**Model calculations and monitoring of the stabilizer column at the industrial diesel fuel hydrodewaxing unit**

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***Keywords:*** *catalytic dewaxing, diesel fuel, optimization, mathematical model, stabilizer column, hydrogen sulphide, corrosion.*

The paper considers the influence of technological parameters for different schemes of flows directions into the stabilizer column on the separation of hydrogen sulphide. The monitoring of stabilizer column at the dewaxing unit was carried out in order to determine the influence of flow rates of reflux and stable naphtha (as additional vapourizing agent) into the column. It was found that achieving the absence of hydrogen sulphide in the stable hydrogenate is possible by increasing the flow rate of reflux and improving the scheme of flows directions into the column. By means of model calculations and processing of results of test run at the industrial dewaxing unit the optimal modes of stabilizer column operation were determined depending on the feedstock composition. As a result of the current research the optimal scheme of flows directions into column was established.

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**Effective choice of distillation columns sequences with internal partitions**

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***Keywords:*** *optimal synthesis, distillation columns, complex of distillation columns, energy efficiency, criterion method calculation.*

In this paper, we propose criterion equations that allow us to make a quick program choice between the different versions of the separation of a three-component mixture based on the calculation of two inequalities. The developed criterial equations and the method of choosing the optimal separation sequence are applicable for the subsequent optimization by rigorous calculation methods of complex complexes of rectifying columns and columns with internal partitions, and also for choosing the optimal separation sequence with initial approximations for each distillation column for the subsequent strict calculation of rectification. The applicability of the proposed criterial equations is confirmed by rigorous technological calculation using the example of column complexes with direct, indirect and symmetrical separation sequences, including columns with an inner wall.

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**Composition and rheological properties of ammophosphate slurry based on ore-balanced from central Kyzylkum phosphorite**

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***Keywords:*** *wet process phosphoric acid, ore-balanced, composition, density and viscosity.*

There have been the composition and rheological properties (density and viscosity) both unevaporated and evaporated ammophosphate slurry obtained on a basis of the mineralized mass from Central Kyzylkum phosphorite by wet-process phosphoric acid subsequent separation of calcium-phosphate slurry into solid and liquid phases then ammonization the latte up to pH 4.0-4.5. The results of chemical analysis on composition determination of both type of ammoniated slurry show that total and acceptable form of Р2О5 on 2 % solution of citric acid in them are from 8.83 tо 13.84; from 8.83 to 13.65 and from 23.80 tо 28.00; from 23.48 tо 28.0 respectively. It was established that effect of wet-phosphoric acid rate, pH and temperature on debsity and viscosity of unevaporated and evaporated ammophosphate slurry. It was shown that data obtained on rheological properties evidence about possibility of the ammophosphate slurry pump from one apparatus to another without difficulty.

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**Physicochemical and commodity property of complex nitrogen-phosphorus-calcium-sulphur containing fertilizer**

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***Keywords:*** *NPSCa – fertilizer, hygroscopic point, sorption kinetics of water vapour, ore-balanced, wet-processing phosphoric acid and sulphuric acid.*

In this study scientific data on investigation of hygroscopic point, sorption kinetics of water vapour and sorption capacity of granular nitrogen-phosphorus-sulphur-calcium containing (NPSCa) fertilizer based on interaction ore-balanced from Central Kyzylkum phosphorite by partially ammoniated mixes of phosphoric and sulphuric acids have been formulated. Fertilizer with initial moisture from 1.12 to 1.92% and static strength in a range of 2.38-3.92 МPа is characterized rather friability. It was established that hygroscopic point of granular fertilizer is fluctuated in ranges of 68.61-75.26%. There has been shown the fertilizer having hygroscopic point on scale of Pestov N.E. is bibulous and weak bibulous substances. The value of sorption capacity of experimental models of complex fertilizer is varied in a range from 9.82 to 16.52% maintaining at that its shape and friability. The fertilizers with that figures rather quite suitable for bulk storage during the all year and handling for long way.

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**Kinetics constant of phosphoric acid decomposition of phosphorite powder from central Kyzylkum**

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***Keywords:*** *phosphorite powder, wet-process phosphoric acid, decomposition kinetics, reaction rate constant, activation energy.*

In this article there have been the results of laboratory researches on study of decomposition kinetics of Kyzylkum phosphorite powder by wet-process phosphoric acid containing various concentration (35,69; 41,20; 44,98% Р2О5) with high norm and at temperature in 5-120 minutes. It is shown that maximal decomposition coefficient of phosphorite powder (Kdec. 99.95%) leads when using phosphoric acid with 35.69% of Р2О5. On a basis of Arrhenius there were derived the equations for optimal condition of phosphorite powder decomposition by phosphoric acid made by Central Kyzylkum phosphorite. Reaction rate kinetics and apparent energy activation for decomposition process have been investigated depending upon decomposition coefficient. It was established that high calcareous containing Central Kyzylkum phosphorites decomposed with optimal temperature and concentration condition have low apparent energy activation in ranges 11.62 – 15.23 кJ/mole.

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**Simulation of hydrodynamic processes in a layer of a regular packing**

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***Keywords:*** *regular packing contact device, gas-liquid system, hydrodynamics, mathematical modeling, relative gas velocity.*

With the help of mathematical modeling of hydrodynamic processes in the layer of a shock-spray packing, the conditions under which there is a change in the hydrodynamic regimes of the interaction of gas and liquid are determined. It is shown that at the initial velocity of the liquid jet *w0* = 0.18-0.63 m/s and the relative gas velocity 7.0-8.3 m/s, a regime is formed in which the liquid jet under the influence of the gas head assumes a horizontal position. An increase in the gas velocity above 7.0-8.3 m/s leads to a curvature of the liquid jet and, as a consequence, to flooding the packing layer. It is established that the nature of the interaction of gas and liquid in the layer of the shock-spray packing depends on the initial velocity of the fluid, the relative gas velocity and the velocity of impact of the liquid jet against the wall of the packing section. An experimental verification of the reliability of the mathematical model is performed.

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**Evalution of the effect of back mixing of the drying agent on technological and geometric parameters of a drum dryer**

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***Keywords****: ideal displacement, backmixing, longitudinal diffusion, Peclet number, relative dryer agent moisture content.*

In this study it was proposed analytical equations of operational line and mass transfer for reel dryer with diffusion flow over dryer agent structure were derived. Longitudinal diffusion calculation algorithm. The algorithm considers Peclet number. The technological and geometrical parameters of reel dryer with considered flow structure were compared with traditional reel dryer with ideal displacement over two phases. The analogy of the results of the calculation of the drying process in a drum dryer by using a heat and mass transfer apparatus and a chemical reactor was considered. It was showed that the moisture content leap at the inlet of the drum and the nonlinearity of working line, which increases the number of transfer units and reduce the average driving force for mass transfer process are affect the necessity to increase the length of the drum dryer.

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