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查全衡 审

油气资源价值分级 与有偿使用的方法研究



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**《油气资源价值分级与
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学术指导 查全衡

INTRODUCT TO A STUDY ON METHOD OF OIL/GAS RESOURCES VALUE CLASSIFICATION AND IT ONEROUS USE

To realize the transformation of economic systems petroleum industry, one of the most crucial links is to develop and utilize the oil/gas resources based on the market mechanism and to establish the system of onerous utilization of oil/gas resources in marketized and normalized mode. For that purpose, the evaluation of the oil/gas reserves value shall be performed scientifically and the method of onerous utilization of oil/gas resources scientized. The value of oil/gas resources depends mainly on the resources conditions affecting the input and output efficiency of the exploration and development of the oil/gas resources, or natural labour productivity for developing the resources. The main purpose of the scientific evaluation of the oil/gas resources value is to link the value and price of the oil/gas reserves with the resources condition difference in oil/gas field. Therefore, the classification of the oil/gas resources value shall be performed according to the resources conditions. The resources classification parameters from the value classification shall be taken as the scientific basis to determine the oil/gas resources value and the tax

and fee level. On the basis of the scientific evaluation of the resources value, the method of onerous utilization of oil/gas resources will be further improved.

The value evaluation of the oil/gas resources means mainly that the state, as an owner of oil/gas resources evaluates the resources value. So far, there are two kinds of important evaluations of the value of oil/gas reservoir the net price method (or the net present value method) set forward by the western countries made the market economy system and the ultimate cost method set forward by the former USSR under the planned economy system Formula are;

$$(\text{net price method}) \quad R_v = \sum_{t=0}^n \frac{(A_t - K_t)}{(1+i)^t} \quad (1)$$

$$(\text{ultimate cost method}) \quad R_p = \sum_{t=0}^n \frac{(Z_t - S_t)}{(1+i)^t} \quad (2)$$

Where R_v or R_p is the oil/gas reservoir value

A_t is the net income in the t th year of exploration and development period or the annual sales revenue minus the annual business cost

K_t is the t th year investment

Z_t is the t th year production value counted by the individual production expenses in ultimate oilfield when the balance is kept between supply and demand

S_t is the total amount of the t th year investment and operating cost.

I is the discount rate

N is the number of years of exploration and production

The principle of these two methods is identical or the oil/gas reservoir value is the oil/gas reservoir revenue minus the production operating cost paid by the operator. The net price method is applicable to the value evaluation of such resources asset as oil/gas reserves and the general evaluation of the engineering economy in petroleum enterprises. The ultimate oilfield shall be determined first when the ultimate cost method is used. However, the scientific method for determining the ultimate oilfield has not yet been established at present. The state is the resources owner. If these two methods are used to evaluate the value of the oil/gas resources, with which to determine the tax on oil/gas resources, there will be the following problems: (1) discount rate I. It is very difficult to determine the discount rate scientifically and reasonably. It will not meet the requirements of the continuous development of the modernized social — economy to evaluate the natural resources value by the discount method because the discount method and the discount factor enable the resources to be consumed rapidly. The more the discount rate is, the more obvious the action is. (2) the oil price and the production operating cost (affected by the productive input product price) vary easily with the market fluctuation, resulting in the fluctuation of the oil/gas resources value in different

periods. (3) The determination of the operating cost of the oil/gas production contains the anthropogenic factor, resulting in the absence of objectivity and science during the evaluation of the oil/gas reservoir value. (4) Methods or formulas above mentioned are not able to reflect the resources value difference resulted from the different resources conditions. Therefore, it is difficult to determine reasonably the value difference of the oil/gas resources and their corresponding tax and fee under the different conditions.

To evaluate scientifically the oil/gas resources value, the theory of Marx's commodity value and the theory of mining rent, especially the theory of differential rent shall be taken as the basis to establish the scientific method for evaluating the oil/gas resources value.

It is well-known that the commodity value is the basis for determining commodity prices, the price is the monetary expression of the value. The resources price (land price) is the capitalization of land rents, the oilfield rent is the price of the use right in the oil/gas field or oil/gas reservoir and also the price of the oil/gas resources in the oil or gas field, or the price of transferring the proprietary right of the oil/gas resources. Therefore, the basis of the oilfield resources value and the basis of the oilfield rent value are identical.

We think that the research on the basis of oil/gas (or

mineral) resources value shall be performed from the viewpoint of continuous development of human society versus the compensatory reproduction during the resources consumption. Therefore, the oil/gas resources value determining the oilfield rent shall contain the necessary social labour for the social compensary reproduction during the resources consumption. The necessary social labour that must be paid because of the oil/gas resources consumption includes geological survey of oil/gas resources to discover the new oil/gas resources, research on development, production and application of the substitution resources to compensate the decrease of the total use value represented by the non-reproductive oil/gas resources, recovery and reuse of resources and research on technical development and application aimed at improving the utilization efficiency to make the social wealth represented by the resources greatly increase. The theory of resources value points out how to determine the resources value from the viewpoint of necessary social labour, but also how to redistribute reasonably the resources revenue (land rent) from the development and the utilization of the resources.

Because the decision method of the genuine mining rent is identical with that of the agricultural rent, the oilfield rent shall be divided into two groups absolute rent and differential rent.

According to the theoretical viewpoint of oilfield rent

or the oil/gas resources value basis set forward by us, in the value the absolute oilfield rent consists mainly of two items of necessary social labour; the management and protection of the ecological environment resulted from the exploration development and utilization (especially development and utilization) of oil/gas resources and the mining management necessary to the development and utilization of resources. For the aggregated scarcity of resources (so far as the long-term demand), the absolute rent contains the cost for compensating the depletion of the worst resource.

Absolute rent of oil/gas resources = oil/gas market price—individual production price in the worst oilfield. (3)

It can be known from the above formula that the state or the society would like to obtain the expected absolute rent revenue and the social cost for compensating the exploration and development, it is necessary to determine the worst oilfield conditions or the worst resources conditions.

The commodity is the entity of price and value, the value is the production cost versus the utility. The use value basis of the oil/gas resources is the natural productivity for the oil/gas productive labour determined by both the use value of oil/gas products and the resources survey and production conditions in oilfields. Due to the resources value or price in any oilfield depends on the difference between the oil/gas product price and the individual productive price

in that oilfield, the crude oil market price in certain oilfield will depend entirely on the crude oil quality under the definite socio — economic and market conditions. The individual productive price depends upon the natural labour productivity determined by such conditions as resources survey, production transportation and marketing in that oilfield. Therefore, the basis of use value determining the amount of the oilfield rent is, in nature, those conditions including resources grade (abundance) quality and geographical location as well as geological and natural conditions, these are called the resources conditions.

Obviously, the oilfield rent, a relative concept depends on both the resources conditions and the socio — economic conditions, but it will depend only on the resources conditions and its quality under the definite socio-economic conditions. When the resources conditions in certain oilfield is inferior and the oil/gas price is lower than the individual productive price, the operator will not perform the exploration and development and the owner will not obtain the oilfield rent, this is, the oilfield rent is naught. If the oilfield which naught in the rent is the worst one, the oilfield rent provided by the superior oilfield will be determined by the following formula.

Superior oilfield rent = (oil price in superior oilfield — oil price in inferior oilfield) + (individual productive price in inferior oilfield — individual productive price in superior

oilfield)

(4)

Obviously, while the oilfield rent is divided into the absolute rent and the differential rent in theory and practice, the oilfield rent itself, in fact, is a differential rent determined by the resources conditions in oilfield under the worst conditions. Therefore the determining method of the differential rent may be used as that of the oilfield rent, the oilfield rent analysis shall put emphasis on the differential rent. The oilfield differential rent, or the differentials of the oilfield rent reflects the principle of high price based on high quality under the market economy conditions in term of use (utility) value and indicates that the more necessary social labour is required to reproduce the high-quality resources in terms of labour social value.

The factor affecting the oil/gas resources value and the oilfield resources value differentials (ie. oilfield rent and differential rent) in many oilfields falls into two categories: socio-economic factor and resources condition factor.

As viewed from the value being the necessary social labour, the socio-economic factor is the dominant factor determining the amount and variation of the oilfield rent or the oil/gas resources value; (1) factor affecting the long-term supply and demand of the oil/gas resources, including scarcity of oil/gas resources, displacement of resources and structure and scale of social consumption; (2) technical factor affecting the utilization efficiency of the resources

exploration and development; (3) short-term market fluctuation factor, including the supply and demand fluctuation in the petroleum market which will raise or lower the crude oil price and medium or short term fluctuation in the oil productive input factor market and price. When the direction of the input factor price fluctuation is identical with that of the oil price fluctuation, the short-term market fluctuation enables the oilfield rent to increase in the money quantity but the resources value remains unchanged basically.

The factor of resources condition affecting the oilfield differential rent (or oil/gas resources value) falls into the following two categories: (1) resources quality factor determining the oil price differentials, it determines the utilization efficiency of the crude oil process and further determines the oil price. According to the study and prediction by experts concerned, the price ratio between low condensate and low quality oil is 1.08 : 0.68. (2) resources condition factor determining the individual productive price of crude oil or the complete cost differentials of oil/gas production. Oilfield resources grade, geological conditions and resources quality affect the investment cost of exploration and development, and the production cost (ie. operating cost), the oilfield geographic location affects the crude oil transportation and marketing cost, the climate condition and the local economic development in the oilfield

play a role in magnifying or multiplying the complete cost of the crude oil production.

To evaluate scientifically the oil/gas resources value, it is essential to eliminate both anthropogenic factors as far as possible affecting the oil/gas productive cost and changeable factors socio-economic and technological conditions affecting the oil/gas resources value, so that, the evaluation of the oil/gas resources value and the corresponding method for onerously using the resources will be established on the objective and scientific basis. The oilfield cost price data shall be analysed scientifically and the oil/gas resources value determined through the determination of the influence of factors on the oil/gas resources value. Besides, the oil/gas resources value analysis shall put emphasis on the differential value analysis. The classification of the oil/gas resources value under the different resources conditions shall be determined through the analysis and comparison of a great quantity of oilfield data, further obtaining the value classification parameters of the oil/gas resources under the different resources conditions. Afterwards, the oil/gas resources value is evaluated actually and determined scientifically on the resources classification parameters basis.

Therefore, the classification of oil/gas resources refers to the classification evaluation of the oilfield resources on the geological survey and geological evaluation basis and

according to the influence of the different resources conditions in oil/gas fields on the exploration, development and utilization of oil/gas resources and the input and output efficiency.

Suppose that R_v , P and C represent resources value, crude oil price and oil productive cost (complete cost) in certain oilfield respectively, A is the worst resources value, i oilfield resources conditions due superior to j oilfield resources conditions (j^* denotes the worst oilfield), then:

$$R_v^i = P^i - C^i \quad (5)$$

$$R_v^i = [(P^i - P^{j^*}) + (C^{j^*} - C^i)] + A = R_v^{i,j^*} + A \quad (6)$$

Let $A = 0$, without regard to the so-called worst oilfield, j and i take the value from discovered oil/gas fields, then:

$$R_v^{i,j} = (P^i - P^j) + (C^j - C^i) \quad (7)$$

Formula (7) shows the relative classification value $R_v^{i,j}$ of resources in i and j oilfields (i superior to j) under two different conditions. It is found through the through study that whether R_v^i and R_v^j are positive or not. $R_v^{i,j}$ is positive at all times, or the value classification between oil/gas resources under the different conditions has economic significance. The change amplitude varied with the market fluctuation of the resources classification value $R_v^{i,j}$ determined by the resources conditions is relatively less than the resources value R^i or R^j which does not reflect the

difference of resources conditions, the classification value between resources under the different conditions is stable and depends mainly on the resources conditions. The value ratio between two resources under the different conditions, or the ratio of input to output efficiency of exploration, development and utilization is more stable and depends solely on the difference of resources conditions. This is the cardinal reason why we perform the resources value classification of the different resources in oil/gas field according the resources conditions and their influence on the input to output efficiency of exploration, development and utilization.

This subject to be studied contains review of explored reserves, value classification of explored geological reserves; the data to be studied contains detailed data on oil/gas field geology and oil/gas reservoir. As viewed from the methodology, the study plays an exemplary role in research on prospective reserves, surplus reserves and evaluation and classification of reserves value.

According to the actual status of the mining user fee levy unit at home and abroad, the resources value classification unit may be divided into three gradations: mining area, oilfield and individual well, of which the individual oil/gas field is the most essential, the oil/gas field is the most basic reserves calculation unit. As viewed from the scope, the value classification of the individual oil/gas

field resources is the most essential among the resources classification, based on the principle, it is most reasonable to determine a high grade of the resources value classification.

The value classification shall be done according to the geological reserves, this is because that the recoverable reserves is the product of the geological reserves multiplied by the recovery ratio. After the geological reserves is determined, the amount of the recoverable reserves depends on the recovery ratio. The reserves geological condition affecting the recovery ratio is an important condition (or factor) affecting the reserves value and its classification. Besides, both the recovery ratio and the recoverable reserves vary with the change of the socio-economic condition or the scientific-technical conditions. One of the purposes of the resources value classification is to provide the scientific basis for the adjustment of the resources price (resources tax and fee) and the exploration and development program (even for the adjustment of the recovery ratio).

If can be known from Formula (7) that as viewed from resources owner, the oil/gas resources value of certain oil/gas field shall be the difference between oil/gas price of the oil/gas field and the individual oil/gas productive price of the oil/gas field. The corresponding oil/gas resources value or the resources differential value consists of the oil/gas price differentials and the production and operating cost differentials. According to the previous analysis, for the

resources value differentials determined by the oil/gas production and operating cost differentials, the natural and objective condition classification of the resources geology is taken as the principal variable and the changeable parameters of the socio-economic and technical condition (referring mainly to the input product price index and the oil/gas price) is taken as the function of the auxiliary variable. Similarly, for the oil/gas price differentials, the resources quality condition classification is taken as the principal variable, the oil/gas price is taken as the function of the auxiliary variable.

If is further defined that the resources value classification means that taking aim at the resources value evaluation and the onerous use, the resources is classified according to the influence of the resources condition differences on the resources value differences or on the oil/gas production and operating cost differences and the oil/gas price differences. The resources condition classification parameter obtained by the resources value classification is the principal variable determining the amount of the resources value under the different conditions. According to the result of the resources value classification, a classification parameter (quantized parameter) evaluating the resources conditions is obtained. Because two individual influential factors of the resources value differentials are different each other, the classification parameters representing the