

Zero-waste Coal Power (ZWCP)

as element of the practical implementation of the Circular Economy in Poland

Coal mining and power generation based on coal produces annually approx. 70 m ton of waste in the form of tailings, ash and gypsum from flue gas desulphurization.

Mineral waste presents more than 60% of all waste generated. Therefore a successful utilization of these anthropogenic minerals is crucial to the practical implementation of the principles of Circular Economy in Poland and the European Union. Such utilization should be based on the properties of these minerals which are useful in civil engineering, reclamation of degraded areas, agriculture and manufacturing of construction materials and products, and shall lead to the realization of the following objectives:

- zero-waste power generation from coal,
- green and low-emission economy,
- saving of natural resources,
- economic growth decoupled from the increased use of resources,
- radical reduction in the volume of produced waste,
- development of the smart society.

Coal Combustion Products (CCP) are safe substances

Many years of research and testing of substances produced in power generation in the framework of **REACH** system have proved that they present no threat to the environment and health of people and animals. All results of testing of the CCP in GLP laboratories are available online on the European Chemical Agency website.

In essence, such an approach is based on noticing the physical and chemical properties of the anthropogenic minerals from mining and combustion of coal and identifying a potential for their processing and use in economy. This in turn is possible due to the existing national markets for products based on such minerals.

Fundamental barriers in this respect on the national level include low public awareness, lack of integration between the supply of the anthropogenic minerals and the demand for such products, as well as the persistence in the economy of mechanisms adverse to the implementation of the Secondary-First strategy.

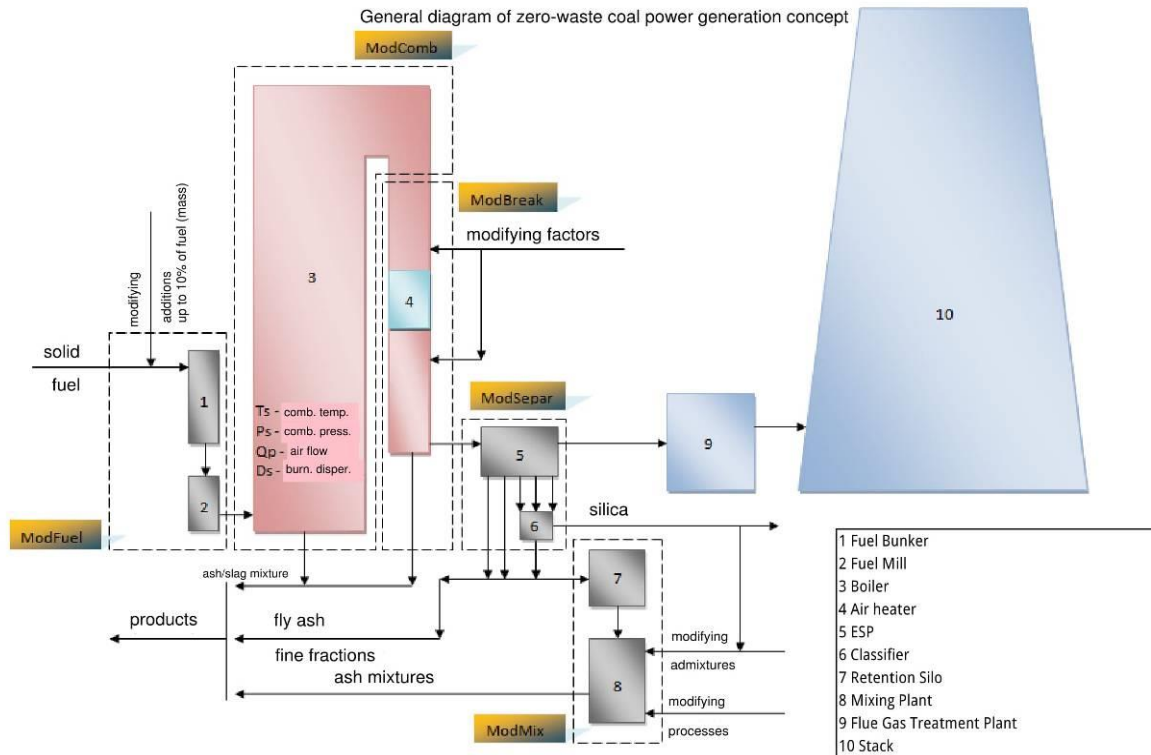
This will be overcome and achieved through a successful implementation of the Circular Economy principles on the national level, by integrating and co-ordinating the activities of market regulators, public procurement agencies of key infrastructural projects, technical standardization bodies, design units and green public procurement in industry, in order to:

- create a holistic approach and foundations for a rational management of non-energy minerals in the country,
- avoid the landfilling of minerals from power generation,
- use the low-hanging fruits in the economy, therefore reducing emissions,
- increase the protection of the natural resources coupled with reclamation and recultivation of degraded areas,
- develop technologies and facilities processing combustion by-products into market products, therefore creating jobs,
- reduce the environmental impact and costs of coal-based power sector.

Key to this approach is such a transformation of properties of the anthropogenic minerals during the process of power generation, so they can meet requirements for various products. In such a case we avoid producing waste and the liabilities in power sector are turned into a new business area – production of raw materials and products for construction and other sectors of the economy. The objective is to transform the properties of these minerals, so they meet the requirements specified in European standards which already list coal combustion products as raw materials or construction products:

EN 13282 Hydraulic road binder, **EN 14227** Hydraulically bound mixtures, **EN 14227** Part 10++ Soil treatment, **EN 12620** Aggregates for concrete, **EN 13043** Aggregates or bituminous mixtures and surface treatments, **EN 13139** Aggregates for mortars, **EN 13242** Aggregates for unbound and hydraulically bound materials, **EN 13055** Lightweight Aggregates, **TC 104** Concrete, **TC 51** Cement and Lime, **TC 227** Road construction, **TC 154** Aggregates.

The potential areas of intervention in the process of power generation from coal are indicated on the following diagram:



Actions to be taken towards ZWCP:

- 1) Acceptance of appropriateness of such an approach due to lowering of costs in power sector,
 - a) less (no) landfilling of coal combustion products,
 - b) protection of part of natural resources,
 - c) increase in supply of low-emission construction products,
 - d) general reduction of costs in the economy due to the above.
- 2) Integration of development of technologies to beneficiate coal combustion products in the power generation process at the stage of:
 - a) preparation and feeding of fuel,
 - b) combustion in the boiler,
 - c) removal of combustion residues from the combustion chamber,
 - d) storage and despatch of coal combustion products.
- 3) Streamlining of standardization and promotion of good practices.
- 4) Preparation of the program for implementation of the Secondary-First strategy.
- 5) Co-ordination of co-operation between the power sector and governmental agencies in implementing of this program. This will be effected through incorporating the above issues into the National Resource Strategy developed by the Ministry of Environment and the Strategy for Responsible Development prepared by the Ministry of Development.



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25 years' experience with processing of coal ash from coal combustion power plants into resources for civil engineering. Member of national standardization body for concrete and CEN working group. Chairman for 20 years of the Polish Union for Coal Combustion Product and past vice president of ECOBA for two cadencies. Promotor of sustainable development in Poland for decades and circular economy approach for last 3 years. Organizes over 200 conferences and workshops in Poland about sustainable development, especially focused on further usage of energy and mining by-product. Inventor of EuroCoalAsh conference, Green Geotechnics, Secondary First and Zero-waste Coal Power.