

# COST-EFFECTIVE TECHNOLOGY FOR HEAT POWER STATIONS ASHES PROCESSING AND UTILIZATION

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The heat power stations (HPS) ashes generated by the burning of coal are on the one hand, the source of environmental pollution. On the other hand, they pose the source of raw materials for industry. There have been accumulated hundreds of millions tons of ash in Ukraine's HPS ash disposals, still containing a number of valuable components. Furthermore, HPS disposals are annually filled with fresh ash inflow of more than 10 million tons. Despite the content of phase terms with high consumer properties in a number of ashes is relatively high, we can only partially assign them to technogenic minerals due to the lack of cost-effective methods of valuable components recovery. Therefore limited quantities of HPS ashes are used up to the present.

The main objective is to create a technically sound and cost-effective technology for separation of HPS ash into several components. Ash is a complex polymineral system, which is characterized by nonuniform composition. Depending on reactivity and mineral composition of burning coal, the content of valuable components in produced wastes varies widely. Thus the content of carbon in wastes can range from 12 to 45% within a few hours. Four groups of methods of separation of polymineral systems are used in the beneficiation of evils: gravitational, magnetic, electrostatic and flotation. A small concentration of some components and their thin membrane is disclosed bean before the separation process that is achieved by the influence of reagents and particle size reduction. The developed method is flotation, providing the carbon-containing concentrate with ash content of not more than 25%. The flotation process is carried out in the presence of a specific reagent effective to separate evils. Obtained by flotation the beneficiation of fly ash-cake (mineral ash fraction) may have an ash content of 94 – 99%. Consequently, the feasibility of separation of narrow grain-size fraction from 40 to 150  $\mu\text{m}$  with average ash content of 33% can be seen from the distribution analysis of HPS fly ash. The "carbon" product can be floated (enriched by flotation). After flotation ash content of carbon concentrate can amount less than 20% along with sulfur content about 0.4%. The sulfur content complies with European requirements. Carbonaceous concentrate can be used as a fuel additive to the fuel oil thermal power plants. The calorific value of it is 5000 – 6000 kcal/kg.

Hypothetical scheme of the separation of ash into two components was developed. It is possible to get rich with carbon fraction due to fractioning, filtering, flotation and drying. We call this fraction as "second coal". By the other words this technology for ash processing allows obtaining products of specified quality regardless of the conditions of coal burning at the HPS. A pilot unit for ash separation was tested at the Pridneprovsk HPS. Installation was working for 600 hours at the initial sol throughput of 5 – 8 t/h or carbon concentrate throughput of 1 – 1.5 t/h. According to developed technology, industrial installation for ash enrichment was put into operation in 1997 at the Luhansk HPS with capacity of 400 thousand tons per year. Ukrainian heat power stations burn mostly gas coal, anthracite, ash-removal containing 15–25% carbon, which limits use in the construction industry. Standards of all countries in the world, including Ukraine, are to restrict the carbon content in the ash for concrete to 3–5%. This requirement is not inconsistent not only for anthracite coal ash, and the ash from the combustion of gas coal of Ukraine, which contains 6–8% carbon. As a challenge of the energetic problems in Ukraine, there is an urgent need for research on the preparation of pellets from biomass energy crops and fly ash.

The samples of anthracite coal ash were taken in Prydeneprovska, Zmyivska and Zelenodolska HPS. Termogravimetry analyzes were conducted to estimate the prospects to burn it separately or (and) in mix with biomass of energy crops and agricultural residues.

**Key words:** Heat Power Stations, Ash, Pellets from Biomass Energy Crops and Fly Ash