Intensification of the commercial run of deriving of isobutylene

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The optimum control of the process of dehydrogenation of isobutene has been analyzed. In order to increase productivity of the process and also obtain of additional economic effect, it has been developed the mathematical model of this process due to regard of temperature, consumption of raw material and the catalyst.

Keywords: isobutene, intensification, optimization, mathematical, model

Increase of productivity of process urgently requires application of more and technical advance.

As is known for deriving of isobutylene, being raw material at development of polyisobutylene and butyl rubbers widely use process of dehydrogenation of isobutylene in pseudo-liquid catalyst bed, circulating in reactor-regenerative system. Opportunities of this process in the production conditions completely are not implemented because of reactor-regenerative (feed-heating) system in the non optimum condition that stipulated not by the account of agency of reactionary medium and conditions of regeneration on activity of catalyst. To optimal support of process absence precludes with convenient and simple mathematical model of process and also a discretization of used analytical methods of the analysis of contact gas enough. Last hampers architecture of continuous analytical monitoring of indexes of process that precludes with creation of a computerized monitoring system and optimum control of process.

In the present operation results of development of method of continuous analytical monitoring of technological indexes of conversion and selectivity not astable process of dehydrogenation of isobutene on dates of a density and thermal conductivity of contact gas based on dynamic kinetic model of the reactor-regenerative block are given.

The abbreviated mathematical model of a commercial run of dehydrogenation of isobutene with the account not stationary activity of catalyst is generated. The given model has been applied for optimum control of process with the help designed on base line of a computer of computerized system.

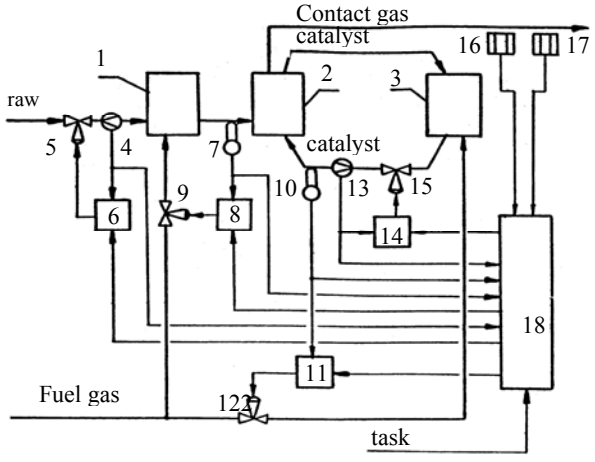

Fig.1. Isobutene dehydrogenation industrial process of automation control method flow diagram.

The way of automatic control of process of dehydrogenation of isobutene is carried out as follows:

In a reactor 2 with pseudocondensed bed of the catalyst on the pipeline the raw material (isobutene fraction) is loaded. Heating of raw material is carried out in the furnace 1 due to fuel gas burning. The temperature of raw material in the entrance of the reactor 2 is measured by the gauge 7 and stabilized with the help of a regulator 8 and the executive mechanism 9, and the raw material consumption is measured by the gauge 4 and stabilized with the help of a regulator 6 and the executive mechanism 5. The task is established by a regulator 6 and 8 from an output of a computer 18. The catalyst from a reactor goes with the help of the pneumoconveyor to a regenerator 3 for restoration. In the last one there has been occurred a removal of a part of coke from a surface of the catalyst. The regenerated catalyst comes back in a reactor 2. The temperature of the regenerated catalyst is measured by the gauge 10 and adjusted with the help of a regulator 11 and the executive mechanism 12 established on the lines of loading of fuel gas in a regenerator. The consumption of the catalyst is measured by the gauge 13 and stabilized by a regulator 14 and the executive mechanism 15. Tasks to regulators 11 and 14 are established from an output of a computer 18.

The density and factor of heat conductivity of reaction are measured accordingly by gauges 16 and 17. The information from gauges on temperature of raw material and the catalyst, the consumption of raw material and the catalyst circulating in system, density and factor of heat conductivity of a product of reaction enter into computer 18. Thus the size of conversion (α), density (ρ_0) of contact gas without hydrogen taking into account, selectivity (S) of process and an output (α.S) of a target product is determined.

Besides in a computer 18 is entered as the help information the value of isobutene concentration in raw material, the common pressure of system, speed constants of isobutene formation and cracking products, constant factors, constants, fractions of the active centers, not had time to be deactivated in reaction to the beginning of regeneration, partial pressure of oxygen in gases of regeneration, factor of proportionality in the equation of speed of the active centers formation, preexponential factors of the equation of speed of the active centers formation, adsorption, speed of regeneration, energy of activation, absolute gas constant, heat of adsorption, energy of activation, regeneration.

After input of the specified information in a computer 18, last one run an computation on the measured values of density and factor of heat conductivity of the current values of conversion, selectivity and on their bases - sizes of an output of a target product (isobutene) in products of reaction.

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