

The formation of the efficient system of ecological enterprise

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Abstract:

The necessity of using ecologically oriented approach in the process of production by developing and introducing the system of ecological management was investigated in the article. The general principles of its formation with the directions of actions and results were determined. 14 principles of efficient management of V.Ye. Deming for raising the efficiency of ecological management system were adapted with the aim of its constant improving, ensuring long-term developing of enterprise, and raising its competitiveness. The conducting of SWOT-analysis in the system of ecological management was suggested for determining the strategies of enterprise activities, further improving and raising the efficiency of this system. The model of forming the efficient system of enterprise ecological management was suggested. The improvement and efficiency of this system presupposes using general principles and those of efficiency, external environmental information, and SWOT-analysis. The international experience of inefficient ecological management, proving the expediency of using the system of enterprise ecological management, was shown.

Keywords: the system of ecological management, efficient management, eco-balance, production, environmental protection, PDCA cycle, SWOT-analysis, strategy, competitiveness, development.

JEL Classification: Q01, Q56, Q57.

Introduction

At present introducing the system of ecological management is a vital necessity for production enterprises and organizations of all the forms of property and directions of activities. It is connected with the topicality of managerial mutual relations on economic objects, providing their stable development, environmental protection, rational using of natural resources, their ecological safety, and also the safety of human vital activities. It is

directed at achieving ecological targets and programs of influence on the natural environment, provides the formation of the knowledge of the ecological strategy of the society development, the management of nature using and nature protection activities, which are determined by biological and social-economic peculiarities of economic object, strategic targets of the society. Hence, the efficiency of economic objects' activities is ensured provided their strategic directions of development are achieved.

Being a part of the general management system, the system of ecological management on the basis of the systemic-ecological approach ensures eco-balance of all management functions following the concept of sustainable development and principles of ecological justice. Thus, the developing and implementing measures in the system of ecological management in practice requires specialists, who possess not only traditional and modern principles and methods of management, the knowledge of economics, nature using, and management of nature protection activities, but also regulation-legal aspects at the national and international levels concerning environmental protection.

1. Research Background

The necessity of managing the impact of production on the environment is the object of investigations of many scholars and researchers. Such Ukrainian scientists, as T.O. Chayka (Chayka, 2018), I.I. Dudnikova (Dudnikova, 2014), T.O. Kirsanova (Kirsanova, 4), G.I. Kupalova, D.K. Ulianova (Kupalova, Ulianova, 2011), T.P. Halushkina, L.M. Hranovska, R.A. Kyseliova (Halushkina, Hranovska, Kyseliova, 2013), V.F. Semenova, O.L. Mykhailiuk Semenova, O.L. Mykhailiuk, 2006), and others devoted their papers to the problems of ecological management. Among foreign scientists and researchers, it is expedient to note the papers by S.Yu. Daiman (Daiman, 2004), P.V. Pakhomova, A.Enders, K. Richter (Pakhomova, Enders, 2003), V.V. Sedov (Sedov, 2012), S.V. Makarov, T.V. Guseva (Makarov, Guseva, 2011), B. Garrod, P. Chadwick (Garrod, Chadwick, 2016), D. Sitarz (Sitarz, 2007), and others. Nevertheless, we consider that the questions of raising the efficiency of enterprise ecological management are not investigated sufficiently.

Investigating the formation of the efficient system of enterprise ecological management under modern economic conditions was chosen as the subject of the article. To achieve the aim of the research, such scientific tasks were set:

- 1) to conduct the research of the principles of forming the system of enterprise ecological management provided the process approach (Deming cycle) is used;
- 2) to determine the peculiarities of forming the system of ecological management, taking into account: general principles, directions of activity, obtained results, and necessary information;
- 3) to disclose the mechanism of forming and implementing the efficient system of ecological management using the 14 Deming's principles of effective management;
- 4) to suggest conducting SWOT-analysis for improving the system of ecological management with determined parameters of estimation;
- 5) to substantiate the directions of SWOT-matrix of enterprise's strategy in the system of ecological management;
- 6) to determine the model of forming the efficient system of enterprise ecological management.

2. Methodology

The following methods were used in the process of writing the article: abstract-logical (to adapt the PDCA cycle, the 14 principles of efficient management, the matrix of SWOT-analysis, and SWOT matrix); systemic analysis (to determine general principles of forming the system of ecological management and efficiency, making the SWOT-analysis and SWOT-matrix); monographic (to find typical evaluation parameters for the SWOT-analysis); normative (to determine enterprise strategy in the system of ecological management); grouping (to define the characteristics of general principles and those of efficiency of ecological management system); modeling (the formation of the efficient system of enterprise ecological management).

3. Results and Discussion

The modern world society requires ecological orientation of countries' economics by improving natural environment, quality and safety of production and products, increasing life longevity, health and well-being of the population. A separate enterprise may not receive the result from capital investments in environmental protection immediately, but on the national scale such advantages are evident, even if they cannot always be estimated. For

example, introducing the rates of sewage purification can raise the expenditures of separate enterprises, but at the same time, will positively affect on the country's scale owing to decreasing diseases of the population as a result of using polluted water. In several cases ecologically oriented production can raise the competitiveness of branches and separate enterprises (Semenov, Mykhailiuk, 2006).

The modern system of ecological management at enterprise, basing on its interests, must have both current and planned measures in the protection of nature and ecological-economic safety, following ecological requirements as to manufacturing products and providing services. At the same time it enables the enterprise to receive indirect incomes owing to improving the quality of manufacturing products and providing services, strengthen its competitive opportunities and investment attractiveness, which create its image and ensure long-term development.

In our opinion, at present, to create the efficient system of ecological management, it is necessary to use the process approach, the so called Deming cycle (known as Deming's circle or PDCA cycle). The PDCA cycle is the algorithm as to the continuous improvement of enterprise's activities, which consist of the following stages:

PLAN (planning) is the planning of actions for achieving the set goal (the development strategy), which includes determining goals and processes, planning the corresponding work, planning and allocating the necessary resources.

DO (performing) – realization of the planned actions.

CHECK (checking) – the analysis of implementing the planned actions on the basis of the key indices of efficiency, revealing and analyzing deviations and their reasons.

ACT (management, correction) – the correction of the detected deviations according to the results of check up, making the corrections and continuing the process of implementing the planned actions owing to constant control.

As it is known from practice, using the PDCA cycle enables to raise the quality of management processes and service, providing the achievement of stable results in the activities of any enterprise, which correspond to the fixed rates and requirements at rational using of resources (PDCA, 2016).

The idea of the PDCA cycle is put in the basis of forming the system of ecological management through the mechanism of its constant improvement as an integral part, ensuring constant raising the efficiency of enterprise ecological activities.

The principles of forming the system of ecological management are given in the State Standards of Ukraine ISO 14004 (Standards, 1997), and they are:

- obligations and policy;
- planning;
- introducing;
- measuring and evaluating;
- analyzing and improving.

In our opinion, only following these general principles and using the corresponding information, the effective formation of ecological management system at enterprise is possible (Table 1).

Table 1. The peculiarities of forming the system of ecological management

| General principles | Directions of activities | Result | Necessary information |
|---------------------------|---|--|---|
| 1. Obligations and policy | Making tactical decisions by the managerial staff and their support by personnel | The formation of ecological policy with its periodic renovation and taking into account the determined goals of enterprise | 1. National and international regulation-legal legislation concerning environmental protection. 2. Manufacturing of modern ecologically oriented machinery. 3. Developing resource saving and ecologically safe |
| | Conducting primary ecological analysis as to the influence on the natural environment together with determining the problems and opportunities of their solving | | |
| 2. Planning | Defining ecological aspects | Developing the ecological program of the enterprise through | |
| | Estimating the impact on the environment | | |

| | | | |
|-----------------------------|---|---|---|
| | The formation of targets and tasks of enterprise's activities aimed at decreasing the negative impact | the detected reason-consequence connection (the reasons are ecological aspects, the consequence – the impact) together with determining the priorities | technologies. 4. Producing ecologically safe consumer goods. 5. Using recycling, secondary resources, and alternative sources of energy. 6. The availability and using local recreational resources. 7. The market of ecological services: eco-monitoring, ecological insurance, ecological upbringing, education, and certification. |
| 3. Implementation | Measures for ensuring the opportunities to achieve goals: - estimating the availability of resources (human, material, financial, intellectual); - raising ecological awareness and personnel's qualification; - integrating the elements of ecological management system with the present management system | | |
| | Measures for ensuring the functioning: - exchange of information, reporting about activities; - making documents of work processes and procedures; - effective management of work; - readiness to deviations and failures. | | |
| 4. Measuring and evaluating | Measuring and monitoring of real ecological characteristics with the aim of determining the efficiency of the conducted measures. Determining the correction and preventive actions in order to improve the system of ecological management | Conducting internal ecological audit with the aim of determining the compliance of the system of ecological management with the declared ecological targets | |
| 5. Analysis and improvement | The analysis of functioning and efficiency of ecological management system Introducing changes and supplements in the system of ecological management, necessary for its constant improvement | | |

The source: made by the author

To make the system of ecological management more effective, we suggest to use 14 principles of efficient management (Systems, 2015), which were suggested by William Edwards D eming, the author of the PDCA cycle.

Table 2. The principles of the effective system of ecological management

| Principles of efficiency | Directions of implementation | Advantages |
|--|--|---|
| 1. The permanency of target | 1. To determine the aim as to the eco-balance of production process and constantly conduct the measures for its achieving. 2. To distribute resources for achieving long-term targets and needs, ensuring their rational using. | 1. Constant improvement of the quality and safety of products. 2. The sufficiency of resources for long-term aims and needs. 3. Raising the profitability and competitiveness of enterprise and its development. 4. The availability of working places |
| 2. New philosophy of conducting business | The production process is oriented not only at profitability, but also rational using and preserving natural resources, following ecological safety | 1. The production of safe products. 2. The development of the national economy together with decreasing the negative impact on the natural environment. |

| | | |
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| 3. Conducting internal control over production and purchases | 1. To liquidate the need in mass checks up and inspections, as the means of achieving the quality and safety of production. 2. Introducing the internal system of checking up the quality and safety of production, purchases. | 1. Raising the quality and safety of production without external checks up and inspections. 2. Forming the responsible attitude to work of enterprise's employees. 3. Minimizing the expenditures on fines and sanctions for violating ecological legislation. |
| 4. Conducting the purchases of high quality and safe components of production, technologies, machinery, etc. | 1. To check the quality and safety of purchased components. 2. Decreasing the number of suppliers of one and the same component by refusing from the services of those suppliers who could not confirm by documents the quality and safety, and also compliance with the declared characteristics. 3. To strive for cooperation in supplying of each component only by one producer. | 1. Raising the quality and safety of products. 2. Forming the base of the suppliers of high quality and safe components by establishing long-term relations based on mutual loyalty and trust. 3. Minimizing general expenditures, but not only initial ones. |
| 5. Improving all the processes together with following the requirements of ecological management system | 1. Constant improving all the processes of planning, designing, manufacturing, etc. corresponding to the requirements of ecological management system. 2. Making the executives responsible for these duties. | 1. Raising the quality and safety of products, productivity of using resources. 2. Constant decreasing the expenditures. 3. The experience of the managerial staff in constant improving the system of ecological management, including: the developing and designing, supplying components and materials, maintenance and improving the equipment operating, training and retraining of the personnel. |
| 6. The current practice of training and retraining of all workers | Providing the raising of ecological awareness, obtaining knowledge, skills, and personnel training, necessary for the effective and competent carrying out their duties | 1. Raising ecological awareness and qualification of the personnel. 2. Using the opportunities of each employee. 3. The obtained skills and abilities enable to follow the changes in materials, methods, design of products, equipment, technologies. 4. Accepting and supporting of changes by the personnel. |
| 7. Using leadership as a method of work concerning ensuring the quality and safety of production | Introducing the responsibility of managerial staff for the products' quality and safety, timely revealing and liquidating deviations and failures in production. | 1. Assisting employees in their better work. 2. Minimizing the defects, faulty or damaged equipment, instruments, and other factors, which are harmful for the quality and safety of products. 3. Introducing modern eco-oriented technologies and technical means in production. |
| 8. Cooperation of managerial staff with employees. | 1. Motivating effective bilateral relations and using other means for getting rid of fears concerning the elements of ecological management system among employees. 2. Establishing cooperation between executives and subordinates. | 1. Raising the interaction between executives and subordinates. 2. Increasing the employees' efficiency of work. 3. Increasing the production opportunities according to the requirements of ecological |

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|---|---|---|
| | | management. |
| 9. The absence of barriers among subdivisions, services, and departments. | 1. Ensuring functional interaction between the employees of different functional subdivisions; researchers, designers, producers, the representatives of commercial and administrative services. 2. Their team work. | 1. Timely elimination of production problems. 2. Raising the efficiency of ecological management. |
| 10. The absence of vain appeals to employees. | 1. Refusal from using posters, appeals, and calls to employees, which call for faultless work, higher level of productivity, etc., but do not contain the information about the methods of achieving these goals. 2. Searching problems in the system of production or ecological management system. | 1. Cooperation of employees with executives as to the requirements of ecological management system. |
| 11. Eliminating arbitrary numeric rates and tasks | 1. Eliminating work instructions and standards, which establish arbitrary rates and quotas for employees and quantitative tasks for executives. 2. Supporting and assisting higher executives for following the requirements of ecological management system. | 1. Ensuring constant improvements of product quality and safety. |
| 12. Being satisfied with labor results of enterprise employees. | 1. Refusing annual attestations (evaluation of employees' activity) and methods of control over targets. 2. Transferring the duties of managers, controllers, and masters from achieving only quantitative indices to the quality and safety of production. | 1. Stimulating the employees to improving the quality and safety of production. 2. Raising the efficiency of ecological management system. |
| 13. Motivating to self-improvement and raising the employees' qualification. | Developing and introducing educational program and support of self-improvement for all employees. The enterprise needs not people, but employees, who improve as a result of studying and self-educating. | Constant renovating and raising the efficiency of ecological management system. |
| 14. The support of ecological management system by chief executive officers (CEOs). | 1. Clear determining the position of CEOs as to constant improving of ecological management system. 2. Creating the structure among CEOs, that will daily stimulate the introduction into action of the above considered principles. | 1. Favoring of ecological management system by each employee. 2. Introduction into action of the above considered principles. |

The source: composed by the author

In our opinion, to raise the efficiency of ecological management system, it is expedient to use the matrix of SWOT-analysis, which contains its weak and strong sides at the enterprise. The studying of Ukrainian and foreign scientific papers (Vasylenko, Tkachenko, 2004) showed, that considerable attention is paid to the importance and peculiarities of conducting SWOT-analysis in the process of determining the level of competitiveness of the branch and enterprise, planning and forming the strategy. SWOT-analysis is a generalized basis for understanding and managing the external environment, which was composed around the corresponding branch or in which the organization functions. This model helps to determine the main problems that are necessary to solve in the process of detailed analyzing the four separate elements of SWOT (Fliasher, Bensussan, 2005). It is a relatively easy instrument for evaluating the strategic position of the branch and enterprise. The SWOT method enables to establish connective lines between external opportunities and threats and strong and weak sides of the enterprise (Mishchenko, 2004). SWOT-analysis is tested in practice instrument for obtaining the survey of the

branch and enterprise strategic situation, and this analysis follows the main principle – strategy must always ensure the conformity of internal opportunities (strong and weak sides) with the external situation (partially reflected in opportunities and dangers) (Aranchiy, 2017).

Let us consider the parameters of evaluating a production enterprise for constructing the matrix of SWOT-analysis in the system of ecological management:

1.Strong (“internal” factors of production, which can be used as a basis for supporting ecological management system) and weak sides (“internal” factors of production, which have to be turned into strong sides, necessary for the support of its development):

- organization: the level of qualification of all employees; their interest in developing the production and introducing ecological management system; the interaction between all the sections;

- production: the available production facilities; the conformity of equipment and technologies with ecological management system; quality and safety of manufactured products; the availability of patents and licences; the cost of products; the reliability of the channels supplying raw products, materials, etc.;

- finance: production expenses, the accessibility of capital, the rates of capital turnover, profitability of business, etc.;

- innovations: the frequency of introducing new equipment and technologies corresponding to the requirements of ecological management; the level of their novelty and efficiency as to the key indices; the terms of covering the expenditures, invested in innovations, etc.;

- marketing: quality and safety of products from the viewpoint of consumers, the popularity of trademark, the assortment completeness, the price level, advertisement efficiency, the reputation of enterprise, the effectiveness of sales system, the qualification of the personnel.

2.Opportunities (“external” factors of production, which are necessary to use for supporting its development) and treats (“internal” factors of risk, which can be avoided):

- factors of demand: market capacity, rates of its growing or falling, structure of demand on products;

- factors of competition: the number of the main competitors, the availability of goods-substitutes on the market, the height of barriers of entering and leaving the market, the distribution of market shares among the main market participants;

- factors of sales: the number of intermediaries, the availability of distribution networks, the terms of supply;

- economic factors: currency exchange rate, the level of inflation, the change of the population income level, the Government tax policy, etc.;

- political and legal factors: the level of political stability in the country, national and international legislation currently in force concerning nature protective activities, the level of the population legal literacy, the level of the corruption of power;

- scientific-technical factors: the level of science development as to rational using resources and preserving natural environment; the experience of introducing corresponding innovations; Government support of introducing ecologically safe machinery and technologies;

- social-demographic factors: the number and sex-age structure of the population, the birth and death rates, the level of the population employment, etc.;

- social-cultural factors: the traditions and system of society values, the existing culture of consuming goods and services, the existing stereotypes of people behavior;

- natural and ecological factors: the climatic zone, the environmental state, the attitude of the public to environmental protection.

The obtained results of the analysis enable to determine the enterprise strategy of activities taking into account ecological management system and the directions of its improvement that is to construct SWOT-matrix of strategies (Table 3), in which owing to the opportunities it is possible to make better the strong sides of enterprise activities and improve the weak sides by implementing certain measures (SO-strategy and WO-strategy).

Table 3. The scheme of SWOT-matrix of enterprise strategy in the system of ecological management

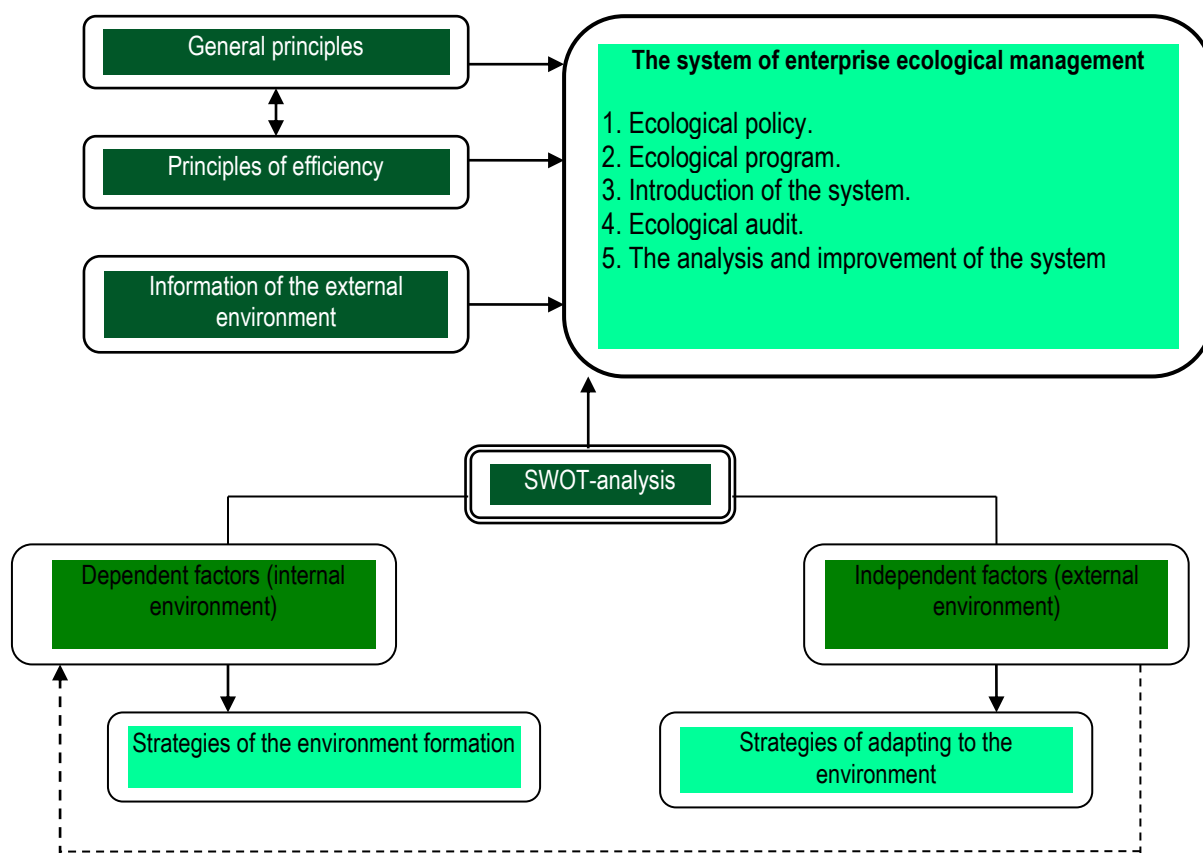
| | | |
|---|--|--|
| <p style="text-align: center;">Factors of internal environment</p> <p style="text-align: center;">Factors of external environment</p> | <p>Strong sides (S):</p> <ol style="list-style-type: none"> 1. High qualification and training of the personnel. 2. Constant improvement of production technological processes and equipment taking into account the requirements of eco-balance 3. Favorable geographical position. 4. Wide assortment of finished products. 5. Utilization of hard wastes. 6. Following the requirements of sanitary-protective zone. 7. Monitoring of the environment. | <p>Weak sides (W):</p> <ol style="list-style-type: none"> 1. Discharges of harmful substances in the atmosphere. 2. Noise pollution. 3. Damaging of roads. 4. The problem of raw material base. 5. The absence of finished products' export. 6. Inaccurate selection of plants in sanitary-protective zone and the problem of their age. 7. The emergence of accident situations. |
| | <p>Opportunities (O):</p> <ol style="list-style-type: none"> 1. Raising the level of employees' qualification. 2. Decreasing the expenses on the supply of raw materials. 3. Cooperation with local suppliers. 4. Using alternative sources of energy. 5. Capital investments in repair and renovating work. 6. Attracting investments. | <p>SO-strategy:</p> <ol style="list-style-type: none"> 1. Additional training of personnel. 2. Regulating the system of supplying additional products. |
| <p>Threats (T):</p> <ol style="list-style-type: none"> 1. Decreasing the amount of traditional raw materials. 2. Raising the level of soil degradation and environmental pollution. 3. Decreasing purchasing prices on manufactured products. 4. Problems in the branch. 5. The absence of the unified governmental policy as to the branch development. | <p>ST-strategy:</p> <ol style="list-style-type: none"> 1. Decreasing the level of degradation processes. 2. The stability of prices on secondary products. | <p>WT-strategy:</p> <ol style="list-style-type: none"> 1. The cooperation with experimental stations and research establishments concerning the process of production eco-balance. |

The source: composed by the author

Corresponding to the SWOT-matrix of enterprise strategy in the system of ecological management, it is necessary to determine the main strategies as to its improvement taking into account ecological, economic, and social impacts.

Thus, we propose to use (Figure 1): general principles and those of efficiency, the external environment information, and also the results of SWOT-analysis with the aim of forming the effective system of ecological management.

Figure 1. The model of forming the efficient system of enterprise ecological management



The source: developed by the author

It is expedient to add, that in the Western European countries the economic losses from inefficient ecological management, according to different estimations, reach 3-5% of GDP; in the Russian Federation they are 10-15 %; there are no corresponding data about Ukraine. That is why ecological management should be considered the most promising way of solving ecological problems of industrial production that is the internally motivated initiative activity of economic subjects, aimed at achieving their ecological aims and tasks. During the recent 10-15 years there is growing awareness among companies in the whole world, that ecological management is an important factor of ensuring the main direction of companies' activities (Yasnolob, 2017)/

Conclusion

The system of ecological management is a necessary element of enterprise's development, which ensures the raising of its competitiveness owing to: the support in the formation of new values in the society, aimed at careful attitude to the nature, which is manifested in growing consumers' demand on ecologically safe products; using resource saving technologies and machinery; following national and international ecological standards.

Using the system of ecological management at enterprise opens new opportunities to it. The eco-balance of production already does not become an obstacle of its development and corresponding extra spending, but it creates additional opportunities for production, entering international markets of sales, raises the competitiveness of products and the enterprise. The conducted measures aimed at rational using of resources and external environment protection owing to decreasing of production expenses, minimizing losses and processing of wastes often leads to the direct lowering of production expenditures.

Very often ecological problems open additional opportunities for the development of enterprises' business activeness, the main reason of which is emerging and constant improving of new resource saving technologies that guarantee the realization of the strategy of long-term enterprise development.

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