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A Review Paper on Cost Evaluation of Heavy Construction Machinery Used in Real Estate Sector Based in Lucknow Using Depreciation Method

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Abstract

One of the important resources in the field of construction process is the equipment for the construction companies. Therefore, a noticeable body of review has been dedicated to research studies on construction equipment. This study aims to examine the overall cost that is utilized on equipment in its complete life cycle that is physical life, economical life and profit life that owner do to gain profit before the equipment losses its life. Currently most of the owner uses straight-line method to calculate the depreciation of the equipment. Therefore the objective of this study is to evaluate the cost by using double-declining method which will help in calculating the profit life earlier before the equipment losses its lives.

Keywords: *Construction equipment, equipment life cycle, depreciation method, cost evaluation, replacement.*

1. Introduction

Necessity is the mother of invention." a famous line said by the philosopher Plato that means a need or problem encourages creative efforts to meet the need or solve the problem. Going through the historical record it shows that the first construction equipment was developed somewhere in last century (Larkin and Wood, 1975). Due to which the construction equipment has rapidly replaced animal drawn equipment which were used in construction projects and were taking months or even years to complete the project.

The need of proper management of equipment was very evident even in the early stages of construction equipment history. Management and accounting, cost techniques were introduced to deal with construction equipment and words such as wear and tear, depreciation, obsolescence and interest rate became part of the equipment manager's vocabulary. As the tools improved, the amount and speed with which construction work could be done increased. Therefore the scale and complexity of construction projects increased. This same development cycle continues today.

Equipment is said to be one of the key factors for improving contractor's capability in performing their work more effectively and efficiently (Day and Benjamin, 1991). By strengthen or upgrading the effectiveness of utilizing equipment large volume of work can be completed within a shorter span and more importantly, within the project schedule time.

A survey finding tells that nearly 10% of the equipment needs to be replaced annually on average in country.

The physical needs to perform construction work have not changed very much. The work to be done changes based on the type of project but the activities that have to be performed are similar for all projects. Activities include site work, the base or foundation, structure and associated parts of connections. It could be construction in real estate sector, highway, building, dams etc. The amount and types of machines required may vary but the need for heavy construction equipment will always exist. Development and evolution of heavy construction is predictable in many ways. Tempered by the economic reality, equipment will be refined with necessity driving the design and development just as it has from the beginning.

2. Review of Literature

Equipment life is an important subject in the construction industry. There have been many researches in this field, drawing from these researches I have decided to work in the same field.

This reappraisal is collected from reviews submitted by different researchers on equipment. They used different methodological analysis for work outing the job related to the equipment cost evaluation. Following are the different literature review for cost evaluation of construction equipment. The study of construction equipment is acute and vital because the share of equipment cost is very symbolic in construction project. It is also one of the resource areas in construction that can generate profit if it is utilized efficiently and effectively.

Generally, construction equipment is one of the most important physical assets in a construction industry. It plays a significant role in construction operation and constitutes a major portion of construction projects. Assakkaf, 2003 stated that cost for construction machinery is the second most important factor (just after the construction resources). In fact according to some author like (Tavakoli, Taye and Erktinl, 1989) nearly 50% of the construction companies own the equipment they use. This data informs how construction equipment is given an important place in the world of construction. The owning of the construction equipment mostly depends upon the project work as said by (Sharma, 1999) tells us the role of construction equipment in any project by saying that the cost of equipment in a project varies from 10 to 30% of the total cost of the project, depending upon the extent of mechanization. This statistics indicates that focusing on the investigation of the managerial aspect of such a huge investment needs closer follow up. In addition to this, it should be arguments in the contemporary engineering development to have a closer look at construction equipment because the extent of mechanization in the new technology engineering contexts appears to be mandatory. According to him, the extent of mechanization determines the cost of a project in terms of cost of construction equipment.

Equipment life can be mathematically defined in three different ways: physical life, profit life, and economic life (Mitchell, 1998). Physical and economic life both must be defined and calculated when considering equipment life because they provide two important means to approach a replacement analysis and to ultimately make an equipment replacement decision (Douglas, 1975). The concepts of depreciation, inflation, investment, maintenance and repairs, downtime, and obsolescence are all integral to a replacement analysis (Gransberg, Popescu, and Ryan, 2006). Physical stage is greatly impacted by a repair and maintenance attention that the machine has received over its lifespan Gransberg et al. Profit life is a time period where equipment are generating a profit (Gransberg et al, 2006). This is a most desired stage of equipment life because after this point equipment will operate with a loss (Douglas, 1978). “Increasingly costly repairs exacerbate (decline, deteriorate) this as major components wear out and need to be replaced” (Gransberg et al, 2006) Thus, this is a critical stage in the equipment life to maximize on profitability and efficiencies. Also, the equipments manager must be able to determine this time period to implement a replacement plan for a new machine while the components are useful (Gransberg et al, 2006). Economic life is based on decreasing ownership costs with the increase in operating costs (Mitchell, 1998). In the paper published by (Taylor et al, 1923) told that a nucleus (central or important) of most modern day economic replacement theory. He defined useful (economic) life of a machine as the period of time that minimizes the unit cost of production for that machine. If a machine is sold before or after that period has expired, the average unit cost of production will be greater than the optimum unit cost. Further a very important line was said that, by doing equipment replacement on a proper timing we can prevents losses of profitability by the increased cost of maintenance and operation as the equipment ages beyond its economic life (Gransberg et al, 2006)

Further (Gransberg et al, 2006) said that the physical life of equipment will be identified as the service life. The piece of equipment that has not been given adequate maintenance throughout its lifespan will deteriorate at a faster rate than a machine that was been given substantial preventative maintenance. Thus, the service lives will vary depending on the piece of equipment and the amount of upkeep it has been provided. Life-cycle costs for equipment have two components, ownership and operating costs. Ownership costs would include initial costs, depreciation, insurance, taxes, storage, and investment costs (Peurifoy, and Schexnayder, 2002). Operating costs would include repair and maintenance, tire, tire repair, fuel, operator, and any other consumable equipment cost (Gransberg et al, 2006).

The principal focus of this paper is on the cost evaluation of construction equipment by depreciation as the reduction in price or value of the equipment is associated with aging, its life and also to develop the profile how asset values decline at different stages of lives.

Problem Statement

A general contractor owns a large fleet of equipment to satisfy the needs for equipment resources in its civil and transportation projects, (Fan, H, Kim, H, AbouRizk, S. Han, 2008) The contractor notices

there are large variations of economic life spans for different types of equipment; and these variations also exist for the same class of equipment with different make, preventive maintenance (PM) history, accumulated unit of services (hours or kilometers), etc. The current annual equipment replacement exercise focuses on the metrics of maximum equipment use and the accumulated repair costs and personal judgment. The statistical cost information on equipment groups is useful but not specific enough to guide the equipment replacement. Replacing a piece of equipment too early or too late is obviously a problem that will increase the equipment "internal rate" charged to projects and decrease the contractor's competitive edge in the equipment-intensive heavy construction market. Thus the owner is unable to calculate the overall life of the equipment and the profit that it can gain from that equipment.

3. Methodology

The review paper has been prepared by going through various journal published by various authors, conferences from the various website database library, Douglas D. Gransberg, construction equipment management for engineers, estimators and owners. The review paper contains the various life stage of equipment, equipment importance in the project work. And by going through various journal paper, books and website etc it was concluded that by the help of depreciation pattern methods such as straight line method, sum-of the-year digit method and declining-balance method the cost of the equipment can be easily calculated and will hopefully give the result before by the help of declining balance method as this method is most accurate and as it is the accelerated depreciation method that provides for larger portions of cost to be written of in the early years; this method nearly approximates the actual loss in market value with time

4. Conclusions

The paper summarizes our research on the cost evaluation of construction equipment by the help of depreciation pattern. As profit is very essential on any investment and when the investment is on large scale depending upon the project size then at the end of the work the profit life is calculated specially in the case of equipment. So by declining balance method the profit life can be calculated earlier so by that the investment, replacement, dispose decision on any equipment can be made easily with much profit. Depreciation is important part of accounting records which help the companies maintain their income statement and balance sheet properly with the right profits recorded.

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