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George R. Turtle

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This article is intended to deal with the activities of the two principal classes of crude petroleum companies, namely, those engaged in producing crude oil and those developing or prospecting oil lands.

The growth of the petroleum industry in America has been very rapid within the last few years, and it is now common knowledge that the crude oil is obtained from beneath the surface of the earth, sometimes in oil pockets of rock formation, but more often in a certain formation of sand and shale.

To extract or draw the crude oil from the oil pockets or oil formations it is necessary to drill to varying depths—usually from 500 feet to 3,000 feet, according to the depth of the strata or sand in the particular district. The drilling may be done by the company's own employees with the use of its own equipment or it may be done by drilling contractors for a fixed sum or for a price per foot.

For purposes of setting forth the various transactions involved in developing oil properties the following notes are based on the assumption that the company uses its own labor and equipment in development work.

Oil Property Leases

The usual custom of an oil company is to obtain a right in the form of a lease to drill or prospect for oil. The lease in most instances calls for a payment of a royalty of a certain proportion—usually one-eighth—of the oil produced.

Leases are acquired in one of the following ways:

(1) From the owner of the fee or lease for a nominal consideration with a provision for a rental to be paid for the time pending commencement of drilling operations.

(2) From the owner of the lease who has acquired it for the purpose of turning over to an incorporated company in consideration for all or a large portion of the capital stock of that company.

It will be obvious that the capitalization of values of oil lands or leases will be merely nominal or large, according to the mode

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of acquisition. The capitalized value will have an important bearing on the operations of the company. The effect of such capitalization is discussed briefly later in this article.

Leases

Capital expenditures under leases will consist of:

(a) Consideration paid for lease or leases.
(b) Necessary legal transfer and filing charges.
(c) Rentals paid prior to commencement of drilling operations.

In addition to the foregoing there is another important item, viz., that of "proving up" the lease. It is not an uncommon occurrence for oil companies to undertake the drilling of unproductive wells, and the writer wishes to express his opinion as to the propriety of capitalizing expenditures incurred.

When the initial well or wells prove a failure it would appear to be quite correct to capitalize the cost thereof on the theory that such expenditure was necessary to "prove up" the lease. If, however, after the company is successful in bringing in a producer (thereby proving the lease), it should again experience failure, it would appear that the cost of the dry well should be written off as a loss. As an exception to this treatment, initial wells unsuccessful by reason of water trouble, preventing the successful pumping of oil after reaching the oil sand, might justify writing off the cost of such wells as a loss.

When, after a certain time a producing well declines in production to a point at which it is no longer profitable and it is abandoned, the remaining book value of the well should be written off.

Field Improvements and Equipment

Under field improvements and equipment are included all expenditures necessary in building and grading roads; construction of buildings for housing the employees, horses, wagons, automobiles and equipment; boilers and engines; portable drilling equipment; drilling tools and equipment; storage tanks and sump-holes; pipe lines; and any other item of capital assets not strictly applicable to nor permanently a part of any well drilled or being drilled. All these charges are to be absorbed in the production cost as depletion of deposits, discussed at length later in this article.

Well Development Costs and Equipment

The expenditures for well development and equipment are those which are necessary in drilling and completing the well, such as those classified below:

1. Wells requiring use of standard rigs (timber or steel derricks):
   a. Grading—cost of—for location of derrick.
   b. Derrick—material (including freight) labor and expense in erecting.
   c. Rigging—including freight.
   d. Wages and board of drilling crew.
   e. Wages and board of miscellaneous labor.
   f. Supplies used and consumed.
   g. Fuel and water.
   h. Depreciation of boiler and engine.
   i. Repairs and replacement of tools.
   j. Rental of fishing tackle (used for recovering tools lost in hole).
   k. Casing (including freight) used in well.
   l. Cement (including freight) used in shutting off water.
   m. Torpedoes used in shooting.
   n. Tubing, valves, pump and fittings for pumping oil.
   o. Superintendence, overhead, etc., and any other expenditure made in completing well.
2. Wells requiring use of star rigs and portable equipment:
   a. All items as in previous case, exclusive of cost of derrick and rigging; but, in place thereof, a proportion of depreciation and repairs of portable equipment, together with any supplies necessary while the rig is in use on that particular well.

Expenditures made on account of non-productive initial wells, such as is discussed under the caption "Leases," should be transferred from the well development section of accounts to the lease section—the cost of which will be absorbed in the same manner as other lease expenditures.

The well development and equipment expenditures will be amortized over the production of the respective wells, as described later.

The foregoing comment deals with the treatment of the more important items of capital expenditures. It is taken for granted

that the recording of other items will be made according to the generally accepted accounting methods.

Operating and Production

Immediately upon the completion of a well and the commencement of the oil flow, the operating and production costs begin. Substantially such costs may be classified as hereunder, viz:

1. Depletion of deposits.
2. Depreciation and upkeep of field equipment.
3. Operating costs.

Probably the most important of the foregoing items is depletion of deposits.

Perhaps the shortest way to explain the method for determining the value of deposits withdrawn from the oil sands will be by use of an illustration.

Assume that a company, (a), acquires title to or lease of 100 acres of oil land, paying therefor, inclusive of recording fees, etc., $10,000.00, (b), expends for rental prior to commencing drilling operations $200.00, (c), expends on field development, such as road-work, acquiring water for drilling purposes, etc., $1,000.00, (d), expends on well development, including derrick, labor and drilling, miscellaneous supplies and expenses, casing, tubing, suction rods and sundry fittings, $8,800.00—in all a total of $20,000.00.

Assume further, (a), the number of wells which can be drilled on the lease to be 20 and, (b), the estimated total average production for each well to be 20,000 barrels.

We have, therefore, 20 wells with an estimated total production of 20,000 barrels each, or an estimated total production of 400,000 barrels for the lease. This total of 400,000 barrels represents the estimated oil reserve and, if divided into the sum of $11,200.00, will give 2 4/5 cents a barrel, the proportion of lease and field development expenditure which is to be amortized for each barrel of oil produced.

We have now to determine the amount of well development expenditure to be amortized. We obtain this by dividing the cost of well development by the number of barrels of oil which we estimate this well will produce—$8,800 ÷ 20,000—giving as a result 44 cents a barrel.

When a company is capitalized heavily and the larger portion of the capital stock is paid for the lease, a heavy charge for de-

pletion will be made to cost of production, which may and frequently does result in a cost of production greater than the market value of the product.

The question naturally arises as to the basis or method for determining the oil reserve. The following suggestions are for use until the producer is in a position to use his own production figures as a base.

1. In old territory where the logs of other producers are available the estimated oil reserve is determined by the use of the average production figures of that territory.
2. In new territory, where only a few wells have been drilled by the companies operating therein, the log or experience of the average of the producing wells should be used.
3. In new territory or "wild cat" land, there is absolutely nothing on which to base any estimate until the company has operated its own well for a certain period, and one estimate is as good as another.

After the company has been producing for some months it may use its daily and monthly production figures as its base for determining the estimated total oil reserve; and as a company usually does not make up its production and operating statement until some months after commencement of operations, it generally is not necessary for any computations as to estimated reserves to be made until certain active production figures are available. When the company is producing oil, the scientific method of computing future reserves can be ascertained from *Bulletin No. 177, Petroleum Technology 51,* issued by the department of the interior, in which the subject is well and sufficiently covered.

In estimating the total oil reserves for a lease in which only one or two wells have been completed it must be borne in mind that the tendency is to a gradual decline in initial production in all wells subsequently drilled; and when estimating the number of well locations in order to determine the total ultimate production, allowance should be made for this probable decline.

The second item entering into production costs is depreciation and upkeep of field equipment. The amount charged for depreciation really consists of two elements, viz:

a. Actual or physical depreciation.
b. Obsolescence.

For general purposes it is not considered necessary to make any distinction, and it might be advisable to write off the total expenditure for field equipment over the term of the lease, for, as the lease terminates, so also the right to drill further wells terminates. There is, however, no objection to depreciating storage tanks, pipe lines, engines, boilers and other equipment, which can be used after the termination of the lease, on the basis of useful life, provided, as is usually the case, the operator has a perpetual pumping privilege. The latter treatment should not be applied to drilling tools and equipment carried on the books, as this class of asset has practically only a scrap value at the time when the right to drill terminates.

Upkeep of field equipment should be absorbed in the operating costs for the period, excepting in the case where such upkeep is incurred in the development of wells and property. In that event a proportion applicable thereto should be capitalized.

The third item under operating and production is operating costs. These costs consist principally of wages of pumper and helper, fuel, superintendence and similar items not specified, expended in producing and caring for oil produced.

General Information

There should be available at all times certain data which are principally informative, consisting generally of the following:

1. Record of leases:
    a. Name of property; district or field; and legal description.
    b. Number of acres.
    c. Name of assignor or vendor.
    d. Royalty rate and to whom payable.
    e. Rental to be paid, when and to whom.
    f. Date lease or title acquired.
    g. Date lease commenced and terminates.
    h. Date lease renewed and terminates.
    i. Date lease recorded.
    j. Date lease approved by department of Indian affairs (as applied to Oklahoma).
    k. Consideration paid; nature of consideration, whether cash, notes, property, bonds or capital stock, and amount of each.

l. Special notes or provisions.
m. Date divisional orders filed and with whom.

2. Record of wells:
   a. Date of commencement of drilling.
   b. Sands encountered, depth of each and feet from surface.
   c. Date drilling completed.
   d. Producer or dry.
   e. If producer, date when put on pump or commencement of flow.
   f. Quantity produced first 24 hours.
   g. Quantity produced each month for first 12 months.
   h. If well is abandoned, give date and cause.
   i. Estimated total reserve for each well, together with revision of computation and date of revision. Basis of estimate should be given.
   j. Total cost of completing each well.
   k. Number of feet of casing and tubing in each well and of each size used.

3. Record of oil produced, giving quantity produced by each well and aggregate total.

This information is compiled from daily reports from the field. The gauges of all storage tanks are taken each morning at seven o'clock and the number of inches of oil in each tank is reported to the office. The office usually has in its possession a chart showing the quantity of oil for each quarter inch of each tank, from which the contents of a tank can be determined at any given time. By taking the difference in measurements from day to day, the daily production is determined, allowance being made, of course, for daily runs.

4. Any other information the state and federal governments require should also be kept in such a manner as to be readily available when required.

Accounting and Recording

The remaining part of this article will deal with the recording of the transactions discussed in the preceding paragraphs.

Generally the organization accounts and entries follow the ordinary custom and comment thereon is unnecessary.

Among the general ledger accounts will be controlling accounts for the following:

1. Leases.
2. Field development and equipment.
3. Well development and equipment.
4. Production expense.

A subsidiary ledger should contain detail of the four accounts above, sufficiently classified to give all the desired information as to expenditures. This subsidiary ledger should contain, (a), a sheet for each lease, showing all charges for cost of lease, filing, recording, etc., fees and rentals; (b), another sheet for each lease with columns headed buildings; engines and boilers; portable drilling equipment; sundry drilling tools; pumps, gauges, etc.; tanks and pipe lines; roads, sump holes, etc.; dry and water holes; (c), a sheet for each well drilled, with a column each for grading; derrick and rigging; labor and board; tools and supplies used; tools, etc., rented; depreciation of equipment; repairs to equipment; casing, tubing, rods, valves, pumps and fittings; sundries.

The voucher register and journal would have columns provided for each controlling account indicated in the foregoing paragraph and columns for selling, office and general expenses and any other controlling account found necessary. A columnar ledger sheet is suggested, in order that a sufficient classification may be made for the more important items entering into the latter class of expenses mentioned.

The regular voucher system should be put into operation, each voucher providing for classification and sub-classification of expenditures under the principal heads. Vouchers will be entered in the voucher register in the usual manner, after which they will be posted direct to the subsidiary records, number of voucher and amount of charge being entered in the appropriate columns. Cash-book and journal items affecting the controlling accounts will be posted to the subsidiary records in a similar manner.

As a general rule oil is sold as soon as a sufficient quantity has been accumulated in the storage tanks. A record should be kept to show the shipments to purchasers. This record should provide for the total shipped, the quantity representing royalty and the net shipment for which payment is to be received.

When a company commences production it usually enters into a contract with a refiner for the sale of its oil. The refiner then

constructs, if one is not already constructed, a pipe line to the producer's tanks. When the producer has a sufficient quantity of oil on hand to make a shipment or a run, as it is called, it requests the purchaser to send a man to make the run. The quantity run is determined by measurements made at the tanks by the producer's and the purchaser's men, each checking the other's figures. The man making the run gives the shipper a run ticket, which shows the tank number, measurements before and after run, temperature, gravity and total inches of oil run. A copy of this ticket goes to the purchaser, who, after making deductions for water and sand, remits monthly to the shipper a cheque for payment of his share. He also remits direct to the owner of the royalty a cheque for his share. Invariably the producer has to issue what is known as a divisional order—which is a statement of the divisional interests in the production, which, of course, include royalties. All divisional interests are liquidated direct by the purchaser of the oil, and the producer only receives payment after all royalties and other interests are deducted from the gross amount of oil sales. The company's accounts, therefore, show no entries for royalties.