STRATEGY OF ECONOMIC GOVERNANCE OF METALLURGICAL ENTERPRISE VIA INNOVATIVE APPROACHES

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Abstract. In market economy, innovation is an effective means of competition, since it helps to reduce production costs, to increase profits, to invite investments, to improve the manufacturer's image, as well as to open and conquer new markets. In connection with this, it is vital to develop a complex of measures aimed at improving competitiveness, which will render the enterprise financially sustainable.

To address these challenges it is necessary to take into account the features of the metallurgical industry: significant investment inflow for functional and process changes, decent outsourcing potential of the branch, the need for support and improvement of material and technical maintenance of logical instruments, lack of skilled personnel who are capable of addressing high-level tasks with due expertise.

This research is devoted to innovative economic mechanisms of running metallurgical enterprise aimed at reducing production costs, and, accordingly, improving its competitiveness.

It is proposed to use indicators calculated by either matrix or tabular method in order to outline economical results of the enterprise, including generalized information about its technical and economic and financial condition, the dynamics of its development, changes in the evaluation of outcomes and action reserves.

Computing of indicators behind economic performance of the enterprise via the given algorithm allows to see interrelations of economic processes and their indicators, promotes transparency and efficiency of the analysis, clarity of perception, promotes the quality of results of the

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adopted management solutions, allows for constant operational control and monitoring.

We also considered the method of reducing production costs resulting from improvements in the management of material flows of a steel enterprise via logistical approach. In this case, we used the correlation method to determine the duration of production streams. It intends to develop a mathematical model of the length of production stream. The conducted research allows to argue that improving the management of material flows based on logistic approach helps to eliminate the organizational and technical reasons that cause long idle time and delay in the moving of metal in all considered material flows.

The next component of reducing the cost of production is labor efficiency. When analyzing foreign experience, a certain system of indicators should be created in a market environment. This system should be public and common for all enterprises, should be regularly displayed in official sources. This will enable enterprises to analyze and plan their activities on a scientific basis, based on broad and truthful information about competitors. Addressing issues of labor efficiency will ensure: quality and profitability of labor, efficiency and intensity of expenses, stability and profitability of labor, efficient use of labor reserves, social security in the workplace, the necessary number of jobs in new areas of activity, decent standard of living, effective credit and monetary policy, investing in the human factor (in the social sphere), science and education, raising capital-labour ratio.

Thus, presented paper analyses innovative economic mechanisms to ensure effective performance of metallurgical enterprise. For the innovative system to be productive, all its components must work, and in close interconnection.

1. Introduction

The role of innovations in modern economy is immense. They ensure the overall competitiveness of produce and the enterprise, as well as promote high profits. In market economy, innovation is an effective means of competition, since it helps to reduce production costs, to increase profits, to invite investments, to improve the manufacturer's image, as well as to open and conquer new markets.

In connection with this, it is vital to develop a complex of measures aimed at improving competitiveness, which will render the enterprise financially sustainable [1; 2].

The basic indicators of ensuring financial sustainability are price, quality and actual cost of production. Therefore, the company needs to correlate closely methods of managing costs, the quality of produce and its price calculations.

The main components of innovative systems are:

– science and its research results, providing the source material (fundamentals) for the whole "chain of innovative development";

– innovative enterprises (organizations) that embrace innovations and create a new product that significantly affects the level and quality of the country's gross domestic product and its competitiveness;

– innovative management etc.

For the innovative system to be productive, all its components must work, and in close interconnection.

The purpose of the paper. This research is devoted to innovative economic mechanisms of running metallurgical enterprise aimed at reducing production costs, and, accordingly, improving its competitiveness.

2. Business efficiency

Attaining the desired economical results of the company's performance is one of the main objectives of its operation, the responsibility for addressing them is entrusted to the management apparatus. Therefore, we shall start by considering the main groups of indicators which can be used to assess the effectiveness of any enterprise.

As shown by literary sources, there are more than 100 points in the set of indicators, which allows the executive to see the full picture of the company's economic performance.

It is proposed to use indicators calculated by either matrix or tabular method [3; 4] in order to outline economical results of the enterprise, including generalized information about its technical and economic and financial condition, the dynamics of its development, changes in the evaluation of outcomes and action reserves.

Comparing indicators from short-term dynamic periods, the ones actually achieved with the ones forecasted and the achieved ones with the standard indicators serves as a basis for decision-making.

The calculation of indicators characterizing production-economic activity of the enterprise via the matrix method begins with the selection of qualitative indicators of work results. The number of indicators may be differ-

ent, but it is expedient to use no more than 10 of the most important ones, which ensure control over economic activity and serve as basis to argue managerial solutions.

When analyzing the work of any enterprise it is expedient to apply the following indicators:

– production sales revenue (PSR), UAH;
– gross profit (GP), UAH;
– net (balance) profit (NP); UAH;
– material costs (MC), UAH;
– production costs (PC), UAH;
– capital goods (CG), UAH;
– labor costs (LC), UAH;
– average number of workers (ANW), people.

The selected indicators are then entered in the first line of the matrix table as output, and in the first column as factors influencing these results. In the intersections of columns and lines of the table we calculate relative indices by dividing the value of the column indicator by the one of the line indicator. Such elements of the table as profitability, material productivity, capital productivity, material intensity, capital-output ratio, labor productivity, capital-labour ratio, own product real wages, expenses per 1 UAH of produce are well-known and often used in traditional analysis. Other items do not have widely known special names.

In the managerial analysis conducted in accordance with this algorithm, their names are given in table 1.

Similar tables are considered concerning the data from reporting and reference period. Given the ease of calculations and the availability of source data in current financial statements, the calculation period can be selected starting from 1 day.

Tables 2-4 contain input data and calculations for the system of indicators of an enterprise's performance, used in the matrix method of managerial analysis behind economic results, are given in. The initial data and calculations were performed for a metallurgical enterprise.

At the last stage, we compute relative changes in the indicators by dividing them in the reporting period into corresponding indicators of the reference period, we also fill the summary table with relative changes in the enterprise's indicators in the reporting period. Based on the changes computed, one can calculate the efficiency of performance of any enterprise.

Table 1

The system of performance indicators of enterprises used in the matrix analysis

	Production sales revenue PSR	**Gross profit GP**	**Net (balance) profit NP**	**Material expenses ME**	**Production costs PC**	**Fixed assets FA**	**Labor costs LC**
production sales revenue PSR		sales profitability	sales profitability	material productivity of of sales	costs per 1 UAH of profits	capital-output ratio	own product real wages
gross profit GP	sales per 1 UAH of gross profit		gross profit profitability	material intensity of gross profit	costs per 1 UAH of gross profit	capital-output ratio of gross profit	own product real wages of gross profit
Net (balance) profit NP	profit per 1 UAH of net profit	net profit profitability		material intensity of net profit	profit per 1 UAH of net profit	capital-output ratio of net profit	capital-output ratio of net profit
Material expenses ME	material productivity	material profitability	material profitability		PC to MC ratio	CG to MC ratio	LC to MC ratio
Production costs PC	return on costs	cost profitability	Cost profitability	MC share in cost price		CG to PC ratio	LC to PC ratio
Fixed assets FA	capital productivity	capital stock profitability	capital stock profitability	MC to CG ratio	PC to CG ratio		LC to CG ratio
Labor costs LC	return on labor costs	Labor costs profitability	labor costs profitability	MC to LC ratio	PC to LC ratio	CG to LC ratio	
Average number of workers ANW	labor productivity	gross profit per employee	net profit per employee	working capital-to-labor ratio	expenses to labour ratio	capital-labour ratio	average annual salary

Table 2

Input data of the enterprise in the reporting and reference period

	PSR, thous. UAH	**GP, thous. UAH**	**NP, thous. UAH**	**MC, thous. UAH**	**PC, thous. UAH**	**CG, thous. UAH**	**LC, thous. UAH**	**ANW, ppl**
Reporting period	3508482	1156715	865417	2172027	2727277	2277216	143722	33421
Reference period	2389639	261540	-256368	1786971	2252578	2301891	102037	30665
RpD to RfD ratio	1,47	4,42	-3,38	1,22	1,21	0,99	1,41	1,09

Table 3

Results of computing performance indicators of the enterprise via matrix method

Reporting period		PSR	GP	NP	MC	PC	CG	LC	ANW
		3508482	1156715	865417	2172027	2727277	2277216	143722	33421
1		2	3	4	5	6	7	8	9
PSR	3508482	1	0,329	0,246	0,619	0,777	0,649	0,040	0,009
GP	1156715	3,033	1	0,748	1,877	2,357	1,968	0,124	0,028
NP	865417	4,054	1,336	1	2,509	3,151	2,631	0,166	0,038
MC	2172027	1,615	0,532	0,398	1	1,255	1,048	0,066	0,015
PC	2727277	1,286	0,424	0,317	0,796	1	0,834	0,052	0,012
CG	2277216	1,540	0,507	0,380	0,953	1,197	1	0,063	0,014
LC	143722	24,411	8,048	6,021	15,112	18,976	15,844	1	0,232
ANW	33421	104,978	34,610	25,894	64,989	81,603	68,137	4,300	1
Reference period		**PSR**	**GP**	**NP**	**MC**	**PC**	**CG**	**LC**	**ANW**
		2389639	261540	-256368	1786971	2252578	2301891	102037	30665
PSR	2389639	1	0,109	-0,107	0,747	0,942	0,963	0,042	0,012
GP	261540	9,136	1	-0,980	6,832	8,612	8,801	0,390	0,117
NP	-256368	-9,321	-1,020	1	-6,970	-8,786	-8,978	-0,398	-0,119
MC	1786971	1,337	0,146	-0,143	1	1,260	1,288	0,057	0,017
PC	2252578	1,060	0,116	-0,113	0,793	1	1,021	0,045	0,013
CG	2301891	1,038	0,113	-0,111	0,776	0,978	1	0,044	0,013
LC	102037	23,419	2,563	-2,512	17,513	22,076	22,559	1	0,300
ANW	30665	77,927	8,528	-8,360	58,274	73,457	75,065	3,327	1

Table 4

Relative change in the indicators of enterprise's performance in the reporting period compared to the reference one

		PSR	GP	NP	MC	PC	CG	LC	ANW
		1,468	4,422	-3,375	1,215	1,210	0,989	1,408	1,089
PSR	1,468	1	3,012	-2,299	0,827	0,824	0,673	0,959	0,742
GP	4,422	0,331	1	-0,763	0,274	0,273	0,223	0,318	0,246
NP	-3,375	-0,434	-1,310	1	-0,360	-0,358	-0,293	-0,417	-0,322
MC	1,215	1,207	3,638	-2,777	1	0,996	0,813	1,158	0,896
PC	1,210	1,212	3,652	-2,788	1,003	1	0,817	1,163	0,900
CG	0,989	1,484	4,470	-3,412	1,228	1,223	1	1,423	1,101
LC	1,408	1,042	3,139	-2,396	0,862	0,859	0,702	1	0,773
ANW	1,089	1,347	4,058	-3,097	1,115	1,110	0,907	1,292	1

At the same stage, one can compute absolute changes in the indicators by deducting from the indicators of reporting period the corresponding indicators of the reference period and also one can fill the summary table of absolute changes in indicators of the enterprise's performance in the reporting period.

Economic performance of the enterprise is assessed for each indicator of the table along with the measuring the effect of various factors via the following formulas:

$$\pm\Delta П_0 = \left(П_T - 1\right)100;$$

$$\pm\Delta П_ч = \left(П_{T(ч)} - 1\right)100;$$

$$\pm\Delta П_з = \left(П_{T(з)} - 1\right)100,$$

where $\Delta П_0$ – relative total change of the table index the period analyzed, %; $П_T$ – change of the table indicator, units; $\Delta П_ч$ – relative change of the indicator due to the change of the numerator in the calculation, %; $\Delta П_з$ – relative change of the indicator due to the change of denominator in the calculation, %; $П_{T(ч)}$, $П_{T(з)}$ – the change of numerator and denominator respectively in the calculation of the indicator.

Computing results for relative indicators for assessing economic performance of the enterprise and the reasons behind their deviations are presented in Table 5.

Table 5

Relative indicators for assessing economic performance of the enterprise

Earnings per 1 UAH of gross profit	Relative changes			Positive changes
	General	Due to the change of numerator	Due to the change of denominator	
1	2	3	4	5
Earnings per 1 UAH of gross profit	-66,8	46,8	-342,3	Increase
Earnings per 1 UAH of net profit	-143,5	46,8	437,6	Increase
Material productivity	20,8	46,8	-21,5	Increase
Return on costs	21,3	46,8	-21,1	Increase
Capital productivity	48,4	46,8	1,1	Increase
Return on labor costs	4,2	46,8	-40,9	Increase
Labor productivity	34,7	46,8	-9	Increase
Sales profitability	201,2	342,3	-46,8	Increase

Ending of Table 5

1	2	3	4	5
Net earnings profitability	-231	342,3	437,6	Increase
Profitability of materials	263,9	342,3	-21,5	Increase
Profitability of expenses	265,3	342,3	-21,1	Increase
Profitability of CG	347,1	342,3	1,1	Increase
Profitability of LC	214	342,3	-40,9	Increase
Gross profit per 1 employee	305,8	342,3	-9	Increase
Material intensity of earnings	-17,2	21,5	-46,8	Decrease
Material intensity of gross profit	-72,5	21,5	-342,3	Decrease
Material intensity of production costs	0,4	21,5	-21,1	Decrease
Material intensity of CG	22,9	21,5	1,1	Decrease
Material intensity of LC	-13,7	21,5	-40,9	Decrease
Working capital-to-labor ratio	11,5	21,5	-9	Decrease
Expenses per 1 UAH of earnings	-17,5	21,1	-46,8	Decrease
Expenses per 1 UAH of gross profit	-72,6	21,1	-342,3	Decrease
Expenses per 1 UAH of net profit	-135,9	21,1	437,6	Decrease
Capital-earnings ratio	-32,6	-1,1	-46,8	Decrease
Capital-GP ratio	-77,6	-1,1	-342,3	Decrease
Capital-NP ratio	-129,3	-1,1	437,6	Decrease
Capital-labour ratio	-9,2	-1,1	-9	Decrease
Wage intensity of earnings	-4,1	40,9	-46,8	Decrease
Wage intensity of GP	-68,2	40,9	-342,3	Decrease
Wage intensity of NP	-141,7	40,9	437,6	Decrease
Average annual salary	29,2	40,9	-9	Decrease

Thus, computing of indicators behind economic performance of the enterprise via the given algorithm allows to see interrelations of economic processes and their indicators, promotes transparency and efficiency of the analysis, clarity of perception, promotes the quality of results of the adopted management solutions, allows for constant operational control and monitoring.

3. Logistical systems and material flows.

Next we shall consider the method of reducing production costs resulting from improvements in the management of material flows of a steel enterprise via logistical approach.

Efficient functioning of logistics systems is one of directions of innovative development in Ukrainian economy. Similar logistics systems should be developed alongside with [5; 6]:

– introduction of innovations and information technologies;

– development of single standards and unification of the running processes;

– reduction of the cost price of products and services provided;

– improving the efficiency of logistic business processes.

In conditions of dynamic development of the metallurgical industry where we observe the development and implementation of the mechanisms that enhance the efficiency of national economic policies via reengineering of existing organizational structures and business processes based on modern IT tools and logistics concepts; the following is gaining momentum:

– to determine and calculate the parameters of an effective logistic strategy of the metallurgical enterprise, based on its strategic and operational goals, on its methods of applying global logistic service, and also taking into account the current market conditions and situation;

– to introduce innovative information technologies to support logistic business processes of metallurgical enterprise. The solution to this problem involves the formation of an information system that in real-time mode is capable to accumulate, processe and present relevant data that ensure effective implementation of these logistic business processes;

– to launch centers of outsourcing interaction in order to construct an efficient system of management behind logistics business processes of the metallurgical industry as a whole.

To address these challenges it is necessary to take into account the features of the metallurgical industry:

– significant investment inflow for functional and process changes;

– decent outsourcing potential of the branch;

– the need for support and improvement of material and technical maintenance of logical instruments;

– lack of skilled personnel who are capable of addressing high-level tasks with due expertise.

The tool for solving the above-mentioned tasks is the concept of reengineering, which uses methods of process oriented management, economic and mathematical modeling as well as information technologies and systems.

Below are the main components in the mechanism of integrating logistics business processes into the management system of functional activity of metallurgical industry:

– business logistics department;
– accounting;
– financial department;
– suppliers of operating resources;
– employees who, within the limits of their functional responsibilities, carry out logistic functions;
– integrated information system of electronic supply chain management.

The systems of material, informational, financial and other flows are the objects of research of both science and the sphere of entrepreneurship. The fundamental difference between the logistic approach and the management behind transferring material resources is that logistics manages the flow, that is, a number of objects that are perceived as a whole.

In logistics, the category of material flow is closely connected and practically can not exist without the "stock" category and from here it is expedient to consider flows and stocks as parity logistic categories that have their own specific characteristics. Hence, there is a close relationship between the dynamic characteristics of material flows and the statistical quantities of material stocks. The flow characterizes the changing of the stock, while the stock reflects the result of the change and accumulation of the flow.

Competition in market relations leads to the transformation of logistics systems, and in particular, it necessitates an increase in the speed of material flows, increases the intensity of their use, complicates the financial relations between logistic intermediaries and reduces the integrity of the logistic chain. At many enterprises, material inventories in production and in distribution networks almost run out.

These trends result in an increase of potential instability of logistics systems. Further research, analysis and study of behavior of logistics systems, their chains and flows contribute to increasing their sustainability and reliability in achieving strategic business goals.

4. Research of material flows

In order to improve the management (increased intensity of use) of material flows in a metallurgical enterprise there was carried out a research of their movement from raw materials to finished products. The purpose of the study is to determine the way various factors influence the length of the production cycle in the system of workshops and to search for ways to reduce them based on the logistics chain.

The study of material flows was carried out within the framework of a steel mill with a full cycle of production (sinter-blast furnace, steelmaking, rolling) in the system of rolling mills [7; 8].

The duration of the production cycle in the rolling mills depends on many factors. To determine their impact on the length of production cycle it is necessary to study the structure of production at this enterprise, determine the route of the metal flow from the moment it arrives in the shop till shipping to other enterprises.

The study of production structure yielded 6 main material flows, given in Table 6.

Table 6

Name and symbol of the main production flows

Name of metal flow	Symbol
Blooming 1150 – merchant bar	1
Blooming 1150 – PRM – merchant bar	2
Blooming 1150 – PRM – mill "250" – rough forged axles	3
Blooming 1150 – PRM – mill "400" – rolled section steel	4
Blooming 1050 – RSSM – freight rails	5
Blooming 1050 – RSSM – mill "400" – rolled section steel	6

Note: PRM – pipe rolling mill, RSSM – rail and structural steel mill

The duration of the production stream can be determined by several methods:

– calculation and analytical method according to which the flow duration is determined by the formulas, using planned data about production output and the actual operating time of the main machinery;

– determination of the length of production flow by monitoring and directly measuring the working time of individual operations;

– studying available accounting documents using economic and mathematical methods, for example, the method of multiple correlation.

In this case, we used the correlation method to determine the duration of production streams. It intends to develop a mathematical model of the length of production stream. This model looks as follows:

$$y = a_1x_1 + a_2x_2 + ... + a_ix_i + в,$$

where a_i – the duration of production stream; x_i – duration of individual operations; $в$ – variable number.

All metal streams of this enterprise to be examined are divided into separate operations according to their structure, which means that x_i factors are found.

To construct a correlation model for the duration of flows we select the factual data from the reporting documents, which define the start and end of the operation for a long time (six months).

Using these data, we made calculations using programs that were compiled in the Excel environment and the "Systat" package.

Based on the data obtained, multiple correlation equations were compiled for each flow, correlation coefficients were determined. These data are shown in Table. 7

Table 7

The equation of multiple correlation for the duration of production flows

Flow №	The equation of multiple correlation	Correlation coefficients
1	$y = x_1 + 0,999x_2 + 0,999x_3 + 0,01$	0,999
2	$y = 0,96x_1 + 1,09x_2 + 0,99x_3 + 0,94x_4 + x_5 + x_6 - 0,16$	0,999
3	$y = 0,589x_1 + 0,97x_2 + 1,11x_3 + 0,965x_4 + 1,95x_5 + 0,999x_6 + + 0,76x_7 + 0,33x_8 + 0,506x_9 + 0,961x_{10} + 7,3$	0,99
4	$y = 1,04x_1 + 1,53x_2 + 0,98x_3 + 0,999x_4 + 0,93x_5 + 1,05x_6 + + 0,98x_7 - 0,05$	0,994
5	$y = 0,73x_1 + 0,71x_2 + 0,76x_3 + 0,96x_4 + 0,63x_5 + 3,06$	0,929
6	$y = 13,7x_1 + 3x_2 + 1,25x_3 + 1,8x_4 + 0,065x_5 + 7,17x_6 + 1,32x_7 - 39,8$	0,802

Note: operations (production factors) x_i are presented in tab. 8.

The high correlation coefficient indicates the reliability of the models obtained and the close connection of the factors in the flow. Using these models, we determined the proportion of impact of each operation on the duration of the flows. In general, we established the following influence of operations (factors) on the duration of streams for all the work flows:

– technological operations make 5-20% of all time;

– transport – 2-39%;

– operations related to handling and shipment – 43.5-90%.

Table 8

Distribution of production factors

The name of the operation	Operations (factors)					
	Flow №					
	1	2	3	4	5	6
1. Expecting loading and heating in blooming mills 1050					x_1	x_1
2. Heating time blooming mills 1050					x_2	x_2
3. Expecting loading and heating in blooming mills 1150	x_1	x_1	x_1	x_1		
4. Cooling time in storehouse of blooming mill 1150			x_2			
5. Rolling and cutting metal in blooming mill 1150	x_2	x_2	x_3	x_2		
6. Rolling and cutting metal on PRM		x_4	x_7	x_6		x_6
7. Time for transportation of metal from blooming 1150 to PRM, intermediate storage, including heating		x_3		x_3		
8. Rolling and cutting metal in blooming mill 1050 and RSSM					x_3	x_3
9. Transporting operations			x_4			x_4
10. Bloom's waiting time in PRM or RSSM receiving warehouse			x_6	x_4		x_5
11. Heating time in PRM continuous-type furnaces			x_5	x_5		
12. Heating, rolling and cutting on mill "400", shipping				x_7		x_7
13. Normalizing in RSSM					x_4	
14. Rolling and normalizing on mill "250"			x_8			
15. Finishing time on mill "250" or PRM		x_5	x_9			
16. Shipping time on mill "250" or PRM		x_6	x_{10}			
17. Finishing and shipping on blooming 1050 or RSSM	x_3				x_5	

Thus, we stress that it is operations related to processing and shipment that most significantly influence the duration of the operating cycle in the enterprise. Therefore, the main focus should be on the operations of group 3 in terms of reduction.

Based on reported and calculated data on the duration of production streams, there were complied operational maps showing the minimum, maximum, average and most likely duration of operations and flows in general (the most probable duration time is calculated via statistical package "Systat"). For example, tab. 9 features operations for the first flow.

The most probable duration of flows serve as template for calculating the standards for the duration of production cycles at the enterprise. On their basis, using the daily consumption of metal, we calculated working capital assets and the amount of their return as a result of bringing

Table 9

Operational card for the duration of operations for the first flow

The list of operations	Duration of the flow, hrs			
	min	max	medium	most probable
Expecting loading and heating in blooming mills 1150	2,2	5,7	5,0	5,0
Rolling and cutting metal in blooming mill 1150	0,2	1,1	0,6	0,5
Finishing and shipping	8,0	96,0	47,1	33,1
Total time of operation, including:	10,4	102,8	52,7	38,6
– technological operations, hrs %	2,4 23,1	6,8 6,6	5,6 10,6	5,5 14,2
– finishing and shipping, hrs %	8,0 76,9	96,0 93,4	47,1 89,4	33,1 85,8

the time of processing metal in the rolling mill to the level of projected standards.

The total amount of working capital released from stocks as a result of reducing the time of transferring metal equals $ 500 thous. per production cycle in the enterprise researched.

The conducted research allows to argue that improving the management of material flows based on logistic approach helps to eliminate the organizational and technical reasons that cause long idle time and delay in the moving of metal in all considered material flows.

For practical implementation of logistic management principles it is necessary, for example, to turn the monitoring service of individual shops into the service for management of material flows of rolling mills or to create a separate logistic structure whose functions should be control and provision:

– of timely shipment of finished products;

– of order-based-production of appropriate quality and strict compliance of production plans to shipment timetables of finished products;

– timely delivery of vehicles during shipment of produce outside the enterprise and while transferring semi-finished products between mills.

An improved transport service management system that completely eliminates delays in moving metal flows, will serve a sound foundation for implementing logistic schedules based on optimal transport time specifications. Their implementation will minimize the duration of metal flow cycles, accelerate the return on working capital and increase the efficiency of their use.

5. Labor efficiency and productivity

The next component of reducing the cost of production is labor efficiency.

Labor efficiency signifies socio-economic category, which determines the degree of achievement of this or another goal, correlated with the degree of rationality of resource expenses in this case.

Labor efficiency is a process of continuous, focused work on improving labor efficiency, or it is a process of searching the best solutions in one or another field of labor activity in order to achieve high results while reducing the cost per unit of these results.

The strategy of effectiveness signifies working out the main areas of improving labor efficiency based on the use of factors, reserves and resources to overcome economic crisis.

The essence of labor efficiency is represented by the concepts "labor productivity" and "labor profitability". The most common in theory and practice is the concept of "labor productivity".

Labor productivity is one of the decisive factors, which ensure an increase in the efficiency of production, reducing production costs. Therefore, the purpose of this study is to analyze the indicators that characterize the efficiency of enterprises, and to define the main and internal production reserves for its increasing.

It should be noted that enterprises that are actively trying to resist negative phenomena and lay the foundations for their future development, should apply the whole range of measures to improve the situation exactly in the present circumstances. Besides, it is impossible to achieve some stabilization of social production (let alone its growth) without stopping the slump and embracing the next cycle of growth of labor productivity. Addressing issues of labor efficiency should be the most important task of the entire socio-economic policy of enterprises. Without an increase in labor efficiency it is impossible to carry out structural adjustment, to create the necessary number of jobs in new areas of work, to ensure decent standard of living.

6. System of performance indicators of the enterprise

When analyzing foreign experience, a certain system of indicators should be created in a market environment. This system should be public and common for all enterprises, should be regularly displayed in official

sources. This will enable enterprises to analyze and plan their activities on a scientific basis, based on broad and truthful information about competitors.

Tabl. 10 presents a system of performance indicators needed by any enterprise for analysis and planning, as well as for assessing its competitiveness [9-11].

The map of the organization enables to establish direct links with affiliated enterprises, to obtain additional information in case of need, to determine mutually beneficial terms of cooperation in the market conditions.

General economic indicators allow to estimate the level of enterprise's competitiveness, to correlate its scale of production, its financial capabilities, the level of social development with affiliated enterprises – its competitors.

Personnel indicators enable to assess the rationality of professional personnel structure, the correctness of staff placement. The average age of employees allows to draw conclusions about the potential of the employee community.

Personnel costs are new indicators for domestic enterprises.

Staff costs are an integral indicator that includes all the costs associated with the functioning of the human factor: salary costs, various types of social insurance, benefits, social infrastructure, education and staff development, dividend payments, etc. In this case, the cost of wages or basic expenses should be less than half of the total cost of personnel.

In this case, the salary costs or basic expenses should be less than half of the total personnel costs.

In addition, if the costs of an enterprise exceed the amount set by competitors, the further activity of such an organization becomes problematic.

Therefore, the planning of labor productivity is a prerequisite of finding ways to reduce staff costs.

When planning labor productivity, two methods are used: the method of direct calculation and the method of planning by factors.

Direct calculation method enables to calculate tolerable reduction in the number of personnel resulting from specific organizational and technical measures. Wherein, they firstly determine the planned number of staff according to certain categories, taking into account its possible reduction as a result of planned measures. Then, relying on calculations for planned staff

Table 10

System of performance indicators of the enterprise

Name of the indicator	Indicator's characteristics
Map of the organization (branch, types of produce, type of ownership, address and telephone)	
General economic indicators	
– amount of produce;	Scope of production
– amount of fixed assets;	Scope of production
– proportion of fixed assets of non-manufacturing kind;	Level of social development
– labor productivity (in kind and in cash);	Efficiency of resource usage
– profit;	Financial state
– proportion of consumption funds in profit	Level of social development
Staff indicators	
– number of staff;	the size of enterprise
– proportion of employees;	Structure of personnel
– proportion of managers;	Structure of personnel
– proportion of experts and officers;	Structure of personnel
– staff turnover;	Structure of personnel
– average age of the staff	Structure of personnel
Staff costs	
– total cost;	costs for human factor
– salary costs;	rational organization of wages
– average salary;	wage level
– salaries of managers;	differentiation
– expenses for social payments in accordance with the legislation;	degree of social protection of workers
– their share in costs;	degree of social protection of workers
	the degree of social protection of workers
– expenses for additional social benefits and benefits;	level of social development
– costs for the maintenance of social infrastructure;	involvement of staff in management
	staff revenue structure
– expenses for the program "Participation in profits";	the effectiveness of using the human factor
– average size of dividends;	the effectiveness of using the human factor
– personnel costs, per unit of product;	
– share of personnel costs in the company's total costs	
Working conditions	
– share of workers in harmful working conditions;	care for workers' health
– the level of injuries;	care for workers' health
– the level of morbidity;	care for workers' health
– losses on the payment of benefits and compensations for poor working conditions	care for workers' health

and planned output, one can determine the level of labor productivity and its growth rate in comparison with the reference period.

In present conditions, the second method should be preferred – the one concerning productivity planning according to factors. In order to use it it is necessary to create a clear classification of factors applicable to all levels of management. The following factors are distinguished:

– external (not connected with the enterprise);

– internal (changes in volumes of production, structural changes in production, upgrade in technical level of production, improvement of management, production and labor organization, commissioning of new objects, etc.)

– socio-political (expectations of inflation, requirements for labor protection and waste management);

– social (level of social protection of workers).

Thus, planning labor productivity consists in working out the most accurate forecast in order to make the right decisions on the designing of factors to improve productivity.

7. Reserves of improving labor productivity

It is possible to identify the main and internal reserves of improving labor productivity at metallurgical enterprise (Table 11).

The most complete identification of reserves can only be obtained if all units are involved in planning and implementation of measures, and the costs will be calculated not for the whole enterprise, but in the areas where they are needed.

The unfavorable situation prevailing at domestic metallurgical enterprises has led to the fact that in order to survive they began to save on everything, primarily, on labor protection and conditions of work. This obviously causes great harm to the health of workers and generally adversely affects the motivation and efficiency of work.

Addressing issues of labor efficiency will ensure: quality and profitability of labor, efficiency and intensity of expenses, stability and profitability of labor, efficient use of labor reserves, social security in the workplace, the necessary number of jobs in new areas of activity, decent standard of living, effective credit and monetary policy, investing in the human factor (in the social sphere), science and education, raising capital-labour ratio.

Table 11

Basic and internal reserves of improving labor productivity at metallurgical enterprise

Basic reserves of production	
Technical and tangible	1. Introducing modern technologies in production. 2. Optimizing fleet of cars, equipment via the replacement of obsolete and modernizing the operating units. 3. Development of complex automation and computerization of production. 4. Electrification and mechanization of auxiliary operations. 5. Using forms of international exchange: licensing, consulting, etc. 6. Equipping production facilities with basic materials, semi-finished products and others based on procurement specification, the use of economical types of raw materials and materials. 7. Combine auxiliary products (required for operation, maintenance and repair) into a single system for quality assurance and performance in optimal time. 8. Regular and purposeful use of by-products for obtaining maximum return, the search for their various use in the production of a wide range of products.
Organizational	1. Development of the commodity nomenclature taking into account market requirements. 2. Implementation of the scientific organization of labor (division, cooperation of labor, proper organization of work places). 3. Improving the organization of production within the enterprise, work on optimal schedules, etc. 3. Implementation and development of systems for marketing management of production. 4. Thorough development of conditions in sales contracts. 5. Permanent search of distribution channels and sales of produce. 6. Support of reliable connections with real and potential consumers of produce.
Economical and social	1. Development of different forms of ownership. 2. Permanent assessment of the company's capabilities compared to competitors' results. 3. The enterprise' strife for product range variability and its quality. 4. Determination the main marketing strategy in the production system. 5. Improving financial stability of the enterprise. 6. Use of rational criteria for the selection and appointment of production managers. 7. Continuous improvement of workers' skills to ensure high quality assortment of products. 8. Establishing qualitative assessment of work, done by sales and marketing agents.

Ending of Table 11

Internal production reserves	
Reserves of bringing down labor intensity of production	1. Mechanization and automation of labor-intensive work. 2. Replacement of obsolete equipment or its modernization. 3. Typization and unification at restoration of commodity range. 4. Introduction of advanced technologies. 5. Improving the organization of production.
Reserves of improving the use of working time	1. Improving surveillance over the downtime of workers. 2. Rational organization of workplaces, continuous provision of all the necessary means. 3. Compatibility of the profession, studying and introducing advanced technologies. 4. Marketing management strategy.
Reserves of rational placement and use of labor force	1. Introduction of professional selection scheme and professional counseling of personnel. 2. Reduction of the share of auxiliary work. 3. Surveillance and prevention of labor discipline. 4. Promoting favorable conditions for carrying out work and obtaining another specialty.

8. Conclusions

Presented paper analyses innovative economic mechanisms to ensure effective performance of metallurgical enterprise. The authors suggest matrix method to determine indicators of economic performance, which includes more than 30 basic indicators, which ensures visibility and efficiency of analysis and allows for constant operational control and monitoring. The paper describes the sequence of logistics management for material flows of the enterprise, which completely excludes delays in the moving of flows and allows to accelerate the turnover of working capital. The research presents the system of labor indicators, required by the enterprise for analysis, planning and evaluation of its competitiveness. The authors define the main and internal reserves of increasing labor productivity, which ensure the improvement of quality, profitability and capital-labour ratio, efficiency of employed labor force and social security in the workplace.

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