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REDUCTION OF OPERATING COSTS OF THE METALLURGICAL ENTERPRISE AT THE EXPENSE OF REFUSAL OF PURCHASED COMPRESSED AIR

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Key words:
inflationary processes, operating costs, operating activities, purchased compressed air, project, compressed air, strategic cost management.

The article investigates the issues of reducing the operating costs of the metallurgical enterprise by abandoning the purchased compressed air. The value and formation of operating costs at the production enterprise are considered. It is established that the most important in most situations are specific proposals to reduce operating costs of production activities. One of the most important areas of optimization of production operating costs at the investigated enterprise is the proposal to implement an investment project to reduce energy consumption in the production process. It is proposed to build a new compressor station, taking into account that in the process of production activities, namely in the technological process in the production of steel pipes, the studied enterprise uses a large amount of compressed air, which does not produce and whose production requires high energy consumption. Various alternative technical solutions for the use of turbochargers or screw compressors are considered. The development of other investment projects aimed at reducing the energy intensity of the enterprise as a whole has been formed. The cost of compressed air in the case of its production at its own compressor station has been calculated. Cost estimation were made in accordance of financial and economic indicators with the internal requirements of the enterprise.

ЗНИЖЕННЯ ОПЕРАЦІЙНИХ ВИТРАТ МЕТАЛУРГІЙНОГО ПІДПРИЄМСТВА ЗА РАХУНОК ВІДМОВИ ВІД ПОКУПНОГО СТИСНЕНОГО ПОВІТРЯ

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Ключові слова:
інфляційні процеси, операційні витрати, операційна діяльність, покупне стиснене повітря, проєкт, стиснене повітря, стратегічне управління витратами.

У статті досліджуються питання зниження операційних витрат металургійного підприємства за рахунок відмови від покупного стисненого повітря. Розглянуто значення й формування операційних витрат на виробничому підприємстві. Встановлено, що найважливіше значення в більшості ситуацій мають конкретні пропозиції щодо зниження операційних витрат виробничої діяльності. Один із найважливіших напрямків оптимізації виробничих операційних витрат на досліджуваному підприємстві є пропозиція реалізувати інвестиційний проєкт щодо зменшення енергоспоживання у виробничому процесі. Запропоновано побудувати нову компресорну станцію, враховуючи те, що в процесі виробничої діяльності, а саме в технологічному процесі при виробництві стальних труб досліджуване підприємство використовує у великій кількості стиснене повітря, яке самостійно не виробляє і виробництво якого потребує великого енергоспоживання. Розглянуто різні альтернативні технічні рішення щодо використання турбокомпресорів або гвинтових компресорів. Сформовано розробку й інших інвестиційних проєктів направлених на зменшення енергоємності підприємства в цілому. Здійснено розрахунки вартості стисненого повітря в разі виробітки його на власній компресорній станції. Проведено розрахунки фінансово-економічних показників згідно з внутрішніми вимогами даного підприємства.

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Statement of the problem

The stability and development of any business entity in a competitive market significantly depends on the creation of an effective cost management system. The amount of costs is an important indicator for assessing the efficiency of the enterprise, including the determinant for the formation of the financial result of the metallurgical enterprise. Given this, the cost management process in terms of operating needs further detailed study and improvement. The development of metallurgical enterprises, namely the production of steel pipes taking into account the modern market environment requires a deeper study of methods and forms of economic management. To achieve the planned efficiency, competitiveness in the market, metallurgical enterprises with limited resources need to constantly compare costs and revenues from operating activities. The process of managing the economic activity of metallurgical enterprises is complicated by the fact that in recent years, uneven inflation has intensified. That is why it is necessary to solve the problem of obtaining maximum profit on the basis of cost management to increase the efficiency of both individual production lines and economic activities of metallurgical enterprises as a whole.

Analysis of recent research and publications

Under market conditions, the competitiveness of enterprises in order to achieve maximum profit must be ensured by a number of requirements. Achieving the goals set by management depends largely on the efficient use of all material and labor resources, which necessitates the study of the economic significance of the cost category and the gradual transition to a single cost management system. A significant contribution to the theory of research of strategic approaches and the choice of the most effective methods of its implementation was made by such well-known foreign and Ukrainian scientists and practitioners as: I.A. Blank [1], V.P. Dyordiai [2], V.K. Makarovich [2], G. Fandel [3], O.K. Fokin [4], A.V. Cherep [5], K.V. Chichulin and I.O. Chapcha [6].

The authors mainly cover the general principles of analysis, its methods, as well as the results and role in management decisions. Much attention is paid to the study of theoretical issues of operating cost analysis.

Thus, Dyordyai V.P. and Makarovych V.K. argue that the analysis of effective management of operating costs requires a qualitative classification and procedure for determining costs. The authors summarize their own research in this area.

Chichulina K.V. and Chapcha I.O. on a concrete example prove the importance of strategic cost management and argue that it is one of the important ways to ensure the development of the enterprise and the competitiveness of its products on the market. The authors pay attention to the problem of minimizing costs in the total amount of net income on the basis of efficient use of production resources and structural changes in the quality of their management.

Objectives of the article

The purpose of the article is to substantiate the theoretical provisions and the introduction of practical recommendations for reducing the operating costs of LLC "INTERPIPE NIKO TUBE" by abandoning the purchase of compressed air.

The main material of the research

Given the intensive development of our economy, metallurgical enterprises in the context of pipe production in determining the price of their products must take into account effective demand. In order to increase the demand of domestic and foreign consumers for their own products, increase competitiveness or simply ensure the existence of the market, many enterprises of the metallurgical complex need to choose to produce more profitable and profitable products that are in demand. If the company seeks to increase profits to achieve high economic performance and at the same time does not want to avoid a decrease in demand for its products, should not move by increasing prices. In all cases, to increase the profitability of products, companies should constantly optimize operating costs for production and sales of their products. Prices can only be reduced to a value that does not exceed the amount of these costs. Without calculation of operating costs, including and the full cost and profitability of products, it is impossible to determine the market price and effectively manage the process of profit formation. Formation of operating costs at the enterprises of metallurgical economy in the context of production of pipes is rather difficult technological process. In the context of the above calculation, the formation of operating costs is an important process, but in most situations, specific proposals to reduce operating costs of production activities are of paramount importance. One of such proposals at the company LLC "INTERPIPE NIKO TUBE" is a project to implement an investment project to reduce energy consumption in the production process. In the process of production activities, namely in the technological process in the production of steel pipes, the investigated enterprise uses a large amount of compressed air, the production of which requires high energy consumption.

According to the results of the analysis, starting from 2017 at the enterprise LLC "INTERPIPE NIKO TUBE" the cost of production of PRS № 2 (pipe rolling shop № 2) increased by almost 3 thousand UAH per ton. The company buys compressed air from a third-party supplier for $ 17 / thousand m^3 and given the growth trend, the cost may increase to $ 22 / thousand m^3. Given that INTERPIPE NIKO TUBE LLC together with PJSC NRZ (part of INTERPIPE Company) spends $ 2.2 million / year on compressed air, and in the future these costs may increase to $ 3.1 million / year such an investment project has a good chance of quick payback.

To enable the project to be implemented, the required amount of new equipment to cover the demand in compressed air was calculated. The results of the calculations are shown in fig.1.

For comparison, two alternative technical solutions were proposed – turbochargers and screw compressors. The results of the comparison are given in table. 1.

Eliminate the shortage of compressed air production capacity in PRS № 2 is possible by transferring 2 screw compressors from PRS-7 to PRS-2 and purchasing 4 new screw compressors to complete the compressor station in

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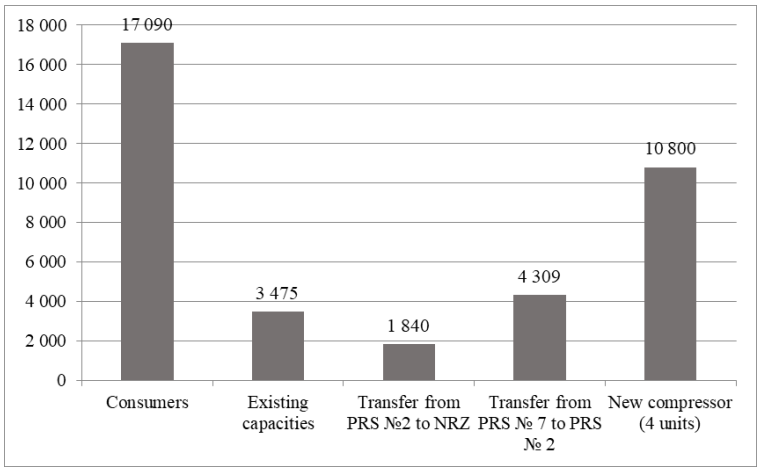

Fig. 1. Compressed air consumption and existing capacity, thousand m^3 / month.

Table 1 – Comparison of technical solutions for project implementation

Options	**Screw compressors**		**Turbocharger**	
Measures	Purchase of 4 screw compressors + transfer of 2 compressors from PRS-7 + screw compressor for NRZ	Purchase of 6 screw compressors + screw compressor for NRZ	Purchase of 3 turbochargers in SM 5000+ screw compressor for NRS	Acquisition of 4 turbochargers in SM 5000 (2 for PRS-7 + 2 for PRS-2) + screw compressor for NRZ
CAPEX, thousand $	481	585	1 417	2 395
OPEX (5 years), thousand $	4 756	4 764	4 567	5 998
Cost of ownership, thousand $	5 237	5 350	5 984	8 393
NPV, thousand dollars USA	3 773	3 662	3 042	1 755
DPP, years	0,49	0,61	1,72	2,84
Internal rate of return (IRR),%	269%	204%	95%	56%
Project implementation period, months	6	6	9	12

PRS-2. This option is most effective in terms of speed of implementation and payback.

To determine the efficiency of the project, it is necessary to calculate the cost of compressed air in the case of its production at its own compressor station (it is necessary to buy 4 screw compressors and build a station on the area of PRS № 2). The calculations are given in table. 2.

The results of calculations show that the cost of compressed air of own production will be 2.6–3.3 times lower than purchased and will be 6.5–6.8 $ / thousand m^3. As a result of the implementation of this project, the company is able to save about $ 2 million / year.

After determining the possible savings, the project budget was calculated (equipment was selected for the budget – screw compressor ECO 315, after the tender procedures, the equipment can be replaced with a similar on). The detailed budget of the project is given in table. 3.

According to the results of the calculation, the project budget is $ 481 thousand without VAT.

The project implementation period is 6 months from the moment of the decision to start the project implementation.

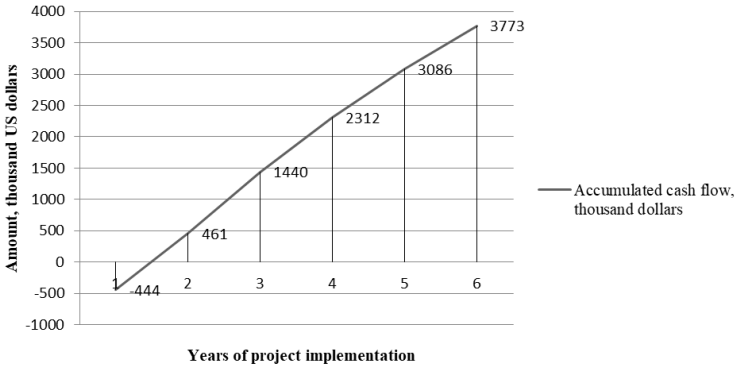

Fig. 2. Project performance indicators

To substantiate the calculations of financial and economic indicators in accordance with the internal requirements of LLC "INTERPIPE NIKO TUBE". These calculations are given in table. 4, table. 5 and fig. 2

The main advantages of this project are a short implementation period – 6 months, and a quick payback – about six months.

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Table 2 – Calculations of the cost of compressed air of own production

Name	Unit measurement	2021	2022	2023	2024	2025	2026
Production volume in PRS № 2 (shipment)	T	123 337	150 000	150 000	150 000	150 000	150 000
Consumption of compressed air PRS-2 + NRZ	thousand m^3 / year	130 647	141 680	141 680	141 680	141 680	141 680
Consumption of compressed air PRS-2	thousand m^3 / year	125 247	136 280	136 280	136 280	136 280	136 280
NRC consumption forecast	thousand m^3	5 400	5 400	5 400	5 400	5 400	5 400
Specific consumption of compressed air	m^3 / t	1 015	909	909	909	909	909
The average cost of compressed air PJSC "Energy Resources"	thousand $ / thousand m^3	0,017	0,018	0,019	0,020	0,021	0,022
Consumption of compressed air consumed by PRS-2	thousand $ without VAT	2 160	2 468	2 592	2 721	2 857	3 000
Consumption of compressed air consumed by NRZ	thousand $ without VAT	93	98	103	108	113	119
Costs of compressed air from PJSC “Energy Resources”	thousand $ without VAT / year	2 254	2 566	2 694	2 829	2 971	3 119
The cost of producing air on their own OPEX							
Electricity costs	thousand $ / year	827	896	896	896	896	896
Spare parts costs (spare tools and accessories)	thousand $ / year	0	0	34	34	34	34
PA costs (salaries for operators)	thousand $ / year	15	15	15	15	15	15
Maintenance costs	thousand $ / year	13	13	13	13	13	13
Together OPEX	thousand $ / year	855	924	958	958	958	958
The average annual cost of its own compressed air	thousand $ / year	855	924	958	958	958	958
The effect of compressed air production	thousand $ / year	1 398	1 642	1 737	1 871	2 013	2 161
Specific cost of own compressed air	$ / thousand m^3	6,5	6,5	6,8	6,8	6,8	6,8
Coefficient of reduction	Unit. measurement.	2,6	2,8	2,8	3,0	3,1	3,3

Table 3 – Project budget

№	Name of equipment	TOTAL
1.	Basic equipment	309
1.1	ECO 315 compressor (4 pcs.)	247
1.2	Compressed air dehumidifier	63
2.	Auxiliary equipment	78
2.1	KTP – 2 pcs. (2 KTP 2x1600)	21
2.2	Vacuum switches with a set of protection	9
2.3	Compressed air pipe with a set of valves	10
2.4	Air ducts with gate valves	5
2.5	Electrical equipment, cables	12
2.6	Cold water meter	0,1
2.7	Air flow meter	6
2.8	Compressor parts	15
3.	Design works	5
3.1	Coordination of the working project	2
3.2	Development of design and estimate documentation for compressor repair	3
4.	Construction and installation work	81
4.1	Installation of ECO 315 compressors	16
4.2	Installation of auxiliary equipment	7
4.3	Commissioning work on the dehumidifier	2
4.4	Overhaul of the ATLAS COPCO GA 250 compressor	4
4.5	Overhaul of compressors with PRS-7	27
4.6	Installation of compressors from PRS-7	4
4.7	Installation of the ATLAS COPCO GA 250 compressor on HP3	2
4.8	Breeding of compressed air on the NRZ site	20
5.	Transportation costs	2
6.	VAT	2
7.	TOTAL INVESTMENT thousand $ with VAT	5
8.	TOTAL FOR THE PROJECT thousand $	481
9.	VAT	95
10.	TOTAL INVESTMENT thousand $ with VAT	577
11.	Undistributed reserve of thousands of $ with VAT	58
12.	TOTAL FOR THE PROJECT thousand $	635

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Table 4 – Indicators of financial efficiency of the project

Indicator	Investment	Years of project implementation				
	0	1	2	3	4	5
Investments, thousand $	(444)	(83)				
Total project income, thousand $	-	2352	2694	2829	2971	3119
Reduce the cost of purchasing compressed air	-	2352	2694	2829	2971	3119
Total project costs, thousand $	-	(924)	(958)	(958)	(958)	(958)
– electricity costs	-	(896)	(896)	(896)	(896)	(896)
– spare parts costs	-	-	(34)	(34)	(34)	(34)
– salary costs for operators	-	(15)	(15)	(15)	(15)	(15)
– maintenance costs	-	(13)	(13)	(13)	(13)	(13)
Net income before depreciation, interest and income tax (EBI TDA)	-	1428	1737	1871	2013	2161
– depreciation	-	(44)	(53)	(53)	(53)	(53)
Net income before taxes (EVT)	-	1384	1684	1819	1960	2108
– income tax	-	(249)	(303)	(327)	(353)	(380)
Net Income	-	1135	1381	1491	1607	1729
– amotisation	-	44	53	53	53	53
Net cash flow, thousand $	(444)	1096	1433	1544	1660	1782
– net current cash flow	(444)	905	979	872	774	687
Accumulated discounted cash flow, thousand $	(444)	461	1440	2312	3086	3773

Conclusions

This article considers the importance and formation of operating costs at the production plant. It is established that the most important in most situations are specific proposals to reduce operating costs of production activities. One of the most important areas of optimization of production operating costs at the researched enterprise LLC "INTERPIPE NIKO TUBE" is a proposal to implement an investment project to reduce energy consumption in the production process. Given the fact that in the process of production, namely in the technological process in the production of steel pipes, the company uses a large amount of compressed air, which does not produce and whose production requires high energy consumption, it was proposed to build a new compressor station. Various alternative technical solutions for the use of turbochargers or screw compressors were considered. The most profitable and most productive was the installation of 4 new screw compressors. The results of calculations show that the cost of compressed air of own production will be 2.6-3.3 times less than purchased and will be 6.5-6.8 $ / thousand m^3. As a result of the implementation of this investment project, the company LLC "INTERPIPE NIKO TUBE" will be able to save about $ 2 million / year. According to the results of the calculation, the project budget is $ 481 thousand without VAT. The main advantage of this project is a short implementation period – 6 months, and a quick payback – about six months. In addition, it is necessary to continue the development of other investment projects aimed at reducing the energy intensity of the enterprise as a whole.

Table 5 – Summary indicators of financial efficiency of the project

Indicator	Value
The cost of capital	21,0 %
Investment capital, thousand dollars USA	528
NPV (net present value), thousand dollars USA	3 773
RI (profitability index)	8,35
DPP (discounted payback period), years	0,49
Internal rate of return (IRR),%	269%

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