**The Model of the becoming deactivation of the catalyst at constant temperature and output constant octane**

If t (a) is considered as the rate of catalyst activity at time t

 (1)

In this equation, ra (t) is the reaction speed at time t and ra (0) is the reaction speed at the start of the reaction with the fresh catalyst (a = 1). If the total speed of the reaction is considered at the form of the multiplication of the three sentences, the first contains the temperature dependence, the second representing the catalyst activity drop and the third is the concentration dependence according to the conversion degree (Xa), because the temperature is constant, we have:

(2)

We use the following equation for illustration of the becoming deactivation rate of the catalyst:

 (3)

In this equation, kd0 and ED are the constant parameters of the becoming deactivation rate and g (XA) representing the concentration dependence in the activity rate equation and n is the degree of the becoming deactivation rate [15]. At constant temperature and constant conversion rate, the becoming deactivation equation is summarized as follows:

 (4)

**Temperature changes with catalyst lifetime**

Industrial units, usually in order to compensate for the catalyst activity decline, try to control the quality of the product with increasing the temperature of the entrance feed instead of reducing the passing rate of the feed from the catalyst (LHSV) because reducing the amount of the product in order to control its quality isn't desirable and economical. Thus, one process of increasing temperature in the production process is observed simultaneously with the decrease of catalyst activity [16]. Increasing the rate of temperature is faced with limitations that determine the lifetime of the catalyst, including the thermic limitation of the reactor and the involved equipment in the process, changing the catalyst base construction, changing the distribution way of active elements on the catalyst (sintering), and also the high cost of the temperature supplying. Ending the catalyst life period, depending on the type of catalyst, the rate of price and also the possibility of revival, take action to its replacement or revival [17].

The following equation expresses the reality of the need to the temperature increase in order to compensation for the catalyst activity drop by connecting the catalyst activity to the function from the operating temperature.

The conditions required for using the below equation are the product constant quality (constant conversion) and also being constant the feed rate (LHSV). The following relevance is being resulted from the equation (2) in constant conversion:

 (5)

Wherein T0 is the used absolute temperature at the beginning of the utilization of the catalyst and T is the temperature to be used at time t till it compensates the catalyst activity drop with the speed constant increase.

By placing the equivalent of the temperature function from equation 2, the above equation is as follows [18]:

 (6)

 (7)

 (8)

By integration of the above equation, we have:

 (9)

To summarize the above equation, we use two parameters B, A, which are defined as follows:

 (10)

 (11)

 (12)

By solving the equation for operating temperature, we have:

 (13)

The equation (13) shows the thermic connection (T) which must be used with the passage of time (t) in order to compensate for the catalyst activity drop.

**Results and discussion**

Regarding the modeling and the review of the obtained results, it can be observed that the amount of pressure drop in the thermal inverters is decreased significantly and the pressure is increased in the high-pressure separator container and at the entrance compressor of the cyclical gas.

Therefore, the output pressure and the amount of cyclical gas flow (the ratio amount of hydrogen to hydrocarbon in the reactor) could be adjusted in the appropriate values. Also, the amount of thermal load will become more in the boiler of the stripper tower. The amounts of hydrogen sulfide, ammonia, and water haven't so changed in the output of the unit. Economically, also, this plan didn't have much-fixed cost [19].