DEPRECIATION OF FIXED ASSETS

THEESIS SUBMITTED FOR HONORS
JAMES J. SCHNEIDER
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DEFINITION OF DEPRECIATION

Perhaps the best known and most widely accepted definition of depreciation is the one formulated by the Committee on Terminology of the American Institute of Accountants. This acceptance is most likely due to the increasing importance of the AIA in the accounting field. The definition is a relatively new outlook on the subject but appears to be the most adequate yet formulated. The definition is as follows:

Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage, over the estimated useful life of the unit in a systematic and rational manner. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year.¹

From the definition it is implied that depreciation may be related to all forces, economic as well as physical, which terminate the life of the asset. It is also evident that depreciation is applied to the investment in the asset rather than to the asset itself.

FACTORS OF DEPRECIATION

In order to understand fully the meaning of this definition it is necessary to review the factors that make up depreciation. For purposes of discussion they will be divided into physical factors, functional factors, and contingent factors.¹

PHYSICAL FACTORS

Included in the division of physical factors of depreciation are wear, tear, action of the elements, and passage of time.² These include only those actions which terminate the life of the asset because of its being worn out.

FUNCTIONAL FACTORS

The functional factors are obsolescence, inadequacy and supersession.³ They are the economic factors in the determination of depreciation.

Obsolescence is the loss of usefulness because of progress of the arts or other external causes such as changes in consumer demand, legislation, or regulation leading to reduction of further production of the product.⁴

Inadequacy is the loss of usefulness brought about by a business change.⁵ This is demonstrated in a situation where the

2. IBID.
3. IBID.
5. IBID.
executives of a business would decide that it would no longer be profitable to manufacture a product. The asset which aided in the manufacture would be discontinued from further use.

Supersession occurs when one asset is replaced by another asset which operates so much more efficiently or less expensively than the old one, it is profitable to discard the old asset and install the new one.¹

CONTINGENT FACTORS

Included in the factor of contingent depreciation are such things as casualty losses and accidents.² This would include fire, theft, or less radical things such as breakage of parts of the asset.

FACTORS INCLUDED IN THE ALLOWANCE FOR DEPRECIATION

Of the above noted factors, only those which are determinable may be included in the allowance for depreciation. These would include the physical factors and the functional factors, with the following exception. There may be either ordinary or extraordinary obsolescence. Ordinary obsolescence comes about because of the ordinary workings of a business. When a change of obsolescence comes about suddenly and cannot reasonably be anticipated, it is called extraordinary. Because of the difficulty in determining this, only ordinary obsolescence may properly be included in the allowance for depreciation.³ If the elements which make up the contingent

¹ Finney, OP. CIT. P. 438
² Holmes, OP. CIT. P. 503
³ Finney, OP. CIT. P. 438
factor could be determined with any degree of certainty, they
would be included in the allowance for depreciation. In view of
the fact that this is almost impossible, they are not included.
SUMMARY OF DEPRECIATION

From what has been said it is evident that depreciation is a
procedure wherein an asset can be consumed as originally planned,
consumed at a greater or lesser rate from normal causes, consumed
by accident or other unanticipated causes, uneconomical to operate
when compared to other assets, or unsuited to the future needs of
the producer.¹ The factors which must be considered when setting
the depreciation rate are use, disuse (for an idle machine usually
will decrease in value), change in production (where there would be
no use for the machine in the new product), restriction on pro­
duction, (where there is a loss of material from natural causes or
from government interference), decrease in demand and progress of
the arts.²

VARIOUS FORMULATED IDEAS CONCERNING DEPRECIATION

Although, to the accounting profession, the definition of
the AIA is well understood, depreciation to most persons seems to
be a controversial subject. More than likely this is due to a
misunderstanding of what depreciation is, and what it actually
consists of. Like most of the terms used in business language,
there are many definitions and ideas about depreciation. Some of

¹ Kohler, OP.CIT. P. 115.
² IBID. P. 116.
these concepts will now be discussed.

ACCOUNTING CONCEPT

The accounting concept seems to cover the subject most adequately but is far from being accepted by everyone. This concept distributes the cost or other basic value of the asset over its useful life. The cost or other value consists of the cost of putting the asset into use and getting it ready for production. The useful life of the asset takes into consideration such things as physical factors and economic factors. It may be proclaimed that it would be impossible to discover a rate which would produce the desired result, and, to a certain extent this is true, but unless the product to be manufactured is an entirely new idea and the asset used in the manufacture of the product is new, it is relatively easy by means of the historical approach of using past experience, to determine a rate which will fairly well fit the needs of the producer.

POPULAR CONCEPT

The popular concept sanctions showing the value of an asset between two dates. The advocates of this idea say that it seems reasonable that the value to the owner should be shown in some manner. They believe that normally an asset is used up more rapidly in the early years of its life than in the later years and that the depreciation policy of the owner should reflect this.

2. Ibid.
If this is done the owner would be able to tell his value of the investment at any time. Because of the backing given to this idea by persons believing the value to the owner should be shown in some way, the declining balance method of depreciation has been established. This method does not conflict with the definition given by the American Institute of Accountants. The method itself consists of taking a higher rate of depreciation in the early years of life of the asset and a lower rate in the later years. The rate in actual practice does not change sharply as one might be led to believe. It does however, decline in a systematic manner which is very closely related to the asset itself.

APPRAISAL CONCEPT

The appraisal concept takes up the difference in value between an existing old asset and a hypothetical new asset.\(^1\) In its simplicity this method seem fairly practical but when the liquidity of the economy of the country is considered, it is an almost impossible method to put in practice. Every time that a new appraisal is made for the purpose of fixing the yearly depreciation the appraisal would have to be adjusted in some manner to the year of purchase of the asset. It is almost incomprehensible that this could be done with any reasonable degree of accuracy. The changes in value of the dollar in the last twenty years points up the difficulty of trying to appraise an asset with a value of twenty years ago.

ENGINEERING CONCEPT

The engineering concept is defined as impaired serviceableness.\(^2\)

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1. IBID.
2. IBID.
As assets grow older they may become less useful, but assets that are physically as good as new are not necessarily as valuable as when new. This concept recognizes obsolescence.

INFLUENCE OF DEPRECIATION IN BUSINESS TODAY

Perhaps the most important reason that depreciation has come into the forefront in the business world today is that for many firms, depreciation is one of their largest expenses and because of the difficulty in measuring it correctly it is one of the biggest problems in modern business.¹ Depreciation is important in business for many other reasons also. There are more machines in use today. The high tax rates on corporate profits call for paying taxes only on real profits. The increase in replacement cost of assets has caused a demand that some adjustment of depreciation practice be made to compensate for changing prices.²

DEVICES USED IN BUSINESS TO SIMPLIFY THE PROBLEM

In order to cope with the problem of measuring depreciation accurately many businesses use an "engineering economy study" which helps to give a basis for a choice between assets to be acquired or retired, by making estimates of costs and revenues.³ Another help may be for the owner to find the value of the assets he owns. In order to ascertain this the owner can have an appraisal made to determine the cost of replacement of the assets.

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¹ Holmes, OP.CIT. P. 503
² Lasser, OP.CIT. P. 9-220
³ Ibid. P. 9-230
CHAPTER II

BASIS FOR COMPUTATION OF DEPRECIATION

CAPITALIZE OR CHARGE TO EXPENSE

When the asset is purchased, a decision must be made as to whether to capitalize the cost or charge it to expense in the year of purchase.¹ Theoretically, if an expenditure is to benefit more than one accounting period it should be capitalized and depreciated over the useful life of the asset. When the asset is depreciated over its useful life the portion of the asset which is used each accounting period is charged to expense. Depreciable fixed assets may be looked upon as long-term prepaid expense items. As the investment is used up it is converted into expense. This consumption of value is one of the costs of income earned over the life of the asset.² Practically speaking, some business firms do not feel it useful to capitalize all expenditures with a useful life of more than one accounting period. However the tax laws are tending more and more toward an insistence that expenditures be capitalized when there is a possibility that they may affect a future period.

1. Finney, OP.CIT. P. 441
NECESSARY FACTORS FOR COMPUTATION OF DEPRECIATION

There are three factors which must be considered before depreciation can be computed. The depreciation base, which usually consists of the cost of the asset plus installation cost. The residual or scrap value, which is nothing more than the amount which can be realized on the disposal of the asset. The estimated life of the asset, which can be measured in either time periods, operating periods, or in units of output.¹

DEPRECIATION BASE

Although the basis of depreciation is usually cost plus installation costs, other bases have been used. These are cost adjusted by index of cost of fixed assets or cost adjusted by index of change in general price level. In order to adjust the cost, index numbers must be used. These index numbers are computed by qualified sources and published at regular intervals. By means of a mathematical computation the cost can be adjusted to reflect these desired values. Other bases that may be used if the situation calls for it would be reproduction cost new (which is no more than the cost to produce a new asset similar to the one to be valued), present sound value (which is the appraisal value of the asset), and the income tax base (which is the adjusted base for determining gain or loss on the sale of the asset).

RESIDUAL OR SCRAP VALUE

An asset may not be depreciated below a reasonable salvage value because if this were done a larger amount would be charged to expense during its life than the asset was worth. Likewise, it is not allowed by the tax laws to change the salvage value because of a change in the price value. If this were done the depreciation charges would differ for the periods after the change was made.

USEFUL LIFE OF THE ASSET

The useful life of an asset may be affected by many factors. As has been said it is affected by wear and tear from natural causes, normal progress of the arts, economic changes, inventions and current developments. Besides these factors it is also influenced by climatic and other local conditions and by the taxpayers policy on repairs, renewals, and replacements. Sometimes it may happen that the personal experience of the manufacturer is not sufficient to determine the useful life of the assets which are used in production. If this is the case there are certain aids which are available to the manufacturer. He may look to the producer of the asset, the experience of other concerns, trade associations, accounting handbooks, Bulletin "F" of the Internal Revenue Bureau and certain professional services, such as those of appraisal engineers, business management advisors and reputable publishers of income tax guides.

2. IBID. P. 2019
3. Kohler, OP.Cit. P. 118
However helpful these aids might be, it must be realized that in the determination of the estimated life of any asset, based on normal usage, the most important factor entering into consideration is the general maintenance policy of the owner because this directly affects the life of the asset.¹

UNIT AND COMPOSITE RATES

Depreciation can be either by the unit method or by the composite method. When the unit method is used, the depreciation is computed for each individual asset. When the composite method is used, depreciation is computed for each group of similar assets.² It is easily seen how much more practical the composite method is than the unit method. If there were a large number of assets of one kind used in the manufacture of a product it would be very difficult to compute the depreciation on each individual asset. This would only be a fraction of the difficulty which would be experienced by the accounting department in keeping the records. The results found by using the composite method are just as satisfactory and give just as clear a picture of the depreciation of the assets. A single rate is not applied to all the assets of the firm but to each group of similar assets, because of the varying factors which make the assets different and which would distort the picture as to the amount of the assets left to be depreciated at any one time.

¹. IBID.
². Kohler, CP.CIT. P. 146
USE OF A RESERVE FOR DEPRECIATION

Depreciation is credited to a reserve account because it is an estimate and because it is desirable to keep the cost of the assets recorded.\(^1\) This means that there are two separate accounts kept. The asset account is debited with the cost or other value given to the asset and the reserve is credited with the amount of the yearly depreciation. The reserve is deducted from the asset in order to find the book value of the asset. Once the reserve is equal to the asset there can be no more credits to the reserve because the object of depreciation is to spread the cost over the life of the asset and this cost has already been exhausted.

SCHEDULES OF FIXED ASSETS

The data which is needed in order to compute the depreciation may be kept on a schedule of fixed assets. This shows for each asset the date of acquisition, the cost, the estimated life, the depreciation taken in prior years, and the depreciation allowance for the current year.\(^2\) The most common of these schedules is a lapsing schedule.\(^3\) This is a worksheet in which the costs of assets are entered in various groups with the detail of their distribution over the years since purchase. The purpose of the worksheet is to show the basis for the annual depreciation, the writeoff of assets

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3. Kohler, OP.CIT. P. 247
fully depreciated, the depreciated or undepreciated costs of items disposed of, and the verification of the balance in the reserve so it can at any time be compared to the cost of the asset.

ADVANTAGES TO USING SCHEDULES

Many advantages go with a well kept record of fixed assets. It gives complete information of each asset and total depreciation expense can be obtained from cards. This provides more accurate Profit and Loss Statements and Balance Sheets, facilitates the proper distribution of expense, and gives information as to the distribution of equipment, equipment available for use, transfer and retirement, and the operating history of each asset.¹

¹. Johnson. OP. CIT. P. 281
METHODS OF DEPRECIATION

When discussing the subject of methods of depreciation it is well to divide the subject into sections. These sections will be proportional methods, reducing charge methods and other methods. The methods will be discussed without trying to show any preference of any one method over any other method.

PROPORTIONAL METHODS

STRAIGHT LINE METHOD

This method sanctions spreading the depreciation equally over all periods of the life of the asset.¹

Formula: Depreciation equals basis of asset minus salvage ———— estimated life of asset

Example: Manufacturer purchases a truck to be used in his business of manufacturing and delivering washing machines. The cost of the truck is $1,200.00. Salvage is estimated to be $200.00. The useful life of the truck is estimated to be 5 years.

Amount of annual depreciation. $1,200.00 - $200.00 = $800.00

UNIT SUMMATION METHOD

This method sanctions calculating a new rate each year for application to book cost of units in a property group. The rate is

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¹ Finney, Intermediate Accounting, OP.CIT. P 443
calculated in such a manner as to produce a total charge equal
to the sum of the accruals as though a rate would have been
applied to each item in the group.¹

When this method is used the rates of each of the items of
the group are, more or less, averaged out to produce a rate for
all the items. Of course, this would have to be a weighted average
to take into consideration all factors. This method is a variant
of the straight line method.

Formula: No simplified formula can be given.

Example: To simplify the example, let us say that a manufacturer
has two machines which he used in his work.

Machine A cost $1,000.00, has no salvage, and has a life of ten years.
Machine B cost $1,800.00, has no salvage, and has a life of eighteen
years.

Rate by the unit summation method would be 7.143% $100.00 + $100.00
$1,000.00 + $1800.00

This rate applied to the total cost of the two machines $2800.00,
would give the annual depreciation of $200.00. It must be remembered
that this rate must be calculated anew each year that there is some
change in the asset account.

WORKING HOURS METHOD.

This method takes into account the fact that if an asset is
used more or less than normal it will be worn out faster or slower
than normal. It is based on the number of hours it is used instead

1. Kohler, OP.CIT. P. 163
of the estimated life in years.\(^1\)

Formula: Depreciation per hour equals basis minus salvage \(\frac{\text{basis} - \text{salvage}}{\text{working hours of asset}}\).

Example: Manufacturer purchases a machine which costs him $550.00. The salvage value of the machine is estimated to be $50.00. The estimated number of hours the machine will operate is 50,000. 

Depreciation rates per hour of operation \(\frac{\$550.00 - \$50.00}{50,000} = \$0.10\)

**PRODUCTION METHOD**

This method is based on the amount of time the asset is used and the number of units produced in each of these time periods. This method is peculiarly suited to a situation where the number of units produced by a machine can be fairly well estimated.\(^2\)

Formula: Depreciation per unit of production \(\frac{\text{cost} - \text{salvage}}{\text{total estimated unit capacity}}\)

Example: Manufacturer purchases an assembling machine. This machine cost $22,500.00 and has no salvage value. It is estimated that this machine will assemble 150,000 cardboard boxes.

Depreciation per unit of production \(\frac{\$22,500.00}{150,000} = \$0.15\)

**SINKING FUND METHOD**

As this method is best known, it sanctions actually setting aside periodic equal amounts which, with compound interest, will produce an amount equal to the original cost or the replacement value of a new asset. In this light, this method is not a method at all but a

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fund for the replacement of worn out assets.

However, this method may be used without actually setting aside assets. When it is used this way, it fairly well fulfills the requirements of a depreciation method.

Example: An actual example will not suffice for this method because it would involve the use of actuarial tables. It will suffice to say that the amount to be credited to the reserve in this method is the sum of the amount which would be credited to the sinking fund plus the amount of theoretical interest which would be earned.¹

PERCENTAGE OF SALES METHOD

In some industries where the sales are very closely related to production this method has been used. It is somewhat like the production method as the charge for depreciation varies directly with production.²

Example: Sales for the year are $82,000.00. Percentage of sales to be used for deprecations is 5%.

Annual depreciation $82,000.00 x .005 = $4,100.00.

REDUCING CHARGE METHODS

UNIFORM RATE ON DIMINISHING VALUE METHOD

This method gives a rate which is applied consistently to the declining balance of the asset. If this method is used a salvage value must be also used. If there is no salvage value a nominal value of one dollar is used.

¹ Kohler, OP. CIT. P. 155
² Royal D.N. Bauer and Paul Holland Darby, Elementary Accounting (Barnes and Noble, Inc.: New York, 1952) P. 70
Example: Manufacturer buys a delivery truck which costs $6,000.00 and has a salvage value of $1,000.00. The estimated life of the truck is eight years.

By the use of logarithms applied to a mathematical formula it is determined that the rate is 28.7166%. This rate would be applied consistently to the diminishing balance of the asset account. The first year depreciation would be: $6000.00 x 28.71666 = $1723.00. The second year depreciation would be: $6000.00 - $1723.00 = $4277.00. $4277.00 x 28.71666 = $1228.21. 1

SUM OF THE YEARS DIGITS.

This method is similar to the preceding method except that no salvage value need be used and the asset is written off faster. 2 When this method is used a fraction is arrived at which is applied consistently to the declining balance of the asset.

Formula:

\[
\frac{N}{N (N+1)} \times \frac{2}{2}
\]

N equals estimated life of the asset.

Example: Manufacturer purchases a machine which cost $12,000.00 and has no salvage value. The estimated life of the asset is 15 years.

Fraction equals \[\frac{15}{15 (15 + 1)}\]

Fraction equals \[\frac{15}{120}\]

Depreciation for the first year \[\frac{15}{120} \times 12000.00 = 1500.00\]

Depreciation for the second year \[\frac{15}{120} \times 12000.00 = 1100.00\]

1. Finney, Intermediate Accounting, OP.CIT. P. 1147
2. Ibid. P. 1148
DIMINISHING RATES ON COST METHOD

When this method is used the rates are chosen arbitrarily and applied to cost. In this method it is the rates that decline. 1

Example: Manufacturer purchases a machine for $10,000.00 which has no salvage value. The rates which are chosen for the first two years are 15% and 14.32% respectively.

The depreciation for the first year $10,000.00 x .15 = $1500.00
The depreciation for the second year $10,000.00 x .1432 = $1432.00

OTHER METHODS

APPRAISAL METHOD

When this method is used the asset is appraised at the end of the period and the difference between the balance of the asset and the appraisal is written off as depreciation. If this method is used the appraiser must be careful to exclude upward or downward fluctuations in market value. 2

Example: Appraisal value of asset is $11000.00. Balance in the account is $1500.00. $100.00 is considered the depreciation expense.

METHOD BASED ON INCOME

When this method is used depreciation is written off in proportion to the income of the period. If a large amount of income is earned during the period, a large amount of depreciation is written off. If a loss is incurred during the period, no depreciation is written off. 3

COMBINED DEPRECIATION AND UPKEEP METHOD

In this method the usual base of the asset is increased by the estimated maintenance costs which will be incurred over the life of

1. Ibid.
2. Ibid.
3. Ibid.
the asset. When actual maintenance costs are incurred they are charged to the reserve. The purpose of this method is to equalize irregular maintenance charges.¹

ANNUITY METHOD

When this method is used the provision for depreciation is a constant amount which is equal to the sum of:

1. A provision at a specified rate necessary to recover cost.
2. Interest on previous accumulations of periodic payments.
3. Interest at higher rate on declining investment in the asset.

The depreciation expense is charged with a greater amount of depreciation than cost. Interest income is credited with the difference. This is hypothetical interest income which comes from the use of the machine.²

RETIREMENT AND REPLACEMENT SYSTEM.

These are not depreciation methods at all but are similar to systems used for depreciation.

A. Retirement. Expense is charged with cost, less salvage, of any asset retired and new assets are charged to property accounts at cost.

B. Replacement. Expense is charged with cost of new replacement asset, less salvage of asset retired.³

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¹ Kohler, OP.CIT. P. 153
² H. A. Finney and Herbert E. Miller, Principles of Accounting, Advanced (Englewood Cliffs, New Jersey: Prentice Hall, Inc. 1952) P. 253
³ Finney, Intermediate Accounting p. 450
BIBLIOGRAPHY


