



Виконаний комплекс досліджень дозволяє зробити висновок про доцільність продовження робіт із модернізації систем керування підприємства, використовуючи принципи проектування АСКТП – «знизу вгору», а також наведені методи й підходи до прийняття основних технічних рішень з використанням вітчизняних технічних і програмних засобів.

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THE TECHNICAL OBJECTS' EFFICIENCY CONTROL BY THEIR RENEWAL

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***Анотація.** Ступінь функціонального вдосконалення технічного об'єкта характеризується рівнем його технологічної ефективності. У процесі експлуатації технічного об'єкта відбувається його знос, який знижує рівень його ефективності. Високопродуктивним методом управління рівнем технологічної ефективності технічного об'єкта є його оновлення. Здійснення оновлення є актуальною задачею. Оновлення як дія може бути частковим, повним і комплексним. Відповідно до складності багатогранного завдання оновлення виробництва, його предметний простір слід розділити на п'ять частин. Розглянуто складові основних елементів кожної частини, які підлягають оновленню. Показано місце та роль кожної частини у впливі їх на формування технологічної ефективності технічного об'єкта. Показано також вплив ступеня зносу технічного об'єкта. Особливої уваги заслуговує проблема*



управління процесом оновлення. Його якість впливає на режим функціонування технічного об'єкта. Режим визначає рівень ефективності технологічного процесу. Ефективність оновлення є тим більш значною, чим більшим є число рівнів виробничо-управлінської піраміди, які займає оновлюваний об'єкт. Організаційно-науково-технічний аспект управління процесом оновлення повинен бути доповненим соціальним. У процесі оновлення вплив та інтереси сфери управління мають бути визначальними для підприємств та інших виробничих структур, незалежно від форм власності та від рівня розташування їх у піраміді виробництва та управління. Важливими елементами кадрової проблеми є завдання підвищення рівня професійної кваліфікації та соціальної відповідальності персоналу. Складання та здійснення програми оновлення мають спиратися на належне ресурсне забезпечення. Найважливішим з результатів процесу оновлення виробництва є підвищення його екологічної ефективності. Ступінь успіху у вирішенні на підприємстві завдань оновлення як системи є істотним показником рівня його технологічної ефективності, професійної компетентності, соціальної відповідальності, організаційно-управлінської зрілості і майстерності керівництва підприємства.

Abstract. *The degree of functional perfection of technical object is characterized by the level of its technological efficiency. During the operation of a technical object, its depreciation occurs. It reduces the level of its efficiency. A highly productive method of control the level of technological efficiency of a technical object is its renewal. Renewal implementation is an actual task. Renewal as an action can be partial, complete and complex. In accordance with the complexity of the multifaceted task of industry renewal, its subject space should be divided into five parts. The components of the main elements of each part to be updated are considered. The place and role of each part in their influence on the formation of the technological efficiency of a technical object are shown. The influence of the degree of depreciation of a technical object is shown too. The problem of control of the renewal process deserves a special attention. Its quality affects the mode of operation of a technical object. The mode determines the level of efficiency of the technological process. The efficiency of renewal is the more significant, the greater the number of levels of the production and control pyramid occupied by the renewable object. The organizational, scientific and technical aspects of control of the renewal process must be supplemented by a social one. In the process of renewal, the impact and interests of the control sphere should be decisive for enterprises and other production structures, whatever of their form of ownership and level of their location in the pyramid of production and control. The important elements of the personnel problem are the tasks of improving the level of professional qualification and social responsibility of staff. The design and implementation of the renewal program must be backed by adequate resources. The most important of the results of the industry renewal process is the increase of its ecological efficiency.*

Ключові слова: управління, технологічна ефективність, технічний об'єкт, знос, застаріле обладнання, оновлення, екологічна ефективність.

Keywords: control, technological efficiency, technical object, depreciation, obsolete equipment, renewal, environmental efficiency

Introduction

For the successful development of industrial production, enterprises need to comply with the world level of development of technic and technology, that allows them to maximize profits and minimize losses, use their internal potential productively, and it is necessary to act in the direction of expanding the products' sales market, deriving the enterprise to a new higher level in the world market.

Since obsolete equipment is characterized by low maintainability due to lack of spare parts, low level of productivity and quality of manufactured products, frequent downtime due to the failure of its separate units, large expenditures of time for troubleshooting, leads to an increase in the cost of its maintenance and production, and also reduces working efficiency, the timely replacement of this obsolete equipment with new ones helps to lower production costs and increase the profit from the operation of the equipment. This allows to increase production efficiency, and the production of higher quality products, which should result from the replacement of worn out equipment with new ones, leads to an increase in the competitiveness of the enterprise.

Statement of problem

The degree of functional perfection of a technical object (TO) is characterized by the level of its technological efficiency (TE), the level of its components: ecological, economical, and general technical.

The new TO has the highest level of TE. From the moment of commissioning, TO experiences depreciation, which leads to a continuous gradual decrease in the level of its TE [1 - 3].

A highly productive method of control the level TE of TO' functioning is its renewal, in the implementation of which the process of development of world production actually consists. Therefore, the implementation of the renewal is an actual task.

Ways to solve the problem

Renewal (RN) of TO is, in essence, a control effect on it, improving its properties, increasing its TE. Similarly, RN of industrial production, its elements is a way, a method for control the level of their TE.

RN as an action can formally be represented in two forms, which can be characterized as follows.



Form "1": full term RN. Its purpose is to replace TO, which has exhausted its service life (resource of workability) and has passed into the limiting state, with a new object.

Form "2": full early RN. Its purpose is to replace a TO, which has not yet worked out its resource, but is outdated, lagging behind the current requirements for the level of TE, by a new object.

Form "3": partial (selective) RN. Its purpose is in RN of TO, through its modernization, reconstruction or technical re-equipment.

RN "1", in accordance with the normative submission, is subject to implementation in a prompt, urgent manner upon reaching the TO limit state. In this case, RN is associated with a large investment of resources (to replace a worn-out unit with a new one).

RN "2" can be carried out when the level of TO efficiency is considered insufficient, although TO still has some residual resource - ΔR . In this case, RN is also associated with a large investment of resources (to replace the worn-out object not yet up to the limit with a new one). However, during the period of time that the previous TO would need to spend ΔR , the new TO will operate at a high level of efficiency which inaccessible to the previous TO. The efficiency gain in the amount of ΔR may exceed the damage from underutilization of ΔR by the previous object. Essentially, this is an early RN.

RN "3" should be carried out when the degree of depreciation of an important unit or part of the TO (still having a residual resource) has reached the minimum acceptable level, as a result of which TE level of TO has decreased to the minimum acceptable value.

The foregoing reflects RN in the narrow sense of this concept, when only TO is subjected to this effect. In this case, an incomplete positive effect is obtained, since the renewed TO remained in the previous (outdated, not renewed) conditions of its use. To obtain the full effect, it is necessary to renewal not only TO, but also to renewal the conditions, the whole sphere (all circumstances) of its use. That is, it is necessary to carry out RN in the broad sense of this concept, that is, comprehensive RN (RN «4»).

From the above, it follows that the full RN gives an effect that is significantly greater than the partial (selective) RN. However, implementation of a comprehensive RN is able provided the the greatest possible (maximum) effect. RN is a complex multi-tier task of a problematic nature, of high dimension.

In the general case, the use of the RN of the considered forms and variants is advisable, since it causes an increase of TE of the renewable TO.

In accordance with the theoretical concepts of the complex multifaceted task of the OBD production, its subject space should be divided into the following five parts:

- machine condition
- equipment operating mode
- staff competence
- staff social responsibility
- production control system.

The Fig. 1 shows a structural and logical diagram of the formation of the effect of production renewal.

The main elements of each part, which are subjected to RN, are represented by the following components:

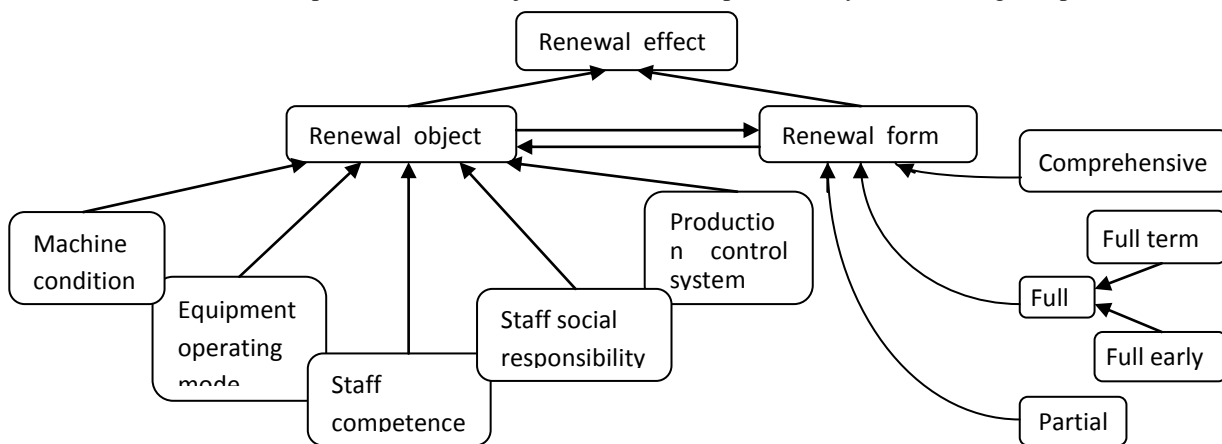


Fig. 1 – Structural-logical diagram of the formation of the effect of production renewal

1. Machine condition:

- scheme of the technological process of the enterprise, workshop, production site, unit;
- content of the set of equipment elements;
- the degree of perfection of structural and layout and other solutions of equipment elements;
- schematic and technical solutions of automatic control systems for technological, energetic equipment and networks for various purposes.

2. Equipment operating mode:



- conditions of equipment use, performance indicators; compliance with their forecast of the enterprise development
- enterprise, workshop, site, unit operation modes,
- mode and technical regulation of maintenance (operational and repair) equipment
- the level of technological (ecological, economical, general technical) efficiency of production elements.

3. Staff competence:

- concept for the development of the enterprise and its team
- the level of business qualifications and professional competence of personnel
- approach and system for assessing the professional capabilities of the employee
- a system for assessing the quality of employees' labor
- structure and development prospects of the personnel of the enterprise, workshop.

4. Staff social responsibility:

- social security system;
- inter-job relationships;
- the current system for assessing the quality of the employee's work, his initiative and activity;
- collectivism in decision making;
- psychological environment in the work collective;
- working conditions at the enterprise;
- awareness of employees in relation to the concept of development of the industry, the enterprise, changes in the social conditions of employees at the enterprise;
- structure and development prospects of the personnel structure of the enterprise.

5. Production control system:

- a system of organizational and technical (strategic, tactical and operational) management of production, its divisions and elements;
- automated control system (organizational and technical operational) (ACS) of the enterprise technological process.

Elements of each part can be subjected to RN totally or selectively.

The Fig. 2 shows a place and role of each part in their influence on the formation of TO TE. The influence of the degree of TO depreciation is also shown [1-4].

The problem of RN process control merits a special attention, because its quality affects the mode of operation of the controlled TO, and the mode determines the level of efficiency of the technological process that takes place in it. This characterizes the importance of TO automatic control systems (ACS).

The enterprise control system acting in the ministry, in the industry; acting automated control systems of workshops, and in them acting TO ACS have formed a multi-level complex production control system. At the same time, the ACS of each level controls, influences the control sphere of all lower levels.

In this regard, it should be noted that the task of control by the subordinate control sphere is a task truly unique in importance, complexity and delicacy. The issues raised are complexly interacting and influence each other.

Reasonably constructed RN of any content is fraught with obtaining a positive result. In general, the received effect (result) leads to direct, squarely tangible profit.

The depth of the TO RN may be different. At the same time, its increasing is always advisable.

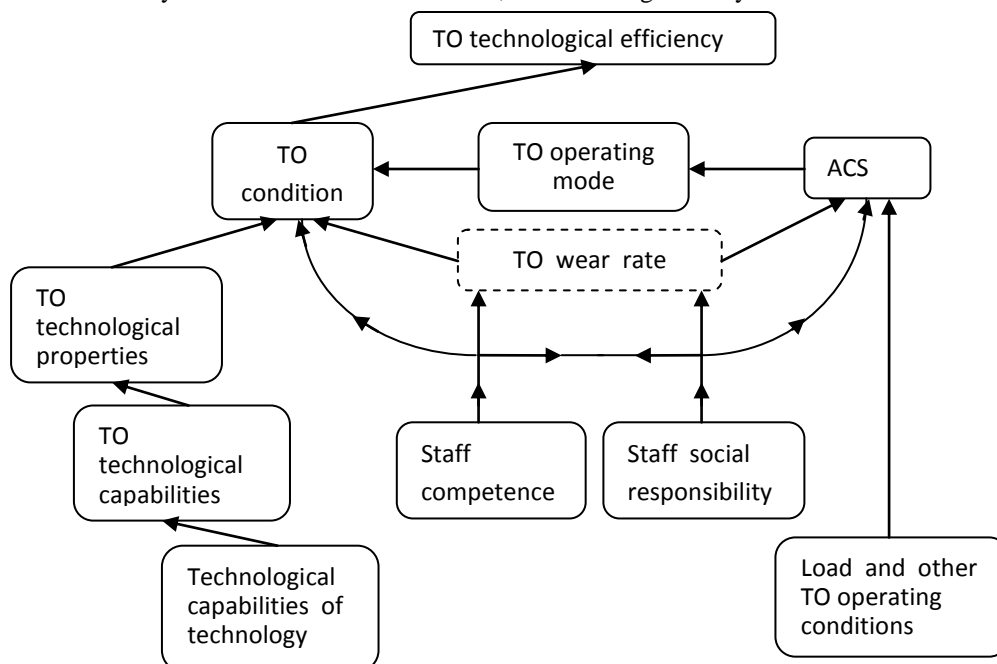


Fig. 2 – Structural-logical diagram of the interaction of factors affecting on TO TE



The solution of the problem of a choice of RN objects, character, content, sequence, the schedule of its realization requires to take note of the actions of a powerful lot of factors and circumstances changing over time. It's necessary system-integrated in-depth approach to the shaper, organization and implementation program of the RN production and any of its elements. Only in this case a high level of RN results is available. Only in this case is it possible to obtain the highest specific efficiency of resource investment in the RN.

RN is a flexible effective tool for TO TE level control. It should be especially noted that the expedient, high-quality, skillful possession of it and its application to the components of the multi-level sphere of control is a large reserve for the successful development of production.

In Ukraine, at a significant number of enterprises, in particular, in the food industry, part of the technological equipment and equipment of boiler houses has completed or is completing the spending of the estimated working life. In station power engineering, more than 80% of the equipment has worked out the calculated resource [5].

RN of such TO has acquired the character of an actual organizing-scientific-technical problem of national importance. With proper organization and its successful solution, a large technological and national economic effect will be obtained. In this case, the possibility of obtaining a large ecological effect is of particular importance.

Understanding that RN should be carried out in order to increase, first of all, the TO ecological efficiency and production in general has conceptual importance. The interests of increasing economic and general technical efficiency are of subordinate importance, therefore its should occupy the second and subsequent positions. The accelerating degradation of the state of the environment (first of all, living nature and human) requires, compels not to "protect nature", but more and more decisively, actively and toughly save it from ruin. On the way to the prompt solution of the tasks of this super-problem, now it is possible to use the only available on a large scale weapons – RN of the existing production. In the real accessible space "time - resources - global scale - psychological inertia and narrowness of understanding of danger", there is no other accessible way in this space. After all, the imaginary creation of the future some fundamentally new, harmless to nature, production will turn out to be nothing more than a complex RN of its outdated version on a global scale, because there is simply no other way.

In terms of the above, the quality of control of TO ecological efficiency is essential [6 - 8].

Considerable interest is the question of the structure of expenses for increasing TE of production [9].

The degree of success in solving RN tasks as a system at the enterprise is an essential indicator of the degree, level of its TE, level of professional competence, social responsibility, organizational-control maturity and professional skill of enterprise leadership (or other production structure).

Conclusions

1. RN is an indispensable element and an effective tool for the development of production.
2. The compilation and implementation of the RN program, regardless of the immensity of its object, should be based on proper, primarily intellectual, resource support.
3. The RN efficiency is the more significant, the greater the number of levels of the production and control pyramid occupied by the renewable object.
4. The important elements of the personnel problem are the tasks of improving the level of professional qualification and social responsibility of staff.
5. The degree of success in the implementation of the RN program of any production area depends to a large extent on the control quality at all levels of used production pyramid.
6. Understanding only the organizational, scientific and technical aspect of control is not enough. Control must be understood, and it is important, socially as well.
7. In the RN process, the impact and interests of the control sphere should be decisive for enterprises and other production structures, regardless of their forms of ownership and regardless of their level of location in the pyramid of production and control.
8. The most important of the results of the RN process of elements and production in general is an increase in their ecological efficiency.

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УДК 621.362.192

МОДЕЛЬ ВЗАЄМОЗВ'ЯЗКУ ГЕОМЕТРІЇ ГІЛОК ТЕРМОЕЛЕМЕНТІВ І ПОКАЗНИКІВ НАДІЙНОСТІ ПРИ ПРОЕКТУВАННІ ДВОКАСКАДНИХ ОХОЛОДЖУВАЧІВ В РЕЖИМІ МІНІМУМУ ІНТЕНСИВНОСТІ ВІДМОВ

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Анотація. Розглянуто конструктивний метод підвищення показників надійності (інтенсивності відмов і ймовірності безвідмовної роботи) двокаскадних термоелектричних охолоджуючих пристроїв в режимі мінімуму інтенсивності відмов. У двокаскадних охолоджуючих пристроях є істотними взаємний вплив каскадів, підвищення перепаду температур, що вимагає аналізу зв'язку показників надійності з енергетичними показниками і конструктивними параметрами охолоджувача. Метою досліджень було підвищення показників надійності двокаскадного термоелектричного охолоджувального пристрою за рахунок варіації геометрії термоелементів і їх розподілів в каскадах в робочому діапазоні перепадів температур функціонування охолоджувача в режимі мінімуму