

# Resource Potential as a Key Factor of Ukrainian Mining Enterprises Competitive Position

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**Abstract.** The paper is devoted to formulation of theoretical, methodological and practical recommendations for ensuring enterprise sustainable competitiveness based on an integrated assessment of key resource determinants. The issue of ensuring enterprise competitiveness require increased attention in modern conditions of Ukrainian economy development. It was determined that implementation in production practice of these tasks are possible due to the efficient enterprise resource potential management, which will ensure maximum using of production capacity, cost reduction, improving product quality and competitive position stability. An object of the study is decision-making processes that appear using the enterprise competitiveness resource potential. Subject of the study is expansion of high-quality products' production in conditions of world demand. The authors were solved the following set of tasks: was clarified the term's essence «competitiveness» according scientific approach; was determined the enterprise position based on competitiveness integral index calculation; was identified enterprise competitiveness main components in accordance with the resource concept; an assessment of the enterprise technical and economic condition was carried out by calculating the wear and sustainable coefficients, also products qualitative parameters were established based on economic and mathematical modelling methods. The reasons for the decrease in the rate of metallurgical enterprise development were determined: outdated technologies, the need to comply with international quality standards, increased competition in the market, wear of fixed assets. In the final part, to solve these problems, a set of measures has been developed to improve the state of the enterprise by expanding the production of high-quality products through an investment strategy.

**Keywords:** competitiveness, mining enterprises, competitiveness assessment, resource potential, product quality, project office.

## 1 Introduction

Metallurgical complex of Ukraine acts as one of the basic elements of the country's economy [1]. Therefore, one of the most important conditions for ensuring sustainable

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Ukrainian economy development is increasing of competitiveness of mining enterprises. Sustainable positions in a competitive environment are determined by the potential of the enterprise [2]. It acquires significant importance for enterprises that operating in a transitional economy, which competitive positions remain insufficiently high on modern world markets. The competitiveness of enterprises is a set of interrelated elements that aim to support and develop both existing and create new competitive advantages [3]. Also, the competitiveness of enterprises understood as the ability to produce competitive products due to its effective using of available resources.

Significant scientific contribution to the study of theoretical problems of competitiveness and competitive advantages of enterprises made by the following scientists: Azoiev H.L., Ansoff I., Afanasiiev A.A.; Dolzhanskyi I.Z. and Zahorna T.O., Ivanova Yu.B., Kotler F., Lamben Jean-Jacques; Mescona M., O'Shaughnessi, Porter M., Fathutdinov R.A.; Hayek F.A., Yudanov A.Yu., Evans D. and Berman B. and others [4]. However, a number of problems associated with efficient use of enterprises resource potential remain insufficiently studied. The theoretical provisions on the management quality of the resource potential components are not fully described and systematized, methods for its assessment are poorly developed.

Continuous rivalry market companies will look for sources to obtain a competitive advantage, in order to maintain or improve the existing market position [5]. The competition level of mining enterprises in foreign markets within the European Union requires strengthening their positions through implementation of new approaches to assessing competitiveness [6-11]. But resource approach remains the most important in the process of evaluating long-term advantages formation possibilities.

In the process of approaches evolution to the «competitiveness» concept formation, its basis was considered the availability of enterprise access to resources (production, financial, human). The resource potential was a weighted average supply of the balance reserves of resources main types. The drawback of this approach was the lack of proper attention to using resources process, because the key aspect of competitiveness was considered not the effectiveness of use, but the resources availability. The task of providing material resources is not decisive, since there are no restrictions on access to modern equipment or high-quality materials, raw materials and components. However, there are significant problems with the financial possibilities of ensuring the processes of forming benefits based on traditional resource provision. Also, stable competitive advantages, as evidenced by foreign experience, are based primarily on intellectual and human resources. Thus, to formation and maintenance a competitive advantage enterprise needs not only to respond to the external environment challenges, which are constantly changing, but also to ensure resource potential development. The need to improve the enterprises' competitiveness and ensure their economic growth poses fundamentally new challenges in the development of new models for rationalizing the consumption of all resource's types. The combination of effective structures and forms, as well as methods of managing the resource potential of an enterprise can provide a positive impact on its activities and is the basis of economic growth.

## **2 Data and methods**

The aim of the study is providing practical recommendations for assessing enterprise competitiveness through resource potential key components in today's market conditions.

The research methodological basis is theoretical foundations of domestic and foreign scientists works in the field of enterprise competitiveness, resource potential, enterprise economics, strategic management, the study of which made it possible to formulate and clarify the conceptual apparatus and essence of resource potential. During the research,

the following methods were used: *comparative* – to identify the impact of individual factors on the enterprise competitiveness; *economic and mathematical modeling* – to study enterprise qualitative parameters; *graph analytic* – in determining the assessment of the enterprises competitive position; *design and construction* – while substantiating the directions of increasing the enterprises competitiveness.

It is characteristic that the efficiency and the level of material consumption of production are formed under the influence of numerous factors of the external and internal environment. From the intra-production factors, one can single out: products material consumption; the quality of the materials used; introduction of new technological equipment; improvement of material-saving technologies for manufacturing products, etc. It is also important to increase the analysis reliability, so to assess the efficiency of using the resource potential, it is necessary to apply the optimal number of indicators and classification groups. Assessing enterprises' resource potential was proposed by L. Berdnikova methodology with using of the following indicators: human resources; fixed assets; material resources; financial resources. The advantages of the proposed methodology are that it presents a fairly wide range of indicators characterizing the use of fixed assets, and a quantitative assessment of human resources, their application will allow a more complete assessment of the effectiveness of planning the use of fixed assets and human resources. The disadvantages of the method include a limited number of indicators characterizing the efficiency of the use of material resources and human resources of the enterprise, which complicates the development and adoption of optimal management decisions to ensure the rational use of resource potential.

Assessment of the enterprise resource potential competitiveness level consisted of three stages. The first stage: collection of financial and economic information about enterprise state; determination of enterprise main goals, the initial and final characteristics of its economic activities. The second stage: calculation of enterprise actual competitiveness level through the components of the resource potential. The following main tasks were solved: selection of indicators set for each component's category of enterprise's potential; measuring the individual level of enterprises resource potential for each group, accepted for comparison. The third stage: analysis of resource potential use level of enterprise and assessment of existing management system effectiveness for enterprise resource potential. Main data sources for the study was information from materials of official publications of the State Statistics Committee and enterprise annual report for period 2017-2019.

## **3 Results**

### **3.1 The current state of mining enterprises competitiveness level in Ukraine**

In modern economic conditions, the main criterion for the enterprises economic development is the competitiveness indicator. An integral index of enterprise competitiveness should include indicators that directly describe the production process, the financial status, the use of staff, the level of innovations, etc. [12]. Applying of the integral assessment methods involves the use of significance coefficients (Tab. 1).

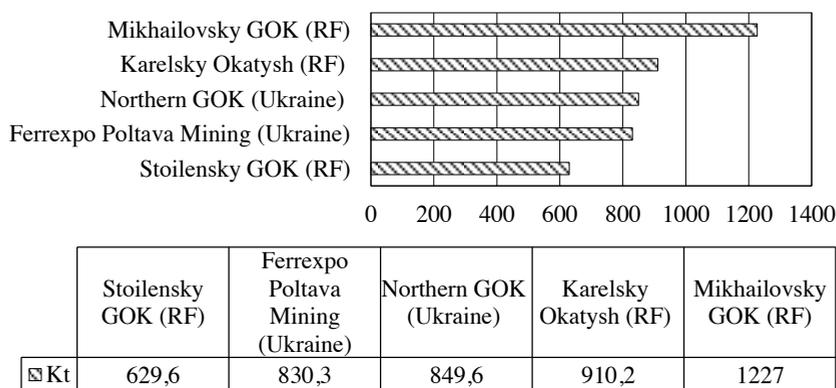
A visual representation of effective use of resource potential for PJSC «Ferrexpo Poltava Mining» was performed. The main product of enterprise is iron ore fluxed pellets. For the period January – May 2019, the enterprise produced 830.3 Kt of iron ore pellets, while the production of Mikhailovsky GOK (RF) amounted to 1227.0 Kt, Karelsky

Okatysh (RF) – 910.2 Kt of Northern GOK – 849.6 Kt and Stoilensky GOK (RF) – 629.6 Kt (Fig. 1).

**Table 1.** Integral index assessment of Ukrainian mining enterprises competitiveness

Enterprise name	Product quality	Share in total volume	Margin of financial strength	Capital investment	Return on resources	An integral index	Place
Northern GOK	0.92	1.0	1.0	0.33	1.0	4.25	I
Central GOK	1.0	0.13	0.82	0.22	0.18	2.35	IV
Southern GOK	0.71	0.15	0.70	0.15	0.14	1.85	V
Inguletsky GOK	0.94	0.16	0.89	0.42	0.1	2.52	II
Ferrexpo Poltava Mining	0.9	0.14	0.32	1.0	0.03	2.40	III

Source: Own processing based on [13].



**Fig. 1.** Enterprises pellets production among the former USSR countries  
 Source: Own processing based on [14].

One of the main company principles is the desire to increase iron ore production in the future, while at the same time demonstrating sound financial management, creating sustainable value for all interested parties. Today PJSC «Ferrexpo Poltava Mining» is one of the world’s largest pellet producers.

### 3.2 Comprehensive assessment of the resource potential components: personnel, fixed production assets, finances and raw materials quality

A hypothesis is pulled out about the existence on mining enterprises the system of forming competitiveness that consists of 4 subsystems – personal, equipment, raw materials and products [15]. The resource potential is understood as a set of various resources, the availability of which ensures the effective functioning of the technological chain for the production of metallurgical products from ore to finished rolled products. Such resources include production capacities, availability and quality raw materials, basic auxiliary materials, fuel, energy and other objects of labor, human potential in the form of the numerical and professional qualifications of workers, financial resources, their size

and the possibility of attracting. An analysis of the human potential assessment of PJSC «Ferrexpo Poltava Mining» is presented in Table 2.

**Table 2.** The human resources analyses of PJSC «Ferrexpo Poltava Mining»

Categories \ Year	2017		2018		2019		Deviation	
	persons	%	persons	%	persons	%	persons	%
Administrative management	580	7.5	500	6.6	460	6.1	-120	43.2
Industrial	6240	80.2	6100	80.9	6147	81.9	-93	33.5
Auxiliary	965	12.3	942	12.5	900	12.0	-65	23.3
Total:	7785	100	7542	100	7507	100	-278	100

Source: Own processing based on [14].

The pragmatism of the consumers of professional educational services has proved that professional knowledge, and skills are not fully required in the in-house labor market of mining enterprises [16]. The development of a socially oriented market economy in Ukraine, the effective implementation of reforms in this direction and the improvement of the well-being of the population is not possible without qualitative financial support for the competitiveness of workers, above all, in the mining industry [17]. The level of use of fixed assets effects on costs size, product prices and enterprise competitiveness. Based on available data of the enterprise consolidated statement the depreciation coefficient was calculated according to formula No. 1:

$$K_D = D \times 100 \div IS \tag{1}$$

Where the following applies:

*D* = is the amount of fixed assets depreciation,

*IS* = is the initial cost of fixed assets.

From the obtained calculations,  $K_{D2017} = 39\%$ ,  $K_{D2018} = 41\%$ ,  $K_{D2019} = 43\%$ . The following fixed assets suitability was calculated according to formula No. 2:

$$K_S = (IS - D) \times 100 \div IS \tag{2}$$

Results of calculations are  $K_{S2017} = 61\%$ ,  $K_{S2018} = 59\%$ ,  $K_{S2019} = 57\%$ , reflect the need to update fixed assets and flow of constant financial investments. So, the dynamics of advanced capital is presented in Table 3.

**Table 3.** Dynamics of PJSC «Ferrexpo Poltava Mining» financial resources

Advanced capital components	Year			2017 in % to 2019
	2017, UAH	2018, UAH	2019, UAH	
Non-current assets				
Unfinished construction	1246317	1559957	2378809	190.9
Fixed assets	7058534	6775459	7139777	101.2
Long-term financial investments	146510	74782	166822	113.9
Total:	104844559	9964357	10450595	9.97
Current assets				
Stocks	3848394	4973315	6822645	177.3
Accounts receivable for goods	2360085	4207966	4606450	195.2
Other Current Accounts Receivable	69315	133108	46300	66,8

Money and their equivalents	320413	1087038	218364	68.2
Total:	8910140	11325661	21290018	238.9
Balance:	19394599	21290018	22829827	117.7

Source: Own processing based on [13].

The quality of pellets is determined by the list of indicators reflected in Table 4. The chemical and mineralogical content (%) and physical properties of unoxidized ferruginous quartzite of the Kremenchuk region are given in Table 5. Ukrainian iron ore products are inferior to foreign ones in the iron content and harmful impurities SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> (Fig. 2).

**Table 4.** Quality indicators of pellets production

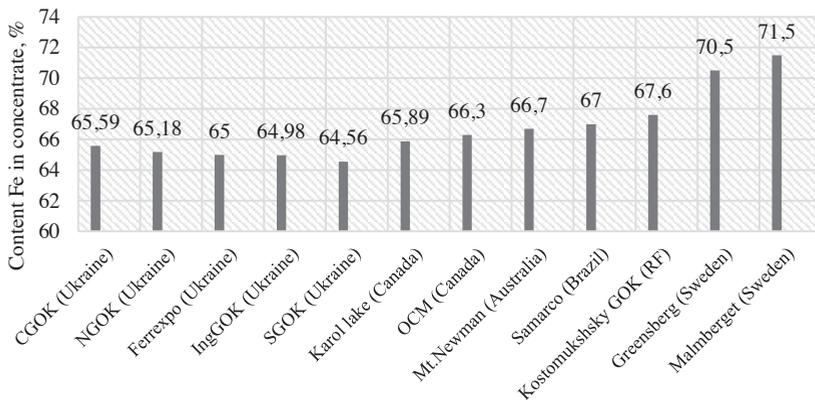
Chemical content	Fe	FeO	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	P <sub>2</sub> O <sub>5</sub>	SO <sub>2</sub>	Others	Weight
Mass fraction, %	62.5	2.0	87.06	8.91	0.48	0.51	0.75	0.02	0.08	0.05	99.8

Source: Own processing based on [18].

**Table 5.** Unoxidized ferruginous quartzites of Kremenchuk district

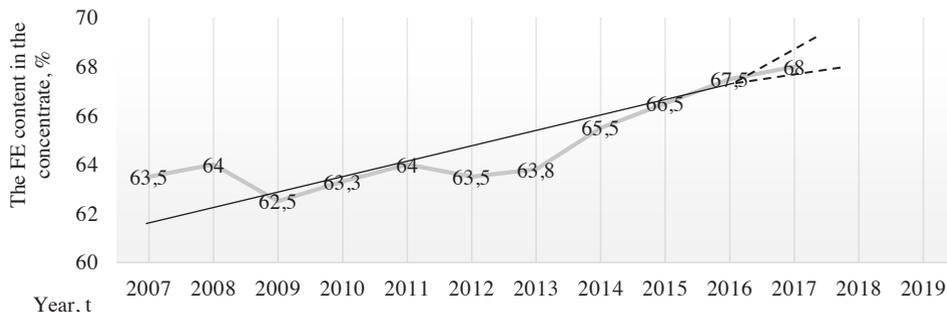
Elements and Oxides	Deposit		Minerals and physical properties	Deposit	
	Horishni Plavni	Yeristovo		Horishni Plavni	Yeristovo
Fe	36.16	34.2	Magnetite	41.6	46.5
FeO	34.13	34.2	Hematite	1.4	0.2
Fe <sub>2</sub> O <sub>3</sub>	16.3	16.0	Iron Carbonates	1.9	0.5
SiO <sub>2</sub>	17.33	16.2	Silicate iron	16.2	5.2
Al <sub>2</sub> O <sub>3</sub>	30.98	30.9	Quartz	32.2	38.39
CaO	41.66	42.3	Apatite	0.2	0.25
MgO	1.51	2.83	Carbonates	5.2	8.0
P <sub>2</sub> O <sub>5</sub>	1.71	1.91	Others	0.9	0.45
SO <sub>2</sub>	2.57	3.09	Volumetric weight g/cm <sup>3</sup>	3.3	3.3
CO <sub>2</sub>	0.075	0.11	Porosity (%) by	4.2-6	3.5
	0.001	0.62	Proto'akonov	15.20	16.20
	3.9	1.66			

Source: Own processing based on [19].

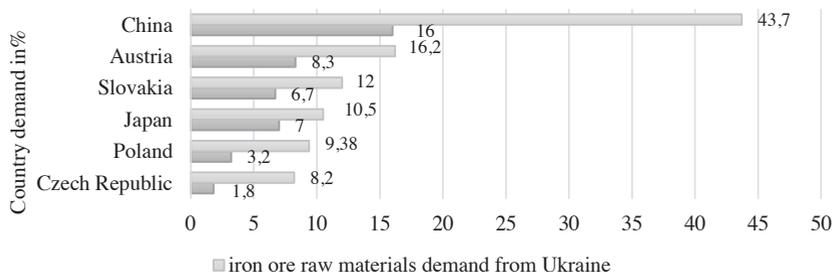


**Fig. 2.** World quality iron ore concentrate manufacturers  
 Source: Own processing.

Based on economic and mathematical modeling, the dynamics of the iron content in enterprise pellets over the past decade was studied (Fig. 3). The general demand trend for iron ore pellets in the foreign market shows Figure 4.



**Fig. 3.** The dynamics of the iron content in concentrate of PJSC «Ferrexpo Poltava Mining»  
 Source: Own processing.



**Fig. 4.** Iron ore demand trend  
 Source: Own processing.

So, the strategic objective for PJSC «Ferrexpo Poltava Mining» should be to stimulate an increasing of high-quality iron ore pellets export with a moderate increasing in their

total production. Suppliers from Australia and Brazil are crowding out the plant from the Chinese market. Therefore, the enterprise is trying to replace China with more profitable sales markets, to reorient supplies to Japan. If earlier the share of deliveries pellets to China was at the level of 25%, today it has decreased to 13%. Among global oversupply of iron ore, there is a shortage of pellet supply. According to experts, by 2020 the global demand for pellets grew by 4%. Global iron ore production is projected to grow at 2-2.3% annually as a result of substitution of China's domestic production of iron ore with imports, particularly from Australia and Brazil [20]. Thus, the low quality of iron ore raw materials significantly effects on enterprises' competitiveness. The quality improvement of any product is compared with the additional volume of its output.

## 4 Discussions and Conclusion

Considering the growing demand for concentrate in the world iron ore market, it is proposed to increase the concentrate volumes with a high iron content of 65%-67%, which requires the purchase of new equipment and attraction of additional investments. According to the National Bank of Ukraine, in the first quarter of 2019, the extractive industry was one of the leaders in attracting foreign direct investment [21]. The metallurgical industry is not among the priority, as it requires large investments now. The equipment of world industry leaders is recommended. In addition to investing in basic equipment, other costs should be considered (Tab. 6).

**Table 6.** Related costs for the project to expand the iron ore production

Costs type	Price, \$
Main equipment expenses	97726483.44
Tools and materials	9772648.34
Building an additional workshop construction	18385184.84
Equipment installation services	24431620.86
Equipment installation supervision	2931794.50
Accompanied equipment	14658972.52
Operating expenses	9772648.34
Other expenses	4886324.17
Total:	1825677.01

Source: Own processing.

Provided an economic justification of project costs: main equipment – 97726483.44\$ (Metso equipment complex); tools and materials – 10% of equipment cost; building an additional workshop construction – 18385184,84\$ (equipping with necessary lighting, two overhead cranes – 50 and 25 tons with lifting capacity, three hoists of 5 tons with lifting capacity, four gates, ventilation and fire extinguishing system); equipment installation services – 25% of equipment cost; equipment installation supervision – 3% of goods cost; accompanied equipment – 15% of main equipment cost (communication systems, additional ventilation, metal structures); operating expenses – 10%; other expenses – 5% (energy, water, sanitation, unpredictable insignificant expenses).

The average income from the sale of 1 ton of iron ore at the company PJSC «Ferrexpo Poltava Mining». amounted to 507.98UAH or 18.814\$ in 2019. With the amount of investment costs – 182565677.01\$, it will pay off after the production of 9703644 tons of concentrate with an iron content of 65%-67%. With price stability for the next 7 years, if the price of the concentrate is equal to the price of pellets with an iron content of 65%, it is possible to calculate the project payback period according to formula No. 3:

$$Inv/\frac{Inc}{V prod}/V incr prod = \frac{182\ 565\ 677,01}{((5\ 923\ 879\ 000)/(11\ 661\ 600))/27}/2915400 \quad (3)$$

Where the following applies:

*Inv* = investment size,

*Inc* = net profit for the year, which is calculated taking into account the fixed and variable production costs,

*V prod* = output per year,

*Vincr prod* = production volume increase (by 25% from 11661600),

27 – base hryvnia rate to \$.

The project is considered expedient for application through a quick recoupment – 3.3 years from the moment of commissioning, or 7.3 years from the moment of the first investments in the amount of 30% of the basic equipment cost. According to the calculation, the project will pay off after three years and four months (3.3284 years) after commissioning. The investment fund for the supply of equipment and its installation in the amount of 182565677.01\$ must be attracted for 4 years. It should be noted that the project will create 1467 work places an additional. To ensure the organization function of project management, it is expedient to create a new structural subdivision – project office, that provides for implementation of appropriate changes in the combine organizational structure. Many project-oriented organizations have implemented a project coordination mechanism, such as a project management office (PMO), to align projects with the organization's strategy, to ensure the success of projects, and to create value for the organization from projects [22]. PMO is a specific infrastructure that ensures the effective implementation of a project within the framework of a computer, communication and information technology systems and established standards for the implementation of activities and communications implementation. The urgency of the proposal to create a project team is that a successful project implementation requires competent project management. Project management education can make a significant contribution to increasing the project implementation success rate and reducing project failures [23].

Thus, it can be argued that the proposed measures are appropriate and effective for the PJSC «Ferrexpo Poltava Mining» and can be recommended for implementation in the enterprise activities. To ensure the stability of other enterprise types it is necessary to systematically assess the effectiveness of resource potential management. Taking into account such an assessment will make it possible to effectively influence the current state and development trends of the enterprise, establish the size and direction of changes, identify more significant factors of such growth, make forecasts and plans for further improving the reproduction processes, using and management of resource potential.

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