DEVELOPMENT OF MICROELEMENT-CONTAINING TECHNOLOGY NPK FERTILIZERS

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Abstract: Considering the current negative balance of macroelements in the soil, the catastrophic decrease in humus content, the use of new generation agrochemicals is necessary to restore and increase fertility. Current trends in the development of world science in the field of mineral fertilizer technology are aimed at the urgent need to find new solutions in the field of agrochemical technology and the involvement of non-traditional raw materials.

Keywords: NPK fertilizers, ammoniation, microelement-containing.

The introduction of microelement-containing compounds into complex fertilizers as a result of the chemical interaction of the components can lead to the conversion of nutrients into indigestible forms, loss of nutrients, efficiency, therefore we provide: 1. search for optimal initial components (secondary resources, production waste), selection of technological processes for obtaining highly effective agrochemicals;

In this regard, the goal of this research is to develop a technology for producing microelement-containing NPK fertilizers; development of standards for the production technological regime, a fundamental flexible technological scheme for complex fertilizers.

First of all, it was envisaged to develop a technology for extracting microelements from industrial waste (spent catalysts from the oil and gas and nitrogen industries); then introducing the obtained microelements into the composition of NPK fertilizers.

Based on the research carried out and the data obtained, the optimal parameters for the decomposition of spent catalysts and the production of complex fertilizers consisting of salts of microelements and fertilizer salts were established.

The technological scheme for the decomposition of spent catalysts consists of the following main technological stages: - loading of spent catalysts into a ball mill for grinding to sizes of 0.016 and 0.5 mm; - loading a solvent into the reactor to decompose catalysts; - separation of the liquid phase from the solid; - the process of ammoniation of the resulting liquid phase; -filtration of the formed suspensions and evaporation of the liquid phase; -separation of the liquid phase from the solid and supply of the solid phase to the fertilizer synthesis unit.

Thus, the spent catalyst from the hopper is fed through a screw feeder using a dispenser to the mill, where it is crushed to a size of 0.016 and 0.5 mm. After reaching certain conditions, the spent catalyst is fed into the solvent reactor, and 50% nitric acid is also supplied there from an additional collection through a pressure bank into the solvent reactor, where the catalysts are decomposed.

The resulting suspension is fed to a centrifuge, where the liquid phase is separated from the solid, which is then fed to a saturator, where it is ammoniated to pH 5.5. The ammoniated catalyst solution is fed through a filter using a centrifugal pump and through a pressure tank to the evaporator, where evaporation occurs. Then the formed solid phase is directly fed to the fertilizer synthesis unit.

For the physicochemical substantiation of the process of obtaining chlorine-free complex nitrogen-phosphorus-potassium fertilizers, fertilizer compositions were developed in the following ratios: N:P:K=1:1.3:1.2; N:P:K=1:1.3:1.6; N:P:K=1:1:1.8. The physicochemical and commercial properties of the obtained fertilizer samples were studied. The solubility was studied by visual-

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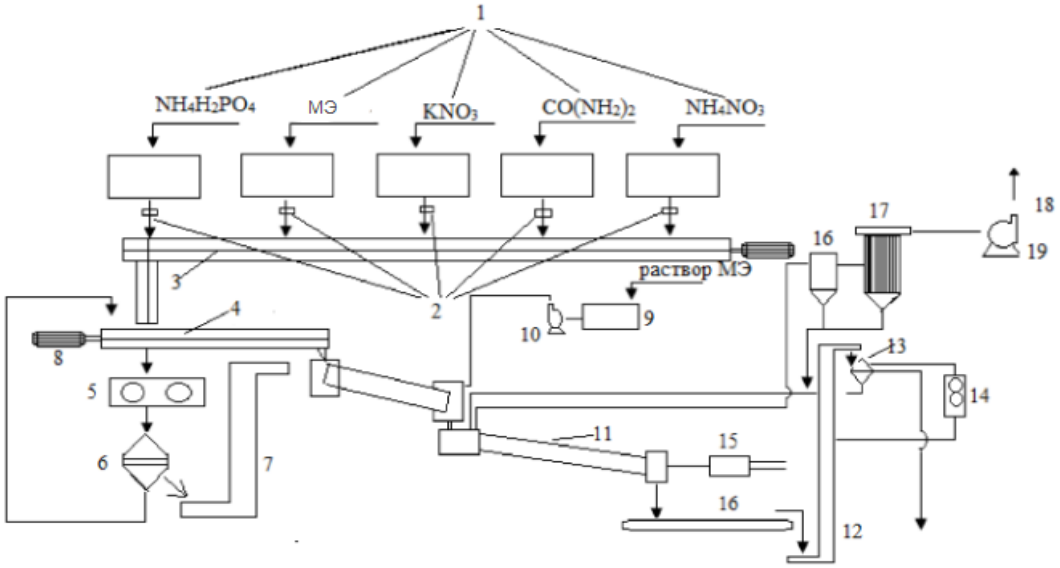
polythermic method and solubility depending on temperature and pressing pressure. Based on the research results, a technological scheme for the production of complex fertilizers has been proposed.

The developed technological scheme for producing NPK fertilizers is shown in the figure. The technological scheme includes the following stages: - preparation of the dry mixture; - disintegration; - compaction with world elements; - pelletizing, granulation and drying; - classification.



Rice. - Technological scheme for obtaining NPK compositions

1-Collection of fertilizer salts; 2-dispenser; 3-screw feeder; 4- disintegrator; 5-press; 6- roar; 7-elevator; 8- humidifier; 9- collection of ME solution; 10 - dispenser; 11 - drum granulator-dryer; 12- elevator; 13- roar; 14-crusher; 15- firebox; 16-belt conveyor; 17- cyclone; 18-bag filter; 19-suction fan

The disintegrator simultaneously receives the calculated amount of fertilizer salts (ammonium monophosphate, potassium nitrate, urea and ammonium nitrate) from the collections through dispensers (2) into the disintegrator using a screw feeder into the granulator-humidifier. Microelements also arrive there at the same time; the resulting mixture of products is sent to a screw humidifier (8). Next, from (11), the moistened product is fed into the drum granulator-dryer (11). The granulated product is sent via an elevator to a classifier (18), in which larger fractions are crushed in a crusher (14) and returned to the elevator and then for classification. From the classifier, the finished product is sent to the warehouse.

Thus, a technology has been developed for producing NPK fertilizers enriched with microelements extracted from industrial waste (spent catalysts from the oil, gas and nitrogen industries).

Implementation of the results of the research will allow us to obtain:

- significant economic effect due to the substitution of imported agrochemicals with domestic ones with high efficiency, obtaining high-quality yields, and the use of secondary raw materials;

- in addition to the economic effect, the use of new water-soluble NPK multifunctional fertilizers will provide a significant environmental effect by restoring and increasing the natural fertility of land, reducing the loss of nitrogen and phosphorus by increasing the efficiency of macroelements and, accordingly, preventing environmental pollution.

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