

---

# UNIT 1 CONSTRUCTION EQUIPMENT

---

## Structure

- 1.1 Introduction
  - Objectives
- 1.2 Planning for Construction Equipment
- 1.3 Purchase, Rent or Hire
- 1.4 Organisation for Equipment Management
- 1.5 Investment and Procurement
  - 1.5.1 Investment
  - 1.5.2 Procurement Plan
- 1.6 Productivity
- 1.7 Calculation of Hire Charges
  - 1.7.1 Depreciation
  - 1.7.2 Interest on Capital Investment
  - 1.7.3 Repair Charges
  - 1.7.4 Operation and Maintenance
  - 1.7.5 POL and Energy Charges
  - 1.7.6 Miscellaneous Supplies
  - 1.7.7 Supervision Charges
  - 1.7.8 Minimum Hire Charges
- 1.8 Selection Criteria
  - 1.8.1 Use of Available Equipment
  - 1.8.2 Suitability for Job Conditions
  - 1.8.3 Uniformity in Type
  - 1.8.4 Size of Equipment
  - 1.8.5 Use of Standard Equipment
  - 1.8.6 Unit Cost of Production
  - 1.8.7 Availability of Spare Parts
  - 1.8.8 Versatility
  - 1.8.9 Selection of Manufacturer
  - 1.8.10 Suitability of Local Labour
  - 1.8.11 Adaptability for Future Use
- 1.9 Budgetary Control and Costing
- 1.10 Cash Flow
- 1.11 Financing Equipment Purchase
- 1.12 Summary
- 1.13 Answers to SAQs

---

## 1.1 INTRODUCTION

---

In this unit you will learn about various aspects of construction equipment. The various considerations in selecting a particular type of equipment and the mode of procuring it are important while making a decision.

### Objectives

By the end of this unit you should be able to explain how you go about

- planning for construction equipment,
- purchasing, renting or hiring of equipment,
- developing an organisation for equipment management,
- investment and procurement policies for construction equipment,
- determining the productivity of an equipment.

- calculating hire charges for construction equipment,
- selecting construction equipment,
- budgetary control and costing, cash flow, and
- financial management.

---

## 1.2 PLANNING FOR CONSTRUCTION EQUIPMENT

---

Equipment planning on major construction projects include besides its selection, the decision about working shifts, number and size of machines, the matching of units working in a team, procurement schedule and the arrangement of necessary technical staff to operate, service and repair of the equipment. Planning of workshop and stores facilities is also an important aspect of equipment planning.

The type of equipment selected usually depends upon soil and valley conditions and upon the characteristics of material to be handled. Whether to use wheeled equipment or track equipment; to use bottom dump or rear dump trucks; to use dragline excavator or power shovel; to use cableways or cranes and trestles for concrete placement, are some of the questions that may have to be answered by the planner of construction equipment after considering soil and valley conditions of construction site.

The number and size of machines selected depend upon the magnitude of work, working days available and number of shifts worked in a day. While multishift operation is effective in increasing daily production, production in the late night shift is usually less and these shifts add to difficulties of supervision and maintenance of equipment. All equipment working in a team must be properly matched in size. The plan of procurement should be coordinated with the production schedule of equipment. Also, planned with equipment procurement should be the spare parts for it and supplies of fuels, oils, lubricants, etc. for its operation. Suitable servicing facilities are essential to realise the planned production rate from equipment.

Availability of operation and maintenance staff in adequate quality and number for the operation of equipment is essential to obtain full production. In case of unavailability of adequately trained staff it may become necessary to start a training school for workmen at the project site. Planning for recruitment and training of personnel is a necessary aspect of planning for construction equipment.

### SAQ 1

- i) What do you understand by equipment planning?
- ii) How do you select the number and size of machines?
- iii) How do the operation and maintenance staff affect the operation of equipment?

---

## 1.3 PURCHASE, RENT OR HIRE

---

Users of construction equipment are often concerned with a decision as to whether to purchase or rent the equipment. Under certain conditions it is financially advantageous to purchase, whereas under other conditions it is more economical and satisfactory to rent it.

There are three methods under which a contractor may secure the use of construction equipment. He may :

- 1) purchase it,
- 2) rent it,
- 3) rent it with an option to purchase it at a later date, and
- 4) lease it, with/without option to purchase later.

The method selected should be one that will provide the use of the equipment at the lowest total cost, consistent with the use that the contractor will make of the equipment. Each method has both advantages and disadvantages which should be considered prior to making a decision. The decision for one contractor will not necessarily apply to another contractor. A contractor should purchase equipment that he will use frequently, and he should rent

equipment that he will use only rarely. For example, one contractor may engage in work that requires the use of wellpoint systems for most of his projects, while another may require the use of such a system only once every 2 or 3 years. The former should purchase it, while the latter should rent it.

The purchase of an equipment, as compared with renting it, has the following advantages :

- 1) It is economical if the equipment is used sufficiently.
- 2) It is more likely to be available for use when needed.
- 3) Because ownership should assure better maintenance and care, purchased equipment should be kept in better mechanical condition.

Among the disadvantages of purchasing equipment are :

- 1) It may prove more expensive than renting.
- 2) The purchase of equipment may require a substantial investment of money or credit that may be needed for other purposes.
- 3) The ownership of equipment may influence a contractor to continue using obsolete equipment after superior equipment has been introduced.
- 4) The ownership of equipment designed primarily for a given type of work may induce a contractor to continue doing that type of work, whereas other work requiring different types of equipment might be available at a higher profit.
- 5) The ownership of equipment might influence a contractor to continue using the equipment beyond its economical life, thereby increasing the cost of production unnecessarily.

The most influential factor in deciding whether to purchase or rent a piece of equipment is its expected long term utilisation. Renters of equipment charge enough percentage to generate a profit, and thus hourly charge would be higher than the comparable cost to an owner—if the owner used the equipment extensively. If the expected use is short term, then renting is usually the less costly alternative.

Once the decision is made whether to purchase or rent, the next decision to be made is whether to simply rent or rent with an option to purchase. The latter alternative will result in a higher rental cost as some of the periodic rental charges will be applicable toward the purchase price of the equipment. This is an attractive alternative if the renter of equipment believes he may have enough use for the equipment to purchase it, but is not sure that the productivity claimed by the renter is as high as predicted. Such rental agreements result in higher hourly charges than straight rental agreements.

## SAQ 2

- i) In what different ways can a contractor secure the use of construction equipment?
- ii) What are the advantages and disadvantages of purchase of an equipment as compared with renting it?
- iii) When should you simply rent an equipment or rent it with an option to purchase it?

---

## 1.4 ORGANISATION FOR EQUIPMENT MANAGEMENT

---

The management and control of the equipment operation and maintenance forces is a responsibility vested in the equipment manager. Success can be realised only if the various key elements of maintenance management are capable of functioning in a streamlined and authoritative organisation. Skilled tradesmen and qualified operating staff can provide their necessary services only where things are orderly. Inadequate supervision, either because of improper quantity or inadequate talent, is the reason why so many equipment and operating man-hours are non-productive.

On the other hand, a well-structured equipment department, drawn on a neatly drawn organisation chart, will not guarantee that the operation and maintenance tasks will be

accomplished as economically or efficiently as possible. An organisation chart will establish a line of authority and responsibility for all functions within the organisation. There should be a definite split between the craft personnel responsible for performing the operation and maintenance tasks and those employed to assist supervision in controlling the work. The latter, a group of maintenance department employees commonly referred to as maintenance control, is a staff entity responsible for the inspection, work reception, job estimating and planning, short and long-term scheduling, and performance analysis of all operation and maintenance tasks. The success of the facilities department can be assessed by the amount of administrative and non-supervisory work that this maintenance group can take over from the daily activities of the operation and maintenance supervisors.

Figure 1.1 is a typical organisational structure for centralised maintenance, while Figure 1.2 shows an organisational structure for area maintenance.

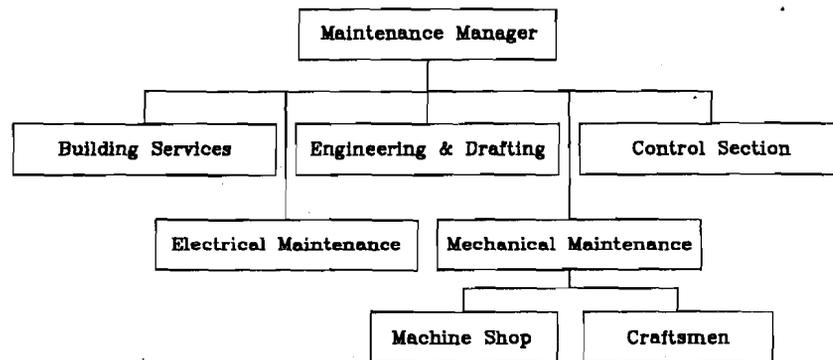


Figure 1.1 : Organisational Structure for Centralised Maintenance

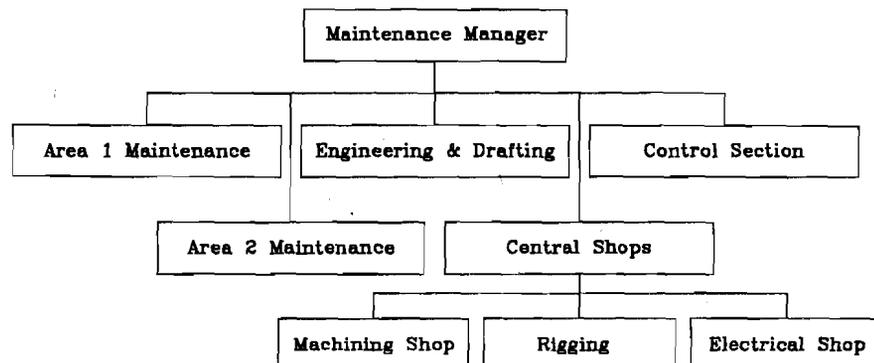


Figure 1.2 : Organisational Structure for Area Maintenance

In developing an organisation, one must tailor it to fit the particular technical, geographical and personnel situations involved. Some of the basic concepts of a good organisation are given below :

- 1) **Establish reasonably clear division of authority with little or no overlap.** The division of authority can be functional, geographic, based on expediency, or a combination of all three. However, there must always be a clear definition of the line of demarcation to avoid confusion and possible conflict that can result from overlapping authority.
- 2) **Keep vertical lines of authority and responsibility as short as possible.** Use of assistants should be minimised unless a clear division of duties can be made between assistant and assisted. Avoid using any level merely as a medium for transmitting information up and instructions down.
- 3) **Maintain optimum number of people reporting to an individual.** The most effective organisations limit the number of people reporting to one supervisor to between three and six. However, where the amount of supervision required is small, or the work supervised follows a general pattern, one man can supervise upto ten or twelve.
- 4) **Fit the organisation to the personalities involved.** Theoretically, smooth functioning of the equipment maintenance department requires consideration of

personalities making up the organisation. This implies a flexible organisation structure which is revised periodically to fit changing personalities and conditions.

### SAQ 3

- i) What are the responsibilities of an equipment manager?
- ii) What are the objectives of an organisation chart for equipment management ?
- iii) What are the basic concepts of a good organisation ?

---

## 1.5 INVESTMENT AND PROCUREMENT

---

For construction equipment you should understand what is meant by investment and procurement.

### 1.5.1 Investment

Construction equipment are expensive and in order not to lock up money which could otherwise have been utilised for other purposes the investment in equipment purchase should be properly planned. Initially, the speed of work will be slow owing to small work areas and the operators are new to their job and the equipment is new. As time passes the speed picks and additional work will also be required to be done. Thus, all the equipment are not required to be procured right in the beginning of the project. It is better and economical both by way of investment and the operation and maintenance to purchase the equipment as when they are required.

### 1.5.2 Procurement Plan

The decision concerning which materials or equipment should be procured by the construction agency is made by the procurement coordinator. Normally, the agency might purchase only those items that require such a long delivery time that orders should be placed even before a construction contractor is selected and those that are of great complexity, requiring a specialised knowledge that the construction contractor might not be reasonably expected to have. Similarly, the question of in-house fabrication in the plant maintenance shops versus purchase from outside sources also is the responsibility of the procurement coordinator. This judgement should be based on the relative economics, the impact on the in-house labour force and the improvement in the construction schedule which might be attainable by fabricating key items in the plant shops.

Procurement may be accomplished by an agency in the material management organisation. The material management organisation has strong responsibilities to assure proper quality, quantity and cost. Within the material management organisation, the procurement system should be structured to provide standardised action in

- a) development of requirements,
- b) estimating costs,
- c) approach to proceed, delegated by appropriate amounts or type of items to various levels in the organisation heirarchy,
- d) funding, including necessary approvals,
- e) bids, request for quotations or requests for proposals, including minimum specifications and distribution in accord with established policy,
- f) evaluation, preparation of appropriate control documents, and award to successful bidder,
- g) follow up to assure on schedule or timely delivery,
- h) inspecting, receiving, marking and recording of the items,

**Operation of Construction  
Equipment**

- i) routing and transportation, including installation where necessary, to final destination,
- j) payment to the vendors,
- k) post audit as necessary to ensure proper operation, achievement of cost reduction, savings, etc., and
- l) documentation of contract/purchase order files to provide necessary information for external or internal audit.

**SAQ 4**

- i) When acquiring construction equipment, how should the investment be planned?
- ii) How will you decide about procurement of construction equipment?
- iii) How will you standardise the procurement system for acquiring construction equipment?

---

## **1.6 PRODUCTIVITY**

---

The quantity of material, the quantity of work for equipment, and the time available for completion dictate the requirements of productivity and thus affect equipment selection. The productivity desired as related to job requirements determines the size, type and number of equipment units. It is also important to analyse the equipment system for the total construction job instead of concentrating only upon the selection of individual units.

Construction equipment generally follow a sequence in which one machine performs a phase of the total work and the other types of equipment perform subsequent phases. The productivity of one machine should balance that of the other for optimum results. Examples are shovel-truck and scraper-pusher combinations.

Each machine has a theoretical production capacity for a specific job under ideal conditions. Assuming this theoretical output as 100 percent, the actual capacity or practical performance on the job is somewhat less. The productivity is dependent on the combined efficiency of the machine, the operator, and management. It is necessary to evaluate all three in order to establish a satisfactory balance.

Past experience is a major factor in determining the productivity of a machine. The buyer's own experience can be supplemented by that of the equipment dealer.

Operating conditions have a considerable effect on machine productivity. All conditions to be encountered in the work cycle must be taken into account in assessing machine productivity. Conditions under which construction equipment operate are seldom static and predictable. Experience and judgement are necessary to define them. Experience gives an understanding of the area in which machines will work, while judgement helps to evaluate possible combinations of operating conditions in practical terms.

**SAQ 5**

- i) How will you select an equipment based on its productivity?
- ii) What are the considerations when two machines work as a team?
- iii) What factors affect the productivity of a machine?
- iv) What role do operating conditions play on machine productivity?

## 1.7 CALCULATION OF HIRE CHARGES

Rentals are normally based on 176 hours or 200 hours per month, with a 50 percent additional charge for second and third shifts. Rentals are charged upon arrival of the equipment at the job site and cease when the equipment is shipped from the job or is declared idle and available for transfer. As some project managers have a tendency to keep equipment on their job beyond the time it is needed, it is well to enforce this rule.

An annual review is made of the equipment by class to see that the rental rates being charged cover the costs that are incurred.

Hire charges include the following :

### a) Ownership Costs

- i) Depreciation,
- ii) Interest on capital investment,
- iii) Major repairs, overhaul costs,
- iv) Transport to site, and
- v) Insurance.

### b) Operational Costs

- i) Repair charges (routine),
- ii) Operation and maintenance,
- iii) POL and energy charges, and
- iv) Miscellaneous supplies and tyres, wire ropes, batteries.

### c) Supervision Charges

#### 1.7.1 Depreciation

Depreciation of equipment ranges from the book value to scrap value. Depreciation is calculated based on the total hours worked with reference to life in hours and also based on years lapsed since purchase with reference to life in years and the actual depreciation is taken as the average depreciation based on hours and years. Depreciation is calculated based on straight line method of depreciation.

#### 1.7.2 Interest on Capital Investment

The interest charges on the capital invested are to be related to the average annual cost of equipment based on the life of equipment in number of years. The annual cost of equipment is determined as follows :

$$AAI = C \times i \times \frac{(n+1)}{2n}$$

where,

- $C$  = book value,  
 $i$  = prevalent government rate of interest, and  
 $n$  = number of years of life of a machine.

In order to take into account of idle time ownership costs, the total of depreciation and interest on investment should be multiplied by the following factors :

Monthly basis	1.2
Weekly basis	1.4
Daily basis	1.6
Hourly basis	1.7

#### 1.7.3 Repair Charges

Repair provisions are made for various categories of equipment which are to be spread over the whole life of the equipment. Over and above this repair provision, escalation of prices of spares might be provided for as given below. The repair provisions are scaled as follows :

1st stage of life	10% of total repair provision
2nd stage of life	15% of total repair provision
3rd stage of life	25% of total repair provision
4th stage of life	30% of total repair provision
5th stage of life	20% of total repair provision

The repair provision could vary to the extent of about 20% over and above the indicated provision if severity of job conditions so demand.

The escalation of prices of spares could be provided for by a notional increase of the book value @ 7% per year from the date of purchase, and percentage scaled repair provision applied over this notional book value to arrive at the provision for the stage under consideration. As for instance, the scaled provision for the third stage of operation is 25% and if it occurs in the 4th year since purchase of equipment, the repair provision for the 4th year could then be 25% of  $[C + (3 \times 0.07) C]$ , where  $C$  is the capital cost.

### 1.7.4 Operation and Maintenance

Apart from the salaries of operation and maintenance crew, the department has to spend on their housing, leave reserve, leave salary, terminal benefits, medical facilities, etc. Therefore, for purpose of hire charges, the annual cost of operation and maintenance and repair crew distributed over the cost of operational hour during the year should be increased by 50%.

### 1.7.5 POL and Energy Charges

POL and energy charges are charged as per actuals, and 25 % to 30% of the cost of fuel/energy is provided for lubricants.

For electrically powered equipment, the energy charges can be obtained by estimating energy consumed in KWH and multiplying it by the energy rate.

$$\text{Energy consumed} = \text{BPH} \times 0.746 \times C_1 \times C_2$$

where,

$C_1$  = factor for category of equipment, and

$C_2$  = factor for type of duty to which it is put in use.

For diesel engine powered equipment, the fuel consumed per hour can be estimated from the following relationship:

$$\text{Diesel consumed} = 0.22 \times \text{FHP} \times C_1 \times C_2 \text{ litres/hr.}$$

Values of  $C_1$  and  $C_2$  are given in Table 1.1.

Table 1.1 : Factors for Category of Equipment and Type of Duty

Sl. No	Category of Equipment	$C_1$	$C_2$		
		Type Factor	Light Duty	Medium Duty	Heavy Duty
1)	Dump Truck	0.30	0.70	1.00	1.40
2)	Motor Grader	0.40	0.67	1.00	1.33
3)	Excavator	0.50	0.80	1.00	1.20
4)	Wheel Loader	0.58	0.70	1.00	1.30
5)	Motorised Scraper				
	a) Twin Engine	0.57	0.70	1.00	1.30
	b) Single Engine	0.62	0.70	1.00	1.30
6)	Bulldozer	0.57	0.75	1.00	1.25
7)	Dozer Shovel	0.61	0.75	1.00	1.25
8)	Diesel Generating Sets	1.00	0.75	1.00	1.25
9)	Air Compressors	1.00	0.75	1.00	1.25

For pneumatically operated equipment the cost of compressed air, in Rs per cum per min, can first be determined by analysing use rate of air compressor which can then be used for the equipment. Rated capacity of equipment may be used for obtaining energy charges.

### 1.7.6 Miscellaneous Supplies

Miscellaneous supplies are considered at 10 % of the hourly repair provision.

### 1.7.7 Supervision Charges

Supervision charges can generally be fixed by the owner of the equipment or department and should be a minimum of 10 % of the total ownership and operational cost as calculated above.

### 1.7.8 Minimum Hire Charges

The hire charges are recovered in respect of production equipment based on actual hours or the following minimum hour whichever is more.

Table 1.2 : Minimum Hire Charges

Basis	Single Shift	Double Shift	Three Shifts
Annual Basis	1200	2000	2500
Monthly Basis	150	250	313
Weekly Basis	36	60	75
Daily Basis	6	10	12

Breakdown or non-availability of equipment continuously for one hour or more is accounted for and is not to be charged.

### SAQ 6

- i) How are the rentals on equipment charged?
- ii) What are the various costs considered while fixing the hire charges of construction equipment?
- iii) How is depreciation of an equipment considered in fixing hire charges?
- iv) How is the interest on capital investment accounted for in determining hiring charges of equipment?
- v) How are repair charges considered over the life of an equipment?
- vi) How are the operation and maintenance of an equipment considered in determining the hire charges?
- vii) How are fuel and energy charges included in hire charges of construction equipment?
- viii) What are the minimum hire charges for different rental periods and for various shifts of working in a day?

---

## 1.8 SELECTION CRITERIA

---

For speedy and economic construction of a project, proper choice of equipment is of primary importance. The problem of proper selection is further complicated because of the wide range of equipment commercially available. Selection of equipment is possible by following some general considerations. These include :

- 1) use of available equipment,
- 2) suitability for job conditions,
- 3) uniformity of type,
- 4) size of equipment,

- 5) use of standard equipment,
- 6) unit cost of production,
- 7) availability of spare parts,
- 8) versatility,
- 9) selection of manufacturer,
- 10) suitability of local labour, and
- 11) adaptability for future use.

### **1.8.1 Use of Available Equipment**

Where the full utilisation of a new equipment for its entire working life is not foreseen nor its utilisation on further projects is uncertain, it may be desirable to use existing old equipment even if its operation is somewhat more expensive. The depreciation cost of the new machine is likely to be high, and this would raise the owning cost of the equipment and thus the unit cost of work.

### **1.8.2 Suitability for Job Conditions**

The equipment chosen should suit the conditions of the job, soil, valley, working conditions and climate of the region.

### **1.8.3 Uniformity in Type**

A minimum number of types should be acquired so that there is uniformity in type of equipment on a job. A common type of engine should be selected for the different machines such as excavators, dump trucks, tractors and scrapers on the project.

### **1.8.4 Size of Equipment**

Larger equipment give higher outputs on full load, but its cost of production is usually greater than that of smaller units working on part load. Larger equipment needs correspondingly larger size of matching units, and shutting down of one primary unit may render idle several other large units. Transportation on works or carriage are generally difficult and costly. Servicing, maintenance and repair facilities have to be greater for larger units. However, larger machines are usually more sturdy and suitable for tough working conditions. It is desirable to have equipment of same size on the project. With standbys, the cost of larger size standby equipment is more than that of a smaller size.

### **1.8.5 Use of Standard Equipment**

Standard equipment is commonly manufactured and available. Such equipment is manufactured in large numbers and so readily available and moderately priced. Spare parts of standard equipment are easily available and are less costly. After the work is over, disposing off standard equipment and its spare parts is generally easier than disposing off non-standard or specialised equipment.

### **1.8.6 Unit Cost of Production**

The economics of equipment is one of the most important considerations in selection of equipment. When calculating owning cost, all items of expenses, like freight, packing and forwarding, insurance, erection, commissioning etc. should be included with the price paid to the supplier.

### **1.8.7 Availability of Spare Parts**

The availability of spare parts at reasonable cost during the entire working life of the equipment should be ensured while selecting a particular type or make of equipment especially of imported equipment. Downtime due to shortage of spare parts commonly accounts for long idle periods during the working life of the equipment. If specialists are needed, their availability should also be kept in mind.

### **1.8.8 Versatility**

The machine selected should, if possible, be able to do more than one function and should be interconvertible.

### 1.8.9 Selection of Manufacturer

It is good 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 important. They should be sincere and capable of extending prompt after sales service.

### 1.8.10 Suitability of Local Labour

The locally available operators and technicians should be able to handle the equipment selected. A special equipment may have excellent performance but may be difficult to handle it through available knowhow.

### 1.8.11 Adaptability for Future Use

If the machine is required to work for only a part of its useful life then means to dispose it off or its employment on some other job should be considered. Obsolescence of the machine should not be overlooked.

#### SAQ 7

- i) What are the general considerations in selection of equipment ?
- ii) How does size of equipment affect production? What are the pros and cons of large and small size of machines on a project?
- iii) What are the advantages of having standard equipment?

---

## 1.9 BUDGETARY CONTROL AND COSTING

---

Budgetary control is a management technique which combines the two elements of planning and control. The processes of management such as

- a) setting of objectives,
- b) preparation of plans,
- c) coordination of plans,
- d) evaluation of plans,
- e) preparation of budgets,
- f) control, and
- g) corrective action

contribute to the technique of budgetary control.

Planning and control are essentially interrelated. Planning is the process of deciding what the organisation is going to achieve and the way it will do so. Control is the process of watching to see that the programme of action and the prescribed standards are adhered to, or of highlighting the reasons why this has not been done.

Top management should set the objectives of the organisation. The objectives may relate to many things, for example, acquiring equipment, return of capital invested, expansion of contracts, improvement of production. In all cases, they must be precise, ambitious and realistic. Precision is required for defining the output to be achieved, factors affecting the output and actions to be taken in case of shortfall of production. Objectives should be ambitious, in that they must not be too conservative or too extreme. While imposing a demand on the skills of the operators, the objectives should be achievable.

Preparations of plans influences the objectives. Plans may be short term (lasting about one year) or long term (longer than one year). During the planning period, the objective will be to improve current operating performance and profits and to implement steps in the long term plan.

Long term plans allow management to recognise the need for action and to allow for that action to be effective. For achieving the plans, there should be proper coordination between the different agencies involved in achieving the objectives. The plans will tend to be

concerned with individual projects such as deployment of new equipment or the improvement of operating efficiency by the provision of new facilities or services. Coordination of plans involves defining the limiting factors and selecting the plan which best achieves the main objective, namely, the maximisation of the return on capital employed while securing the long term well being of the organisation.

Whatever the planning period, each plan must comprise an evaluation of all factors, both internal and external, affecting performance, an objective, a programme of action and an evaluation of the financial effect of the plan.

A budget is the financial evaluation of management plans. The aim of all management plans is the maximisation of profits in relation to the capital employed. Thus, money is the medium through which the success or failure of an organisation and its management will be judged. Maximisation of the return on capital employed is a long term objective. A high return on capital employed can be earned in the short term to the detriment of the future well being of the organisation. For instance, a policy of not investing in plant and research and development will restrict capital employment but will probably mean that in the long term, the organisation will become uncompetitive by virtue of obsolete methods on equipment.

The objectives of control are :

- a) general financial and cost control—requiring the use of budgets and accounts to relate earnings and expenditure to planned performance,
- b) performance control—requiring the use of standards and costs to disclose technical inefficiencies and the advantages or disadvantages of alternative methods or equipment, and
- c) the establishment of data for future plans.

Whenever shortfalls occur in budgetary planning, corrective action should be identified and enforced to improve the situation.

In costing of construction equipment, the largest element is the spare parts and consumables. This part should be compiled by the equipment buyer in conjunction with the operating personnel. Using the purchase budgets and production targets, it will determine the requirement of spare parts and consumables, period by period, to meet the output, and will be evaluated in cash cost terms. Considerations should be taken into account such as bulk buying, delivery periods, stock holding, suppliers credit terms and trade discounts, as well as recognising any changes in material specifications, new model introduction, etc. In timing the purchase of spare parts and consumables, consideration must be given to the necessity to keep inventory levels to the bare minimum and thereby not tie up valuable capital. Special competitive pricing exercises should be undertaken from potential suppliers to ensure that costs are strictly controlled and competitive.

### **SAQ 8**

- i) What is the objective of planning a budget?
- ii) What are the objectives of budgetary control?
- iii) What are the largest elements in costing of construction equipment ?

---

## **1.10 CASH FLOW**

---

Cash flow analysis is concerned with the cash phase of the capital turnover cycle. In a construction project, the turnover of capital follows a continuous cycle which proceeds from cash to assets such as plant, equipment, and inventory, to receivables; and back to cash. Significant figures which describe the cash phase are (a) cash balance at any given time, (b) rate of cash flow (inflow, outflow, net increase or decrease) per unit of time.

### **1.10.1 Reasons for Cash Flow Analysis**

A construction agency must have enough cash to meet obligations as they appear and management meets this problem by carrying cash balances supplemented by sources of credit which are adequate for the purpose.

Cash flow guides management in deploying its liquid capital resources most effectively. While capital in the form of cash or equivalent assets can earn a return, this rate of return is generally lower than the rate that can be earned from investments in other types of business assets such as fixed deposits in banks. Hence, cash balances are held at minimum level consistent with anticipated requirements in order that cash in excess of such requirements can be promptly invested.

Cash flow has also come into widespread use by investors as an index of management's opportunity to shift a company's capital into areas offering the most attractive rates of return and as a measure of ability to pay dividends when profits are available. Interest in cash flow analysis shows a construction environment characterised by rapid technological change and growth.

Cash includes capital in temporary investments made to hold cash, provided such investments can be converted to cash without material delay or loss when needed for disbursements. Excluded are assets such as plant, equipment and inventories which cannot be converted into cash for making current disbursement without impairing future revenues.

### SAQ 9

Why do you carry out cash flow analysis for equipment ?

---

## 1.11 FINANCING EQUIPMENT PURCHASE

---

Good equipment is constantly being improved, and becoming more and more expensive as it becomes increasingly larger and more productive. The contractor must have his fleet constantly analysed, both (1) to replace worn-out equipment as it becomes more costly to repair and maintain, and (2) to replace otherwise satisfactory units as they become obsolete. This requires financing, so that the contractor can conserve his cash and remain sufficiently liquid to manage his business and have reserves to take advantage of contracting opportunities as they occur.

Equipment can be financed in several ways :

- 1) Some dealers from whom equipment is purchased generally accept down payment, usually from 10 to 25 percent of the purchase price, and the balance is accepted in monthly instalments. A note and a conditional sales contract is given by the buyer to the dealer. It may be for the full amount of the purchase with a credit showing the amount of down payment, which includes principal and interest. The dealer retains ownership of the equipment until the last payment is made.

The interest rate is usually quite high, perhaps 50 percent higher than the dealer can obtain from his bank, and sometimes, if the dealer is financing his own paper, the note and conditional sales contract may carry interest on the full purchase price until the entire purchase price is paid. This type of contract, charging as it does "interest on interest", is extremely expensive and should be avoided at all costs. If the buyer has any reasonable credit rating, he can always insist on the interest being charged "on a declining balance". The dealer frequently will decide to discount the note with his bank. In this case the contract will carry simple interest on a declining balance as payments are made. If, however, the dealer has named a higher rate of interest than the current rate charged by the bank, he may be able to discount the note for its face value, thus getting paid immediately for the full list price of the equipment including his commission, and may not have to pay the manufacturer the wholesale price of the equipment for 30, 60, or possibly 90 days.

- 2) Many commercial corporations finance construction equipment. The corporations do a professional job but usually charge high interest rates, always higher than the normal bank interest rate. If the contractor lacks a good credit rating, they charge full interest on the original loan until paid.
- 3) A number of companies buy equipment and lease it back to the user on a term basis. Under certain circumstances a contractor may wish to consider the lease arrangement. For example, a contractor may have a fairly long term job that will last as long as or perhaps a little longer than the equipment lease. Since the equipment rental is entirely a tax deductible expense, the contractor may charge the rental to the operating cost of

the job. If he is fortunate and gets another contract that can use the equipment at or near the end of the lease period, he can purchase the equipment for 10 to 15 percent of its original list price and come up with a bargain going into the second job. Leasing can be particularly advantageous to the smaller contractor who does not have the resources to purchase an expensive piece of equipment.

- 4) When the contractor has good bank credit and an adequate amount of available cash, he may deal directly with the bank. For this he places an "equipment note" with the bank. The note includes a list of equipment being financed and the purchase price of each equipment. Since the contractor is going to pay the dealer or manufacturer cash, he will be able to secure a cash discount of 10 to 15 percent off the list price of the equipment. Generally, the banks prefer to finance about 75 percent of the original cost. This leaves the contractor with 25 percent to finance out of his own pocket. The terms of the loan are flexible both as to interest and repayment dates, the length of time varying with the expected life of the equipment. Heavy excavating equipment may be financed up to 4 years, heavy trucks and tractors upto 3 years, lighter trucks, compressors, concrete mixers etc. for 2 or 2.5 years. Payments on the note are made monthly or quarterly.

### **SAQ 10**

What ways do you know by which equipment can be financed ? Describe them in brief.

---

## **1.12 SUMMARY**

---

In this unit you learnt how construction equipment are planned and when should an equipment be purchased, hired or taken on rent. The organisation for managing equipment has many functions as explained in the unit. What should be the investment and procurement plans and criteria for selection of construction equipment have been discussed. Cash flow, budgetary control and costing are all important aspects of financial management and have been covered here in brief.

---

## **1.13 ANSWERS TO SAQs**

---

Check answers of all SAQs with respective preceding text.