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ANALYSIS OF MATERIAL RESOURCES USAGE OF THE COMPANY

Abstract

Introduction*. Any household decision is evaluated by their final result, which is profit. One of the main factors affecting the profit is the level of material stocks. Revenues from sales and profit appear only when the subjects of labor used in the production, transfer their value to the cost of manufactured product and find the final user. Therefore, stable supply of material resources is a precondition for the functioning and development of any company.*

Methods. *Used the methods of analytical research of efficient use of material resources, namely: logical methods, mathematical methods of linear programming, heuristic methods.*

Results. *Investigated objectives, main directions and information support of analysis. Described the services of control over efficiency of material resources management at the enterprise. Carried out research of the task of analyzing the efficient use of material resources in the enterprise. Described the methods of analytical research of efficient use of material resources.*

Discussion. *The efficient management of material resources movement provides the enterprise with additional benefits such as reducing production downtime, creating adequate reserves of stocks to ensure its rhythm, minimizing losses from freezing funds in inventories, saving costs from the proper use of storage facilities, etc. That is, effective management of material resources creates real preconditions for economic growth and determines the competitiveness of industrial enterprises.*

Keywords: *material resources, material capacity, material return of product, inventory turnover ratio, the ratio of fixing the inventory.*

Introduction.

Current economic conditions, based on the laws of the market, laws of supply and demand and competition, force Ukrainian enterprises to adapt quickly to changes in the market environment and avoid unreasonable risk making managerial decisions as for the use of all available production resources and in particular material.

Any household decision is evaluated by their final result, which is profit. One of the main factors affecting the profit is the level of material stocks. Revenues from sales and profit appear only when the subjects of labor used in the production, transfer their value to the cost of manufactured product and find the final user. Therefore, stable supply of material resources is a precondition for the functioning and development of any company.

Analysis of recent research and publications.

Research of material resources at the enterprise, their analysis and efficiency, have recently been engaged in by such scientists as Bubela A.V. [2], Kasych A.O. [3], Orlova V.S. [4], Kolmakova O.M. [5], Ruban L.O. [8] etc.

Purpose.

Investigation of methods of analysis of material resources of the enterprise to increase the efficiency of their use and, consequently, to improve the profitability of the enterprise.

Research methodology.

The scientific research used the methods of analytical research of efficient use of material resources, namely: logical methods, mathematical methods of linear programming, heuristic methods.

Results.

1. Objectives, main directions and information support of analysis

Stocks, according to the principle (standard) of accounting (P(S)A) №9 "Stocks", an asset is recognized if it is probable that the company / institution will receive future economic benefits associated with their use, and their value can be reliably measured.

For accounting purposes, stocks include:

- raw materials, basic and additional materials, components and other tangible assets intended for the production of goods, performing works, rendering services, distribution, transmission, service of production and administrative needs;
- unfinished production in the form of not completed processing and assembly of parts, components, products and unfinished technological processes. Unfinished production at enterprises, institutions, performing works and rendering services consists of expenses to perform unfinished works (services) as for which enterprise / institution did not acknowledged revenue;
- finished products produced by the company, institution intended for sale and which meets technical and quality characteristics foreseen by the contract or other normative and legal act;
- goods in the form of tangible assets, purchased (received) and held by enterprise / institution for the purpose of further sale;
- low value items used for up to one year or a normal operating cycle, if longer than one year;
- current biological assets, assessed by P(S)A №9, agricultural produce and forest products after its initial recognition.

An important condition for enterprise development and intensification of production is stable supply of material resources (material current assets) and its efficient use. This is because the cost of material resources makes a significant share in expenses of production, respectively, saving and rational use of raw materials, semi-finished products or components helps to improve the financial situation of the company.

Main objectives of the analysis of material resources are:

- evaluation of company's supply by separate their types,
- search of reserves of inventories rational use,
- research of the impact of state and effectiveness of material resources usage on results of enterprise activity.

The main directions of material resources analysis are shown in Figure 1.

Analysis of enterprise supply by material resources, which is carried out by two main directions.

The first aspect is the analysis of the dynamics of composition and structure of material resources.

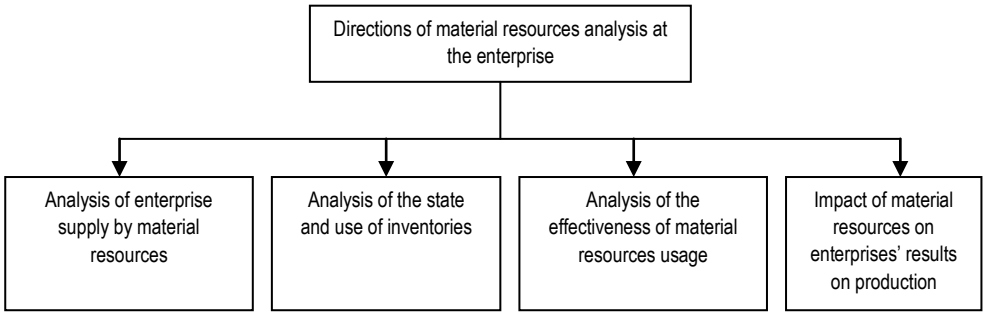

Figure 1. Directions of material resources analysis at the enterprise

They helps to identify: what deficit and expensive materials enterprise uses; consumption of which of them is dominant in the production of a specific product; whether production differs by material capacity. To do this, calculate the following indicators: the share of material expenses in total expenses on production; share of certain types of material resources, mostly raw materials, basic materials, fuel, energy, in their total cost; the share of material expenses on production of certain products in their total cost and its change for a certain period; the quality of received from suppliers materials and their compliance with standards and technical conditions.

The second aspect is the analysis of material resources movement which involves assessment of supply rhythm. In case of violations in supply of material resources calculate the following indicators: standard deviation; level of uneven supply; coefficient of variation.

Analysis of the state and use of inventories to determine the surplus (excess) of stocks, actual value of stocks compare with normative, study the dynamics of their leftovers, completeness, availability of unnecessary and damaged materials and raw materials. The most important indicators characterizing the intensity of inventories consumption is turnover ratio, coefficient of fixing and turnover duration.

Analysis of the effectiveness of material resources usage analyze in the following main directions:

- analysis of material resources usage,
- analysis of generalizing and specific indicators of their use efficiency,
- factor analysis of production material capacity.

Material resources usage can be described by the following indicators: the total expenses of materials and material expenses per unit of production. To generalizing indicators of the estimation of effectiveness of their use include: profit per one hryvnya of material expenses, material return, material capacity, ratio of the rate of production scope and material expenses growth, the share of material expenses in prime price of produce, coefficient of materials usage. For more detailed analysis of material resources usage, apply specific indicators that characterize consumption of certain components of material resources (main and additional materials, fuel, energy, etc.).

Impact of material resources on enterprises' results on production is determined using the method of factor analysis. The impact of the efficiency of material resources usage on the scope of produced production determine with different levels of detailing. Factor of the first level is change of material expenses and effectiveness of their use (or material return or material capacity).

An important role in the fulfillment of analysis efficiency of the effectiveness of material resources usage has the content and quality of information base of analytical research. To information sources of material resources analysis include: planned, accounting and reporting and notaccounting documents.

Planned information for assessing the supply of enterprise needs in material resources is contained in the prospective and current plans of material and technical supply, specifications, planned cost estimates of products and so on. Planned data is used for the analysis of enterprise supply by tangible assets: planned stocks' scopes and flow volumes (portfolio of orders), contracts, agreements for

the supply of raw materials.

Primary and reporting documents are used in retrospective analysis of material resources. Main forms of primary accounting information are acts of material acceptance, cards of warehouse account, accounting data on materials leftovers in stock, invoices, shortage certificates, power of attorney and more.

Accounting data is needed for:

a) analysis of company's supply by necessary inventory, meaning all data from warehouse, synthetic and operating accounting;

b) analysis of material resources usage, meaning data from reporting on material expenses on production transferred on the prime cost of commodity production.

To not accounting information include contracts for the supply of raw materials, norms and standards of material resources spending, results of marketing researches, P(S)A 9 "Stocks".

The analysis of material resources involves the use of the system of indicators. By the nature of economic processes reflection these indicators are divided into absolute and relative. Absolute indicators characterize satisfaction of the need of enterprise in material resources and are measured in cost and natural units. Relative indicators allow evaluating the use of material resources, for example, the level of material capacity or material return of production. Only the combination of these two groups of indicators gives a complete idea about the possibility of increasing production efficiency through rational use of material resources.

Organization of analytical work is determined by the composition and technical level of the management department. The efficiency of material resources management depends on coordination of efforts of three major functional services of the enterprise: marketing, management and accounting (Figure 2).

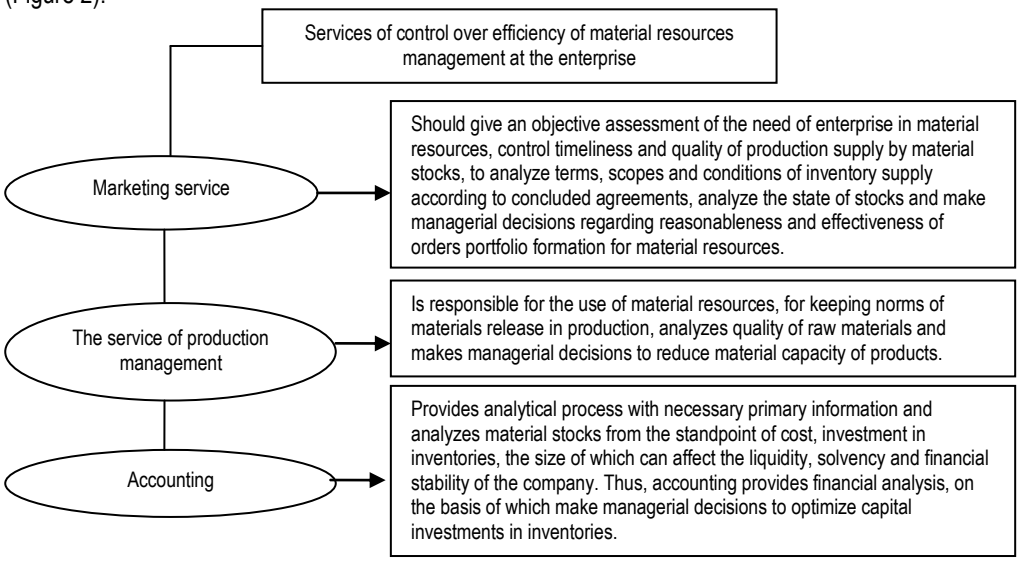

Figure 2. Services of control over efficiency of material resources management at the enterprise

2. Analysis of ensuring the enterprise by material resources

The availability of material resources of appropriate assortment and quality is a necessary condition of production, achieving a stable financial state by enterprise. An important way of finding reserves to reduce production prime cost and increase of profit is the analysis of composition and structure of material resources and identification of tendencies of their change to take appropriate managerial decision.

In any specific field of national economy use certain material resources (raw materials, fuel, energy, components, semi-finished products, containers, spare parts, etc.).

Determination of absolute and relative deviation of actual value of material resources from estimated (planned) cost or cost of prior periods in general for enterprise or for certain types characterize the tendency of their changes.

The composition and structure of material resources depend on the industry to which the enterprise belongs; type of product which it produces and features of material and technical supply. The composition of material resources is their distribution into separate groups and types, and structure is a quantitative ratio between cost of certain groups and types of material resources in their total cost.

Analysis of composition and structure of material resources allows identifying: what deficit and expensive materials enterprise uses; consumption of which of them is dominant in the production of a specific type of product; whether products differ by material capacity. To do this, calculate the following indicators: the share of material expenses (cost of material resources) in total expenses on production; share of certain types of material resources, mostly raw materials, basic materials, fuel, energy in their total cost; the share of material expenses on production of certain products in their total cost and its change for the analyzed period.

This retrospective analysis makes it impossible to draw conclusions about the completeness of enterprise needsin material resources coverage, that's why it is important to pay attention to the correct calculation of planned need, level of need fulfillment according to concluded contracts for the supply of material resources, their actual implementation.

A more detailed analysis foresees the characteristics of sources of need coverage (both external and internal). External sources include supply under concluded contracts, and internal - reducing materials waste, use of recycled materials, own manufacture of semi production, introduction of advanced energy-saving technologies.

The real need for the acquisition of materials is defined as the difference between total demand in a certain kind of material resources and the possibility of covering from internal sources. Obviously, the accuracy of defining internal sources predetermines objectivity of calculating the need in external sources. Sources of material resources inflow may be commodity and raw materials exchange, other enterprises as well asown production and wastes usage.

Analysis of plan fulfillment on logistics analyzes to determine the correctness of the determination of needs in material resources. Needs should be determine on the basis of data on planned production volumes, norms and standards of expenses and stocks. The real need in external material resources is defined as the difference between the total need in materials and the amount of own internal sources of coverage.

Performing analysis it is necessary to find out whether all the needs in external materials are secured by contracts with suppliers and whether these contracts are executed. The level of needs coverage by external sources is defined as the ratio of material resources volume in accordance with signed agreements for their supply to defined need, which can be covered only by external sources. For this assessment use planned and actual ratios of supply:

K (cov.pl..) = (Internal sources of covering the demand in natural terms +
+ Concluded contract for the supply of materials in natural terms)/ Planned need for materials in natural terms (1)

K (cov.a.) = (Internal sources of covering the demand in natural terms +
+ Received from suppliers materials in natural terms)/Planned need for materials in natural terms (2)

The first ratio shows the level of needs coverage in materials by concluded contracts and the second - how the actual supply covers needs (how a plan on deliveries is fulfilled).

Such an analysis is carried out for each type of material resources.

It is necessary to analyze the fulfillment by suppliers of each contract, including the terms and assortment of supplies. If contractual obligations are not fulfilled by suppliers, it is necessary to find out whether penalties for breaching the contract were applied to them.

An indirect indicator of supply evenness is absence of downtime due to lack of raw materials. In case of downtime due to lack of raw materials it is necessary to consider whether these materials and semi-finished products were missing in the company's warehouses or they just were delivered in a wrong time to working places.

Analysts also find out whether the quality of received from suppliers materials answers standards, specifications and terms of contracts. In case of delivery substandard materials also find out whether the claim was put up to suppliers.

To ensure continuous production is essential to organize properly the stocks replenishment. As for each title of objects of logistics supply should be set standards within which those stocks may fluctuate.

Stocks of material resources of the company are divided into: current and insurance (reserve) technological and seasonal stocks.

To the maximum norm of stock include all of the mentioned above components. It reflects the state of stocks at the moment of receipt of another batch of materials.

To minimum norm the current stock is not included. This norm reflects the state of stocks in the period when the current stock is fully spent and is expected the receipt of the next batch of supply. Current stock is calculated by multiplying the interval of deliveries in days and average daily use of material.

The actual availability of objects logistics supply for each independent unit of nomenclature is compared with the maximum and the minimum norm of stock, expressed in days of use on production. If actual stocks are lower than the minimum norm, they should be urgently filled up because there is a risk of disruptions in production due to the lack of materials. If stocks are larger than maximum norms, they are excessive. Surplus is advisable to sell and involve to the turnover raised in this way monetary funds.

Insufficient supply of materials or supply of low quality ones, replacement of materials by others, disruption of terms of delivery cause loses in production volumes or increase of production expanses. During the analysis it is necessary to calculate corresponding losses.

The decline in production scopes due to short supply of materials calculate by dividing the quantity of undelivered materials by the norm of their use per unit of produce. The same reduction due to the poor quality of materials is calculated by dividing wastes over plan by the norm of respective material use per unit of produce.

As a result of replacing one material by another appears the difference in norms of these materials use for production. To calculate the loss of the company as a result of this change, it is necessary to multiply material overspending per unit by the actual volume of output from this material and by the price of the unit of material. In addition, other materials (not foreseen in the contract) may require additional processing, which, in turn, involves additional labor costs, which are calculated by multiplying wages per unit of processed materials by the quantity of these materials. The resulting amount should multiply by percentage of charges on social needs.

Replacing one material by another also foresees the difference in price of these materials. Losses caused by increase of prices on materials are determined by multiplying difference in price by the quantity of replaced material.

Material resources of the enterprise are in constant motion: they come to the warehouse from suppliers and then transfer them to production, where gradually, during processing, they take the form of finished products.

At the stage of receipt of material resources to the company analyze the rhythm of their supply. It is clear that companies wish to choose a rational method of material resources supply, but this is not always possible to achieve. One of the used methods is “just-in-time”, which provides the supply of material resources in clearly defined terms and in appropriate amounts. Under these conditions reach rhythmical, uninterrupted supply of enterprise by material resources and their effective use in the production process.

Simultaneously analyze compliance of volume, assortment and quality of received material resources to conditions in concluded agreements for supply, as well as production losses as a result of violations appearance. Violations of terms of supply cause the decrease in production and sale scopes. The main reasons for decrease in production are: insufficient stocks, increase in actual spending of materials over norms and so on. Analysis finishes by development of measures to optimize the level of stocks, improvement of the state of their storage, elimination of abnormal stocks.

3. Analysis of the effective use of material resources

In the analysis of material resources a great importance has determination of the limit, further which it is not reasonable to dismember a study of the general in order to avoid loosing of its specificity. In this regard, the limit of the analysis of effective use of material resources is usually defined by its goals and objectives, and program and content of analysis by features of researched object and its target orientation.

Objective of the analysis of effective use of material resources is to obtain the most informative key parameters that give an objective and accurate assessment of the availability of different types of material resources at enterprise in terms of ensuring its competitiveness, enabling assessment of the effectiveness of management decisions as for portfolio of orders for material resources, identifying reserves of increase the efficiency of resource usage, development of measures for their mobilization.

Formation of tasks is a basic structural element in techniques of analysis of efficient use of material resources (Figure 3).

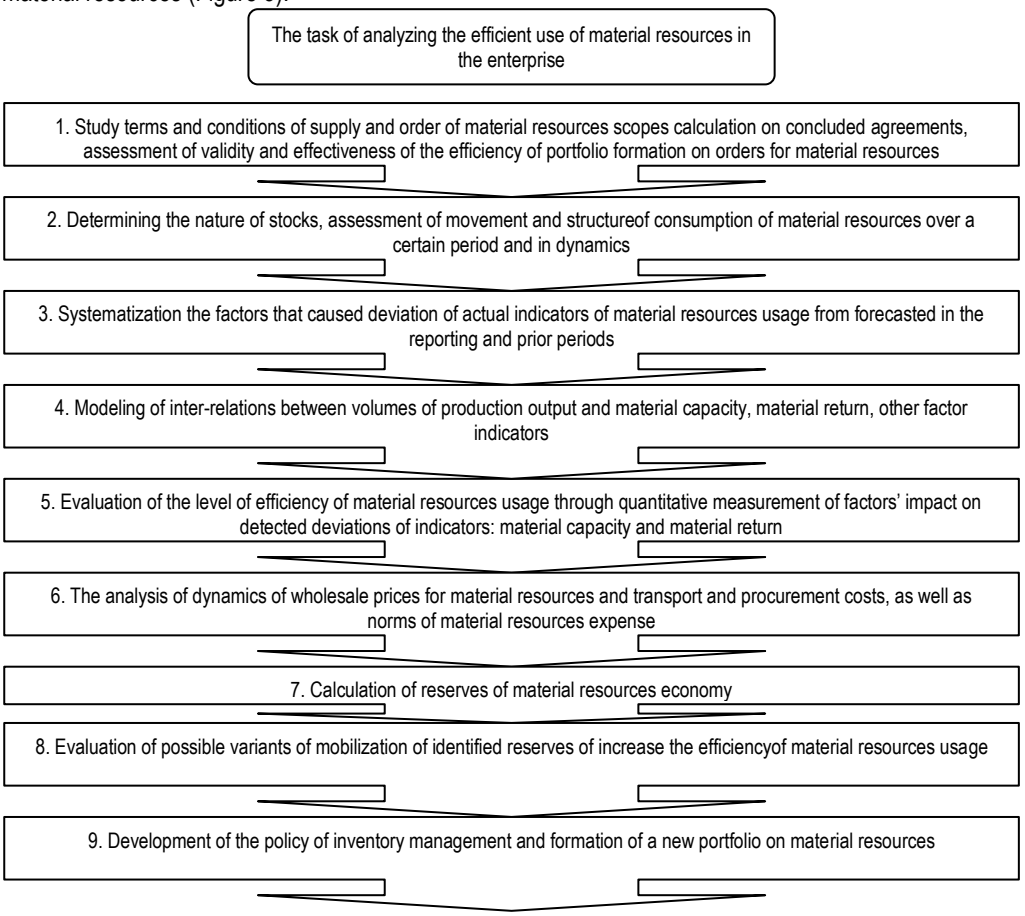

Figure 3. The task of analyzing the efficient use of material resources in the enterprise

The structural element of analysis techniques of efficient use of material resources are also ways of analytical research - logical, mathematical and heuristic (Table 1).

Table 1. The methods of analytical research of efficient use of material resources

The methods of analytical research	Scope
Logical methods	Are used for the analysis of the state of stocks, estimation of their movement and structure of consumption of material resources over a certain period and in dynamics, deviations of actual indicators of the usage of material resources from forecasted in the reporting and prior periods basing on arithmetic calculations (comparison, grouping, absolute, relative and average values, balance consistency); establishing interlinks between the volume of production, material capacity, material return, other factor indicators (modeling); quantitative measurement of factors' impact on detected deviations of material capacity and material return (factors' detailing, elimination).
Mathematical methods of linear programming	Use to study stochastic dependencies, which differ by approximation and uncertainty and are probabilistic in nature, they are used to analyze the validity and effectiveness of orders' portfolio for material resources when it is necessary to consider the impact of market factors which cannot be combined in single deterministic model (construction of a linear equation or system of equations).
Heuristic methods	Are associated with expert evaluations of production situations based on a creative approach and gained experience. They are suitable for assessing possible variants of mobilization of identified reserves of more efficient use of material resources and development of the policy of production stocks management (method of collective notepad, "brainstorming", control questions, analogies, etc.).

There is the certain system of technical-economic indicators for the analysis of efficiency of material resources usage. These indicators are differentiated depending on the features of production and separate types of labor subjects.

In general case all these indicators represent a level and sum of material expenses, instead of sum of material resources. They show the cost of material resources which are used on output production, and the level of their usage — specific weight of material expenses in the cost of the produced products.

Normative expenses of material resources per product unit, per certain service and per certain output scope is a key element in the system of management and analysis of material resources usage, because only comparatively with them an enterprise can define efficiency and expedience of actual expenses.

The analysis of material resources effective usage is related to research of level of material resources usage. Consequently, a task of analysis is a search of sources of these resources economy and decline of material capacity of products.

Material capacity of products is a cost indicator which represents the level of material expenses (without depreciation) per every hryvnya of commodity output and is calculated as ratio of sum of all material expenses to the cost of commodity output:

$$M_c = \frac{ME}{VO} \quad (3)$$

where ME - material expenses for the researched period;

VO – volume of output.

Material return of products (a reverse indicator to material capacity) characterizes output from every hryvnya of the spent material resources and is calculated as ratio of commodity output to the sum of material expenses:

$$M_r = \frac{1}{M_c} = \frac{VO}{ME} \quad (4)$$

One of sources of economy of financial resources is a decline of specific material capacity which represents the level of material resources usage on separate type of products and is calculated as ratio of amount or cost of the used material resources per separate type of products to the amount or cost of the produced products of this kind.

During an analysis it is also necessary to pay attention to specific weight of material expenses in production cost which characterizes the level of material resources usage according to the structure of output and is calculated as ratio of material expenses sum to a complete unit cost.

In the process of production activity there are always deviations of actual indicators from planned. The coefficient of materials consumption represents the level of actual material resources usage efficiency and shows economy or over waste of materials against the set norms. The calculation of this coefficient requires re-calculation of the planned sum of material resources on an actual production scope. This coefficient is calculated as ratio of actual material expenses to planned, re-calculated into actual output scope and assortment of products. An optimum value of this coefficient must be not greater after 1.

According to tasks of analysis of effective use of material resources it is possible also to calculate partial indicators of material capacity that characterize the level of use of certain types of material resources (metal capacity, fuel capacity, raw materials capacity, energy capacity, etc.). Such calculations are performed by the service of production management.

For the estimation of material resources usage efficiency it is necessary also to calculate such indicators:

1. Turnover of inventory (inventory turnover ratio) is calculated by dividing the value of commodity production (net income from sales or cost of sales) by the average leftovers of inventory during the analyzed period:

$$IT = \frac{NI}{\bar{I}} = \frac{CS}{\bar{I}} \quad (5)$$

where NI–netincome (revenue) from sales of products (good sand services);

CS — cost o fsales (good sand services);

$\bar{I}$ *- average left overs of inventory during the reporting period.*

Average left over sare defined as the arithmetic average of inventories at the beginning and end of the reporting period. If the calculated inventory turn over ratio amounts, forin stance, 3, it indicates that the company for ensuring its activity has inventory for four months in advance (12: 3 = 4) and stocks were replenished three times during the year. Itis difficult to determine the optimal for any enterprise value of this indicator, so you should consider specific features of certain type of economic activity. The higher inventory turn over is, the more effectively they are used, a lower cost is spent on their formation. Reduction of the value of inventory turn over in the reporting period in comparison with its value in the previous indicates a slow down in turn over of inventories.

It should be emphasized that in the numerator indicated not a sales volume but the output, because it shows the real value of inventory during the period under review.

2. The ratio of fixing the inventory, indicator, inverse to the coefficient of inventory turnover, is calculated by the formula:

$$k_{f.i.} = \frac{\bar{I}}{NI} = \frac{\bar{I}}{CS} \quad (6)$$

It describes the cost of material resources, which account for one hryvnya of netin come or cost of sales. The positive trend - a reduction of this indicator as for previous periods.

3. Duration (period) of inventory turn over (inventory storage period) is equal to the ratio of number of calendar day sin the period under review to the turn over of material resources and is defined by the formula:

$$D_{i.t.} = \frac{t}{IT} \quad (7)$$

where t – the number of days for which is calculated turn over (thus believed that the month is 30, quarter - 90, half a year 180 and a year 360 days).

Duration of inventory turn over shows the time during which inventories are transformed in to money. Decrease in value of the indicator in the reporting period compared to the previous is considered positive if it does not prevent the normal production process, does not endangers hortage of material

resources. It should be noted that the above indicators can also be calculated for certain types of inventory (raw materials, semi-finished products, components, etc.).

The analysis of the effective use of material resources on these indicators is conducted by the service of financial management or book-keeping (by an analytical department) and consists in establishment of tendencies of change of speed material resources turnover for certain period, changes of circulating and changes of storage terms with the purpose of factors exposure, which caused the negative influence and for developing measures using the discovered reserves. If during the analysis it was found that the terms of inventory turnover increased, there was a tendency of decrease in production, it is necessary to make decisions about reducing the receipt of material resources. The ratio between the volume of production and sales and the amount of material resources at each company is different. It depends on the nature of business activities and goals of the company.

The next step in analysis of effective use of material resources is modeling of causal relationships between indicators of material expenses and the cost of manufactured products to detect deviations of actual expenses from normative factors affecting the size of these deviations and the change in output.

Analysis of the study of causes of changes in material capacity of products conduct on three levels:

a) material capacity of all products produced by enterprise;

b) material capacity of a particular product;

c) material capacity of a unit of output.

Material capacity of production of the enterprise depends on the amount of material expenses of its production and on the amount and structure of production. In turn, the value of material expenses is affected by: the number and structure of production, specific costs of materials and their value, and the volume of output is affected by the amount and structure of output as well as selling prices for it.

Analysis of material capacity of certain products is carried out to assess its level and establish the causes of the change. The main reasons include changes in specific expenses of materials, prices of materials and prices of a unit of output.

After the analysis of material capacity it is necessary to analyze material expenses on the production of separate products. The objects of such analysis are products which occupy considerable specific gravity in the general output scope, and also new products. The source of analysis is a calculation of prime price of unit of products.

Conclusions and discussions.

The rational management of material resources is one of the reserves to reduce the cost of products, and therefore a factor in increasing profits and profitability at the enterprise. In addition, the efficient management of material resources movement provides the enterprise with additional benefits such as reducing production downtime, creating adequate reserves of stocks to ensure its rhythm, minimizing losses from freezing funds in inventories, saving costs from the proper use of storage facilities, etc. That is, effective management of material resources creates real preconditions for economic growth and determines the competitiveness of industrial enterprises.

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