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ACCOUNTING FOR DEPRECIATION AND DEPLETION*

NORMAN FITZHUGH**

The necessity of a reasonably accurate determination of depreciation and depletion in measuring net income, or in determining a financial position, is now so well recognized that it hardly seems worth while to review the gradual growth of this recognition. Many causes have contributed to this result. Accountants have continued to stress its importance and their efforts have been helped materially in later years through the recognition of its importance by various taxing authorities and regulatory bodies.

In any discussion of accounting for depreciation and depletion where the discussion is not intended primarily for accountants, it is necessary to define as clearly as possible the accounting conception of these terms.

Depreciation as used by the accountant does not conform to the ordinary dictionary definition of this word. The word depreciation is derived from the Latin verb *depretiare* which is derived in turn from the Latin *de*, meaning away from, and *pretium*, meaning price, and the dictionary stresses price, or sales value, reduction. To the accountant depreciation means, not a loss of money or sales value, but a loss of useful value, and the following definition has been generally acceptable to accountants:

“Depreciation is loss in physical or functional value of physical property, other than wasting assets, due primarily and chiefly to ordinary wear and tear which has occurred theoretically in the past and is not offset by adequate repairs and replacements.”

Depletion refers to wasting assets such as unmined minerals, uncut timber, *etc.*, and is measured by the proportional part of such assets removed. The word comes from the Latin *depletus*, from *de*, away from, and the verb *plere*, meaning to fill. Its literal derived meaning is therefore to unfill, which fairly states its meaning to accountants and others. It refers to the removal of natural resources from the original stock.

Another term having a relationship to these terms is *obsolescence* which is a loss in functional or economic value due to such causes as the normal progress of the arts and sciences. This term

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indicates the inadequacy of the asset through inability to compete with more modern things of the same class rather than any loss through wear and tear. It frequently is an important element in depreciation computations but is usually included as part of the depreciation allowance rather than as a separate item. Sudden and unexpected obsolescence on the other hand does not enter into the calculation of depreciation.

The term *amortization* is usually used in connection with intangibles. It may write off a bond discount or premium, or it may write off patents, copyrights, leaseholds, *etc.*, over their expected life. It is also frequently used to refer to the write-off of physical assets in such cases as, for example, the erection of buildings on leased land where it is known that the life of the buildings will considerably exceed the term of the lease. Whether the term depreciation or amortization is used in such cases is not particularly important.

Depreciation and depletion frequently occur side by side, particularly in operations having to do with natural resources, and there are certain borderline cases in which there is not entire agreement as to whether certain items which are really deferred charges are to be made subject to depreciation or depletion. In opening a coal mine, for instance, certain preliminary work, such as driving entries or haulways into the coal preliminary to commercial operation, is capitalized. In such cases, the term depreciation is frequently used in writing off this development work, although it would appear that in the interest of a uniform terminology this term should be more properly used for physical assets only.

DEPRECIATION

The definition of depreciation previously given states that it is due "primarily and chiefly to ordinary wear and tear". This is the usual cause of depreciation and in many cases, especially of short-lived assets, the only cause. However, since other things frequently contribute to depreciation, a better understanding of depreciation, as the term is used by accountants, will be gained by a brief statement of the various contributory causes. These causes are briefly as follows, and while the various factors are usually of importance in the order in which they are here stated, this is not always true and in fact their importance will vary materially from this order in certain industries.

(1) *Wear and tear of use.* As before stated, this is the chief cause of depreciation and generally the cause whose results can be most accurately foretold. The adequacy of the asset to the duty it has to perform has an important bearing here. It is obvious that a machine used in work for which it is intended will last longer than if it is loaded with work too heavy for it.

(2) *The action of time and the elements.* The ordinary processes of decay, rust, the action of acids and other deteriorating actions all take their toll. It is frequently the case that assets depreciate more rapidly in idleness than in use.

(3) *Deficient maintenance.* The question of adequate maintenance has an important bearing on depreciation. The definition of depreciation previously given makes it clear that depreciation is to take care of the loss not made up by repairs and replacements. This does not mean that ordinary repairs, which merely keep the asset in useable condition over its normal life, should decrease depreciation allowances. The depreciation charge is normally based on adequate maintenance if it is to be determined with reasonable exactness, and insufficient maintenance must be provided for by increasing the normal allowance.

(4) *Obsolescence.* The effect of obsolescence is one of the hardest factors to estimate with any reasonable certainty. Normal progress causes buildings and equipment having a fairly long physical life to become "out of date" and uneconomical to use on account of necessary competition with more modern buildings and equipment. The history of industry shows constant change in this respect. The element of obsolescence which the accountant must take into consideration in calculating a depreciation allowance is only that which is the result of more or less gradual processes and which, from the evidence of the past, can reasonably be foretold for the future. This is difficult enough but experience has shown that depreciation allowances on long-lived assets which did not take this factor into account have been entirely inadequate. It is impossible for the accountant to provide for sudden and catastrophic changes sometimes called obsolescence. He should not burden the income of a given period with provision for something which may not happen. It is frequently the part of wisdom to provide reserves for unforeseen contingencies but such a reserve is merely an arbitrary allocation of surplus.

The federal income tax laws provide for a deduction which is termed "a reasonable allowance for the exhaustion, wear and tear

of property used in the trade or business including a reasonable allowance for obsolescence." Departmental regulations distinguish between such gradual lessening in value as may be included in this allowance as obsolescence and a sudden and unexpected termination of value which may be taken as a loss only when it occurs.

(5) *Exhaustion of supply.* An element to be considered is whether the normal life of the asset will exceed the supply of product in connection with which it is of use. This applies particularly to assets used in connection with wasting assets such as sawmills, mining plants, etc.

BASIS FOR DEPRECIATION

The first step in determining depreciation allowances is of course to determine the base or sum to be depreciated. In any case, the sum to be depreciated will not include the estimated salvage value, if any, which the asset will have at the end of its useful life. In many cases, where it is expected that the salvage value of an asset will be insignificant, it is, as a practical matter, deemed to have no salvage value. Where there is a large number of items, the inclusion of insignificant salvage values unnecessarily complicates the determination without having any real practical value. In such case, the full base of the asset is recovered through depreciation and if there is any salvage it is treated as income.

Cost of the asset is almost universally recognized as the proper base to be recovered. This is on the theory that the question is simply that of recovering the amount actually expended and not the question of replacement of an asset. Cost in this case means the original cost in money or its equivalent of the asset in place and ready to perform its intended function, less its estimated salvage value, if any. It will include, in the case of machinery and equipment, freight and installation charges. In the case of buildings erected by the owner, it will include various overhead charges such as insurance during construction, etc. In the case of equipment manufactured in the plant in which it is to be used, it should carry its ratable share of costs, the same as equipment manufactured for sale.

While cost is so generally recognized as the proper base for accounting purposes that it can be stated as the general rule, there are advocates of other methods which may be briefly mentioned.

What is known as *replacement cost* is based on the theory that it is an asset rather than dollars and cents which is to be recovered.

There are many reasons why this theory does not find general acceptance. In very few cases will the asset be replaced by exactly the same kind of asset, and there is the further difficulty of determining what the price level will be at some future time.

The *cost plus maintenance* base advocated by some is on the theory that the total cost of an item of depreciable property over its useful life is the cost of the property plus the cost of maintaining it in a useable condition. This is a plausible theory but the practical difficulties in using it are too great. In addition to other factors the amount of maintenance to be spent must be estimated in advance. It simply introduces another element of possible error.

Certain other bases are used in certain instances. The practice, somewhat general a few years ago, of writing up assets to reflect what were then considered sound values has fallen into some disrepute, and in many cases assets had to be written down again. Where appreciated assets remain, it may be stated in general that where the corporate entity has changed, or where securities were sold to the public on the basis of appreciated values, depreciation on the written-up value in excess of cost should be charged against earnings just as depreciation on cost is charged. In other cases, the depreciation on value in excess of cost may properly be charged against the surplus resulting from this excess value. In either case of course, the total value — cost plus appreciation — must be recovered through the depreciation charge.

Income tax laws allow other bases in certain cases, such as the value of assets at March 1, 1913, of assets acquired before that date, or the value at the date of gift of property received by gift before January 1, 1921. In general, however, cost is the basis required. Adjustments to cost on account of reorganizations, mergers, *etc.*, are entirely statutory and have reference to the basis rather than the method of calculation of depreciation.

METHOD OF COMPUTATION

In the computation of depreciation, after the basis to be recovered is determined, the next step is to choose the method which can most accurately be applied. At this point it will be necessary to determine two things. First, whether depreciation shall be calculated on each item or on groups of similar items, and second, what unit of measurement must be used. This unit of measurement may be time based on life expectancy, or unit of product

based on the ultimate capacity of the asset to take care of so many units during its life.

Whether to depreciate items singly or to use groups of items will usually depend on the size and age of the operation. It may be stated, however, that almost all large operations now keep such records that group depreciation is merely the total of individual items. The use of so-called composite rates on large groups of dissimilar items has fallen into disuse owing to its impracticability.

Whether to write an asset off over its estimated useful life on the basis of annual charges, or to write it off ratably by units of product which it may expect to handle in its life, or to write it off over the number of hours it may be expected to operate during its life, are questions of engineering and operating experience rather than accounting. Other things being equal, the choice will gravitate to the unit whose quantity can be most accurately foretold. If the accountant has to determine these questions himself without engineering or management assistance, he will examine such records as exist covering the performance of similar items, and he will have access to many published tables of life expectancy of various kinds of assets. These things must be examined in the light of any peculiar conditions which may exist in the particular industry which might cause variance from the average. The methods of determining depreciation ordinarily used are as follows.

Straight Line Method. This is the method generally used and has to its credit simplicity and ease of application. Under this method, depreciation is charged in equal annual instalments over the useful life of the asset. It is probably as accurate as any other method, its accuracy usually increasing with the number of items to which it is applied. While it is true that it is difficult to estimate what the life of any particular unit will be, surprisingly accurate results can be obtained over a large number of units. If a reasonably accurate forecast of probable life has been made, it will not be necessary to take any particular account of discarded items since the items discarded before being fully depreciated will be fairly offset by items still in use but fully depreciated on the books.

Diminishing Balance Method. This method consists of applying a fixed percentage to the diminished balance each year which will reduce the asset to its salvage value at the end of its useful life. The advantages claimed for this method are that, as the asset grows older, maintenance costs tend to increase and since depre-

ciation charges are being reduced each year there is a more equal distribution of total costs. It is not often used since it is cumbersome in application. It may be used with advantage sometimes where there are few units but in a large plant with many units of different ages, maintenance tends to equalize itself and the straight line method produces just as accurate results with considerably less trouble.

Production Method. This method is useful where there is production of a uniform product or where the wear and tear from use is particularly heavy. This method is frequently used also in computing depreciation on assets used in the production of natural resources. It consists simply in writing off the assets at so much per unit of product. The difficulty here — and the same difficulty applies to depletion — is in determining the number of units. It has a very irregular spread if production is not fairly continuous, but it has the very considerable advantage of charging depreciation more equitably against the cost of the product. It is a very logical method and the fact that it is not more generally used is due to its difficulty of application in most cases.

Machine-hours Method. Applied in cost accounting, it consists of placing a charge against each hour a piece of equipment is in use. It is based on an estimate of how many hours the equipment may be expected to operate during its life.

Annuity Method. This method is based on the theory that the asset involved should return interest on the diminishing value of the investment. An equal annual charge is computed sufficient to take care of this interest as well as the investment. This charge is then reduced by the interest, and since the interest on the diminishing balance decreases year by year, the amount of the depreciation charge increases each year. The objection to this method is that the charge against earnings is heaviest in later years when maintenance also tends to become heaviest.

Sinking Fund Method. This method requires that a sum be set aside annually which, with such interest as it can be expected to earn, will recover the cost of the asset by the end of its useful life. If an actual fund is established and the fund earns interest, it is a useful method. In most cases, however, it is impracticable and it is seldom used.

While no system of depreciation is free from some objection, it is the duty of the accountant to seek in each case for the system which will in all likelihood produce the most accurate result, always

provided the system is practical and useable, and, as has been stated, it has been found that the straight line method will serve most acceptably in most cases.

It should be stated that depreciation as determined by the accountant does not often agree with actual observed depreciation as determined by appraisal. The reason for this does not seem to be generally understood. If an asset is in 90% physical condition and depreciation amounting to 40% of the cost of the asset has been written off instead of 10%, it seems to many people unreasonable. The reason for this apparent discrepancy is of course that the accountant is concerned only with service life and if 40% of its service life has expired, or if 40% of the units it can handle have already been handled, only 60% of its service life remains. It is not generally understood outside of industry itself that an asset cannot deliver 100% of its physical life. When it has reached a certain percentage of deterioration or inadequacy it cannot be used economically and must be replaced. Due recognition has been given to this deviation from observed depreciation in the definition of depreciation at the beginning of this article in the words "which has occurred theoretically in the past". The accountant's definition does not recognize depreciation as any lessening in sale value or as any particular percentage of physical condition, but only as a percentage of service life expired.

DEPLETION

Since depletion refers to a diminution of supply of natural resources it is measured in terms of units of the asset. Unmined coal or other mineral, oil and gas in the ground, or timber on the stump may be likened to an inventory to be drawn on as needed. This undrawn balance is termed the reserve. It may consist of raw materials to be further processed or it may consist of raw materials to be sold as they are removed. Theoretically, the determination of depletion is simple: in its calculation a unit cost is determined which is the total cost of the reserve in place divided by the number of units which the reserve contains, and this unit cost is applied to the number of units produced. If it is correctly applied, the diminishing asset or reserve will always carry its proper proportion of original cost or other basis, and the asset will be entirely written off when the last unit is produced.

While the theory is simple, the practice is sometimes very difficult, since it is almost impossible in many cases to estimate the

number of units with accuracy. Uncut timber can be estimated by a competent cruiser with considerable exactness, but minerals underground present considerable difficulties and oil and gas present still more difficulties. In many cases any reasonably accurate determination is almost impossible, and it has sometimes been suggested that in such cases the accountant should not attempt to charge depletion, but should simply say that there is so much remaining after all other charges and that this residue contains an unknown element of depletion or capital return. It is generally accepted, however, that an estimated depletion, based on the best engineering and other opinion possible, should be used in such cases and corrected as changes are indicated.

It should be stated that neither a depreciation nor a depletion determination should be like the laws of the Medes and Persians. If through any change in conditions it can be determined that the useful life of any asset may be longer or shorter than was originally estimated, the allowance for depreciation should be changed accordingly, and if it is determined at any time that the recoverable units of product are more or less than anticipated, the unit charge must be adjusted. The object in all cases is to show the facts with as much exactness as possible.

Certain statutory allowances for depletion under federal income tax acts are entirely arbitrary and do not affect accounting procedure. Percentage depletion, while useful for tax purposes, cannot displace cost depletion, which must be determined as accurately as possible for the computation of profit or loss and the statement of the financial position.

The question of depreciation in the case of public utilities has been so controversial that it would be impossible to cover it adequately in any short article. In the main, utilities except telephone companies have in the past used what is known as the retirement reserve method in taking care of depreciation. This retirement reserve method rests on the theory that in a mature public utility retirements and replacements occur with such regularity that it is not necessary to create a reserve except for retirements which can be expected within a short period and that there is actually no loss until the property is retired. This does not conform to the accounting concept which maintains that no matter how large the aggregate assets are, a proper financial position cannot be stated unless the assets as a whole are reduced by an amount representing at least a reasonable estimate of that portion of the service life of

all assets which has expired. There has been some tendency of late to favor this viewpoint by public service commissions.

In closing, it might be well to consider the ultimate effect of depreciation charges. Fundamentally, depreciation is an element of the cost of goods or services and it is expected that it will be recovered through revenue as a part of the price charged for such goods or services. If it is so recovered, as it will be except where there is an actual operating loss, the depreciation charge does not result in loss but results in the conversion of an asset from one form to another. When depreciation is entered on the books there is a charge for depreciation as an expense or cost affecting profit and loss and a corresponding credit affecting the balance sheet by decreasing the net value of the asset. Without further consideration it might appear that nothing but loss has occurred. Actually, however, this depreciation is in the process of being recovered as part of the price charged for goods or services, and while there is a decrease in depreciable assets, there is a corresponding increase in cash or accounts receivable or some other asset. Since proper accounting requires that the business be reimbursed for all costs including depreciation before there is any addition to surplus, it follows that there is no diminution of net worth on account of depreciation charges unless there is an actual operating loss.