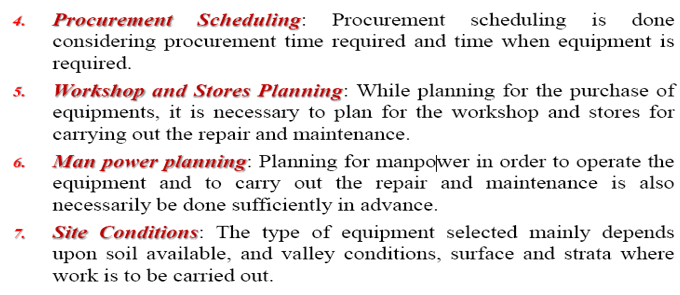
The advantage and disadvantages of using machine and manual labor in construction project





**Forecasting equipment requirement**





**Output and capacity of equipment**

Output of equipment varies with the different condition. The followings are some of them

* Different types of soil need different amount of effort
* Reduction of horse power of engine due to altitude
* Time spent on servicing and inspection varies with the working condition
* Operator’s efficiency
* Haul road
* time spent on the unproductivity work
* Changing weather condition
* Capacities of matching machineries working in the same group

**Equipment selection**

Proper selection of equipment for a construction project is vital importance for its speedy and economical completion. Selection of the right piece of  
equipment, like the right man for the job, affects field productivity. Productivity directly  
influences profitability. Using a machine that does not have enough capacity will slow down  
productivity. Using a machine with too large capacity might increase productivity to some  
extent, but will ultimately negatively affect profitability, because of the cost of operation of  
the oversized machine. Pairing machines with mismatched capacities are not efficient and will  
not yield the optimum unit price for the work.

The following are the main points which should be considered in the equipment selection

* Suitability for job condition/matching: The first equipment selection step involves matching the right machine to the workactivity. The work activity includes all factors associated with the specificphysical task. Each piece of construction equipment is specifically designed by the manufacturer to perform certain mechanical operations that accomplish the work activity.The equipment must meet the requirement of the work, climate and working condition. The equipment selection mainly depends upon soil available, surface and strata where work is to be carried out.
* Size of the equipment: The size of equipment should be such that it must be able to be used with the other matching unit.
* Standardization: It is better to have same type and size of equipment's in the project
* Availability of equipment in the market: The equipment which is easily available in the market should be purchased.One of the most important considerations when selecting a piece of equipment is theavailability of the right machine with proper and timely service, maintenance, and repair.
* Availability spar part: While selecting particular type or making of equipment, it should be ensured that the spare parts will be available at reasonable price throughout the working life of the equipment.
* Versatility of equipment: in construction project multipurpose of equipment is mostly required. But there are certain types of equipment’s which are not utilized fully.
* Depending on professional: The equipment selected should be satisfactorily handled by available operators and mechanics.
* The type and condition of the working surface and the distance to be traveled affect the  
  choice of tires or tracks.
* Use in the future project: When equipment completes only a part of their life in a project. It should be kept in view that the equipment can be used in future project and may not become obsolete.
* Selection of most suitable equipment.
* Types & Size of equipment depending upon particular project.
* Costs & Profitability in using that equipment.
* Usability of that equipment i.e. with respect to future projects.
* Durability, Workability & Disposability of that equipment.

**Replacement of equipment**

The main reasons for the replacement of the equipment are

* Deterioration: It becomes necessary to replace the machine when it wears out and does function properly
* Obsolescence:Is the reduction in value and marketability due to the competition between  
  newer and more productive models.The useful life of the existing machine is finished it is not effectively produce for the required work in construction project. So the existing machine is to be replaced with newequipment becomes produce more products of good quality with less labor and has more efficiency.
* Inadequacy: with the change of product design to meet the customers demand of quantity to be manufactured, old machinery becomes inadequate and therefore, call for different manufacturing equipment.

**Down time of equipment**

The down time is the duration from the time when equipment goes under breakdown to the time when it is restored to service.Or

Downtime is the time when equipment does not work due to repairs or mechanical adjustments. Downtime tends to increase as equipment usage increases. Availability, the portion of the  
time when equipment is in actual production or is available for production, is the opposite of  
downtime. For example, if the equipment’s downtime is 10%, then its availability is 90%.

Down time can be reduced by the following ways:

* Speedy fault detection/ diagnosis: fault should be detected before it becomes serious enough to affect performance. Or the time spent in fault diagnosis can be reduced down time of equipment
* Speedy repairs: time for repairs include the time required for fault detection and diagnosis, removal of assembly, stripping, adjustments, assembly and final trial test.
* Reduction waiting time: waiting time for repair is considerably higher than actual time taken for repairs due to the irregular (random) arrival of repair jobs.

**Operation and Utilization**

Since this is the task directly responsible for production, maximum managerial care should be given to the ‘operation’.

Following are the main factors which effect the operation:

* Availability of Trained Personnel.
* Adequate repair and maintenance facilities in the projects.
* Availability of spares required for repair and maintenance.
* Working Conditions.
* Haul roads should be well maintained
* Information monitoring system
* Feedback should be extended to the manufacturers
* The output of each equipment should be compared with that of pre-determined norms.
* Encourage operators and maintenance personnel for giving long life of the equipment.

**Reduction of Construction Cost**

A cost reduction in construction can be achieved by adopting following ways:

* **Proper planning**
* **Timely supply** of funds, equipment, materials, and personnel.
* **Proper equipment planning and selection.**
* **Proper equipment** operation, maintenance and utilization.
* Adopting **proper inventory** control.
* Engaging **experienced operators**
* **Monitoring progress** and adopting scientific methods.
* Ensuring **continuous supervision**.
* Adopting **innovations** and **latest techniques** suitable for the job
* **Eliminate unnecessary** construction requirements.
* Use **local materials** when they are satisfactory.