Application of Statistical Analysis and Prediction to the Petroleum Industry of China and Its Development Prospect

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1. Inherent characteristics of exploiting petroleum have decided the role of statistical analysis and prediction

Petroleum enterprises are industrial production departments specially engaged in the exploration, development, processing and refining of oil and natural gas. Its major activities include the probing of objective natural laws for underground hydrocarbon resources in terms of existence, migration and accumulation, and the exploring and developing of underground hydrocarbon resources in accordance with objective laws in order to build oil and gas fields to exploit oil and gas and to process and refine them. All these characteristics have decided the wide application of statistical analysis and prediction in every production process.

1.1 The concealment of reservation for hydrocarbon resources has decided that a large amount of geologic statistical analysis has to be conducted.

Hydrocarbon resources is buried underground, invisible and intangible, and so the exploration work becomes extremely complex and arduous. The exploring object is oil and gas bearing basins (including lands and seas), while the distribution of oil and gas bearing basins is both broad and scattered. It is impossible to observe directly the distribution of underground hydrocarbon distribution. It is only with the help of many indirect means of geophysical exploration, drilling and logging that a great quantity of basic information of data can be obtained. After which, statistical analysis and prediction shall be proceeded following determined modes, to make judgement for oil and gas bearing quantity and quality, so that the law for underground hydrocarbon resources can be realized. In this process, many kinds of numerical and theoretical statistical methods are applied: such as the model formed by oil bearing sands and shales and its statistical analysis, statistical analysis and judgement of oil bearing formation and gray evaluation analysis for the development of explored undeveloped reserves (i.e. the statistical analysis of reservoir description). We can see that, statistical analysis and prediction have showed, on the very beginning of oil production, a widely applied prospect and role. On this aspect, engineering geologic statisticians have contributed a lot.

1.2 Benefits of hydrocarbon development affected by the high risk of the exploration and development of hydrocarbon resources and the intensity of capital intensive technology have decided the role of statistical analysis and prediction.

The complexity and arduousness of the exploration of hydrocarbon resources have also brought about high risks at the same time. To simplify it, the hydrocarbon reservoir of industrial development value found by various exploration methods may be proved to be failed or lack of hydrocarbons, which will in turn result in a loss of exploration costs. Generally speaking, provided about 40% wells can encounter hydrocarbons, that will be a quite good situation. Still, about 60% wells may be proven to be failed and result in loss. Even for those determined hydrocarbon reservoirs of industrial development value, usually not all of them can encounter hydrocarbons when drilling exploratory wells. Both the technological risks and economic risks are difficult to predict, and so the exploration and development of hydrocarbons are highly risky. At the same time, the probing process through repeated practices and realization has decided its long development period, and tremendous engineering work necessary from drilling to its matching construction and finally to the level of commercially development. The coordination and cooperation of all speciality and technology have decided its big investment. Besides, the economic benefits of investment are affected by the abundance of hydrocarbon resources, geologic conditions (such as reservoir physical properties, burying depth and the complexity of structures) and the natural depletion law of non-
regenerable resources during the exploitation process of oil fields. These characteristics have also
decided the role of administrative statistical analysis and prediction in the production of oil
industry: such as the statistical analysis for the increase of hydrocarbon reserves adapting to the
increase of hydrocarbon production, the statistical analysis for the synchronous increase of invested
capitals and economic benefits, and the potential analysis for the science and technology on
increasing oil production and benefits. On this aspect, administrative statisticians have contributed a
lot.

2. Prospect of the statistical analysis and prediction of oil

With the total opening-up to the outside world of petroleum industry of China, statistical
analysis and prediction will play an irreplaceable role in the whole production process, and are
expected to get further developed on the following aspects:

2.1 The combination and prediction of engineering geologic statistical analysis and
administrative statistical analysis shall be tighter.

If the engineering geologic statistical analysis and prediction of petroleum enterprises can be
compared as a ship, then the administrative statistical analysis and prediction of them is its steering
wheel. Because of the affect of system on statistical analysis in the past, the engineering geologic
statistical analysis and administrative statistical analysis in petroleum enterprises of China
developed and operated in their own ways and towards their own objectives. As a result, individual
operation and short of inter-communication between them occurred. With the total stepping into
market of petroleum enterprises of China, the combination of the two will be tighter.

2.2 The field of statistical analysis and prediction of petroleum will be broader.

The financial crisis in Asian reveals that economic statisticians are rather immature in the
monitoring and predicting alarm of economic operating status, especially in certain specific
economic field such as finance or certain specific economic class such as industrial structure, lots of
blanks on the aspects of monitoring and predicting alarm are still left. And therefore it is impossible
for them to analysis and predict timely the crisis before its breaking out. If this is considered as a
defect of international statistical work, then the failure of predicting timely the phenomenon of
global oil prices fall can be diagnosed as a “common feeling” of lacking foresight for those
petroleum statisticians who have been infected. The financial budgets of many oil companies before
the breaking out of crisis are based on a rising oil price of world market. However, the falling of oil
price caused by financial crisis is quite out of the expectation of the administration level of oil
companies, which is worth of meditation of us. Under normal conditions, it is very difficult to find
out the crisis factors from the existing statistical index system and national economy accounting
system under the cover of complex economic phenomenon. And so, the field for developing
statistical analysis and prediction of petroleum will be broader. It is unfair, unwise and detrimental
to restrict the responsibilities of administrative statisticians of petroleum within the scope of merely
providing data. With the continuous perfection of market economy, petroleum enterprises are in
great need of market information on market demands, price changes and possibility of fund
collecting. Furthermore, a predictive analysis for the total supply and total demand of the national
economy is required as well, based on which the general structure of investment orientation, asset
constitution, product supply and development prospect can be determined for enterprises.

L'application et la perspective de L'analyse et la prévision sur les statistiques dans L'industrie
pétrolière de Chine

La dissimulation de la réserve des ressources des Hydrocarbures et la complicité et la
difficulté de son exploration et son exploitation demandent de grandes quantités de travaux de l'analyse et la prévision des statistiques sur les descriptions géologiques des réservoirs. Le risque évident de l'exploitation du pétrole a recours à une nécessite absolue ole l'analyse des statistiques et une prévision correcte. Au fur et à mesure qu'on réalise en Chine une politique d'ouverture à l'étranger sous tous les rapports dans l'industrie pétrolière de Chine, on combine de plus en plus l'analyse et la prévision des statistiques des données de la génie géologique avec celles des statistiques de la gestion des entreprises, donc on voit aussi une large perspective dans le domaine des travaux de l'analyse et la prévision des statistiques à l'industrie pétrolière en Chine dans le future.