

- development of eject drilling mathematical model allowing to calculate mechanical speed under various geological conditions;
- development of runout decrease methods;
- testing of drilling control methods;
- design of catching-charging device which can replace worn out pellets, run in and pull out pellets to reduce round-trip time;
- research to solve directional drilling problem using the ejector tool string [2].

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**GEOECOLOGICAL PROBLEMS OF COAL INDUSTRY  
(ON THE EXAMPLE OF KEMEROVO REGION)**

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The work presents the main data of coal production and indexes of Kemerovo region air pollution level due to the coal industry. The materials of the study were reports of the department of natural recourses and ecology of Kemerovo region and Russian scientists' investigations devoted to the problem of geoecology of the coal industry.

The goal of coal mining is to economically remove coal from the ground. Coal is valued for its energy content, and since the 1880s is widely used to generate electricity. Steel and cement industries use coal as a fuel for extraction of iron from iron ore and for cement production [3]. The environmental impact of mining includes erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater, surface water by chemicals from mining processes [4]. In urbanized environments mining may produce noise pollution, dust pollution and visual pollution.

The aim of the research is to review the impact of the Kemerovo region coal industry on the general state of air pollution.

The materials of the present study were:

a) reports of the department of natural recourses and ecology of Kemerovo region from 2005 to 2013 years;

b) Russian scientists' investigations devoted to the problem of geocology of the coal industry

The method of research was the analysis of scientific publications on the topic and the data of coal production and the air pollution level of Kuzbass.

Kemerovo region takes a leading position in coal mining in Russia due to the great number of coalfields. Coal enterprises are scattered all over the area. The scale below shows the growing tendency of coal output in Kuzbass during 2005-2013 [5].

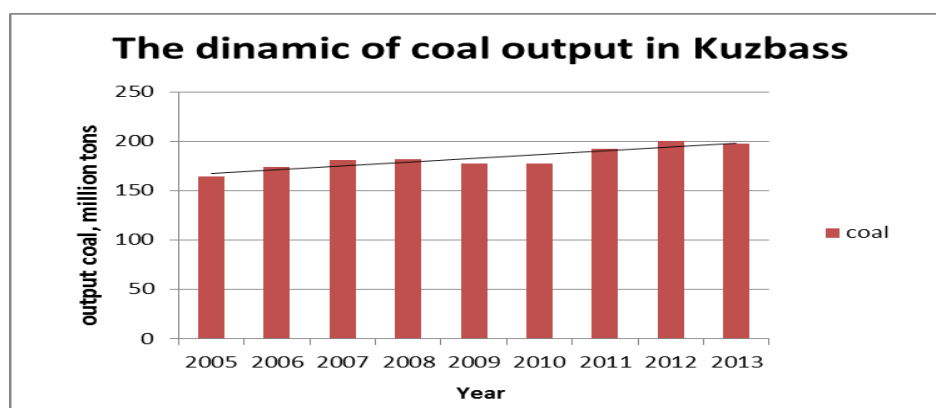


Figure 1 – The dynamic of coal output in Kuzbass, 2005-2013

On one hand, this tendency is good because it brings jobs and wealth to the region. But on the other hand it has a great environmental impact: destruction and degradation of the soil under the heaps, pollution of groundwater and surface water, pollution of air by industrial emissions, the disappearance of the natural flora and fauna etc. Because of the specific topography and the certain climatic conditions, the majorities of discharged industrial enterprises pollutants are not dispersed in the air but accumulates in the Kuznetsk trough, which is close to the major cities of the region, such as Belovo, Kiselevsk, Leninsk-Kuznetsky, Novokuznetsk, and Prokopyevsk. It is worth noting that Kemerovo and Novokuznetsk are in the list of the most polluted cities of Russian Federation because of the poor air state. API of Novokuznetsk is 22, while API of Irkutsk is 18, API of Kemerovo is 13, API of Novosibirsk and Tomsk is 10 and API of a billionaire city Saint-Petersburg is 7[6]. These data show the horrible state of the air in Kemerovo region. Just 30% of Kemerovo region territory meets a satisfactory environmental conditions but only 5-10% of residents live there [1].

Coal industry of Kuzbass has a great influence on the overall state of the air in the region. Overall contribute in air pollution from coal industry enterprises of Kemerovo region is represented in the chart below [5]. The main pollutants are the following: solids,  $SO_2$ ,  $NO_x$ ,  $CO$ ,  $CH_4$  and others. There are also some specific pollutants, such as methan, inorganic dust with 70-20% of  $SiO_2$  and soot. As we can see there is a connection between the quantity of output coal and the pollutants. It is also clear that coal enterprises are the main reason of air pollution in the region because their impact in overall pollution is more than 50%.

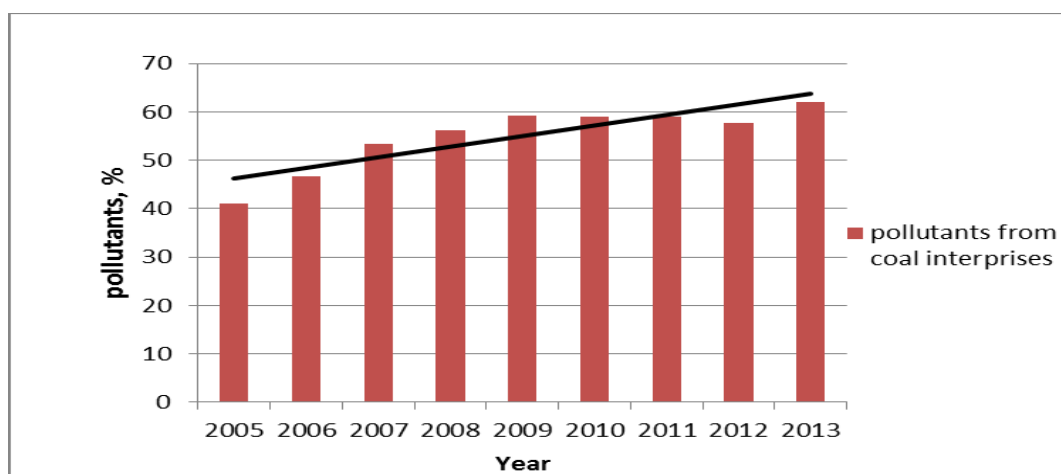


Figure 2 – The dynamic of pollutants produced by coal enterprises, 2005-2013

With the development of the coal industry and the increase of coal production there is a question of ecological safety of the coal industry.

According to Nikolay F. Reimens the basis of ecological security includes the realization that natural-resource potential of the earth is limited, that is why it is necessary to determine the maximum of natural resources extraction and what changes in the nature the humanity is allowed to do. [2].

The state of the environment continues to deteriorate. Thus it is necessary not to eliminate the consequences of pollution impact on the environment but prevent it. Until this is done talking about the high geoeological safety of the coal industry is meaningless.

The analysis of statistical data showed that the situation in the Kemerovo region is critical. It is necessary to take measures to control and reduce the negative impact of the coal industry on the Kuzbass environment.

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