Use of the Main Industrial Facilities of Industrial Enterprises: Efficiency Analysis

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Abstract: The main feature of the enterprise is the availability of detached property in its ownership, economic or operational management. It is detached property that provides the material and technical possibility of the enterprise's functioning, its economic independence, and reliability. Without a certain property, neither large or small enterprises, nor individual entrepreneurs can carry out their activities. It is difficult to overestimate the national economic importance of the effective use of fixed assets. A more efficient use of fixed assets leads to a reduction in the need to manage new production capacities with a change in the volume of production, and, consequently, to a better use of the enterprise's profit. Effective use of fixed assets is closely linked to the improvement of the quality of products because, in a market competition, high-quality products are better sold and are in higher demand. An important direction in improving the efficiency of the use of fixed assets is the improvement of their structure. The article presents a methodology for analyzing the efficiency of the use of fixed assets of an industrial enterprise, including several stages. The main coefficients of analysis of the use of the company's fixed production assets are considered. The main directions of increasing the efficiency of the use of fixed assets in an industrial enterprise are determined. The influence of the use of fixed assets on the efficiency of an industrial enterprise as a whole is proved. Effective use of fixed assets means the acceleration of their turnover, which largely contributes to the solution of the problem of reducing the gap in terms of physical and moral depreciation, accelerating the pace of renewal of fixed assets.

Keywords: industrial enterprise, basic production assets, enterprise efficiency, fixed capital

JEL Classification: L00, L52, L53, L60, M11

INTRODUCTION

The problem of increasing of the efficiency of the use of basic production assets and the capacity of enterprises is central to the period of the emergence of the Russian economy in modern conditions. The

place of the enterprise in industrial production, its financial status, and competitiveness in the market depends on the solution of this problem.

The main production assets of an enterprise are means of labor that are involved in the production process for a long time while retaining their natural form, and their cost is transferred to the manufactured product gradually, in parts, as they are used.

The composition of the basic production assets is largely determined by the industry affiliation of the enterprise. Unquestioned are the differences of many industries: construction, transport, agriculture, communications and other areas of management.

The structure of fixed production assets is determined by many factors, the most important ones are the following (Babich, 2014):

—   the nature of the products;

—   the level of technological complexity of production;

—   the enterprise's geographical location.

Differences in fixed assets according to the nature of the produce are obvious if one compares, for example, machine-building, motor transport or trade enterprise. If for an industrial enterprise the usual share of machines and equipment is 30-40% or more, in trade organizations it is about 10-12%. Equally indisputable are the differences even in products close to each other, but different in terms of tasks, e.g. a car factory and an auto service workshop.

As for geographical conditions, first of all, it is necessary to take into account the differences in the heating season duration and the need for heating in general, as well as annual changes in daylight hours, as it is observed in the regions of the Arctic, and specific features of seismic hazard in a number of areas.

PROBLEMS TO BE SOLVED WITH THE HELP OF THE EFFICIENCY ANALYSIS OF THE MAIN PRODUCTION FUNDS USE

Any enterprise, regardless of its form and type of activity, must constantly consider the movement of its fixed production assets, their composition, and state, the effectiveness of their use (Babich, 2006).

This information allows the company to identify ways and reserves to improve the efficiency of the use of fixed assets, and, in addition, to detect and correct negative deviations in time, which in the future may have serious consequences for the successful operation of the enterprise.

That is why the problem of increasing of the efficiency of fixed assets use is so important for any organization. After all, their inefficient use leads to a drop in production or sales, which in turn reduces the company's revenues, and, accordingly, affects profits.

When analyzing the main production assets, special attention is paid to the study of the state, dynamics, and structure of fixed assets, since they occupy a large proportion of the long-term assets of the enterprise.

Analysis of fixed assets is important for any enterprise or organization since they are the basis of any type of activity. Despite the differences in fixed assets in terms of the nature of the produce, it is obvious that they are the driving force of production.

Therefore, the analysis of fixed production assets is the basis for planning and forecasting the volumes of output, the number of workers and many other indicators of the enterprise's activity (Babich, 2014).

Solving the problem of efficient use of fixed assets means increasing the production of products necessary for society, increasing the output of the created production potential and better meeting the needs of the population, improving the balance of equipment in the country, reducing the cost of production, increasing the profitability of production and savings of enterprises. A complete use of fixed assets also leads to a reduction in the need to manage new production capacities when the volume of production changes, and, consequently, to a better use of the enterprise's profit.

THE USE OF THE MAIN INDUSTRIAL FACILITIES OF INDUSTRIAL ENTERPRISES: EFFICIENCY ANALYSIS METHODOLOGY

For the analysis of fixed assets, many different techniques have now been developed. Among them, it is possible to identify well-known and much-used ones as well as not so well known and little-used techniques. Common methods include such types of analysis as horizontal and vertical ones (they are based on quantitative analysis of the structure of fixed assets and its change), analysis of changes in return on assets, capital intensity and profitability, indicators of extensive and intensive equipment loading. Methods based on calculating various coefficients, such as the coefficient of retirement, renewal, growth of fixed assets, are not well studied; In addition, the efficiency of the use of fixed assets is very accurately reflected in the use of current and installed equipment stock (and they are not generally calculated at enterprises), also there are necessary coefficients that determine the influence of various factors on performance indicators (methods of factor analysis: the method of absolute differences, the method of chain substitution, etc.).

The analysis of fixed assets is carried out in several areas, the development of which in a complex allows assessing the structure, dynamics, and efficiency of fixed assets and long-term investments (Table 1).

The choice of directions of analysis and real analytical tasks is determined by management needs, which forms the basis of financial and management analysis, although there is no clear boundary between these types of analysis (Babich, 2006).

Sources of information for the analysis are: the company's business plan, the plan for the technical development of the enterprise, the company's accounting balance sheet, the appendix to the balance sheet, the report on the availability and movement of fixed assets, the balance of production capacity, data on the revaluation of fixed assets, inventory cards of fixed assets, design –specific and technical documentation, and other.

Assessment of the level of technical condition and development of production capacity begins with the analysis of the composition and movement of fixed assets. The composition of fixed assets should be understood as the internal ratio of its parts. Movement means the receipt, retirement, wear, replacement, renewal, increase or decrease of funds. The technical level of production depends largely on the changes in the structure of fixed assets, their movement. Therefore, the composition and movement of fixed capital is considered in the complex.

Table 1
Analysis of fixed assets: the main directions

The main directions of analysis	*Analysis objectives*	*Analysis types*
Analysis of the structure and dynamics of fixed assets	Evaluation of the size and structure of capital investment into fixed assets. Determination of the nature and size of the impact of the value of fixed assets on the financial position and structure of the balance sheet	Financial analysis
Analysis of the effectiveness of the use of fixed assets	Analysis of fixed assets movement. Analysis of performance indicators for the use of fixed assets. Analysis of equipment operating time. Integral assessment of the use of equipment	Managerial Analysis
Analysis of the maintenance and operation of equipment cost-effectiveness	Analysis of costs for major repairs. Analysis of costs for routine maintenance. Analysis of the interrelationships in the volume of production, profit, and expenses for the operation of equipment	Managerial Analysis
Analysis of the effectiveness of investments into fixed assets	Evaluation of the effectiveness of capital investments. Analysis of the effectiveness of loans for investment	Financial analysis

Analysis of the structure of fixed assets allows us to evaluate their composition in terms of the extent of their use in the production process. To assess the change in fixed assets at historical cost, the horizontal and vertical analysis should be carried out.

The horizontal analysis consists in evaluating the dynamics of indicators, establishing their absolute changes and growth rates. Vertical analysis is the analysis of the structure of objects.

Data on availability, depreciation, and movement of fixed assets are the main source of information for assessing the production potential of the enterprise. The assessment of the movement of fixed assets is carried out on the basis of coefficients (Tables 2 and 3), which are analyzed in dynamics over a number of years.

The coefficient of receipt (novelty) reflects the share of new fixed assets in all fixed assets at the end of the reporting period.

The coefficient of renewal characterizes the share of new fixed assets in the enterprise.

The refresh rate coefficient reflects the number of funds disposed of per unit of newly introduced objects, that is, the number of retired obsolete objects as a result of the introduction of new ones.

The update scale factor reflects the share of new funds relative to the initial value.

The update time has the opposite meaning with respect to the scale factor of the update.

The retirement ratio shows the share of retired fixed assets. The growth rate reflects the growth rate of the fixed assets of the enterprise under study.

The replacement factor shows the share of newly introduced fixed assets aimed at replacing the retiring fixed assets.

The coefficient of park expansion has a certain range of values, depending on which conclusions are drawn. If the number of incoming objects is less than the number of retired ones, $C_{exp} < 0$, the park is

narrowed. If the number of incoming and outgoing funds is equal, $C_{exp} = 0$, - the park remains unchanged. If the number of received fixed assets exceeds the number of equipment that has left, that is, $C_{exp} > 0$, - the fleet of machines and equipment expands (Babich, 2006).

The coefficient of stability characterizes the fixed assets that are retained for further use.

Table 2
Indicators of fixed assets movement

Indicator name	Calculation method
the coefficient of receipt	Received (entered) fixed assets / Fixed assets as of the end of the reporting period
The receipt rate	(New fixed assets received in the reporting period - Fixed assets liquidated in the reporting period) / Fixed assets at the beginning of the reporting period
The replacement factor	New fixed assets received (introduced) in the reporting period / Fixed assets liquidated in the reporting period
The coefficient of renewal	New fixed assets / Fixed assets as of the end of the reporting period
The refresh rate coefficient	Fixed assets liquidated in the reporting period / New fixed assets received (introduced) in the reporting period
The update scale factor	New fixed assets received (entered) in the reporting period / Fixed assets at the beginning of the reporting period
The update time	1 / Update scale factor
The retirement of fixed assets ratio	Fixed assets disposed of (liquidated) in the reporting period / Fixed assets at the beginning of the reporting period
The growth rate ratio	Amount of increase in fixed assets / Cost of fixed assets at the beginning of the reporting period
The coefficient of park expansion	1 - Refresh Rate Coefficient
stability coefficient	(Fixed assets as of the beginning of the reporting period + Fixed assets disposed of (liquidated) in the reporting period) / Fixed assets at the beginning of the reporting period
Life time	1 / Retirement Coefficient

The life time is determined by the inverse of the retirement factor. It characterizes the actual service life of fixed assets.

Table 3
Indicators of fixed assets movement

Indicator name	Calculation method
Wear factor	Amount of wear (depreciation) of fixed assets / Initial (replacement) value of cash balance of fixed assets = 1 -
Shelf life coefficient	Residual value of available fixed assets / Initial (replacement) value of cash balance of fixed assets = 1 - Wear factor

The assessment of the effectiveness of the use of fixed assets is based on the application of a technology of evaluation common to all resources, which involves the calculation and analysis of indicators of output

and capacity. The indicators of output characterize the output of finished goods per 1 rub. resources value. Capacity indicators characterize costs or resources of resources per 1 rub. output value.

Resource stocks mean the amount of cash resources at the balance sheet date as per the balance sheet, costs mean the current expenditure of resources, in particular, that of fixed assets, i.e. depreciation. When comparing the reserves of resources with the volume of revenue for the period, it is necessary to calculate the average value of the reserves for the same period. The return on assets (F_o) is a general indicator of the effectiveness of the use of fixed assets:

$$Fo = \frac{Volume\ of\ production}{Average\ annual\ initial\ (recovery)\ value\ of\ fixed\ assets)}$$

The calculation of the indicator own and leased fixed assets are taken into account, while leased and conserved fixed assets are not taken into account. The rate of return on assets is analyzed in dynamics over a number of years, so the volume of production is adjusted for changes in prices and structural changes, and the cost of fixed assets - by the coefficient of revaluation. The increase in the return on assets leads to a decrease in the amount of depreciation deductions attributable to 1 ruble value of finished products or amortization capacity. Growth in capital productivity is one of the factors of intensive growth in output.

Another important indicator characterizing the efficiency of the use of fixed assets is the capital intensity (F_e) of fixed assets:

$$Fe = \frac{1}{F_o} = \frac{(Average\ annual\ initial\ (recovery)\ value\ of\ fixed\ assets)}{Volume\ of\ production}$$

The change in the capital intensity in the dynamics shows the change in the value of fixed assets by 1 rub. produce value and is used to determine the amount of relative overspending or savings in fixed assets (E): $E = (F_{e1} - F_{e0}) * Q_1$, where F_{e1}, F_{e0} are the capital ratio of the reporting period and the base period, respectively; Q_1 is the volume of output in the reporting period.

To develop the technological policy of the enterprise, an in-depth factor analysis of the efficiency indicators for the use of fixed assets (primarily capital productivity) is needed (Babich, 2006).

The analysis of the operation of the equipment is based on a system of indicators characterizing its use in terms of numbers, operating time and power. To analyze the quantitative use of equipment, it is grouped according to the degree of use (Figure 1).
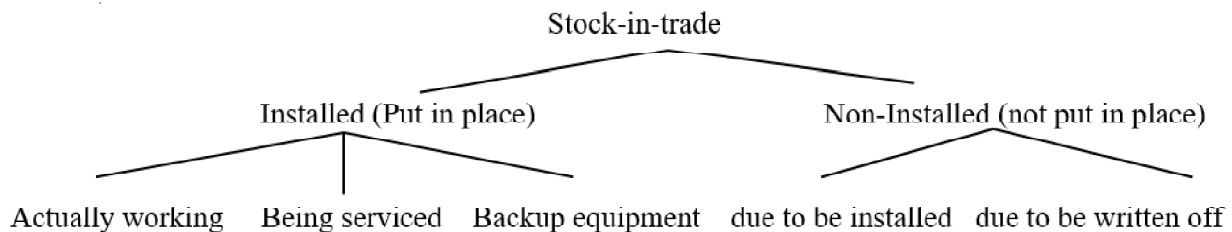

Figure 1: Composition of stock-in-trade

To characterize the degree of equipment attraction, the following is to be calculated:

– the coefficient of use of the Stock-in-trade *(C)*:

$$C_S = \frac{the\ amount\ of\ actually\ working\ equipment}{the\ amount\ of\ equipment\ available};$$

– the coefficient of use of the equipment installed *(C)*:

$$C_i = \frac{the\ amount\ of\ working\ equipment}{the\ amount\ of\ equipment\ installed};$$

– the coefficient of use of the equipment commissioned *(C)*:

$$C_C = \frac{the\ amount\ of\ equipment\ installed}{the\ amount\ of\ stock-in-trade}.$$

If the values of the indicators are close to one, then the equipment with a high degree of workload is used, and the production program corresponds to the production capacity.

To characterize the extensive workload of equipment, the use of equipment over time is to be analyzed (table 4).

Table 4
Indicators characterizing the time fund for the use of equipment

Time fund indicators	Conventional symbol	Calculation formula	Notes
Calendar fund period, days.	F_c	$F_c = T_{c.d.} * 24$	$T_{c.d.}$ - Number of calendar days for the analyzed
Nominal (mode) fund	F_n	$F_n = T_{nsh} * t_{dsh}$	T_{nsh} - Number of shifts for the analyzed period, t_{dsh} - Duration of working shift, hours.
Effective fund	F_{ef}	$F_{ef} = F_n - T_{plrp}$	T_{plrp} - Time of planned repair, hour.
Useful fund	F_u	$F_u = F_{ef} - T_{dwn}$	T_{dwn} - time of unscheduled downtime, hours.

The level of in-shift use of equipment characterizes the workload coefficient of equipment (C_w), which allows estimating the loss of equipment operation time due to preventive maintenance and other factors:

$$Cw = \frac{Fu}{Fc} = \frac{Fu}{Fn} = \frac{Fu}{Fef}.$$

The level of conditional use of equipment characterizes the coefficient of shifts *(C_{sh})*:

$$C_{sh} = \frac{Actually\ worked\ number\ of\ machine-shifts\ for\ the\ period}{The\ maximum\ possible\ number\ of\ machine-shifts\ worked\ by\ the\ installed\ equipment\ per\ one\ change\ of\ period}.$$

Under the intensive workload of equipment, the assessment of its productivity is understood. The coefficient of intensive equipment loading (C_{inw}) is determined by the formula:

$$C_{inw} = \frac{\textit{Average hourly actual use of equipment}}{\textit{The average hourly use of a unit of equipment}}.$$

A general indicator that characterizes the complex use of equipment is the integral load index C_{intl}

$$C_{intl} = C_{w} * C_{intl}.$$

FORMATION OF WAYS TO INCREASE EFFECTIVENESS OF USING THE MAIN INDUSTRIAL FUNDS OF INDUSTRIAL ENTERPRISES

Improving the use of fixed assets and production facilities means accelerating their turnover, which largely contributes to the solution of the problem of reducing the gap in terms of physical and moral depreciation, accelerating the pace of renewal of fixed assets. Finally, the effective use of fixed assets is closely related to another key task - improving the quality of products, as high-quality products are being marketed and in high demand in market competition conditions (Babich & Mityuchenko, 2016; 7].

The successful functioning of the basic production assets depends on how fully the extensive and intensive factors for improving their use are realized.

All reserves to improve the efficiency of the use of fixed assets and capacities can be reduced to two groups of reserves: intensive and extensive ones, in accordance with the indicators. At the same time, it is important to remember that in each industry the possibilities for implementing reserves will be different and will require deep knowledge of the specifics of the industry. It is impossible, for example, to maximize the extensiveness coefficient in the beet-sugar industry, but in sugar-refined production one should strive for this (Dãuñker, 1955).

Factors and reserves for improving production efficiency also determine concrete ways for their implementation (Babich, 2014, 6].

In the market conditions, in the presence of stable demand for the products of the industry and raw materials for their production, the ways of improving the use of fixed productive assets are determined by the need to realize the reserves for a complete loading of equipment. Reserves for growth in output based on an increase in the coefficients of intensive and extensive use of fixed productive assets are illustrated by the Gurrari scheme (Figure 2).

The following formulas will help you to make the necessary calculations for constructing a schedule of reserves for growth in output volume:

- using the formula, calculate the intensive coefficient (C_{int}):

$$C_{int} = \frac{\textit{Average daily output}}{\textit{Average daily production capacity of the enterprise}} = \frac{25,1}{110} = 0,2282.$$

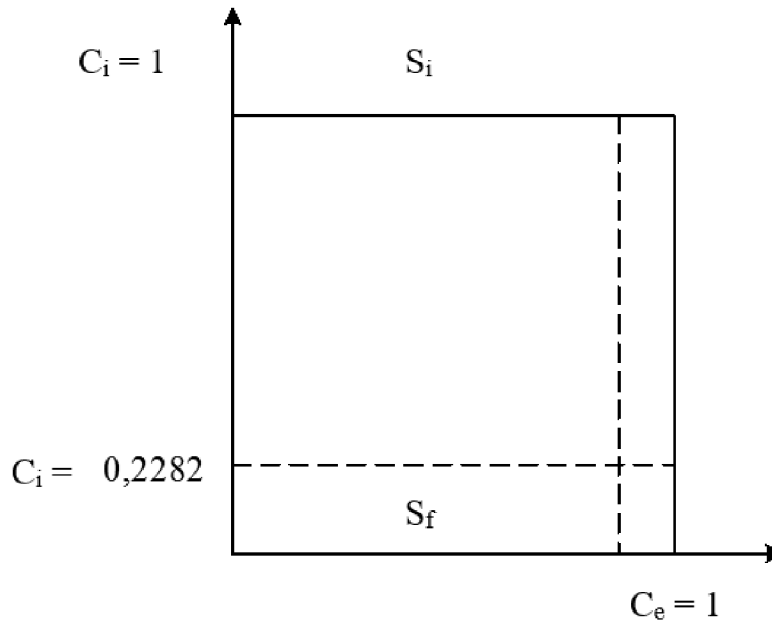- using the formula, calculate the extensive coefficient (C_{ext}):

Figure 2: Reserves for production growth

$$C_{ext} = \frac{Actual\ (planned)\ fund\ of\ working\ hours}{Estimated\ Working\ Time\ Fund,\ adopted\ for\ the\ determination\ of\ production\ capacity} = \frac{23}{24} = 0,9583.$$

In these conditions, the increase in the efficiency of the use of fixed production assets is carried out by an increase in the volume of production, an increase in the intensity factor.

Directions to improve the efficiency of the use of fixed assets can be diverse, the main ones are as follows:

1. Improving the quality of raw materials, bearing in mind the increase in the content of useful substances in raw materials and its manufacturability, the possibility of extracting the product. With an increase in the quality of raw materials, the output of commodity output rises, and with the same operating fixed assets, the return on assets inevitably increases. Taking into account the achievements of domestic and foreign practice, this allows increasing the return on assets by 20-25%.

2. Reduction of losses of useful substances in waste and garbage. Industrial utilization of waste and garbage at the place of their occurrence allows to increase the volume of products to 20%, and the return on assets by 10-15%.

3. Introduction of achievements of modern scientific and technical progress and, first of all, waste-free, low-waste, resource-saving technologies and equipment for their implementation. This increases the output of products from the same volume of processed raw materials and the return on assets. This includes the introduction of new systems for automated management of basic production assets.

Improve the financial performance of the company can be both by increasing working capital, and by reducing costs. A significant share of the costs of large manufacturing enterprises accounted for the main production assets and, first of all, their active part - equipment. The processes of managing the main production assets are an integral part of the unified enterprise management system and are aimed at ensuring their effective use. The information system for managing fixed assets is designed to increase the overall efficiency of the fixed assets of enterprises by automating the processes of operation, maintenance, and repair of technological equipment of buildings and structures, as well as the processes of material and technical supply and storage of enterprises.

4. Replacement of existing obsolete equipment with new, more efficient and economical. With a normally functioning economy, under conditions of aggregate concentration with a doubling of the capacity of machines, the price increases only by a factor of 1.5. This determines the growth of capital productivity.

5. Increasing the level of concentration of production to the optimum size. According to the law of concentration of production with a doubling of production, the value of fixed assets increases only by one and a half times. This is a consequence of an increase in the share of the active part of fixed assets, the effect of aggregate concentration and an increase in the scale of production. After all, the economic efficiency of the concentration of production is largely due to a decrease in capital intensity, and this is the reciprocal of the return on assets.

6. Creation of economic incentives to improve the efficiency of the use of fixed assets. The market in this respect is a universal mechanism. After all, in the market, all business entities operate on the terms of self-financing, and their competitiveness is ensured by the lowest resource consumption, including the basic production assets. High degree of equipment loading, accelerated depreciation, and replacement for more modern, high-performance and economical are the indispensable condition for the survival and prosperity of enterprises.

Thus, any set of measures to improve the use of production capacities and fixed assets should provide for the growth of production volumes, primarily through the effective use of on-farm reserves, the full use of machinery and equipment, and the reduction in the timing of the development of newly commissioned facilities.

Improving the use of fixed assets is reflected in the financial performance of the enterprise by increasing output, reducing costs, improving product quality, reducing property taxes and increasing book profits.

To determine the value of fixed assets in the future period, it is advisable to use the extrapolation method based on the average absolute growth provided that during the last three years the enterprise has increased the cost of fixed production assets at the same rates (Table 5).

$$\Delta_j = y_i - y_{i-1}; \ y_t = \frac{\Sigma y_i}{n} + \frac{\Sigma \Delta_j}{m} * t.$$

Table 5
Smoothing the indicator of the value of fixed assets

Years	The basic production assets, thousand rubles. (y)	Symbol of time (t)	Margin (Δ)	Aligned values (y)
2014	13 086	−1		13 086
2015	13 749	0	663	13 953,33
2016	15 025	1	1276	14 922,83
Total	41 860	0	1939	
Mean value	13953,33		969,5	

The use of the average absolute growth for the forecast is possible only if the following condition is satisfied:

$$\sigma^2_{marg} \leq \rho^2,$$

where $\rho^2 = \frac{1}{2} * \frac{\Sigma\Delta^2_j}{m}$; $\sigma^2_{marg} = \frac{\Sigma(y_i - y_{ti})^2}{n}$.

In this case

$$\sigma^2_{marg} \leq \rho^2, since\, \rho^2 = 1550808,75; \ \sigma^2_{marg} = 17396,71.$$

The condition is satisfied, therefore, we can make a forecast:

$$y_i = y_{i-1} + \frac{\Sigma\Delta_j}{m} * t;$$

$y_{2017} = 15025 + 969,5 * 1 = 15994,5$ **thousand rubles**;

$y_{2018} = 15994,5 + 969,5 * 1 = 16964$ **thousand rubles**.

Increasing the efficiency of the use of fixed assets is now of great importance. Enterprises possessing fixed assets inherited from the socialist economy should not only strive to modernize them, but also make the most efficient use of what they have, especially in the current conditions of finance and productive investment deficit.

CONCLUSION

Analysis of the state of industry in Russia indicates a crisis of its state, which can not be overcome: an outdated management paradigm, low consumer solvency, lack of funds and investments, high wear and tear of equipment, difficulties in produce sales, imperfect regulatory framework, lack of raw materials and fuel, and other reasons. In the process of the presented research, it was proposed to use the operational management of the main production assets and production capacities in order to increase the efficiency of the industrial enterprise and to move to a qualitatively new level of management activity.

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