PolFerAsh - sustainable technology for phosphorus recovery

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Waste management defines long-term goals in the area of limiting waste storage and intensification of preparations for reuse and recycling of priority waste streams. This category may include waste rich in phosphorus, aluminium, iron, silica, i.e. sewage sludge and ash resulting from its incineration, which should be treated as an alternative feedstock for industry. Such an approach ensures the realization of goals of circular economy assuming industrial symbiosis thanks to which waste or by-products from one industrial sector would become a resource for another sector. In its latest documents the EU gave a commitment to support innovative industrial processes and ensure a consistent interpretation of regulations referring to by products, which should facilitate the efforts to acknowledge some waste as secondary phosphorus raw materials.

The PolFerAsh technology is deduced to the management of ashes after incineration of sewage sludge and the production of solid and suspension fertilizers. The technology results from the demand of the fertilizer and municipal industry, and is a response to concerns related to reports of the depletion of natural phosphate raw materials. It is a way to manage waste, reducing the amount of waste sent to landfills and the associated costs.

The comparison of PolFerAsh to processes carried out on an industrial scale shows that similar methods are used to separate phosphorus from ashes in the RecoPhos and Tetra - Phos processes. However, this process can only be used for high-quality ashes, where the content of heavy metals and silicas are low due to the lack of an additional purification step.

The proposed PolFerAsh technology uses only nitric or phosphoric acids to extract phosphorus compounds from ashes and ensures a high degree of phosphorus recovery without additional wastewater treatment. This can be achieved by operating the process at a low concentration of acids and an appropriate ash to liquid phase ratio. In the processes of leaching ashes with nitric and phosphoric acids, no additional waste is generated, and the extracts are rich in nitrogen and phosphorus compounds.

The technology allows to obtain diversified fertilizer products, or semi-finished products for further processing, enabling the expansion of the product range that meets the market requirements and is confirmed in a certified laboratory. For the PolFerAsh technology, 6 process variants were selected, leading to different products. For the best products, experiments and summary balance calculations of a multi-stage fertilizer production process with the use of alternative raw materials were performed - from extraction of ashes from sewage sludge to granulation of fertilizers or production of suspension fertilizers.

From the planned three variants of the technology scale (local, medium and industrial) the medium scale was selected after talks with potential buyers. Medium scale targeted at smaller investors from the fertilizer industry and waste management technology or environmental technologies, or groups of sewage treatment plants with thermal treatment stations for sewage sludge. It assumes the transport of the necessary raw materials and ashes from dispersed sources to the location of the installation. On that basis preparation of a preliminary engineering design of an installation that can be launched in operational conditions and valuation of the technology (estimation of investment costs in the CAPEX system) was performed.

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