

## ASH AND SLAG HANDLING

## 3.7. Analytics

## 3.7.30. Creating the industry of processing and use of coal combustion by-products

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## ABSTRACT

Creating the industry of processing and use of coal combustion by-products from the position of law is based on the legislation of the Russian Federation (№ 7-FZ; № 184-FZ; №89- FZ; GOST R 1.4-2004, GOST 30772-2001), as well as on the principles of public and private partnership.

A purpose of forming the industry is prevention of the planned negative impact on the environment and elimination of accumulated environmental damage by processing and beneficial use of coal combustion by-products unreasonably related to production and consumption wastes.

## INTRODUCTION

Systematic approach to management of coal combustion by-products (CCPs), including fly ash (dry ash), bottom ash, boiler slag as well as ash and slag mixture significantly affects the increase in workforce productivity and production efficiency.

At the same time, special aspects in regulatory laws impede development of the best practices of by-products management. They almost put CCPs use outside the law. In this connection there is a need to develop and explore such innovation techniques that allow to establish a system that ensures the rational use of the assets with adaptation of the advanced technologies of domestic and foreign models.

The current fragmented approach to solving the coal ash problem in Russia, as well as a lack of definitions and terms, defining the concept "Ashes" in the legislation, restricts CCPs use.

Under the order of the JSC "TGC-11" the Law Faculty of the Omsk State University named after F.M. Dostoevsky carried out the studies of legal acts of the Russian Federation. That was made to develop a legal reasoning to solve the problem on using coal ash in the national economy.

Analysis confirmed the need in adopting a *program-target method* as the main one, governing the relations. It is based both on the legal reasoning of coal combustion by-products processing and use, and identifies the sources of funding.

## THE PROGRAM-TARGET METHOD AS THE ONE FOR THE PROBLEM SOLUTION

Under 2<sup>nd</sup> paragraph of Minutes resulting from the working meeting of the RF representatives of the Omsk Region and management of "INTER RAO UES" and JSC "TGC-11" dated 04.09.2012, " ... on preparation of the relevant legal act ... ", Government of the Omsk Region decided to develop a long-term Program.

Design and development of the Program is multi-

functional and gives a significant contribution to the elimination of a number of problems in improving the efficiency of coal-fired power production and socio-economic development of the Omsk Region during the project period, including:

- seeking additional commodity funds;
- reduction of the deficit to a number of natural non-metallic building materials;
- reducing the negative environmental impact;
- rational use of natural resources and investments;
- development of regional industry of building materials, agricultural fertilizers, ensuring the planned growth of housing, socio-cultural and industrial construction, engineering and transport infrastructure;
- solving problems related to reduction of importing raw materials from outside the Region resulting in increase in the cost of production;
- cessation of growth and decline in storage of ash from coal-fired power plants;
- improving the quality of arable land in agriculture and increasing yields.

Currently representatives of JSC "TGC-11" and the Ministry of Natural Resources and Environment of the Government of the Omsk Region developed and submitted for approval the sub-program "Creating the industry of processing and use of coal combustion by-products in the Omsk Region" to be included in the state program of the Omsk Region as a territorial subject of the Russian Federation called "Environmental protection of the Omsk Region".

**Public and private partnership** is the core of infrastructure problems solution.

The analysis showed that a systematic approach to solving the coal ash problem in the territorial subjects of the Russian Federation is for the first time applied; previous attempts were only fragmented.

## COAL ASH IS A BY-PRODUCT

Unlike the practice realized in advanced countries worldwide, no Ministry or Department of Russia has taken responsibility for processing and use of by-products from coal-fired power industry:

- for the Ministry of Energy of the Russian Federation coal ashes (raw materials) are non-core products;
- for the Ministry of Natural Resources and Ecology of the Russian Federation coal ash is, in fact, the underutilized part of extracted natural resources, which in accordance with the Federal Law № 169 "On Production and Consumption Wastes" dated 29.12.2000, is related to production wastes.

As a result, the entire responsibility for use of the mentioned material and conservation of natural resources falls on the territorial subjects of the Russian Federation, which (except for some Regions) shift the problem to the generation companies. Generation companies, in their turn, regularly pay taxes and penalties. For example, Omsk branch of the JSC "TGC-11" annually pays about 45 million rubles for disposing the ash and they use their efforts to find the way out of this situation.

From a legal point of view according to a Federal Law № 309 "On Production and Consumption Wastes" dated 30.12.2008, chapter 1, item 4.1, ash and slag from power plants are referred to wastes of the 5th class of hazard, that means they are virtually non-hazardous. However, according to GOST 30772-2001 "Resource saving, waste management. Terms and definitions", paragraph 3.16, introduced by the Russian State Standard Resolution of 28.12.2001, art. #607, as they relate to ashes, this item is: ashes and slags are by-products of coal-fired power industry, being not the aim of its production, but they are useful as raw materials in other industries. (Note) **By-products are not production wastes.**

To construct a system for controlling by-products of the JSC "TGC-11", the systematic preparation work has been carried on for a number of years.

## EFFICIENCY OF COAL ASH USAGE

As a basis for processing and utilization of by-products in various sectors of economy three main applications have been taken:

- large-scale use of by-products instead of natural resources for the territory planning, cure of effects of subsoil use; reclamation of the worked-out pits; construction of highways; interim reclamation of solid waste disposal sites and landfills;
- processing and use of coal ash as a raw ingredient in construction materials, agricultural ameliorative and nitride fertilizers;
- replacement of raw mining products at extraction of valuable raw materials for various industries: non-ferrous metallurgy, petrochemistry, chemistry, etc.

The work was aimed at construction of the innovation system for ash processing and use, ensuring increased production output, for conservation of natural resources, increasing production efficiency of coal-fired power industry, improving environmental quality for the population within the framework of socio-economic development of the Omsk Region (Fig.).

In the Omsk Region thermal and electric energy are generated at three coal-fired CHPPs (CHPP-2, 4 and 5) being parts of the Omsk branch of JSC "TGC-11" together with one thousand two hundred sixty two city and district heating plants.

By-products are represented by dry ash collected at CHPP-4 and ash and slag mixtures, stored at three ash disposal areas of CHPP-2, 4 and 5, as well as slag including small amounts of ash, stored at the special-

ly equipped areas at urban and district heating plants.

In the Omsk Region annual ash production makes about 1.6 million tons per year (depending on the average temperature drops), including CHPPs of the Omsk branch of TGC-11 producing more than 1.5 million tons, city and district heating plants – producing about 0.06 million tons. Total amount of ash and slag mixtures accumulated on ash disposal sites of CHPPs reach 67 million tons. Government of the Omsk Region doesn't conduct any statistics relating to accumulation of ash and slag from district and municipal boilers.

On average starting from 2010 the JSC "TGC-11" used more than 50% of ash from the current total annual output, for example, in 2010 they used 824000 tons, in 2011 - 859000 tons, in 2012 - 880000 tons, in 2013 - 642000 tons.

Over the years, in order to draw ash and slag into economic circulation, "TGC- 11" has been studying and developing the markets.

To increase the use of by-products "TGC-11" is conducting considerable work to build the competitiveness of ash and slag in the following areas:

- I. Motivation of using coal ash as materials for large-scale applications instead of natural resources for the territory planning, cure of effects of subsoil use; reclamation of the worked-out pits; construction of highways; interim reclamation of solid waste disposal sites and landfills.
  - 1) JSC "TGC-11" together with the Siberian Automobile and Highway Academy (SibADI) in accordance with the Federal Law 184 dated 27.12.2002 and GOST R, developed and agreed the Standards of Organizations:
    - "Ash and slag materials from Omsk CHPPs of the JSC "TGC-11" for road construction";
    - "Ash and slag materials from CHPPs of the JSC "TGC-11" for vertical planning of the areas, backfilling, curing the effects of subsoil use; reclamation of the worked-out pits".
  - 2) According to GOST R 1.4-2004 and GOST R 1.5, ash and slag materials produced at companies of the JSC "TGC-11", starting from 04.09.2012 are listed in the products catalog of the Russian Federation, as testifies the catalog sheets attached to the Standard of Organization.
  - 3) To prepare supporting documentation and quality certificates for the shipped coal ash batch, in 2009 the Omsk branch of the JSC "TGC-11" created, equipped and accredited a specialized laboratory.
- II. Processing and use of coal ash as raw ingredients in building materials, agricultural fertilizers:
  - 1) In Omsk three factories have been built: the first - for producing porous materials, sand-lime brick factory and the cement one, consuming dry ash;
  - 2) It has been developed and tested a technology for using ash and slag mixtures from the disposal areas in agriculture for production and application of granular and ameliorating nitride fertilizers (to improve arable land and the fertility increase);

3) Preparations for production of other granular ash materials are carried on. They include expanded clay, sand ash and other materials from the dumped ash and slag mixtures.

III. Extraction of raw materials from ash replacing raw mining products used for various industries: non-ferrous metallurgy, petrochemistry, chemistry.

1) Together with scientists from the Omsk State University named after F.M. Dostoevsky the JSC "TGC- 11" developed a technology for deep-processing of ash and slag mixtures. When developing the technology, a discovery has been made (patent #2502568 "A method for the complex processing of ash from coal combustion"), which significantly reduces the cost of operation for extracting SiO<sub>2</sub> from ash;

2) Design of the enterprise producing substitutes of raw mining products for various industries is under progress.

The goals set can't be achieved without creation of favorable conditions for enterprises, specializing in the processing of by-products from coal-fired power industry of the Omsk Region. There's a need to work out the provisions to encourage businesses to increase their interest in coal ash usage.

To prevent risks from the perspective of legal jus-

tification for using coal ash produced in the Omsk Region, application of the program-target method will concentrate available state and local resources, as well as off-budget investments to address key problems in different spheres of life.

Analysis of the RF legislation, regulating circulation of the coal ash, related to industrial wastes, carries inference that in a majority of territorial subjects of the Russian Federation these questions are not interpreted. Based on that, the called sub-program "Creating the industry of processing and use of coal combustion by-products" is a pilot project on use of inorganic portion of extracted natural resources and it's relevant to many regions of the Russian Federation in achieving comprehensive ecological and economic effects.

Therefore, formation of the legal framework, justifying the use of coal ash is possible through the use of the program-target method similar to a sub-program "**Creating the industry of processing and use of coal combustion by-products**".

**S.I. Kozhemyako, V.R. Shevtsov.** Creating the industry of processing and use of coal combustion by-products // Proceedings of the V Conference "Ashes from TPPs: removal, transport, processing, landfilling", Moscow, April 24–25, 2014 — M.: MPEI Printing House, 2014. P. 137 – 142.

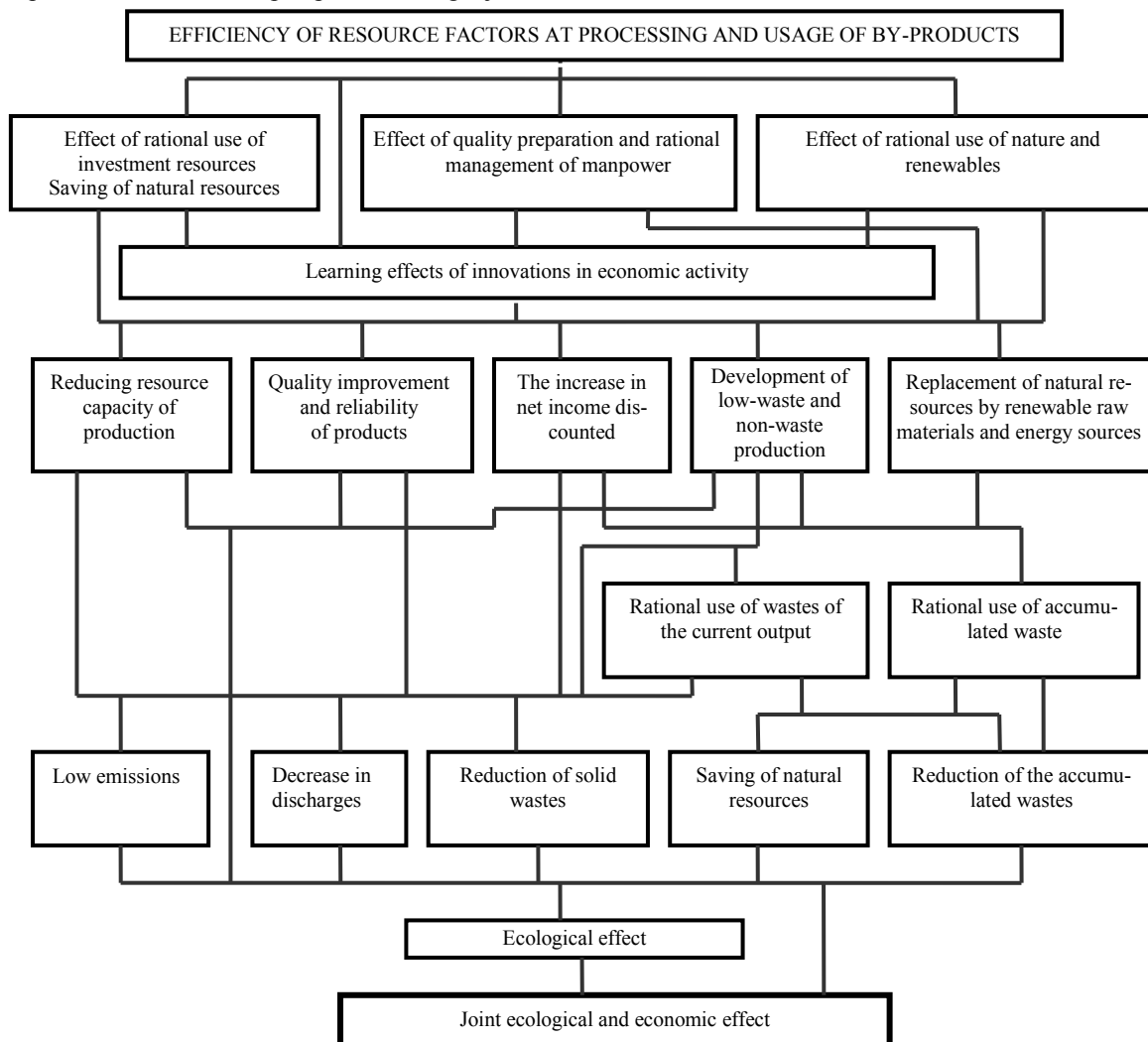


Fig. The effect of resource factors of processing and use of by-products from coal-fired power plants