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Oil Inventories Accounting *

BY HOWARD S. THOMPSON

The subject of oil inventories is one which has caused, and still is causing, a great deal of controversy, both within the petroleum industry and between the industry and the accounting profession. For some time committees of the American Petroleum Institute and the American Institute of Accountants have been working closely together in the attempt to establish some formula with respect to inventories which will allow fair statistical comparisons between oil companies. The tangible results to date appear, however, to be quite insignificant, probably because the subject is such a broad and complex one and there are so many and various methods now in use.

There is relatively little accounting literature relating to the oil industry and such as there is does not, in my opinion, do justice to the subject of oil inventories. This may very well be for the reason that no one as yet has desired to take the responsibility of putting his name to a subject which has so many pitfalls, and I, myself, have no wish to rush in where wise men fear to tread. It is accordingly intended not to offer my opinions as definitive answers to the questions discussed, but rather to submit the problems in the hope that satisfactory solutions will be hastened by more extended thought and effort on the part of professional accountants generally.

PERMANENT AND SEMI-PERMANENT STOCKS

The many different problems which arise in accounting for oil inventories are so closely related to each other, and all have so many ramifications of their own, that it is extremely difficult to separate one problem from the others, and it is likewise difficult to discuss the general principles applying to any of them without becoming involved in a consideration of technical details. There is, nevertheless, one question which I think may safely be said to be more fundamental than the others but, unfortunately, has so far not received the attention its importance warrants, although it has been considered by some accounting officers of members of

*An address before the California State Society of Certified Public Accountants at San Francisco, California, June 7, 1935, and also before the Los Angeles Chapter of the California State Society, October 7, 1935.

the industry and by some professional accountants; and it is now, I believe, being studied by the committees representing the two Institutes. This question relates to the large quantities of various petroleum products, in excess of normal current requirements, which are frequently carried by integrated oil companies and by many refining companies, and, at times, due to peculiar circumstances, by strictly producing companies.

The many causes for this condition may be indicated by a few illustrations. In the case of an integrated company or a refining company, it may be due either to the policy of purchases in the attempt to maintain stabilized market conditions, to the desire to accumulate adequate reserve stocks to protect future requirements, to inability to dispose of the excessive stocks or to a combination of these factors. In the case of a producing company holding a large quantity of crude oil in excess of current sales, this may likewise be due to the inability to dispose of the excessive stocks, or it may result from the expectation of higher prices. Physical conditions also have a considerable effect upon the quantity of petroleum products continuously included in oil inventories. For instance, where floating tank covers are used in order to minimize the losses from evaporation, the tanks having such covers can not be emptied below the point at which the descent of the floating cover is stopped without incurring some of the evaporation losses which the cover is designed to prevent. It is probable that the quantity of oil or other petroleum product in such a tank would not ordinarily be reduced to the point where the floating cover would be ineffective. Again, the use of pipe lines for the transportation of crude oil or refined products has the effect of "freezing" in the inventory the quantity of such products necessary to fill the pipe line. It is, of course, obvious that the same crude oil or other product does not remain in the pipe line, but, as the quantity in the pipe line remains practically unchanged, the principles concerned are substantially the same as those relating to petroleum products in tanks with floating covers.

Whatever may be the cause, it is known in many cases, and can be reasonably assumed in many other cases, that the inventories are in excess of normal current requirements. All accounting authorities seem to agree that a clear distinction should be made between current assets and other assets and that the classification of current assets should include only those which either represent

cash or are expected to be realized, in cash or the equivalent, within a reasonable length of time in the ordinary course of business. It may, therefore, be strongly urged that in the circumstances previously mentioned, the inclusion of an entire oil inventory among the current assets is definitely contrary to accepted accounting principles.

In order to reflect the oil inventories in the balance-sheet in accordance with the generally accepted principles of accounting, it is necessary first to determine the quantities and the valuation bases for the permanent or semi-permanent portions thereof and next to determine the proper classification for these more or less fixed portions. These two problems are very closely related and, in both, the difficulties of solution are by no means insuperable, once agreement has been reached on the general proposition that only the current portion of the oil inventories should be included in the current assets.

A survey, recently made of the economic inventory requirements of all refiners, pipe lines and terminals, indicates the somewhat surprising result that approximately two-thirds of the total composite inventories are to a considerable extent frozen. This percentage undoubtedly varies in individual integrated companies and refiners, but it is rather convincing evidence that a large portion of such oil inventories should not be considered as current assets. At least a few of the progressive oil companies maintain statistics relating to their expected current requirements and to the availability of various portions of their inventories for those requirements. In the absence of such statistics in a particular case, the quantities of crude oil and other products to be excluded from the current assets could be satisfactorily determined, under the general rule previously stated, that current assets are those expected to be realized in the regular course of business within a reasonable period.

It has been shown that specific oil may remain permanently in storage in tanks with floating covers, and that equivalent quantities may be permanently maintained in pipe lines, even though there is an actual physical change in the oil. Comparable conditions are frequently found to affect a substantial portion of the inventory. It is not unusual for the same oil to remain in the same tanks for a number of years, and even oftener the oil moved from storage tanks is immediately replaced by a comparable quantity of other oil. It accordingly follows that, where ade-

quate statistics are maintained by the accounting company, it is possible quite easily to determine, not only the portions of the inventory which are more or less fixed, but also to identify the particular quantities of oil belonging in that category. Where such identification is possible, it is helpful in establishing the price basis to be used in valuing this portion of the inventory.

If it is agreed that the fixed and semi-fixed portions of the inventory are to be excluded from current assets in the balance-sheet, the question of their proper classification is then presented. It may fairly be urged that the fixed quantities of oil, which must be permanently maintained in tanks with floating covers, in pipe lines and under other comparable conditions, are a part of the permanent investment which is necessary to ensure the most effective use of the physical equipment. Since these quantities usually are not, and in many instances can not, be sold or removed as long as the particular physical equipment is in use, it would follow that, to be strictly in accord with accepted principles of accounting, the values of these quantities of oil should be included in the fixed (capital) assets.

Next to be considered and classified is the oil which is carried as a reserve for future requirements. This oil is surely not a current asset and, although it is not fixed as an asset to the same extent as is the oil required to assist various items of physical equipment to fulfill their functions, it seems to me that it may reasonably be likened to the underground reserves of oil, the investments in which are, of course, included in the classification of fixed assets. It could, therefore, be decided with apparent propriety that the inventory of oil in reserve storage should also be reflected in the balance-sheet as a fixed (capital) asset.

In a different category is the oil which is held by reason of a market stabilization policy or the company's inability or indisposition to sell. Both of these conditions often exist in the case of an integrated company or a refining company, and both may also be present in the case of a producing company—although in the latter case the accumulation of inventory stocks is also frequently due to the expectation of higher market prices. Such oil is the most difficult of all to classify properly, and this difficulty is due to a large degree to the deficiencies and inconsistencies in our present accounting terminology, which has "justed growed" like Topsy. The oil in this category is certainly neither a current asset nor a fixed one, but what is it? It might be said to be a

deferred asset in the sense that its realization is assuredly deferred, although this classification has not been widely used for assets of any nature. On the other hand, this oil seems to possess the characteristics of a semi-permanent investment in a commodity, rather than in a security to which the balance-sheet designation of "investments" has customarily been restricted. It will thus be seen that there is now no existing classification in which to reflect, with entire satisfaction, the excess oil stocks resulting from market conditions. However, at the present time and until more clarity and elasticity develop in the terminology of accounting, I would be inclined to favor including the semi-permanent investment in inventory in the classification "investments" with the investments in securities.

The foregoing remarks are not quite as revolutionary as they may seem. It has already been said that these conditions are well known to officers of the industry and, although not perhaps for the same reasons which I have expressed, are nevertheless included in the matters which have been, and are still being, discussed between the committees of the American Petroleum Institute and the American Institute of Accountants.

METHODS OF ACCOUNTING FOR OIL INVENTORIES

The accounting problems relating to the subject of oil inventories start with the production of crude oil and increase in variety and complexity as the oil is refined and marketed. This condition can be indicated by the following questions, which must be decided in each particular case more or less arbitrarily, at the present time, on account of the absence of anything in the nature of a recognized practice.

Should the current posted market prices or the cost prices be used in valuing inventories of crude oil?

In running crude oil to stills should the "first in and first out" method, the average cost method or the "last in and first out" method be used?

Should the crude oil inventories be reduced to cost or market, whichever is lower, on the balance-sheet? If this is done, should the deduction be shown as a reserve account or as a credit to the assets?

Should the corresponding charge then be made in its entirety directly to profit-and-loss or to surplus with respect to the adjustment applicable to that portion of the inventories carried forward from a prior period?

The "last in, first out" method of valuation of petroleum inventories recommended by the American Petroleum Institute's committee on uniform methods of oil accounting, and adopted by the Institute's board of directors, appears to be an indirect attempt to solve some of the problems created by the existence of large permanent petroleum stocks. In the application of this principle it has been recommended that:

"Current costs of crude oil and products should be charged against current sales as long as inventory quantities remain approximately unchanged or sales are about equivalent to new acquisitions (production and purchases).

"In the costing of crude oil stock (inventory), current production and current purchases should be the first applied to current cost of sales and current operations . . .

"In the costing of product inventories, current purchases and current production should be the first applied to current cost of sales and current operations . . .

"In starting the 'last in, first out' inventory plan, the prices should be set at a conservative or reasonable figure. In the future, inventory prices should not be reduced to market prices, when lower than the regular inventory value. Where the market value of the inventory is less than that carried in the balance-sheet, such condition should be shown in parentheses or as a footnote in such manner that the approximate difference can be ascertained, either in dollars or percentage."

This action of the American Petroleum Institute was commented upon in an editorial in the March, 1935, issue of **THE JOURNAL OF ACCOUNTANCY** in which it was said that,

"There will be differences of opinion as to the accuracy of the method of valuing inventory which is recommended by the Petroleum Institute, and in recognition of this fact it has been arranged that deliberations shall take place between the accounting committee of the Petroleum Institute and the American Institute of Accountants' special committee on inventories. These deliberations should determine whether the principle of 'last in, first out' may be considered as acceptable and in consonance with sound accounting or, if there be a difference of opinion between the two committees, what alteration in the method of application of some such principle may be required to make it acceptable. There has been something resembling a tradition in favor of 'first in, first out' for ordinary merchandise inventory valuation, but it may be that there is something inherent in the inventory of commodities such as oil which will justify the principle which the Petroleum Institute now advocates. At any rate the question is of more than academic

importance and the two committees should be productive of something almost authoritative."

This editorial was unquestionably correct in stating that there would be differences of opinion as to the accuracy of this method, although I think that the weight of the argument would be adverse. If this procedure as recommended by the American Petroleum Institute's committee was an indirect attempt to solve the accounting problems created by semi-fixed inventories, as indicated by the Institute's explanation, it is my opinion that the solution not only does not solve the problem but creates an entirely erroneous situation. On the other hand, I am far from being in accord with the "first in, first out" method which is quite reverently referred to in the aforesaid editorial in THE JOURNAL.

There seem always to have been arguments, and there perhaps always will be, on almost every angle of inventory accounting, but on none more than on this particular phase. For some years I have favored the "average" method of accounting for the flow of commodities and their inventories, as I am convinced that better results are currently obtained under this method and that more satisfactory comparisons can be made as between periods. There are many situations in which neither the "first in, first out" nor the "last in, first out" rule can be applied for various reasons, and even in those cases where it is possible to use one or the other of them, I think that they are much less desirable than the "average" method, on account of the defects in the reasoning upon which they are based.

For example, suppose that in an 80,000-barrel-capacity tank there are 40,000 barrels of thirty gravity crude oil, purchased at the price of \$1.00 a barrel, amounting in the aggregate to \$40,000, and that subsequently 40,000 barrels of twenty-eight gravity crude oil are purchased at the price of \$0.90 a barrel, aggregating \$36,000. Assume for the sake of illustration that when the later purchase is run into the same tank and commingled with the previous quantity of thirty gravity oil, we have then 80,000 barrels of twenty-nine gravity oil, which cost a total amount of \$76,000, representing an average price per barrel of \$0.95. Thereafter 20,000 barrels of this twenty-nine gravity oil are sold from the tank. From which purchase was this oil sold? Was it from the thirty gravity oil purchased at \$1.00 or was it from the twenty eight gravity oil purchased at \$0.90? It is probable that under

these conditions the question could never be definitely answered and it would follow, therefore, that the use of either the "first in, first out" or the "last in, first out" method would necessarily be based upon a purely arbitrary assumption. In view of these circumstances, it is my belief that the "average" method more nearly accounts for what actually happens.

The following condition, although somewhat unusual, will further illustrate the point. A large oil company has a distributing depot in a portion of the world which is inaccessible during approximately six months of each year, and it accordingly must make deliveries to this depot during the remaining six months, say beginning with the first of April and ending with the last day of September. The sales made by this depot are relatively small during the period in which it is receiving supplies, and its major distributing operations occur from the first of October of each year to the last of March the following year. Would it be correct to say that the oil or other petroleum products sold from this depot during the month of October are those which it received during the period immediately preceding? Would it not be more correct to say that the inventory on hand at October first consisted of so many barrels of oil at an aggregate cost of so many dollars, and that therefore each barrel of oil sold from this stock should be costed out at the average price per barrel?

Nearly every oil company maintains a record of the physical movements of the various commodities and of their inventories. These movement records facilitate the application of any accounting method and any basis of valuation which may be used, but even with this assistance the "average" method is somewhat easier to operate than either the "first in, first out" or the "last in, first out." The example given with respect to a particular tank is not intended to indicate that the accounting for movements and inventories of products should in all cases necessarily be in such detail that each individual tank must be separately treated. The circumstances in each case will control, I believe, the extent to which detail accounting is required. It may therefore be stated as a general proposition, which is of course subject to modification in specific instances, that each separate group of tanks in the same location containing the same commodity, whether it be crude oil, gasoline, fuel oil or some other product, may satisfactorily be accounted for in the principal records as a unit under the "average" method.

It remains to be seen, of course, just how widely the "last in, first out" method will be adopted by the members of the oil industry, and a forecast naturally can not be made at this time as to the result of the deliberations on this question between the committees of the American Petroleum Institute and the American Institute of Accountants. It is to be hoped that whatever conclusion is reached will aid in gaining the ultimate end of fair statistical comparisons between companies.

METHODS OF PRICING OIL INVENTORIES

So closely connected with the problems relating to the current and non-current portions of oil inventories, and to the methods of accounting therefor, as to be virtually inseparable are the problems relating to the methods of pricing these inventories. The methods currently in use among members of the oil industry vary considerably, not only between various companies, but, in some cases, between different departments within a company in regard to the several commodities produced. These methods may, however, be broadly described as cost or market, whichever is lower, actual cost and expected realization. Each one of these methods has some advantages as well as some disadvantages which distinguish it from the others.

The cost-or-market-whichever-is-lower method is, I believe, subject to more objections than the two other methods, for its use has in the past years caused quite absurd conditions in the accounts and published reports of oil companies as a result of widely fluctuating market conditions. This circumstance was recognized by the American Petroleum Institute's committee on uniform methods of oil accounting when in connection with its recommendation of the "last in, first out" method, it also recommended that "in future, inventories are not to be reduced to market prices where such market is lower than a conservative or reasonable cost or inventory valuation. Where the market value of the inventory is less than that carried on the balance-sheet, such condition should be shown in parentheses or as a footnote in such manner that the approximate difference can be ascertained. This may be expressed in figures or percentage." I sincerely hope that this particular recommendation will be followed by oil companies generally.

There are a great many small producing companies, whose inventory at any date is not in excess of its production for a few

days, which follow the practice of reflecting their inventories at current posted market prices and do not attempt to compute their unit costs in order to conform to the cost-or-market-whichever-is-lower method. The straight market method of valuing inventories does, of course, result in the anticipation of profits at the end of any accounting period but, where the inventory is an insignificant factor and the practice is consistently followed during each accounting period, I do not think this procedure is subject to severe criticism.

I imagine that the majority of professional accountants would generally prefer to have inventories priced at actual cost. The term "cost" is, however, one of the most misleading words used in accounts. It is, I think, generally understood by accountants, and as generally not understood by laymen, that either a unit price or an aggregate amount which is stated to represent cost is not an actual demonstrable fact but is only the opinion of one person or a group of persons based upon the use of arbitrary factors. This is due to the requirement that, in attempting to value inventories at cost, the elements to be included therein and the bases for their inclusion must be determined. Inasmuch as this determination requires the use of at least some arbitrary factors, we thus preclude the possibility of ever arriving at anything that can be truly stated to be actual cost. These conditions render it extremely unlikely, if not in fact impossible, that within the petroleum industry, or even within the major portion of the industry, there can ever be obtained a costing formula or procedure that will make possible really close comparisons between companies.

The realization basis for pricing inventories seems to have been used to quite an extent in the valuing of finished by-products in accordance with the well recognized principle that expected realizable values of by-products, rather than their cost, may be properly applied as credits in determining the cost of the principal product. Although I think that this is quite an arbitrary procedure, it has, at least, the merit of simplicity. I do not know, however, of any case in which the realization basis has been applied to the principal product, and I doubt very much whether it could be satisfactorily applied to it.

In this brief discussion of the methods of pricing oil inventories, I desire to refer to still another method which has apparently not received the extensive consideration in relation to oil inventories

to which in my opinion its seeming advantages entitle it. This is the principle frequently referred to as "standard costs." During recent years the theories underlying this method seem to have received more and more favorable consideration in other industries, and it has features which seem to render it quite suitable for application to inventories of both crude oil and finished petroleum products. The standard cost of a product is the sum of the predetermined basic rates for the direct labor, materials and other charges entering into its production. This theory recognizes that all costing operations are to some extent arbitrary and, because of this fact, it starts with a complete arbitrary in contra-distinction to the procedure followed in the attempt to ascertain actual costs, where the arbitraries creep late into the costing procedure and are buried and often forgotten.

While the proponents of standard costs are apparently steadily growing, they seem to be divided into two schools of thought, one of which advocates the use of standard costs solely as a measure for comparison against actual costs, while the other school advocates the substitution, throughout the accounting records and financial statements, of standard costs in place of actual costs. It is not within the scope of this paper to discuss the relative merits of these two opposing opinions, but I do wish to point out that if there is sound accounting justification for the use of standard costs in place of actual costs this method might well be the answer to our prayers for a satisfactory method of pricing oil inventories.

In the operation of the ideal standard-cost system, the inventory accounts are affected, during a period or as between periods, principally by changes only in the quantities in the inventories and to only a relatively slight extent by adjustments of the standard costs as the result of experience. Under this method, therefore, the fluctuations in actual operating costs receive their full effect in the income account. Another advantage claimed for the standard-cost method is simplicity of operation, which makes it easier to account for the movements of products and the resulting inventory than under the other methods mentioned.

I sincerely hope that the possibility of applying the standard-cost method to the oil industry will be widely studied by the accounting profession and by the industry itself. For, while it may finally be determined that this method is not directly suitable, the theories underlying it may at least provide the basis

upon which a satisfactory method of pricing oil inventories can be evolved.

ARRANGEMENT OF INCOME ACCOUNT TO REFLECT INVENTORY CHANGES

The control which can be exercised by the accounting profession over the problems of the method of accounting for the movements of petroleum products and the basis of pricing is necessarily limited to the continued advocacy and recommendation of principles having the general approval of the profession. On the other hand, the classification of the inventory as between current assets, investments and fixed assets may be made either in the course of the regular accounting procedure or as the result of an audit, and to that extent, therefore, the profession can exercise more direct control over this matter.

Another question relating to oil inventories, which should be under the control of the accounting profession, is the arrangement of the income account so that the various transactions may be suitably reflected there, irrespective of the methods of accounting and pricing employed. The arrangement now generally used in the reports of oil companies is based on the recommendations made several years ago by the American Petroleum Institute's committee on uniform methods of oil accounting, whereby the operating charges were to be segregated as to costs, operating and general expenses; taxes; intangible development costs; depletion and lease amortization; and depreciation, retirements and other amortization. The main features of this recommendation have been quite generally followed, although in particular instances either more or less detail has been shown.

There has, however, been another more recent development, as the result of which the operating charges have been restricted to the costs, operating and general expenses and taxes, after which something called "operating income before reserves" has been shown before the deduction of depletion, depreciation, intangible development costs and amortization. It hardly seems that there could be any argument in favor of this later development which reflects the theories of many writers in financial journals who refer to charges of this nature as "mere bookkeeping entries." Professional accountants quite universally consider that provisions for the exhaustion or extinguishment of fixed assets are just as much a part of costs as salaries and other incurred operating expenses.

Nevertheless, whether the operating costs in the income account are arranged in accordance with the original recommendations of the American Petroleum Institute or in accordance with the later tendency, it is not apparent, from recently published income accounts of oil companies, where the adjustment has been made to reflect the increase or decrease, as the case may be, in the inventory of petroleum products during the year. In all cases where the inventory adjustment is not shown as a separate item it should, theoretically at least, be applied ratably to all the various expenses incidental to the production. It is possible, however, that, in many instances in which the American Petroleum Institute's form of income account is used, the entire amount of the inventory adjustment has been deducted from costs, operating and general expenses to show the total amounts charged off on account of depletion, depreciation, intangible development costs and amortization. While this may be desirable so that the total of these items be shown, it does, in my opinion, result in a misstatement of the costs, operating and general expenses. Where both the inventories at the beginning and at the end of the year and the charges for the extinguishment of fixed assets are relatively small, this misstatement may not be serious, but it could easily run into large sums of money.

Recently I have attempted, in several instances, to correct this condition in audit reports by showing separately, under operating charges, the amount of the fluctuation in the inventory during the period. I should, however, like to go even further than this and group the various items of expenses in such a way as to show exactly, though not necessarily in great detail, those items which, either in whole or in part, are considered applicable to the cost of the product, including therein, of course, as a separate item the amount of the inventory fluctuation. It is quite probable that there may be other and more satisfactory answers to this particular problem, and I should be glad to see an improvement generally adopted, as I do not think that we should continue blindly to follow an arrangement in which an account must be misstated to conform to tradition.

CONCLUSION

In the discussion I have attempted to adhere to general accounting principles to avoid being lost in a maze of detail. Each of the phases discussed has, of course, many ramifications, but it

is probable that once the primary questions are solved the details themselves will fall into place quite easily. It is evident that no one man, no one oil company and no one firm of professional accountants can take the responsibility for deciding these questions or have the authority to influence the general adoption of their opinions. It is, however, possible that the organized bodies of professional accountants can agree among themselves as to the general principles and speed the time when the balance-sheets and income accounts of oil companies, both individually and collectively, shall be more in accordance with the facts than is now possible under several erroneous practices which have unfortunately received the sanction of custom.