

Chapter Three: Equipment/Plant Economics

Equipment/Plant Access and Costs

There are three basic ways of securing construction equipments. These are **Buying (direct Ownership), Renting or Leasing.**

Direct Ownership:

It has the advantage of guarantying use and control of equipment whenever demanded but requires continuity of work for it to payback its cost because such equipments are very expensive. Beside, their maintenance services require adequate attention. If a construction company foresees the use of construction equipment continuously, direct ownership will bring down its competitive cost of bidding to increase the chance of acquiring/winning projects.

Rental Services:

Those are short term provisions of construction equipments from renting organizations for the purpose at hand. This is particularly advantageous if the job is of short duration and a construction company do not foresees continuity of similar works. Companies can also use rental services for testing and selecting construction equipments before direct ownership. Rental charges are higher than normal direct ownership expenses. Besides, there could be shortage during peak work seasons. Responsibility for maintenance is indicated in the rental contract.

Lease Services:

Those are long term agreements for the use of construction equipments. This is an alternative to direct ownership where the leasing company owns the equipment for the agreed time and the lessee (user) pays the owner to use the equipment. Lease contracts clearly state the responsibility of the two parties including the management and servicing of the equipments. Lease rates are applied mainly to recover the capital costs of the equipment for its periodic replacement plus overhead and profit if servicing of equipment lies on the lessee partner. For rental and leasing system, there is what we call Equipment Pool System.

Equipment Costs: The three major issues related to equipment costs are:

- ✱ The Optimum economical Life Time;
- ✱ The optimum way to secure a construction equipment, that is; the cost of either Owning (Capital Cost) or Renting or Leasing of a construction equipment; and
- ✱ The cost of Operation.

These issues require several records or information with regard to evaluation of equipments performances, establishing owning and operating costs, and analyzing their replacements. Recent development of the information technology has made this task better and several records keeping software's are on market.

Generally, Equipment costs are divided into three major parts. These are:

- ✱ Accessing or Availing Costs (Owning, or Renting, or Leasing Costs),
- ✱ Operating Costs, and
- ✱ Overhead and Markup Costs.

➡ **Accessing or Availing Costs**

Ownership Costs

Cash flows for Purchase expenses, Salvage Value (SV), Tax savings from depreciation, Major repair and Overhauls, Insurance, Interest and Tax Costs, and Storage and Miscellaneous expenses for construction equipments constitute the significant components of Ownership costs.

The **purchase expenses** include the price of the equipment, its shipping or other forms of transporting services and necessary custom taxes to own it. The amount paid by the owner (a liquid asset) for the equipment (a fixed asset) is considered as an exchange mechanism to own equipments.

These equipments when used, wear takes its toll and they are considered consumed which reduced their value because its productivity and revenue generation is reduced.

This phenomenon is called depreciation where an owner is entitled to prorate the consumption of the investment costs over the service life through tax savings.

Salvage Value is revenue shown as cash inflow of equipments if they have value at any time of their transfer of ownership or their disposal. Machines that wear out and possess few secondary uses could be grouped as low salvage value equipments. On the other hand, there are equipments either gets overhauled to keep their operating conditions or even have multiple service life applications which could be regarded as high salvage value equipments. There is a possibility also when subsequent brands with new and technologically, economically and socially better products succeed, then its salvage value dramatically reduced.

Tax savings from depreciations can only be applicable if only the company who owns the equipment is profitable. There is a possibility to carry over two years where such profitability occurs. Depreciation is a legitimate cost of business that recognizes the loss in value of equipment over time.

Tax saving from Depreciations can then be computed using Straight line, Declining Balance, Sum of Years digits and Production methods or use of Tax code schedules. Using the first approaches, the three major factors used to compute tax savings from depreciations are initial cost or basis, service life in years and their salvage or residual values. Hence the amount that can be depreciated or claimed by way of tax deduction is the difference between the initial net value of the asset and its residual or salvages value.

Straight Line Method: It is called a linear method that allocates depreciation values of equipments uniformly along its service years. That is,

$$D_{lm} = I_{oc} / N$$

$$BV_n = I_{oc} - (N * D_{lm})$$

Where:

D_{lm} = Depreciation using Linear Method;

I_{oc} = Initial Owning Cost;

N =Number of Years; and

BV_n = Book Value @ N years.

Accelerated Methods: In these methods, large amounts of depreciations are considered during the early years of the equipment life. Two methods can be considered for accelerated depreciations approaches. These are Declining Balance and Sum of Years Digit Methods.

Declining Balance method applies twice the rate of the Straight Line method for depreciation when applied to new equipment with a useful life of at least 3 years. It is called a Double Declining Balance method (DBB). For second hand equipments the declining balance method uses an optimal rate of One and half times the Straight line method. Declining Balance Method should not necessarily close on Salvage Value. Equipment rental firms that intend to sell equipments after three years could profit from using such accelerated methods.

Sum of year's digit method is the application of depreciation base which is held constant and the yearly rate is considered decreasing. For example if the life time of construction equipment is 5 years, its denominator of fraction depreciation is $(1+5) * 5/2=15$, then its depreciation is computed by multiplying the proportion (say 5/15 for the first year, 4/15 for the second year, etc) with the Initial Owning Cost.

Production Method: Depreciation in this method accounts for the number of hours the equipment was in use for a given year. Therefore, the asset's cost is recovered and prorated using a per-unit-of-output basis. This method ensures that depreciation deduction is available when the machine is productive and theoretically profitable or income producing.

Tax Code Schedules: Under this method, equipments are classified as 3, 5, 10 or 15 years real property. Light trucks less than 6.5 tons are considered as a 3-years property. Most average weight equipments are considered as a 5-years

property. Some heavy construction equipments are considered as a 10-years property. Public utility properties are assigned a 15-years life time.

While all equipments having up to 10-years life time are recommended to use DDB, for greater life time 150% DB method is used. It should also be noted that the depreciations are computed for life time years plus one year. For instance for a 10- years life time, the depreciation computation lasts for 11 years.

Major Repairs and Overhauls are included under ownership cost because they are meant for increasing the service life of equipments. These costs are additional to initial investment costs and shall be considered expenses at the time of their investment to be added on the Book values to be depreciated.

Insurance, Interest and Tax costs (IIT Costs): Insurance costs often ranges from 1–3% of Average Annual Value (AAV) of equipments which can either be an actual premium paid to insurance companies or a self-insurance fund retained by the equipment owner.

Tax costs refer to those equipment ownership taxes charged by customs offices which are commonly assessed between 2–4.5% of AAV depending on location and property taxes.

Interest costs are related to either interest payments if the equipments are purchased with loan or loss of interest on the money invested if purchased in cash. In this case the borrowing and saving interest rates are applicable respectively. Hence the interest costs are computed using the product of interest rates in percentages and AAV. AAV is computed using the following expression:

$$AAV = \{I_{oc} * (n + 1) + S * (n - 1)\} / 2 * n$$

Storage and Miscellaneous Expenses Equipments require storage and other miscellaneous costs due to bad weather, in between job times and their breakdown for maintenance. These demand storage places either through self ownership or space rental services and other subsequent utilities together with wages for operators or guards. These expenses are combined in an overhead cost of projects which can be

estimated as 0–5 %. This can either be considered under owning costs or overhead and mark up costs.

Operation Costs

Typical expenses during equipment operations are Fuel, Oil and Grease (FOG) costs, Normal Repairs and Tire and High Wear Items Replacement Costs. Operators' costs are often considered in Labor costs component of CBSs and are not considered as a part of equipments operation costs.

Either manufacturers' or good service records could be used to estimate hourly FOG expenses of equipments. Besides, routine maintenance, servicing and tires and high wear replacement parts such as blades, bucket teeth, ripper tips, and cutting edges can also be estimated per working hour.

Overhead and Markup Costs

In addition to the direct costs of ownership and operation, general overhead costs constituted Equipment costs, These costs are associated with wages of mechanics and supervisory personnel's, clerical and records services, rental and amortization of maintenance facilities. A markup or profit margins expressed as percentage of total hourly operating costs is also part of the Equipment costs.

Examples: