METHOD FOR ANALYZING THE CAPITAL UTILIZATION OF OIL REFINERIES

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In the analysis of costs, it is convenient to distinguish the following groups of indices: general indices of capital utilization, or capital return indices; indices of extensive active capital utilization; indices of intensive active capital utilization, integral indices of active capital utilization, special indices of capital utilization.

The most important of these are the capital return indices. They give the general character of capital utilization and represent the ratio of the volume of production (total of finished product) to the active capital, and also to productive capital. The volume of production can be determined per 1,100, or 1000 rubles of capital outlay.

The index of utilization of active capital is the ratio of the volume of production to the active capital (mean yearly, quarterly, or monthly), while the index of utilization of productive capital is the ratio of the volume of production to the productive capital (mean yearly, quarterly, or monthly).

A correct calculation of the general capital utilization indices depends primarily on the accuracy of determination of the volume of production. It must be borne in mind that it is practically impossible to calculate the volume of production as a physical quantity in the conditions of oil refining, owing to the lack of comparability. Present methods of normative cost processing also do not give a correct representation of the volume of production of commercial oil refining plant. It is nevertheless convenient to determine production on the basis of gross or industrial production, using stable prices. Regardless of the absence of a strict interrelation between the physical volume of production and its monetary value, in conditions of comparable prices and constant production range, price indices can be secured by determining the volume of production with the necessary degree of accuracy.

The effect of changes in the range of production on the general indices can largely be eliminated by determining the volume of production for raw materials and comparing it with the general indices at any time. The production volume for raw material is the quantity produced, expressed in cost units, per 1000 tons of raw material. Increase in the production volume for raw material, as a rule, under the present system of prices for oil products, is accompanied by a deterioration in the capital indices. This is explained by the following circumstance: a higher output from the same quantity of raw material (which is obtained in petroleum refining when secondary processes are developed and chemical methods are introduced) will require a large outlay of capital and working time. However, it must be borne in mind that the growth of costs of petroleum refining with the development of secondary processes and the improvement of production quality indices usually leads to an improvement in performances of plants consuming fuel and oil, and an increase in the output per man-hour. This is the ultimate criterion of the efficiency of secondary processes. The prices should to a great extent reflect the national economic efficiency of increases in production quality.

It is most convenient to compare the relative indices of capital returns and production volume.

For a correct determination of the general indices, it is necessary that the capital should be comparable.

An assessment of capital for cost recovery at January 1, 1960 made it possible to bring all these elements (regardless of the year of introduction) to a single estimate, and to make comparison at least for the last few years. In calculating the general indices of capital return, it is necessary to base them on the total balance value (mean yearly, quarterly, or monthly) as this gives the most direct indication of the productive basis of the plant. The mean value of the capital, $C$, is found from the formula

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\[ C = C_H + \frac{P \cdot K}{H} = B (H - K_B), \]

where \( C_H \) is the capital returns at the beginning of the period under review, \( P \) is the value of the capital laid out in this period, \( K \) is the number of months of exploitation of new capital outlay, \( B \) is the value of the capital laid out in the period under review, \( K_B \) is the number of months of exploitation of the outgoing capital, and \( H \) is the number of months in the period under review.

In the course of the analysis it is important to determine how the changes in capital returns are reflected in the cost of production and the productivity per man-hour.

The reduction in costs due to reduction of the depreciation deductions, \( C_a \), is given as a percentage by the formula

\[ C_a = \left( 100 - \frac{100 - I_a}{I_p} \right) \frac{I_a}{100}, \]

where \( I_a \) is the depreciation index (the ratio of the level of relative depreciations in the period under review to the level in the base period), \( I_p \) is the index of capital returns (the ratio of the level of capital returns in the period under review to the level of the base period), and \( C_a \) is the relative weight of depreciation reductions in the cost of production in the period under review.

Variations in the amount of depreciation deduction, \( A \) (as a percentage) per unit of production (or per ruble production), for changes in the value of the capital utilization and the volume of production, are given by

\[ A = 100 - \frac{100 + O}{100 + V} \times 100, \]

where \( O \) is the increase or decrease of the mean value of the capital, \( 1\% \), \( V \) is the increase or decrease of the volume of production, \( 1\% \).

The reduction in the cost of production, \( C_p \) (in \%), for reduction of the relative importance of constant expenses, caused by increase in capital returns, can be calculated from the formula

\[ C_p = 100 - \left( P_p + P_c \frac{I_p}{100} \right), \]

where \( P_p \) is the relative weight of variable expenses in the cost of production in the basic period, \( \% \), \( P_c \) is the relative weight of constant (stable) expenses in the cost of production in the basic period, \( \% \), and \( I_p \) is the index of capital returns.

The relation between an increase in productivity per man-hour \( \Pi \) (in \%) and the increase of capital return is given by

\[ \Pi = \frac{P - 100}{V \cdot X_p + C \cdot X_c} \times 100, \]

where \( P \) is the increase in capital returns in relation to the basic period, \( \% \), \( V \) is the relative weight of the piece workers (labor of which cost increases with production volume) in the general cost of labor in the period under review, \( X_p \) is the number of piece workers, \( \% \) of basic period, \( C \) is the relative weight of the fixed-payment workers (labor of which the cost remains constant with rise in production volume) in the general cost of labor in the period under review, and \( X_c \) is the number of fixed-payment workers, \( \% \) of basic period.

In analysis of capital returns it is important to give a correct qualitative (and if possible quantitative) estimate of the basic factors determining any particular level.

In the first place it is necessary to determine the influence of reconstruction on the indices of capital return. In many particular cases reconstruction is a more effective way of increasing productive capacity than new building.