

OPERATION AND MODERNISATION OF FIXED ASSETS AT MACHINE-BUILDING ENTERPRISES

Abstract. The article presents the research into the issues of operation and modernisation of fixed assets that is of particular importance in conditions of investment development by machine-building enterprises at the modern stage of the economic development of Ukraine. Investments targeting particular facilities (buildings, transportation means, and equipment) stress the relations between investments and fixed assets. Modernisation seen as improvement of functional features of equipment, taking into account the stimulating factors, helps increase the production quality indicators.

Key words: modernisation, fixed assets, fixed assets operation, life cycle of fixed assets, factors of modernisation, improvement of fixed assets, machine-building enterprises, depreciating of fixed assets.

Problem statement

The importance of material factors of production – the fixed assets – has increased during the past years. The increase of production volume occurs due to the effective use of productive fixed assets. Economic efficiency of machine-building enterprises depends on certain indexes. One of the basic indicators is production capacity of fixed assets. The basic problem of fixed assets operation is their maintenance, renovation and successful exploitation for further work at the enterprise. The solution of this problem can be facilitated through extensive study and research into modernisation as renovation of the active (productive) part of fixed assets and improvement of production quality indicators (labour productivity, quality of products, operating lifetime). Considering that repair works can fully renew primary properties and prevent premature wear one can state that there is possibility to maintain successful operation of fixed assets. Today management of machine-building enterprises of Ukraine practically does not use the system of preventive maintenance, that negatively affects maintenance, modernisation and use of fixed assets. So the issue of fixed assets operation

efficiency comes to the forefront in studying and researching the enterprise activities.

Analysis of the recent research and publications

Home and foreign scholars do research into the issues related to effective enterprise activities by improving fixed assets operation. On the one hand, this can be done through modernisation, and on the other hand, through improvement of professional qualities of maintenance personnel engaged in production. The issues related to effective activities of enterprises, successful operation and modernisation of fixed assets have been studied by many scientists, among them being: Melnyk S., Mochernyi S., Kravchenko O., Kuzmin O., Osypov V., Horngren C. T., Foster G., Datar S. M., Dubinin S. and others. The enterprises that are operating fixed assets that do not meet modern technological requirements, must modernize and use them most effectively. It is especially relevant in modern social and economic environment characterized by lack of financing and investments.

Research objective

The aim is research into the aspects of successful operation and modernisation of fixed productive assets at machine-building enterprises.

Research materials

The modern stage of socio-economic development of our country needs implementation of the necessary investment policies that are responsible for the state of production, technical level of fixed assets resulting in the increase of the enterprise competitiveness and profitability. Research into the aspects of successful operation and modernisation of productive fixed assets is especially relevant at the modern stage of development of economic thought in our country.

Development of national economy is directly related to the recreation of fixed assets, being drivers of production, as meeting social demands requires renovation and technical reequipment of the existing fixed assets or introduction of new ones that is dictated by rapid development of science and technology. Achievement of this goal needs investments. Investments are the basis for the development of enterprises and all types of economic activities. Buildings, constructions, transport vehicles, equipment are often objects of investments and that is why there is interrelation between investments and fixed assets. It explains interdependence between the investment process and the fixed assets operation at machine-building enterprises.

S. Melnyk [1, p. 162] characterizes the concept “operation of fixed assets” as the process of useful use of fixed assets in productive activities of the enterprise during a certain period of time and expenditures on their repair, modernisation, completion of construction, replacement of separate parts and maintenance.

A. Kravchenko [2, p. 29] considers that economic nature of fixed assets is determined by those specific conditions in which they are exploited, and also by how they came to an enterprise: whether they have been produced, acquired, obtained free, leased or rented.

Modernisation is improvement of operating machines and equipment and bringing them into the state corresponding to the requirements of modern technical and economic level by structural changes, replacements, strengthening of units and parts, setting adaptations and devices for mechanization and computer-aided production. Modernisation is taking place in case of improving production quality indicators (lowering production costs, improving working conditions, increasing products quality) [3, p. 196].

S. Mochernyi [4] interprets the essence of the concept of modernisation as a process of the partial upgrading, replacement of obsolete equipment (machines, mechanisms, equipment, devices etc.), technology of production, technical and technological reequipment of industrial and agricultural enterprises.

Modernisation, as a result of partial moral obsolescence, deals with equipment (machines, facilities, machine-tools) while reconstruction concerns the enterprise as a whole or its production units (work shops, areas), and the repair process refers to every separate object or its component. There is interrelation between the types of the productive fixed assets depreciation and the forms of their removal. Graphically this interrelation between the types of fixed assets depreciation and the methods of their removal is presented in Fig. 1.

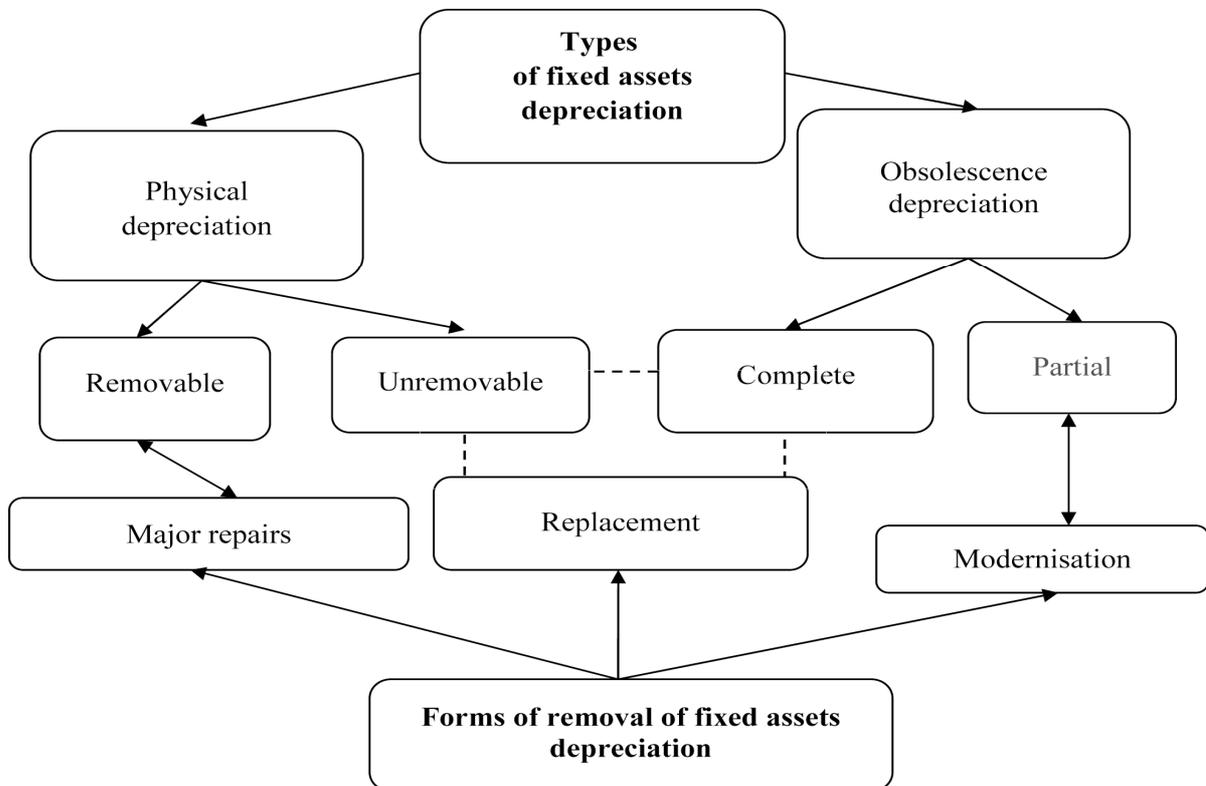


Fig. 1. Types of fixed assets depreciation and forms of their removal

The moral depreciation is caused by creating new and more advanced equipment but to improve the operation of the existing fixed asset is possible by upgrading the relevant construction elements (of equipment, machinery, machine-tool). Modernisation embraces the quality changes of the active part of fixed assets, as it concerns the productive fixed assets. The improvement of fixed assets is not only repair, reconstruction (further construction) and modernisation (reequipment). In fact, as a result of changing functional features there must be felt a positive economic effect.

However, Dubinin S. [5] notes that modernization never means only technological upgrade, it always implies a choice of certain changes in social relations initiated by the country's elite. Should modernization be considered as the direction of structural changes in economic policy at the national level or just as a technological upgrade? We believe that technological basis of modernization is the key to the term interpretation. Technological upgrading consolidated with the investment strategy of a machine-building enterprise will contribute to both ensuring successful fixed assets operation and getting socio-economic effects.

Operation of machines, equipment and machine-tools is effective in case an enterprise carries on successful policies (has a system of planned preventive repairs) on removal of depreciated fixed assets and improvement of existing fixed assets.

To improve operation of fixed assets and production capacities at enterprises is possible due to their increased exploitation in intensity and their increased loading in extensity [6], the observance of proportionality and shiftiness in the fixed assets (equipment) operation, the active process of controlling, repair works, modernisation and technical maintenance of the operating fixed assets.

While determining composition of expenditures by types of improvements it is necessary to follow applicable state regulations. The ways of improve functioning of fixed assets are presented in Fig. 2.

Further construction (extension), replacement of separate parts of fixed assets, modernisation, modification, introduction of effective technological process mean expansion of certain buildings and constructions, technical re-equipment of other objects, implementation of new technique and technology, mechanization and automation of production that individually or in combination increase the initial value of a piece of fixed assets. To perform these works it is obligatory to have project specifications and estimates as well as appropriate permits from the state control and supervision authorities.

The accounting of costs related to repair and improvement of fixed assets is regulated by the Order "On approval of guidance on accounting of fixed assets" [7], Regulation (Standard) of Accounting 7 "Fixed Assets" [8] and by the Tax Code of Ukraine (TCU) [9].

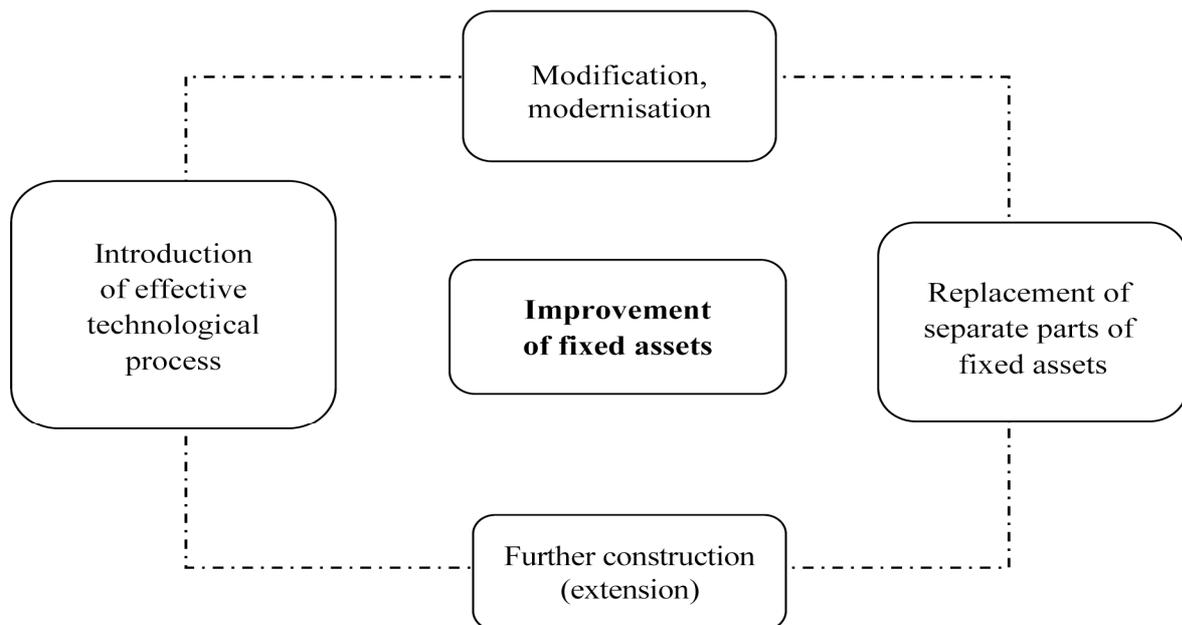


Fig. 2. Methods of improving fixed assets functioning

Note: compiled by the authors [7]

There is the difference between modernisation and repair: repair results in improvement (enhancement) of the initially accepted normative performance indicators (useful life, capacity, quality etc.) of fixed assets objects while expenditures on modernization are referred to the increase of the value of fixed assets (i.e. they cannot be referred to the production costs). An important difference between repair and other types of the fixed assets rehabilitation consists in that expenditures on all types of repairs refer to current costs, and expenditures on reconstruction and modernisation refer to capital costs.

Legislation contains no clear definition of such concepts as modernization, repair and other types of fixed assets operation improvements. However, some normative documents provide the definition of such concepts. Accounting Policy Regulation 7 “Fixed Assets” and Section 6 of “Methodical recommendations on fixed assets accounting” define the concept of modernisation as the improvement of technical parameters of equipment with the aim of increase its useful life or production capacity [7, 8].

In tax legislation improvement is presented by permanent and capital repairs, reconstruction, modernization, technical upgrading and other types of works that contribute to successful operation of fixed assets.

According to Tax Code of Ukraine the original value of fixed assets is increased by the amount of costs related to repair and improvement of fixed assets (modernization, modification, completion, additional equipment, reconstruction), which leads to an increase in future economic benefits originally expected from the use of the fixed assets objects in an amount exceeding 10 per cent of the aggregate book value of all groups of fixed assets subject to depreciation at the beginning of the fiscal year, with referring the amount of improvement to the fixed assets object that has been subjected to repair and improvement. Accordingly, costs of repair and improvement of fixed assets in the specified amount are subject to depreciation in accordance with paragraph 144.1 of Article 144 of Tax Code of Ukraine. At the same time, the amount of costs associated with repair and improvement of fixed assets, including leased or received in concession or created (built) by the concessionaire not exceeding 10 per cent of the aggregate book value of all groups of fixed assets at the beginning of fiscal year is referred to by the taxpayer as part of expenditures. At this, the tax

accounting of expenses made for the repair and improvement of facilities depends on the use of fixed assets:

- they are included in the cost of sold goods, works, and services, if the fixed asset is used in operating activities (subparagraph 138.8.5, paragraph 138.5, Article 138 of Tax Code of Ukraine);
- they are included in other expenses (paragraph 138.12, Article 138 of Tax Code of Ukraine) [9].

Provision 102, which contains the definition of concepts referring to repair of automotive vehicles as a complex of operations on restoring proper operation or functioning of products and recovering resources of products or their components, provides interpretation of other concepts. In particular, current repair is the repair that is executed for ensuring or restoring operation of a product and consists in replacement and (or) restoration of particular parts.

The major repair is the repair that is executed for restoring proper operation and complete or close-to-complete renewal of a product resource with replacement or restoration of any of its parts, including basic ones. Technical maintenance is a complex of operations or an operation to support functioning or proper condition of a product when it is used as intended, stored and transported. The concepts of repair and modernization should be distinguished from the concept of technical maintenance of the fixed assets objects. After technical maintenance the state of the object does not improve in comparison with the previous one. These measures are aimed only at preventing abnormal aging or deterioration of the object for further use (storage, moving etc.) [10].

The cost of upgrading, modification, renovation, retrofit, completion can be either capitalized, i.e. increase the value of fixed assets or written off as the costs of the reporting period. The principles of capitalization or reference to the current costs associated with fixed assets primarily depend on when those costs were incurred [11].

Thus, the law regulates that the amount of the costs associated with repair and improvement of fixed assets in the amount not exceeding 10 per cent of the aggregate book value of all groups of fixed assets at the beginning of the financial year is referred to the expenditures while the expenses exceeding 10 percent are referred to a specific item of fixed assets, which was subjected to repairs and improvements.

In case a taxpayer has no fixed assets at the beginning of a financial year, a 10-percent repair limit is zero. Accordingly, if after January 1 of the same year the same taxpayer acquires fixed assets and then repairs or improves them during the year, the expenses on these measures are not included in the composition of costs (are considered above-limit costs), however, the original cost of fixed assets subjected to repair and improvement will increase by the amount of these expenses. It is necessary to note that the taxpayer has the right to allocate the total amount spent on repair and improvement to the fixed assets object that underwent repair and improvement come true, even if the amount of 10-percent limit has not expired [12].

Repair costs may be considered capital investment, if the purchase price of an asset already reflects the commitment (necessity) of the company to spend in future on bringing the asset (fixed asset) to a state in which it can be used (operated successfully).

For example, in case of acquisition of a building that needs repair, repair costs are allocated to the increase of the original cost of this building to the amount that can be recovered from the use of the building in future. In particular, as a result of the executed works on improving the fixed assets the expected useful life of the asset and the quality of products (works, services) produced (provided) by this object increased. Modernization of the fixed asset is conducted to prolong its useful life, separate parts of equipment are replaced to increase the quality of products (works, services). Replacement of such a component in this case is reflected by capital investments into acquisition of a new fixed assets object and writing off the replaced object.

In record-keeping repair costs are reflected by the debit of account 23 "Production", or by class 9 "Expenses on activity" and by the credit of account 63 "Settlements with suppliers and contractors" (if works are performed by a contractor). The improvements of a fixed assets object as they are implemented are written off by the debit of account 15 "Capital investments" and by the credit of accounts 13 "Depreciation (amortization) of fixed assets"; 20 "Inventories"; 22 "Low-value fast-deprecating items", 65 "Payments for insurance"; 66 "Payments to employees" (if works are performed by economic method). In case the improvement is done by a contractor, the expenses are allocated to the credit of account 63 "Settlements with suppliers and contractors" [13, p. 10–13].

Thus, modernization is upgrading of the active part of fixed assets with the further increase of the efficiency of their use, increase of production capacity and prolongation of their useful life in accordance with the modern technological requirements. Modernisation consists in comparatively minor design changes, in relatively insignificant change of materials and methods of treatment, however, followed by the improvement of production quality indicators and improvement of working mechanisms, machines and other equipment.

Deterioration of equipment is one of the reasons of modernisation, and it is demonstrated through excessive operating costs and increased expenses on technical maintenance. However, it is found that foreign enterprises (probably, their majority) are accustomed to keeping old equipment in operation, even if its functioning is unsuccessful. Technical maintenance costs in general in many ways exceed the value of investments [14].

Thus, competition between enterprises requires permanent investments in assets, that makes it necessary to create differentials that will guarantee competitiveness. Some authors state that many enterprises using resources search for the ways to improve their operating efficiency, among them being gaining the confidence of investors, customer loyalty, and obtaining more competitive position willing to invest in high-tech and available equipment, to ensure maximum use of tangible and intangible resources [15].

The technical upgrading of a machine-building enterprise means taking a complex of measures, in accordance with the enterprise operation and development (without expansion of existing floor spaces), that envisage raising separate areas of production to the modern technical level due to introduction of new technologies, mechanization and automation of productive processes, modernisation and replacement of the worn physically and technically obsolete equipment that can be presented as the implementation of investment strategies. During technical upgrading it is worth taking into account the life cycle of fixed productive assets, as a set of stages (with upgrading and without upgrading) demonstrates the ability of machines and equipment to be further operated.

O. Makeyeva [16, p. 229–232] characterizes the life cycle of fixed assets as a period from the

beginning of capital investments in an object to the object liquidation and presents the following life cycle stages:

- capital investments into a fixed asset;
- productive use of the fixed asset;
- restoration and improvement of the fixed asset’s quality characteristics;
- disposal of the fixed asset.

At the same time, in our opinion, the stage of “Restoration and improvement of of the fixed asset’s quality characteristics” needs wider study

with specification of stages. The life cycle of the fixed productive assets is presented on Fig. 3.

The stage of “Restoration of fixed productive assets” consists of the following phases: scientific and engineering development, designing, upgrading of the fixed productive asset (modernisations) and exploring. Considering that the restoration of the fixed productive assets contributes to their further operation, modernisation as an improvement of functional features of equipment gives an opportunity to get significant results in production.

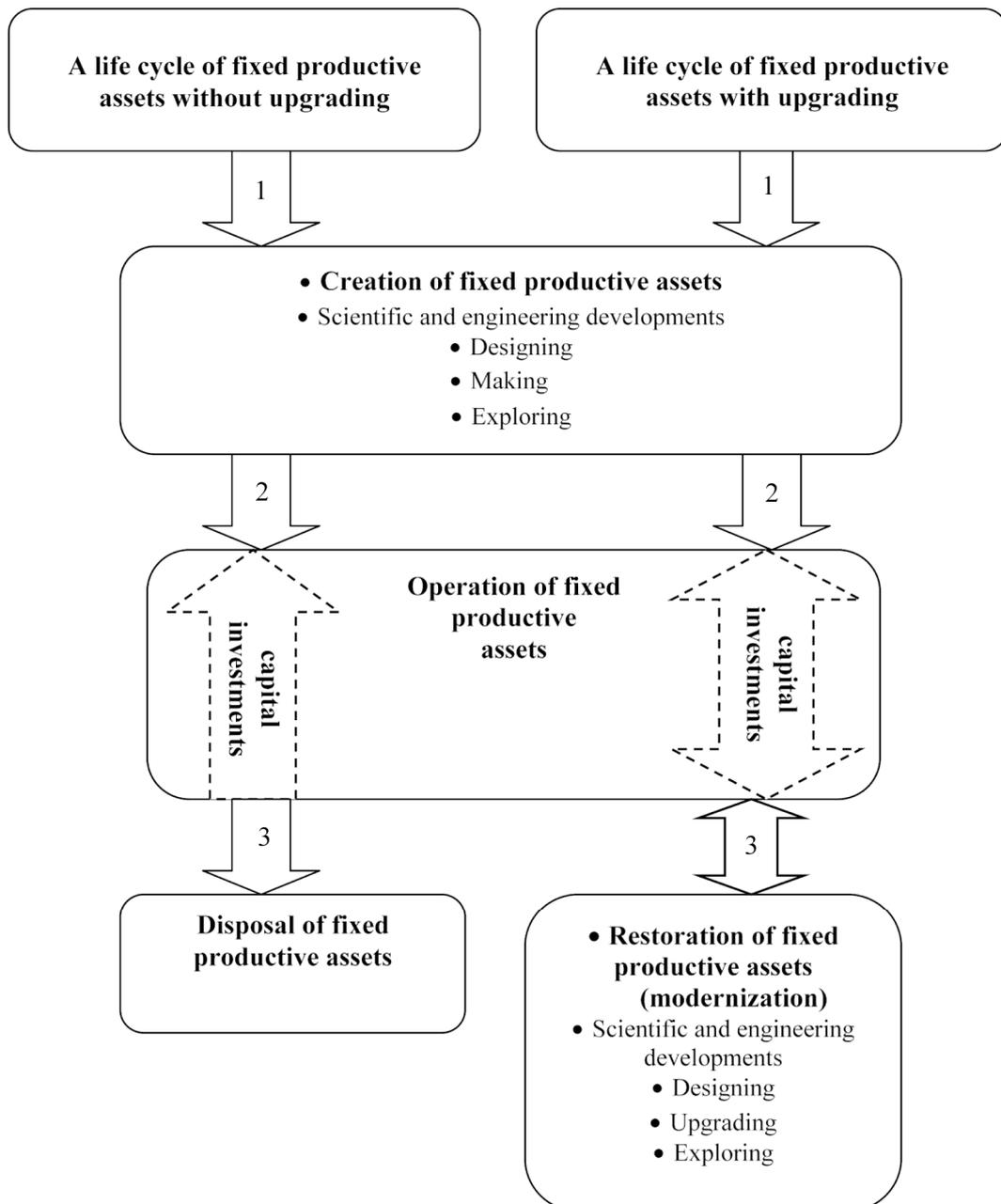


Fig. 3. Life cycle of fixed productive assets

Note: compiled by the authors [16]

Taking into account external and internal factors that influence the machine-building enterprise it is possible to distinguish factors that contribute to modernisation of fixed productive assets (machines, equipment, machine-tools).

The factors that stimulate modernisation of machine-building enterprises are presented in Fig. 4.

The factors that contribute to modernisation of fixed productive assets are of different character. In particular, the enterprise management, at their discretion, trying to make fixed assets operate successfully and to further exploit them introduce the system of technological inspections, repairs and modernisation that meets current needs of post-industrialized development.

A factor of economic globalization is all-embracing in relation to intellectually-informative resources, innovations, competition, that acquire importance today. O. Bilorus, D. Lukyanenko [17] characterize the quality features of economic globalization as the features that reflect the processes of transnationalization, regionalization and global institutionalization, where the driving forces are fundamental scientific and technological changes on the basis of all-embracing informatization.

Development of economy depends on limited raw material resources while intellectual and information resources have no quantitative limitations and are able to multiply, replicate and

self-develop. Investment strategy implementation is related to diversification of production and creation of fund for upgrading fixed assets.

The results of the research [18, p. 262] into the influence of diversification of production at “Company VEEM-Metalavtoprom” LLC, specializing in manufacturing bus components, passenger seats for public transport, in particular, show that for implementing “A102 “Karpaty”” investment project the company modernized and bought a large portion of equipment for manufacturing basic products.

The company’s management has an opportunity to launch manufacturing of new types of products using both upgraded and purchased high-accuracy equipment.

In particular, Humeniuk A. [19, p. 137] states the necessity of creating fund for upgrading fixed assets that can be used for improvement, upgrading, and restoration of fixed assets with the aim of improving technological aspect of production.

It is worth noting that, apart from the available factors, a number of internal production factors can also stimulate modernisation of fixed productive assets. Internal production reasons (factors) can be different (increase of profitability, energy efficiency, materials efficiency, capital productivity and upgrading of fixed assets) for every separate enterprise.

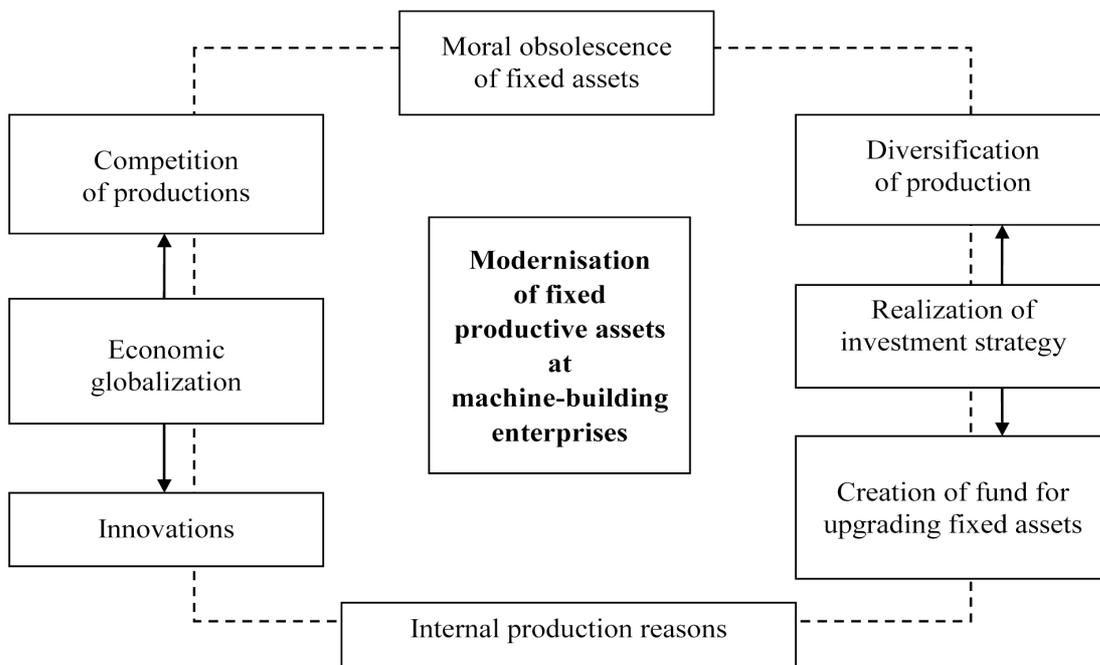


Fig. 4. The factors that stimulate modernisation of machine-building enterprises

Note: compiled by the authors [17–19]

Thus, it is expedient to calculate the integral index of modernisation investment efficiency at “Company VEEM-Metalavtoprom” LLC that is formed on the basis of internal production factors :

$$I = \sqrt{\frac{\Delta FFA}{\Delta FA} \cdot \frac{\Delta PFA}{\Delta FA} \cdot \frac{\Delta EFA}{\Delta FA} \cdot \frac{\Delta MFA}{\Delta FA} \cdot \frac{\Delta KFA}{\Delta FA} \cdot \frac{\Delta RFA}{\Delta FA}}, \quad (1)$$

where I is an integral index of investment efficiency of modernisation; ΔFFA is an increase of capital productivity; ΔPFA is an increase of labour productivity; ΔEFA is an increase of energy efficiency; ΔMFA is an increase of materials efficiency; ΔKFA is an increase of investments; ΔRFA is an increase of profitability; ΔFA is an increase of fixed assets upgrading.

Table 1 presents summary calculations of the integral index of investment efficiency of modernization at “Company VEEM-Metalavtoprom” LLC in 2013–2015.

Table 1

Summary calculations of the integral index of modernization investment efficiency at “Company VEEM-Metalavtoprom” LLC in 2013–2015

Indexes	Marking	2013	2014	2015
Increase of profitability	ΔRFA	0,036	0,04	0,045
Increase of energy efficiency	ΔEFA	0,008	0,0095	0,01
Increase of capital productivity	ΔFFA	0,017	0,019	0,02
Increase of materials efficiency	ΔMFA	0,013	0,015	0,018
Increase the labour productivity	ΔPFA	0,02	0,03	0,04
Increase of investments	ΔKFA	0,12	0,14	0,16
Increase of fixed assets upgrading	ΔFA	0,035	0,04	0,05
Integral index of modernisation investment efficiency	I	0,66	0,69	0,74

Source: formed by the authors on the basis of the company’s reports

The low value of even one of the partial estimations substantially reduces an integral estimation. It is possible to state that the integral index of investment efficiency of modernisation at “Company VEEM-Metalavtoprom” LLC in 2015 is 0,74 and is within the limits [0–1]. When profits increase, when there is increase of internal

production factors, fixed assets upgrading grows, the value of integral investment efficiency of modernisation also increases.

Accordingly, having obtained a general integral index for a certain enterprise for every year, it is possible to analyse the dynamics of investment efficiency of modernisation and identify factors that have the greatest influence on it and stimulate it, taking into account the aspects of operation and modernisation of fixed assets.

Conclusions

Analysing aspects of operation and modernisation of fixed assets at machine-building enterprises special attention should be given to legislative interpretation of the concepts of repair and improvement of fixed assets, stages of life cycle of fixed assets restoration and factors that contribute to modernisation of equipment, machines and machine-tools. One of the main factors that stimulate modernisation is a moral obsolescence, economic globalization and investment strategy. Modernisation touches only the active part of fixed assets.

Modernisation of fixed productive assets improves the quality indexes of enterprise operation (labour productivity, lifetime of fixed assets, quality of products) and stimulates successful fixed assets operation, taking into account the modern technological needs of machine-building industry.

References

1. *Record-keeping of improvement and repair of fixed assets : materials of X International scientific conference [“Ecological and social reference-points of record-keeping, control, economic analysis : civilization challenges”]*, (Zhytomyr, October 13–15, 2011). Zhytomyr: 2011. – 464 p.
2. Kravchenko A. A. *The Registration-analytical providing of management the fixed assets of agricultural organizations : of dissertation of candidate of economic sciences : 08.00.12 / Alain Andreevna Kravchenko. Stavropol, 2011. – 214 p.*
3. Osypov V. I. *Economy of enterprise: train aid / V. I Osypov it is Odesa: “Lighthouse”, 2005. are 724 p. s.*
4. Mochernyj S. V. *Economic encyclopaedia / of S. V. Mochernyj – K: The Publishing center “Academy”, 2001. are 848 p. s.*
5. Dubinin S. *Alternatives of modernisation // Free thought. – 2010. – No. 2 (1609). – p. 5.*
6. Khariva P. S. *Economy of enterprises: train aid / P. S. Khariva. – Ternopil: Economic thought, 2000. – 500 p. s.*
7. Order “On approval of guidance on accounting of fixed assets” No. 561 of 30.09.2003. [Electronic resource] – Access mode.: <http://www.zakon.rada.gov.ua>.

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8. Regulation (Standard) Accounting 7 "Fixed Assets": of 27. 04. 2000 No. 92 [Electronic resource]. – Access mode: <http://www.zakon.rada.gov.ua>.
9. Tax Code of Ukraine: of 02.12.2010 № 2755-VI [Electronic resource]. – Access mode: <http://www.zakon.rada.gov.ua>.
10. Regulations on maintenance and repair of road vehicles road transport No. 102 of 30.03.98 p. [Electronic resource]. – Access mode: <http://www.zakon.rada.gov.ua>.
11. Horngren C. T., Foster G., Datar S. M. Cost Accounting: A Managerial Emphasis. – 10-th Edition, Prentice Hall, Inc., 2000. – 360 p.
12. Bulletin of the Ministry of income and fees Ukraine [Electronic resource]. – Access mode: <http://www.zakon.rada.gov.ua>: <http://www.visnuk.com.ua>.
13. Ghranov R. Reconstruction, modernization and repair of fixed assets / R. Ghranov // Debit – Credit. – 2004. – No. 17–18. – P. 10–13.
14. Casarotto Filho N. and Pires L. H., Networks of small and medium enterprises and local development: strategies for achieving global competitiveness based on the Italian experience. (São Paulo, SP: Atlas, 2001).
15. Buiar D. R. and Hatakeyama K., Information technology as competitive leverage in Paraná new industrial hub. *Revista Educação e Tecnologia*, 7, 2011, 39–52.
16. Makeeva O. V. The life cycle of fixed assets – issues of accounting and control / O. V. Makeieva // *Journal of Social and Economic Research*. – 2002. – No. 12. – S. 229–232.
17. Bilorus O. Global transformation and development strategy: monograph / A. G. Bilorus, D. G. Lukyanyenko and others. – K.: VIPOL, 1998. – 416 p.
18. Kuzmin O., Drymalovska Kh., Stelmakh Kh. Diversification as a strategy of investment and innovation development of enterprises materials IV International Scientific Conference ["Modern challenges of the global economy"], (Kyiv, 19–20 lyst. 2015). – K.: Taras Shevchenko National University of Kyiv, 2015. – 292 p.
19. Ghumenjuk A. F. Theoretical and practical problems and methods of forming the fund upgrades of investment property in lease terms / A. F. Ghumenjuk // *Herald of Khmelnytsky National University. Scientific journal*. – 2009. – No. 6. – Vol. 1. – P. 137–140.