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THE FIXED ASSETS’ OPTIMAL SERVICE LIFE EVALUATION TOWARDS THE PROCESS OF THEIR INNOVATIVE RENEWAL

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Purpose. The efficiency of the enterprise’s financial and economic activity is largely determined by the availability of the necessary production potential, the main component of which is fixed assets (FA). Currently, Ukrainian enterprises are characterized by a high level of FA’s wear and tear, which is the leading factor of low production efficiency. The current situation explains the need for significant changes in the area of updating the fixed assets, and necessitates the development of new methodological approaches and relevant practical recommendations. In this connection, the problem of choosing the process of reproduction of fixed assets and determining the expediency of carrying out these measures becomes especially relevant. At the same time, the terms of use of fixed assets are the main parameter in the process of their innovative renewal, in connection with which the problem of quantitative assessment of the optimal terms of operation of the equipment arises. The purpose of the article is to investigate and substantiate the concept of the optimal period of use of fixed assets, as well as to analyze how deviations from this period affect the investment support of the process of innovative renewal of the FA by constructing relevant equations with discounting of cash flows.

Design/methodology/approach. The article uses the cash flow discounting method, iterative and balance methods to calculate the optimal service life of the FA and to analyze the impact of deviations from these terms on investment support for the innovative renewal of fixed assets. The obtained calculation results are visually displayed using tables and a graphic method.

Findings. The article examines several methods for determining the optimal service life of the fixed production assets of enterprises and the moment of their reproduction. Three main approaches to management decision-making regarding the expediency of updating FA are identified and studied: cost-effective, profitable, and comparative. The main methods and criteria for choosing the moment of replacement of existing FA with new ones were considered, and their advantages and disadvantages were evaluated. The author proposes and substantiates an approach to determining the optimal service life of the FA based on the use of equations with cash flow discounting. Corresponding numerical calculations are given. The influence of the deviation from the optimal FA’ operation period on the investment support for their innovative renewal was also assessed.

Practical implications. The methodical and practical results obtained in the research process can be used to calculate the optimal service life of existing main production assets and the rational moment of their replacement with new ones, as well as in the development of the company’s depreciation policy.

Originality/value. The quantitative assessment of the equipment's terms of use and its influence on the process of their renewal is important, since too long a period of use of fixed assets does not allow the timely introduction of new, more progressive types of equipment. At the same time, the significant shortening of the service life of the FA (with the same rate of depreciation) does not allow to accumulate the appropriate funds for renewal.

Keywords: fixed production assets, innovative renewal, service life of FA, investment provision, depreciation, discounted cash flow.

Paper type: Research paper.

Problem statement

The efficiency of the enterprise's financial and economic activity is largely determined by the necessary production potential availability, the main component of which is fixed assets (FA). It is the state and structure of fixed assets that determines the technological and technical development of production, which is the foundation and prerequisite for the country's development. Currently, Ukrainian enterprises are characterized by a high level of wear and tear and obsolescence of fixed assets, which is one of the main factors of low production efficiency and insufficient opportunities to produce competitive products for world markets. This problem is particularly acute for industries, for example, in mechanical engineering, the level of wear and tear of FA currently exceeds 59 %, for enterprises producing construction materials it is approximately 62 % [1]. The current situation explains the need for significant changes in the field of updating the fixed assets, and necessitates the development of new methodological approaches and relevant practical recommendations. Carrying out the process of updating fixed assets at the enterprise requires solving a number of interrelated tasks, such as determining the optimal service life of the FA, developing an investment strategy for updating it, choosing its best form and type, etc.

Under the current conditions, enterprises should independently search for optimal options for updating the fixed assets. In connection with this, the problem of choosing the process of reproduction of fixed assets and determining the expediency of carrying out these measures becomes especially relevant. At the same time, the terms of use of fixed assets are a key parameter in the process of their renewal. Too long period of use of fixed assets does not allow timely implementation of new, more progressive types of equipment. At the same time, a significant reduction in the service life of the equipment (at the same rate of depreciation) does not allow to accumulate the appropriate funds for renewal. In connection with this, the problem of quantitative assessment of optimal periods of use of fixed assets in the process of their innovative renewal arises.

Hypotheses formulation and presentation of goals

The article examines the hypothesis regarding the influence of the terms of use of the fixed production assets on the resource provision of their renewal in the process of innovative development of the enterprise.

The purpose of the article is to investigate and substantiate the concept of the optimal period of operation of fixed assets, as well as by constructing the appropriate equations with discounting of cash flows to analyze how deviations from this period affect the investment support of the process of innovative renewal of FA.

Analysis of recent research and publications

The problems related to rational implementation of FA update processes have been increasingly studied by scientists for decades. In particular, in the economic literature, there are a number of methods that allow determining the optimal service life of fixed assets and the correct moment of their reproduction. The analysis of domestic and foreign theory and practice shows that in general there are three main approaches to making managerial decisions regarding the feasibility of renewing FA. These are the so-called cost, profit and comparative approaches. So, for example, according to the cost approach, the minimum average annual costs for their operation over the entire period of functioning is taken as a criterion for the optimal service life of FA. Also, with this approach, renewal is considered economically feasible at the moment when the minimum total annual operating costs are reached [2, 3, 4].

These authors believe that during the implementation of processes of simple reproduction or disposal of FA, there is a need to reduce the costs of their maintenance and operation. Thus, the methods of determining the time of expediency of updating the fixed assets are based on the calculation of costs.

The profitable approach consists in determining the maximum expected average annual income from the use of fixed assets or the maximum market value of the enterprise [5, 6, 7, 8].

This approach is used by the enterprise in the process of extended reproduction of the FA, since in this case, in order to make an appropriate decision, it is necessary to carry out quantitative calculations regarding the possibility of obtaining additional income from the implementation of these measures. That is, the use of the income approach is obvious with the extended reproduction of FA. In general, Ivanov V.L. considers both of the above criteria as such, which can be widely applied in economic practice [5].

The comparative approach is based on the comparison of efficiency from the operation of existing fixed assets and the purchase of new ones [6, 7, 8, 9]. The authors come to the conclusion that the methods of determining the expediency of replacing the existing equipment with new ones are based on a comparative approach, since the company decides whether to keep or replace the equipment currently in use. To do this, you should analyze the difference between the old equipment and possible alternative options for replacing it with a new one. Therefore, the comparative approach allows determining the expediency of replacing fixed assets. Also, a number of foreign scientists from Germany, the USA, China, etc., in their works investigate the issue of the reproduction of fixed assets, in particular, the influence of service life and depreciation on the development of the production potential of enterprises in the context of modern trends in the development of production [16, 18, 19, 20, 21].

Thus, target orientation (cost minimization, profit maximization, etc.) always underlies the process of updating fixed assets, and also determines its criterion indicators. At the same time, appropriate quantitative methods and models should be used.

However, despite a significant number of scientific works devoted to the problems of implementing the process of updating the fixed assets, there is a need to continue such research, since a number of problems in this area are not finally solved. So, for example, one should take into account the fact that the active and passive parts of the FA are used at different time intervals, that is, the innovative renewal of fixed assets is connected with the rational choice of the period of use of their individual components.

Research methods

During the research on the optimal operational period of the fixed production assets and its impact on investment support for the innovative renewal of FA, we utilized scientific research methods such as systematization, cash flow discounting, economic and mathematical modeling, analysis and synthesis, as well as graphical and tabular data presentation methods.

Presentation of the main material

The solution to the problem of determining the optimal period of operation of fixed assets is based on the results of economic studies related to the theory of consumer value of assets and the content of which is the choice of the best of alternative options for their renewal. Depreciation of fixed assets is considered a loss of their consumer value. To preserve it, it is necessary to calculate the point in time after which a decrease in the consumer value of fixed assets will lead to financial losses for the enterprise from their untimely renewal. In addition, as already emphasized, too long a period of use does not allow for the timely introduction of new, more progressive types of equipment, while a significant reduction in the service life of FA (with the same rate of depreciation) will not allow to accumulate enough funds for their renewal. The methods of this group include methods and models designed for calculating the useful life of labor equipment, analyzing costs for the operation of health facilities, etc.

At the same time, it should be noted that the terms of use of fixed assets are divided into three types [12]:

– the normative service life of FA, which is calculated according to the relevant depreciation standards for their renovation;

– the effective service life of the equipment, during which the company receives profit from the operation of the equipment;

– the optimal service life of the maintenance equipment, which ensures the achievement of the extreme value of a certain optimization criterion regarding their service life.

The criteria for the optimal service life of fixed assets can be different, but the most common criterion for the optimal service life of fixed assets is the minimum cost of manufacturing of a unit of production during the time of their operation [13]. This criterion should be used in cases where the volume of products is produced per unit of time is practically unchanged throughout the entire service life of the equipment.

There are also currently other criteria for choosing the moment of replacing existing fixed assets with new ones. For example, in [9], the following criterion for the expediency of replacing obsolete equipment with new ones is proposed: if the cost price of the unit of production without taking into account depreciation under the condition of using the old equipment exceeds the specific costs of its production during the operation of the new one. As mentioned above, Ivanov V.L. [5] notes the existence of at least two generalizing criteria for optimizing the service life of fixed assets – the maximum value of the total profit received for the entire period of their use, as well as the minimum value of the average annual costs for maintenance of the data of fixed assets during the entire period of their operation. At the same time, the cost of production (amount of costs) is defined as a function associated with such parameters as annual depreciation deductions, costs for repair of equipment, their initial cost, service life. The average annual value of production costs is taken as a criterion for optimizing the service life of the equipment, and by applying the appropriate mathematical apparatus, the extremum (minimum) of this function is found, and, accordingly, the sought value $T -$ is the optimal service life of fixed assets.

Practice shows that with the increase in the service life of the equipment, not only the cost of maintenance, but also the productivity, often changes. There, the productivity of the equipment may decrease over time, for example, due to an increase in the duration of repair work, etc. Given these prerequisites, determining the optimal service life of the equipment turns out to be a more difficult task, since both the productivity of the equipment and the costs of their operation are described by functions of the time factor. The paper [2] states that under these conditions, “the rational term for equipment replacement will be the year in which the minimum costs per unit of production are achieved for the entire service life of the equipment”.

Often, when planning the renewal of FA, it is necessary to determine their effective service life, which in general can be determined from the equation:

$$P_t - C_t \ * N_t = 0, \qquad (1)$$

where $P_t -$ is the price of a product unit in the time period t (c.u.); $C_t -$ unit cost of production in the time period t (c.u.); $N_t -$ volumes of production (in natural units) in the time period t.

The indicator of the effective service life of FA should be used when the products manufactured with their help are in significant demand. Then it will be advisable to decommission the old equipment at the end of its effective service life.

In business practice, methods and models are widely used, which are focused on reducing costs and are used to compare options for renewal of fixed assets, in particular investments in capital investments. The most widely used model from this group is the so-called reduced cost method.

At the same time, it is assumed that capital and current production costs are interchangeable, and for a separate object, the option of capital investments in the project is chosen according to the criterion of minimizing the weighted sum of current and one-time capital costs [14]:

$$C + E_n K \rightarrow min, \tag{2}$$

where $C -$ current costs during the operation of the investment project (c.u./time); $E_n -$ is the norm of reducing capital costs; $K -$ is the cost of the investment project (c.u.).

The positive aspects of this method include the possibility of analyzing investments separately for each production link, since local current costs for them may be different. Among the debatable aspects, one can note the lack of consideration of the time factor. Also, the content of the regulation on the reduction of capital costs is not entirely clear. Often, the standard of economic efficiency of capital investments, i.e. their profitability, is taken as E_n. But under E_n it is more legitimate, in our opinion, to understand the cost of replacing a unit of production cost with capital.

The method of reduced costs is also used when analyzing the expediency of replacing old, operating equipment with new equipment, if overhaul of the latter is possible. As a simple method of such evaluation, a comparison of the cost of capital repairs of old fixed assets with the cost of purchasing new ones can be used. The purchase of new equipment to replace the existing one is considered appropriate if the following inequality is met:

$$K_d \geq F_n, \tag{3}$$

where $K_d -$ is the cost of major repairs of existing health facilities (c.u.); $F_n -$ is the cost of acquiring new FA (c.u.).

It should be noted the ease of application of this criterion, since both parts of inequality (3) are known values. But this approach has a number of disadvantages, considering which it can be applied only if the repair to a large extent ensures the return to the operating equipment of those technical and economic parameters that it had in its new state, that is, at the beginning of operation. In our opinion, a sufficiently adequate criterion for the expediency of replacing existing equipment with a new one:

$$C_d + E_n * K_d \geq C_n + E_n * F_n, \tag{4}$$

where $C_d -$ is the production cost without taking into account amortization for the operating FA (c.u./time); $C_n -$ is the cost of production without taking into account depreciation for new fixed production assets (c.u./time).

It should be noted that the formula (4) contains positive aspect of criterion (3), i.e., this method also compares the costs of capital repairs of existing equipment and the purchase of new ones, but in addition, the costs of operating existing and new FA are taken into account.

One should not overlook the widely used method for evaluating the effectiveness of investment projects, in particular in new fixed production assets, the net present value method – NPV, which is based on discounted cash flows that take into account the time factor:

$$NPV = \sum_{t=0}^{T}(V_t - Z_t)\frac{1}{(1+d)^t} - \sum_{t=0}^{T} I_t \frac{1}{(1+d)^t}, \tag{5}$$

where $T -$ is the operating period of the investment object; $V_t -$ results (income) received at step t(c.u./time); $Z_t -$ current costs incurred at step t(c.u./time); $I_t -$ investments (capital investments) made at step t (c.u.); $d -$ discount rate.

As a rule, a year acts as a step in the NPV method. An investment project is considered acceptable from the point of view of the project participant (investor), if the net discounted income (NPV) is not negative (NPV ≥ 0).

When comparing alternative investment projects, preference should be given to the project with a higher NPV value.

The net present value method, in a slightly modified form, is also used to optimize the useful life of fixed assets. In their works Blech Y. and Gotze U. described the relevant model, where the optimization criterion is the maximization of net cash income and which is presented in the following analytical form:

$$NPP = \sum_{t=1}^{T}(NP_t)\frac{1}{(1+d)^t} - I + L \rightarrow max, \tag{6}$$

where $T -$ is the service life of fixed assets (time); $NP_t -$ net income from the sale of products manufactured on the basis of data of the FA, in the $t - th$ period (c.u./time); $I -$ cost of acquisition of FA (c.u.); $L -$ revenue from the liquidation of FA (c.u.); $d -$ discount rate (in fractions of a unit).

According to this model, the period of operation of the equipment will be optimal, during which the value of the indicator of net monetary income (NPP) will reach its maximum value.

Also known is the model based on the value of the critical profit indicator. Its content is to find out how much the value of net cash income (NPP) will change if the life of the equipment is extended for 1 year. At the same time, there will be an additional inflow of NPP, but after another year of using the equipment, its liquidation value will be lower. The critical profit index (CPI) is calculated according to the following ratio:

$$CPI_t = NP_t + L_t - L_{t-1}(1 + i), \tag{7}$$

where $i -$ is the rate of return that could be obtained with another option of using the funds from the liquidation of the FA (in fractions of a unit).

According to this model, the term of service of the fixed assets is considered optimal, after which the sign of the CPI indicator changes from "+" to "$-$". This means that it is advisable to continue using the equipment only as long as the benefit from its additional operation is greater than the losses due to the reduction in the liquidation value of the equipment.

In order to solve the problem of determining the optimal service life of the FA, we suggest using the following approach. First, it is necessary to determine the service life of fixed assets as such, which is characterized by the balance of accrued depreciation and the cost of fixed assets that are disposed of. In this case, the rate of growth of fixed assets will be ensured by the share of profit, which is used for capitalization for the purpose of forming appropriate investments [15].

At the same time, the desired service life of fixed assets satisfies the equation:

$$K = \frac{\Delta K + n_1\ K}{1+\Delta K} + \frac{\Delta K + n_2\ K}{(1+\Delta K)^2} + \cdots + \frac{\Delta K + n_t\ K}{(1+\Delta K)^t} + \cdots + \frac{\Delta K + n_T\ K}{(1+\Delta K)^T}, \tag{8}$$

where $K -$ is the cost of new FA ((c.u.); $\Delta K -$ rate of growth of FA (in fractions of a unit); $n_t -$ rate of depreciation for the $t -$th year of operation of the FA (in fractions of a unit); $T -$ is the period of use of FA (years).

The equation is based on the following principles. The sources of investment for the renewal of fixed assets are profit and depreciation.

The ratio of the profit used for investment to the cost of fixed assets is ΔK, which is equal to the rate of growth of FA. This value is constant during the interval of use of fixed assets. The amount of depreciation deductions is calculated according to the mechanism of taking into account the residual value of fixed assets.

Let's present in tabular form the change in the cost of maintenance and depreciation deductions on the example of the operation of fixed assets for T years (Table 1).

Table 1

Calculation of changes in the value of fixed assets and their size depreciation deductions according to the years of their operation

Year of operation	Residual value of FA	Depreciation rate	Depreciation deductions
1	K	$n_1 = n$	$n_1 K$
2	$1 - n\ K$	$n_2 = n(1-n)$	$n(1-n)K$
3	$(1-n)^2 K$	$n_3 = n(1-n)^2$	$n(1-n)^2 K$
4	$(1-n)^3 K$	$n_4 = n(1-n)^3$	$n(1-n)^3 K$
…	…	…	…
T	$(1-n)^{T-1} K$	$n_T = n(1-n)^{T-1}$	$n(1-n)^{T-1} K$

As can be seen from the table, the obtained results can be generalized for any term of operation of fixed assets (T).

The corresponding depreciation coefficients, by which the initial cost of the equipment is multiplied for the purpose of calculating depreciation, are given in the third column of Table 1.

In the above dependence, the rate of growth of fixed assets is the discount rate. If the terms of use of fixed assets T^o differ from the optimal ones, then the above equation takes the form:

$$K = \frac{\Delta K + n_1\ K}{1+\Delta K} + \frac{\Delta K + n_2\ K}{(1+\Delta K)^2} + \cdots + \frac{\Delta K + n_i\ K}{(1+\Delta K)^t} + \cdots + \frac{\Delta K + n_{T''}\ K + \Delta I}{(1+\Delta K)^{T^o}} \qquad (9)$$

In this equation, the value ΔI at $T^o \leq T$ characterizes the unearned funds in relation to investments in the amount of K. They can be considered as certain losses, provided that the equipment that is not used at the enterprise is not sold. The same value of ΔI at $T^o \geq T$ will characterize the surplus of funds needed to reproduce the initial cost of fixed assets.

It should be noted that if $T^o = T$, then the value $\Delta I = 0$.

The amount of these funds also depends on the rate of depreciation and the rate of growth of fixed assets.

Let's analyze this equation using specific numerical examples. Without reducing the generality, we believe that the condition K =1, is fulfilled, that is, funds ΔI are considered as percentages. Then we get the following expression for determining ΔI:

$$K = \frac{\Delta K + n_1\ K}{1+\Delta K} + \frac{\Delta K + n_2\ K}{(1+\Delta K)^2} + \cdots + \frac{\Delta K + n_{T^0}\ K}{1+\Delta K\ ^{T^o}} + \frac{\Delta I}{1+\Delta K\ ^{T^o}} \qquad (10)$$

From this equation we get:

$$\frac{\Delta I}{1+\Delta K\ ^{T^o}} = 1 - \ \frac{\Delta K + n_1}{1+\Delta K} + \frac{\Delta K + n_2}{(1+\Delta K)^2} + \cdots + \frac{\Delta K + n_{T^0}}{1+\Delta K\ ^{T^o}} \qquad (11)$$

We determine ΔI from equation (11):

$$\Delta I = \ 1 + \Delta K\ ^{T^o} \times (1 - \ \frac{\Delta K + n_1}{1+\Delta K} + \frac{\Delta K + n_2}{(1+\Delta K)^2} + \cdots + \frac{\Delta K + n_{T^0}}{1+\Delta K\ ^{T^o}}\ ) \qquad (12)$$

Square brackets contain the amount of money discounted over the years (depreciation and the capitalized portion of the profit) over the period T^o.

We denote the expression in square brackets as ${}_{t=1}^{T^o} C_t$. Then the ratio for finding ΔI will look like this:

$$\Delta I = \ 1 + \Delta K\ ^{T^o} \times (1 - \ {}_{t=1}^{T^o} C_t) \qquad (13)$$

The calculation is carried out in two versions of the depreciation rate – 17 % and 28 %.

We perform the calculation in two stages: in the first stage, we discount the cash flow, and in the second stage, we directly calculate the value of ΔI depending on T^o.

Table 2

Calculation of discounted cash flows and the value of ΔI
(at $\Delta K = 0,07$ and $n = 0,17$)

t	$n_t = n(1-n)^{t-1}$	$\Delta K + n_t$	$1 + \Delta K\ ^t$	$C_t = \frac{\Delta K + n_t}{(1+\Delta K)^t}$	${}_{t=1}^{T^o} C_t$	$1 - {}_{t=1}^{T^o} C_t$	$\Delta I = 1 + \Delta K\ ^{T^o}(1 - {}_{t=1}^{T^o} C_t)$
1	0,1700	0,2400	1,0700	0,2243	0,2243	0,7757	0,8299
2	0,1411	0,2111	1,1449	0,1844	0,4087	0,5913	0,6769
3	0,1171	0,1871	1,2250	0,1527	0,5614	0,4386	0,5373
4	0,0972	0,1672	1,3108	0,1276	0,6890	0,3110	0,4076
5	0,0807	0,1507	1,4025	0,1074	0,7964	0,2036	0,2855
6	0,0670	0,1370	1,5007	0,0913	0,8877	0,1123	0,1685
7	0,0556	0,1256	1,6058	0,0782	0,9659	0,0341	0,0547
8	0,0461	0,1161	1,7182	0,0676	1,0335	-0,0335	-0,0576

As tabular calculations show, in the last column of the table, the ΔI indicator changes its sign from "+" to "–". This means that ΔI takes on a value equal to zero during this period of time (between the seventh and eighth year of operation of the fixed assets). That is, the required amount of funds for the reproduction of fixed assets will be received when their service life approaches 8 years.

Graphical interpretation of the dependence of the amount of funds on the term of use of the FA is presented in Fig. 1.

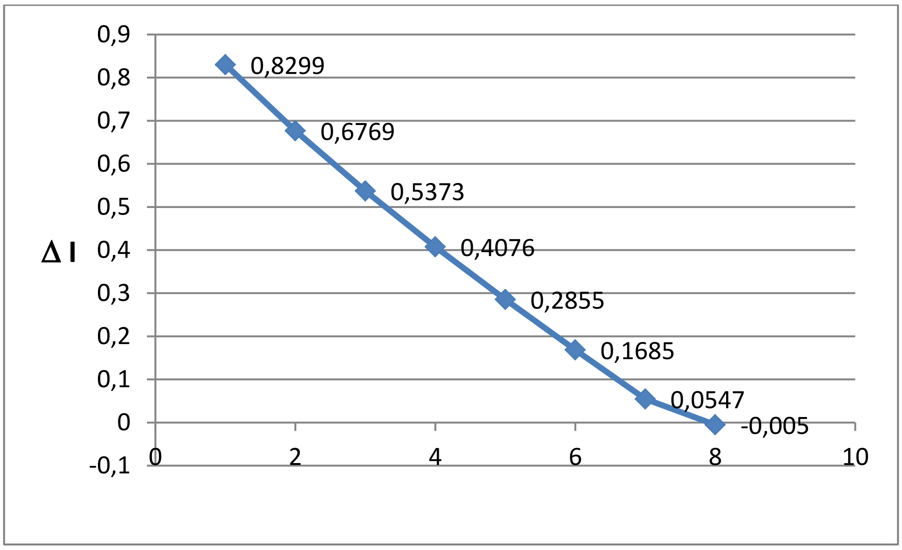

Fig. 1. Dependence of the size of investments ΔI on the terms of operation T^o of fixed assets (at $\Delta K = 0{,}07$ and $n = 0{,}17$)

As evidenced by the analysis of the dependence shown graphically, the funds required for the reproduction of fixed assets will be received when their service life approaches 8 years. If these terms are shorter than this period, then there is a lack of funds for such reproduction.

For the rate of depreciation equal to 28 %, we will carry out similar calculations (table 3).

Table 3

Calculation of discounted cash flows and the value of ΔI (at $\Delta K = 0,07$ and $n = 0,28$)

t	$n_t = n(1-n)^{t-1}$	$K + n_t$	$(1+\Delta K)^t$	$C_t = \frac{\Delta K + n_t}{(1+\Delta K)^t}$	$\sum_{t=1}^{T^o} C_t$	$1 - \sum_{t=1}^{T^o} C_t$	$\Delta I = (1+\Delta K)^{T^o}(1 - \sum_{t=1}^{T^o} C_t)$
1	0,2800	0,3500	1,0700	0,3271	0,3271	0,6729	0,7200
2	0,2016	0,2716	1,1449	0,2372	0,5643	0,4357	0,4988
3	0,1451	0,2151	1,2250	0,1756	0,7399	0,2601	0,3186
4	0,1045	0,1745	1,3108	0,1331	0,8730	0,1270	0,1665
5	0,0752	0,1452	1,4025	0,1035	0,9765	0,0235	0,0330
6	0,0542	0,1242	1,5007	0,0827	1,0592	-0,0592	-0,0888

The results of calculations are graphically interpreted in Fig. 2.

As can be seen from the graph, with a higher rate of depreciation, the useful lives of fixed assets, during which the necessary funds are received for their reproduction, are significantly shorter and amount to approximately 5 years.

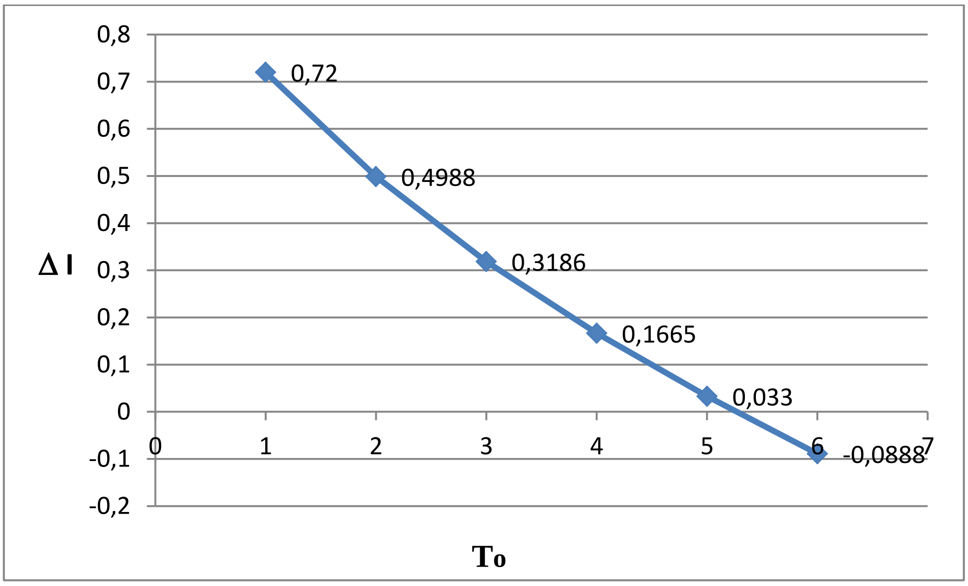

Fig. 2. Dependence of the size of investments ΔI *on the terms of operation* T^o *of fixed assets (at* $\Delta K = 0{,}07$ *and* $n = 0{,}28$*)*

Conclusions

As the research has shown, determining the necessary amount of financial resources when carrying out an innovative renewal of the fixed assets, i.e., replacing existing equipment with a more progressive new one, is of great importance in business practice and requires consideration of such a factor as the service life of FA. If the equipment is operated for a period that is less than optimal, then such premature replacement leads to the loss of certain volumes of investment resources. These losses can be compensated in two ways, namely: 1) introduction of new, more cost-effective equipment into production; 2) by increasing the terms of use of the existing equipment in those production units where the FA is not updated.

Thus, investment support for innovative renewal of fixed production assets with certain annual growth rates depends on two factors: the amount of depreciation deductions and the share of profit that goes to capitalization. Therefore, the establishment of the optimal service life of the FA and the appropriate depreciation policy can be considered the most rational directions of investment support for the innovative renewal of the fixed assets.

Prospects for further research

Further scientific research in this area can be directed to the search for the selection of rational periods of use of directly such components of the fixed assets as their active and passive parts, as well as to the development of an appropriate depreciation policy, taking into account the possible emergence of new innovative types of technical means.

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ОЦІНЮВАННЯ ОПТИМАЛЬНИХ ТЕРМІНІВ СЛУЖБИ ОСНОВНИХ ВИРОБНИЧИХ ЗАСОБІВ ПІДПРИЄМСТВ У ПРОЦЕСІ ЇХ ІННОВАЦІЙНОГО ОНОВЛЕННЯ

Досліджено підходи до визначення оптимальних термінів служби основних виробничих засобів промислових підприємств як головного параметра у процесі їх інноваційного оновлення. Розроблено метод визначення оптимальних термінів використання основних засобів (ОЗ) з використанням рівнянь та дисконтованих грошових потоків. Проаналізовано, як впливають різні терміни використання основних засобів на інвестиційне забезпечення процесу їх оновлення. Теоретичні висновки обґрунтовано кількісними розрахунками.

Ключові слова: основні виробничі засоби, інноваційне оновлення, термін служби ОЗ, інвестиційне забезпечення, амортизація, дисконтований грошовий потік.