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## MANAGEMENT OF ECOLOGICAL INNOVATION

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### *Abstract*

In the paper, the following types of innovations are considered: technological, marketing, organizational, environmental, strategic, managerial, and aesthetic ones.

Also, the work considers one of the classifications of environmental innovation projects (depending on the goals achieved): single-purpose and multi-purpose.

In the work, the special feature of technological structure of oil refining, petrochemical and chemical enterprises is highlighted which consists in the interconnection of production stages, the technological interconnection of by-products produced and production wastes formed.

It is mentioned that in more detail the assessment of the economic efficiency of environmental projects, in work (Burenina, Kotov & Byl, 2017) is considered. It is noted that sometimes environmental investment projects can be attributed not to single-purpose (ecological) measures but to multi-purpose (technological) ones acc. to the way of their economic evaluation. An example of such a project developed by the scientific and technical staff of branch of FGBOU VPO Ufa State Petroleum Technical University in Sterlitamak (utilization of waste products of soda production) is considered and the results of the economic efficiency evaluation of this project are presented.

The paper suggests a wider use of such measures of indirect action as product taxes (payments), a system of returnable deposits, trade in the rights (permissions) to emission, security deposit, and civil responsibility in order to increase the economic interest of enterprises in the implementation of environmental innovations.



**Keywords:** Innovation, economic efficiency, environmental activities.

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## 1. Introduction

It is known that the main types of innovation [FPSSR] are technological (process, product), marketing, organizational, environmental, strategic, managerial and aesthetic ones.

Environmental innovation represents new and considerably advanced goods, works, services and production processes, organizational or marketing methods promoting an increase in environmental safety, improvement or prevention of negative impact on the environment. The dynamics (trend data) of the main indicators of innovative activity during the period from 2010 to 2014 is given in Table 1 according to [FPSSR]. As follows from the data of Table 1, the innovation activity of organizations in the reporting period (approximately 10%) was supported mainly by companies introducing technological innovation. The specific weight of such organizations was growing slightly from 8 to 9%. For other types of innovation including environmental ones, the decrease in innovative activity is observed. This dynamics is confirmed also by change of the costs allocated to technological and environmental innovation. So, if the costs for technological innovation in the reporting period grew 2.2 times, the costs for environmental innovation were cut 1.8 times.

**Table 01.** Key figures of innovative activity of enterprises

| **Keyfigures** | **Years** | | | | |
|---|---|---|---|---|---|
| | **2010** | **2011** | **2012** | **2013** | **2014** |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Innovative activity of organizations (specific weight of organizations performing technological, organizational and marketing innovation in reporting year), % | 9.5 | 10.4 | 10.3 | 10.1 | 9.9 |
| 2. Specific weight of organizations performing technological innovation in reporting year, % | 7.9 | 8.9 | 9.1 | 8.9 | 8.8 |
| 3. Specific weight of organizations performing organizational innovation in reporting year, % | 3.2 | 3.3 | 3.0 | 2.9 | 2.8 |
| 4. Specific weight of organizations performing marketing innovation in reporting year, % | 2.2 | 2.3 | 1.9 | 1.9 | 1.7 |
| 5. Specific weight of organizations performing ecological innovation in reporting year, % | 4.7 | 5.7 | 2.7 | 1.5 | 1.6 |
| 6. Costs for technological innovation (million rubles): | | | | | |
| - in current prices | 400 803.8 | 733 815.9 | 904 560.8 | 1 112 429.2 | 1 211 897.1 |
| - in fixed prices of 2000 | 101 124.6 | 159 745.5 | 183 347.5 | 214 641.4 | 218 128.3 |
| 7. Special costs connected with environmental innovation (in million rubles): | | | | | |
| - in current prices | 26 616.4 | 24 131.4 | 27 768.7 | 15 098.2 | 20 914.0 |
| - in fixed prices of 2000. | 6715.4 | 5253.2 | 5628.5 | 2913.2 | 3764.3 |

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## 2. Problem Statement

Since the achievement of the primary environmental effect does not require special environmental costs during the implementation of technological measures, it is difficult to divide the total amount of investments allocated for the implementation of technological measures between the solution of environmental problems and industrial-economic problems without the use of conditional distribution mechanism. The negative trend in innovation activity of enterprises in the implementation of environmental protection measures can be attributed to the above said facts, as well as to the lack of economic interest of economic entities in the implementation of environmental innovation.

When assessing the economic efficiency of environmental projects it is necessary to take into account the specifics of organization of technological processes of oil refining and petrochemical enterprises (Nasyrov & Daminev, 2015; Leybert, Vanchukhina, & Khalikova, 2016).

## 3. Research Questions

Let us highlight the following research items:

- Consideration of the classification of innovations and environmental measures
- Studying the dynamics of innovative activity of entities
- Identifying the specific features of organization of production processes of oil refining and petrochemical enterprises
- Consideration of measures of state support in the sphere of environmental regulation

## 4. Purpose of the Study

The purpose of the study is consideration of methodological recommendations on the economic evaluation of environmental investments as well as measures of state regulation of environmental protection activities.

## 5. Research Methods

The technological structure of enterprises of chemical industry is interconnected: the products of some production sites, process plants and workshops can be used as raw materials' components, semi-finished products, auxiliary materials, energy sources or fuel for other production stages. The situation with by-products and production wastes is similar, but in a broader spatial scale. The byproducts or production wastes of some enterprises can be used as components of material resources for other businesses. (Burenina, Zakharova, & Nigmatullina, 2017). This circumstance needs to be considered in case of development, in particular, of nature protection projects, one of the directions of which is development of the engineering procedures allowing utilizing production wastes either to obtain elementary substances or to form specific types of products. The last ones can find their practical application at the plant to be analyzed or at the enterprises of other industries.

The methodical bases of cost efficiency assessment of nature protection projects developed by us are described in detail in this work (Damineva & Evtushenko, 2016a).

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It should be noted that according to the method of their economic evaluation, some investment projects aimed at preventing environmental consequences of pollution of the surrounding environment can be attributed to multi-purpose (technological) actions earlier than to single purpose (ecological) ones.

The research performed in Sterlitamak branch of FGBOU VO UGNTU directed to utilization of liquid waste of soda production to give calcium peroxide (Nasyrov & Daminev, 2015) can be attributed to a multi-purpose project. Distinctive features of calcium peroxide obtained using the technology considered are: use of main waste of soda ash production (still waste liquid); low consumption of main reagents; high quality of the product (the content of main substance 75-92% of mass). It is necessary to consider also the cost advantage - the price of production is twice lower than that of competitors.

Positive net present value and short payback period of investments (less than a year) prove the economic feasibility of the project.

These positive results of the environmental innovations can be observed if they are aimed at obtaining the final product of recyclable waste.

If ecological actions are directed only to a decrease in emission/dumping of hazardous substances, then the received savings in payment from reduction of amount of emitted/discharged pollutants will not cover the increase in cost value of purification of discharged or generated wastewater.

Decision on implementation of such actions should be made not only by taking into account their economic benefit but also on the basis of their state or regional social-and-ecological significance. In these situations, the measures taken are to be connected with the increase in the state support of nature protection activities, in particular, with the strengthening of indirect corrective actions on natural resource users. The following measures of indirect corrective actions are known: payment for emissions (charges, taxes); payment for use of resources; product taxes (payments); payment for ecological violations; a system of returnable deposits; trade in the rights (permissions) to emission; mortgage deposit; civil responsibility; the subsidies including grants, tax benefits, floating loans; stimulating taxes and payments for covering expenses (Damineva & Evtushenko, 2016a).

## 6. Findings

In this paper, the following conclusions are drawn:

- It is considered one of the classifications of innovations used in the Russian statistical reporting, namely, technological (process, product), marketing, organizational, environmental, strategic, managerial, aesthetic innovations are distinguished (Federal Public Statistics Service of Russia). At the same time, depending on the goals to be achieved it is proposed to emphasize single-purpose and multi-purpose activities in the group of environmental innovations (Damineva & Evtushenko, 2016b).
- On the basis of the dynamics of innovation activity it was revealed that in the analyzed period of time (2010-2014), the innovative activity of organizations was supported by the companies implementing technological innovations. For other types of innovations, including environmental ones, there is a decrease in innovative activity. This dynamics is confirmed by increased costs for technological innovation by 2.2 times and by reduced costs for environmental innovation by 1.8 times.

- When considering the technological organization of production processes of oil refining and petrochemical industry, the interconnection of production stages is revealed; namely, the products of certain production sites, process units and workshops serve as components of raw materials, semi-finished products, auxiliary materials, fuel and energy resources for other production stages. When developing the enterprise's environmental strategy, it is necessary to take into account that the waste products can be used as components of material and energy resources for other enterprises.
- The authors suggest using such indirect measures as food taxes, a system of returnable deposits, trading in emission rights, security deposit, and civil responsibility in the Russian practice of management more widely.

## 7. Conclusion

When developing a plan for environmental protection work, it may be advisable to select no single effective environmental projects, but to form a set of environmental measures (environmental portfolio) that will reduce the negative environmental result from the production and economic activity of enterprises, but not worsen its financial results (Damineva & Evtushenko, 2016a; Vanchukhina, Leybert, & Khalikova, 2016).

Implementation of environmental innovations in domestic practice requires a long time period associated with the development and approval of appropriate legal framework for effective use of economic instruments in environmental activity (Damineva & Evtushenko, 2016b).

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