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The Title: Study on the process of obtaining extractive phosphoric acid depending on the method of decomposition of phosphoric raw materials.

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Summary

The aim of the work was to investigate the processes of obtaining extractive phosphoric acid by the dihydrate method depending on the method of phosphorite decomposition. Four types of phosphorus-bearing raw materials and two production installations owned by Grupa Azoty Zakłady Chemiczne "Police" S.A. were selected for these tests. The first installation is line D with an annual production capacity of 150 Gg of 100% H3P04, in which the phosphorite extraction process takes place in a cascade of five reactors. The second installation is the E-line with a single reactor with an annual production capacity of 180 Gg of 100% H3P04.

Subsequently, in four stages, in two installations, phosphorus-bearing materials from Morocco, Algeria and Senegal with different impurity content (Morocco, Morocco with Senegal, Algiers with Senegal and Algiers) were subjected to the digestion process with sulfuric acid (VI). The measurement cycle for each tested case lasted 12-13 days. In the produced H3P04, the density, content of orthophosphates (V) and sulphates (VI) as well as the temperature of the reaction pulp were determined. On the other hand, in the discharged phosphogypsum, the focus was on determining the moisture content of the three forms of orthophosphate (V) contained in it, and the shape of calcium sulphate (VI) dihydrate crystals was compared, because the shape and size of the phosphogypsum crystals have a significant impact on the phosphate efficiency of the entire process.

On the basis of the obtained results and the developed dependencies, it was found that:

- extractive phosphoric acid with a similar concentration can be obtained, regardless of the reaction system, but in the case of decomposition of phosphate rock with a low content of the main impurities the highest phosphate efficiency of the extraction process was achieved by decomposing Algerian phosphate in one reactor, despite the fact that it was a raw material with a high content of impurities.

- the recommended raw material for processing in the 5 reactor installation, in terms of the phosphate efficiency of the process, is Moroccan Senegalese phosphates,
- the raw materials recommended for use in the single-reactor installation are a mixture of Moroccan Senegalese phosphates and pure Algerian raw material.

Based on the profit and loss balance calculations, including the indicators adopted in Grupa Azoty Zakłady Chemiczne „Police" S.A., and taking into account the phosphorus content in the discharged phosphogypsum and orthophosphates (V) in the raw H_3PO_4. it was found that additional financial benefits can be obtained by comparing the appropriate raw materials phosphorus-bearing for a given type of technological solution of the installation.

In this doctoral thesis, the complicated production processes of extractive phosphoric acid were analyzed, which allowed to present, by means of a collective balance of profits and losses, proposals and recommendations for implementation in Grupa Azoty Zakłady Chemiczne „Police" S.A.

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