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COMPREHENSIVE MODERNIZATION OF RAILWAY TRANSPORT AS AN INNOVATIVE EFFICIENT INSTRUMENT TO RAISE COMPETITIVE CAPACITY OF A COMPANY

Problem definition. In the modern severe economic environment of the country, industrial development requires continuous raising of competitive capacity from companies and cutting of considerable expenses for transport services, therefore finding more efficient conditions of railway transport operation and cutting expenses for logistics is a relevant issue.

Analysis of the latest researches and publications. Theoretical and practical aspects of efficient operation of the railway field and railway transport are represented in works of many national and foreign scientists such as, M.M. Adzhavenko, M. Babel [4], Yu.S. Barash, V.P. Gudkov, V.L. Dikan, I.O. Zharska, N.F. Zenchuk, O.I. Zorin, D.M. Kozachenko, N.M. Kolesnikov, L.V. Kostyuchenko, M.V. Makarenko, Kh.V. Matvienko, A.A. Mikhalchenko, M.I. Mischenko, A.V. Momot, M.A. Oklander, O.V. Orlovska, T.V. Pepa, O.O. Petrenko, O.M. Polyakova, R.Sh. Rustamov, L.G. Chernyuk, E.N. Shirokova, and M. Shkoda [4].

The aim of the article is study of comprehensive modernization as the innovative efficient instrument to reduce transport costs under modern operation conditions of large industrial and transport companies.

The main part. Under conditions of globalization expansion only a market and a rate of return form competitiveness of each company, therefore increasing efficiency of its business operation is one of essential strategic targets of modern business development irrespectively of a sphere of introduction and a field of application. Thus, under conditions of increasing resource shortage, significant price fluctuations at world commodity markets, deepening of competitive struggle both at domestic and foreign markets, search of efficient solutions for further development along with maintaining of current market positions is becoming more and more important. Introduction of more variable engineering and information solutions allows to raise general competitive capacity of each company in the short term. These development trends are exclusive and intensive way to restore production which involve more efficient employment of resources without additional new factors of production.

Introduction of the viable solutions often requires large investments that is considered as an additional build-up devoid any economic sense under conditions of Ukrainian economy formation taking into account availability of considerable production facilities accumulated during the Soviet period, low labour costs. Only some companies build their own business on high-quality efficient bases creating modern production facilities and service centers. Moreover the national government has not yet found effective instruments to stimulate development of the national economy and effort directions to reach maximum synergy effect.

In the context of current high export orientation of Ukrainian economy in a segment of low value-added products, considerable dependence on import of energy resources it is search and introduction of efficient energy-saving technologies and development of domestic market of raw material resource consumption and processing along with build-up of export of more technological products that is becoming of high priority. Development of the domestic market is that driving force that will allow not only to increase a level of business activity at the macroeconomic level but to reach macroeconomic stabilization as well as balancing of state budget targets and reduction in unemployment level in the mid-term. Certainly, operation efficiency is impossible without introduction of a range of measures including of fiscal and budget nature, and without smooth operation of each element of the economic system.

Taking into account the selected topic, including logistics aspects of activity carried out by industrial companies and their associations, we will consider applied examples of increasing efficient of transport field operation as an element of the general economic system of the country. The transport field not only meets needs of the national economy in freight and passenger operations, and due to the advantageous geographic position it creates extra proceeds for the account of in-transit handling of freight. Thus, according to results of 2015 contribution of transport to the GDP of the country makes almost UAH 100 billion or 7.1% of its total amount [1].

Taking into account a raw material structure of Ukrainian economy and availability of prevailing products that are most often transported (iron ore, metal products, grain crops, construction materials), the largest share in the freight operation structure falls on railway transport (58.2% according to results of 2015 p. [2]). Besides, railway transport also plays one of the main service function for industrial companies – technological one, connecting transportation of raw materials, intermediate goods, and finished products among production departments into a single production complex. Thus, depending on a producibility level of finished products railway transport forms up to 30% of their value and correspondingly effects competitiveness level of not only manufactured products but fields in general, especially during a period of adverse market conditions at world raw material markets. It is the subject of authors' research – as a promising sector of increasing efficiency of business entities.

Railway transport represents a separate production and technological complex that includes in less detail:

- infrastructure (railway tracks and located on them engineering structures, transmitting equipment that are used to ensure transportation process);
- rolling stock (traction equipment and car fleet);
- loading/unloading points (handling equipment).

Without taking into consideration support railway transport and quiet large fleet of private cars, in the transport field a prevailing form of ownership is state form represented by Ukrzaliznytsia PJSC (100% of shares are owned by the state [3]), which is a monopolist at the railway transportation market.

Valid legislation sets almost exclusive right to freight transportation only by traction equipment of Ukrzaliznytsia PJSC, not admitting private companies to railway transportation. However current physical state of the traction equipment does not allow to meet needs in railway freight transportation even under conditions of significant reduction in transportation volume observed during 2014 – 2015 (see Fig. 1).

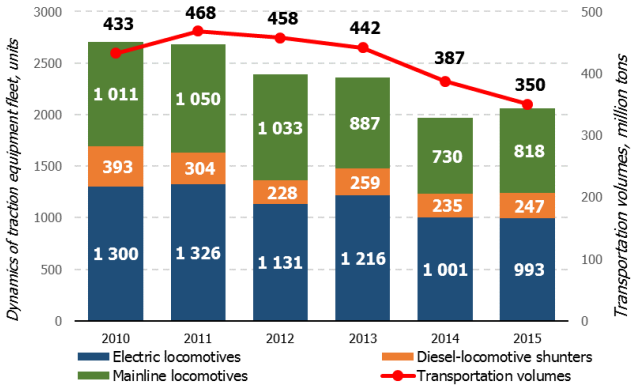

Fig. 1. Dynamics of traction equipment fleet owed by Ukrzaliznytsia PJSC and transportation volumes in 2010 – 2015 [2]

Analysis of dynamics of traction equipment fleet indicated in Fig. 1 shows that in 2010-2015 reduction in operating fleet of mainline locomotives and traction equipment makes almost 27%, however transportation volumes decreased only by 20%, that, in authors' opinion, is connected with general reduction in a freight base due to deterioration of economic situation in the country and aggravation of crisis phenomena in the world economy.

The authors illustrated a structure and quantity of inventory stock of traction equipment owned by Ukrzaliznytsia PJSC as of 01.07.2015 (see Table 1).

Table 1

Inventory stock of traction equipment owned by Ukrzaliznytsia PJSC as of 01.07.2015

(units)	All	park that is used			park that is not used
		working park	reserve	repair	
INVENTORY STOCK	**3 872**	**2 058**	**588**	**562**	**664**
Diesel locomotives	**2 152**	**1 065**	**309**	**281**	**497**
mainline locomotives	719	247	93	118	261
mainline freight locomotives	*648*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
Mainline passenger locomotives	*71*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
diesel-locomotive shunters	1 433	818	216	163	236
Electric locomotives	**1 720**	**993**	**279**	**281**	**167**
freight	1 191	н.д.	н.д.	н.д.	н.д.
direct-current locomotives	*676*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
alternating-current locomotives	*515*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
passenger	479	н.д.	н.д.	н.д.	н.д.
direct-current locomotives	*250*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
alternating-current locomotives	*229*	*н.д.*	*н.д.*	*н.д.*	*н.д.*
double-current	50	н.д.	н.д.	н.д.	н.д.

Analysis of inventory stock of traction equipment by operating life illustrates wear out of all types of locomotives, namely: a number of locomotives with operating life exceeding 30 years makes over 84% and is 3236 out of 3872 locomotives being on the balance sheet of the company. In authors' opinion, this fact is connected with insufficient level of traction equipment renewal and actual performing of 'state' functions by Ukrzaliznytsia PJSC in financing of losses from passenger transportation for the account of freight transportation.

The issue of traction equipment renewal along with rehabilitation of infrastructure is one of long-term priority tasks of Ukrzaliznytsia PJSC that is proved by an investment plan of the company for 2016 – 2018 approved by the Ministry of Infrastructure of Ukraine in February 2016. It is planned to allocate over UAH 5.2 billion for renewal of the traction equipment during this period.

The most urgent issue, that demands solution and developed at the moment both by management of Ukrzaliznytsia PJSC and a private sector, is to select an optimum alternative of traction equipment renewal that can include the following alternatives: complete overhauling with extension of useful life, modernization or purchase of new equipment. Advantages and disadvantages of each of the offered alternatives are stated in Fig. 2.

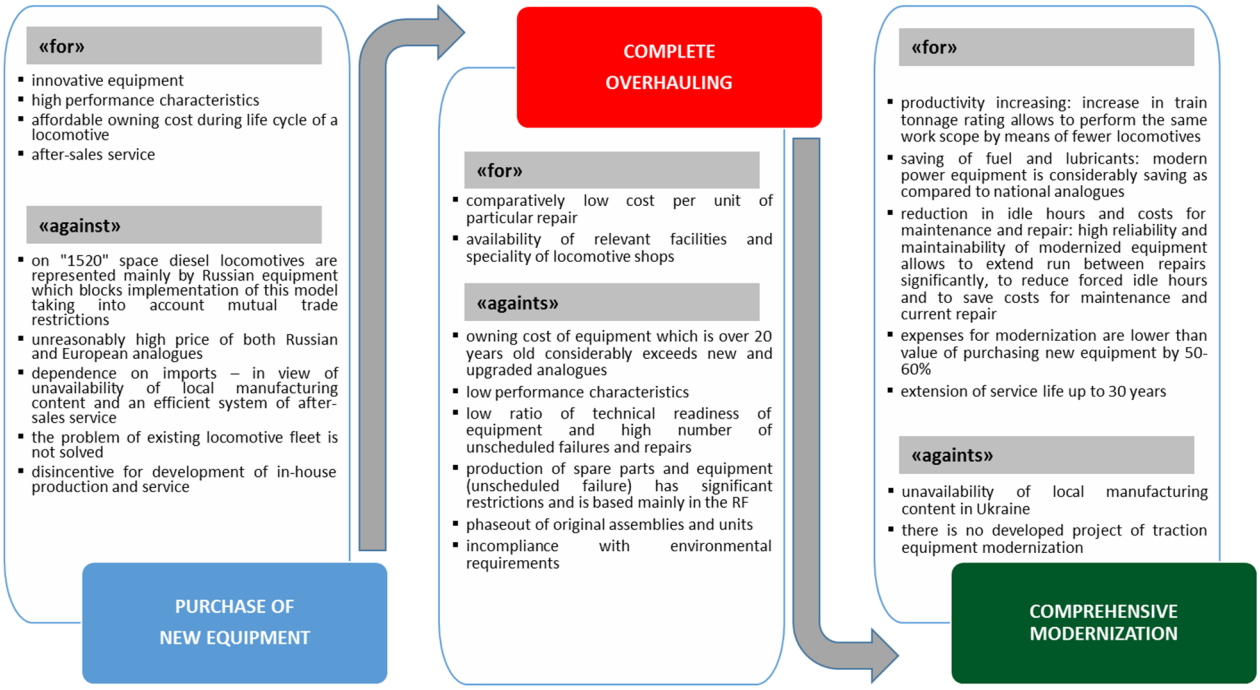

Fig. 2. Disadvantages and advantages of alternatives considered for traction equipment modernization (the authors' creation)

Essence of comprehensive modernization is in radical technical modernization of equipment: only an underframe and a main frame are left from an old locomotive and the rest assemblies and units are substituted for new – that means that basing on the existing main frame a new locomotive is built. According to experts of the transport field, value of the mentioned modernization makes Euro 900 thous. to Euro 1,800 thous.

Thus, despite of considerable accumulated experience in complete overhauling and its relatively low value, further development of this approach to renewal of traction equipment is unpromising. In authors' opinion, analyzing efficiency of using transport it is necessary to put in the forefront such economic index as 'life cycle cost' of a particular unit of equipment that covers the whole scope of costs: capital expenditures to maintenance costs. The stated point of view is economically grounded by experience of Polish company, Cargo (Polish Railways) [4, p. 13].

The authors have formed disadvantages and advantages of existing alternatives of traction equipment renewal (see Fig. 2) where the alternative of comprehensive modernization is the most promising. Productivity increasing, saving of fuel and lubricants, reduction of idle hours and costs for maintenance and repairs, lower value as compared to purchase of new equipment and extension of service life up to 30 years are referred to positive economic changes in this alternative.

The research of applied aspects of each specified alternative considered for modernization of traction equipment in view of life cycle of locomotives allowed to develop the following diagram (see Fig. 3) which also proves perspective and accordingly efficiency of modernization both in medium and long term. In addition, depending on loading and intensity of locomotive use

costs for its modernization are repaid in 3-5 years. It should be noted that the specified development model showed itself in Baltic, European countries, and the RF as the most progressive and efficient scenario of traction equipment renewal.

According to the authors, analysis of life cycle cost of locomotives based on gained experience in operation of traction equipment after modernization (see Fig. 3) proves efficiency of this model versus other alternatives – complete overhauling and purchase of new equipment. Reduction in operational costs and increase in technical readiness of equipment along with decrease of unscheduled failures allows to return investments in locomotive modernization in 3-5 years depending on intensity of loading operations and locomotive load.

Therefore, comprehensive modernization is the efficient instrument used to reduce operational costs and accordingly costs of railway transportation.

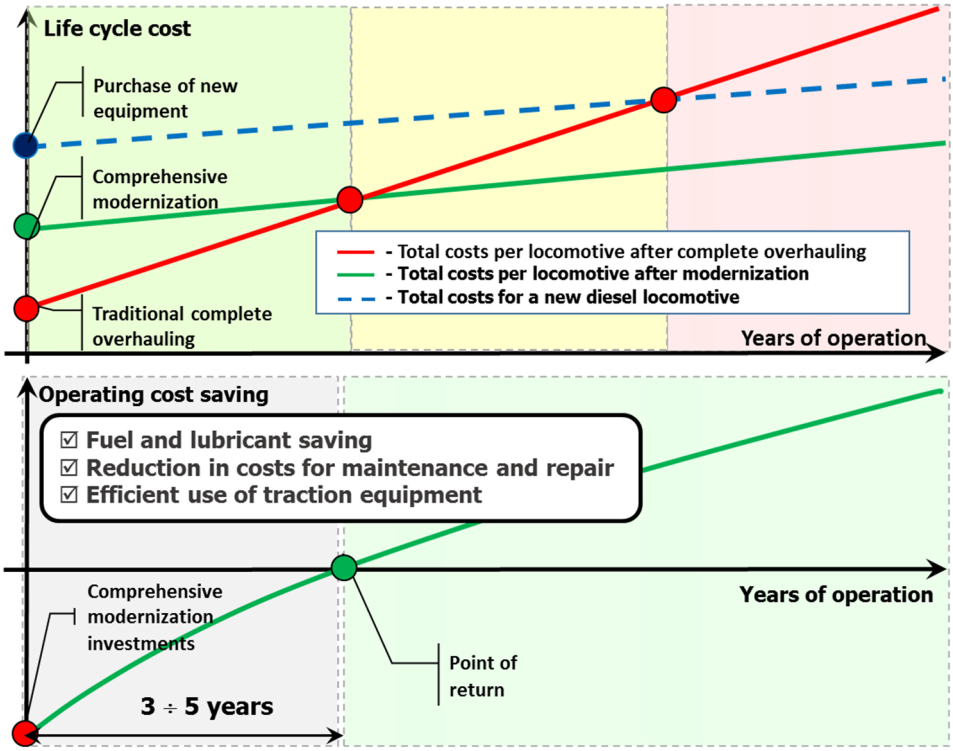

Fig. 3. Life cycle cost of a locomotive and return on investment in its modernization (summarized by the authors basing on [5])

Conclusions. It has been found that existing fleet of traction equipment owned by both state and private companies is significantly worn out – average age makes over 30 years.

The analysis showed that obsolescence of traction equipment along with physical ageing does not allow to ensure even 70% of performance characteristics existing at the market of new and upgraded equipment analogues.

It has been proved that a model of locomotive operation generally accepted in Ukraine lies in 'operation to failure'. Technical condition of rolling stock does not allow to increase productivity of the fleet without involvement of additional units of equipment that requires additional solid investments.

It is found that along with shortage of traction equipment on some transportation routes it is quiet difficult to assess capacity of repair service market in view of availability of considerable excess power and reserves due to decrease in volumes of production and transportation accordingly – operating fleet makes less 50% of inventory stock.

It has been substantiated that over 30% of traction equipment reached age limits and is subject to disposal through impossibility to extend its service life by means of complete overhauling. In this case modernization is a solution that will allow to effect the desired result with extension of locomotive service life for up to 30 years.

It has been analyzed that experience of Poland, Baltic countries, and the RF shows ability of the model of traction equipment modernization not only in view of performance characteristics, but also in view of life cycle cost of locomotives – modernization is the most efficient scenario of traction equipment renewal with return in 5 years maximum.

Basing on analysis of technical and economic indices of railway transport renewal, it has been established disadvantages and opportunities of different alternatives considered for renewal of traction equipment (purchase of new equipment, complete overhauling, comprehensive modernization) among which comprehensive modernization is the most economically sound and efficient.

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Логутова Т. Г. Полторацький М. М. Комплексна модернізація залізничного транспорту як ефективний економічний інноваційний інструмент підвищення конкурентоспроможності підприємства

В статті розглянуто теоретичні та практичні аспекти оновлення основних засобів залізничного транспорту промислових і транспортних підприємств, що дозволить підвищити конкурентоспроможність підприємств за рахунок зниження вартості готової продукції. Обґрунтовано перелік переваг при виборі комплексної модернізації, як дієвого інструменту підвищення ефективності функціонування залізничного транспорту промислових і транспортних підприємств.

Ключові слова: транспортна галузь, інноваційний інструмент, промислове підприємство, комплексна модернізація, вартість життєвого циклу.

Логутова Т. Г., Полторацкий Н. М. Комплексная модернизация железнодорожного транспорта как эффективный экономический инновационный инструмент повышения конкурентоспособности предприятия

В статье рассмотрены теоретические и практические аспекты обновления основных средств железнодорожного транспорта промышленных и транспортных предприятий, которые позволят повысить конкурентоспособность предприятий за счет снижения стоимости готовой продукции. Обоснован перечень преимуществ при выборе комплексной модернизации, как действенного инструмента повышения эффективности функционирования железнодорожного транспорта промышленных и транспортных предприятий.

Ключевые слова: транспортная отрасль, инновационный инструмент, промышленное предприятие, комплексная модернизация, стоимость жизненного цикла товара.

Logutova T., Poltoratskyi M. Comprehensive Modernization of Railway Transport as an Innovative Efficient Instrument to Raise Competitive Capacity of a Company

The article considers theoretical and practical aspects of modernization of railway transport owned by industrial and transport companies that will allow to raise competitive capacity of the companies due to decrease in value of finished products. It is substantiated a list of advantages when choosing comprehensive modernization as the efficient instrument to raise benefits from railway transport operation by industrial and transport companies.

Keywords: transport industry, innovative instrument, industrial enterprise, complex modernization, cost of life cycle.

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