HETEROGENEOUS AZEOTROPIC DISTILLATION CONVENTIONAL (HAD) FOR DEHYDRATION OF TER-T BUTANOL

ESCUELA SUPERIOR POLITÉCNICA DE CHIMBORAZO

RICHARD CARLOS ROJAS QUINTERO

Email: richard_r9731@yahoo.com

Backgorund:

The tert-butanol production process is one of the most demanded conventional processes in the chemical industry, especially for its production of chemical and pharmaceutical products, the most common methods for obtaining it are the hydration or hydrolysis of hydrated tert-butanol, it is takes into account that the difficulty arises when the final product desired for the synthesis and manufacture of other derivatives is anhydrous tert-butanol which, being contained with water, forms a homogeneous azeotrope, the most feasible process for its separation is by azeotropic distillation. , cyclohexane is commonly used as a entrainer due to its peculiarity of acting as a phase separator for the formation of a heterogeneous azeotrope, in the peculiar case it is necessary to use heterogeneous azeotropic distillation (HAD), taking into account the energy consumption and the operating costs generated in the process, however until now the conventional processes Azeotropics are in greater demand at the chemical industry level.

Description of the flowsheet

For the process of obtaining tert-Butanol, also known in the composition of DWSIM as 2-methyl-2-propanol, it was carried out using the conventional method of azeotropic distillation, which begins with an equimolar mixture of t-butanol and water at a temperature of 303.15 K with a pressure of atmosphere, it should be noted that the entire process was carried out in SI units, in the first column (DC-01) which fulfills the function of pre-concentrator, in addition to an azeotropic distillation column (DC -02), to control the formation of internal loops in the system, the Recycle Loops tool was used twice, with which it is possible to keep track of the maximum number of iterations with a certain percentage of tolerance, the two columns have a reboiler and condenser, but considering that in the (DC-01) the condenser is added in the external part to the distillate head, this is because its external control is necessary, especially the energy consumption, this process It takes us to a decanter where it is necessary to separate two liquid phases, one is an aqueous phase that is recirculated to the (DC-01), having a large amount of water, the organic phase contains a large percentage of entraining agent, which is recycled to the (DC-02) for use in the formation of a desirable ternary azeotrope, to obtain the anhydrous tert-butanol as bottom product, two (HE-01) and (HE- 02) which have a consumption of 4080.56kW and the second of 715.84kW this is especially to balance the input temperature to (DC-02). The most relevant outputs of the simulation were, at the head of (DC-01), the bottom product (S-06) is a large amount of water (0.998) from the separation process, and at the output of (DC-02) as bottom product (S-08) we have anhydrous tert-butanol (0.998). It is considered an efficient process obtained percentage of composition of 0.998 anhydrous tert-butanol and 95% efficiency in its separation process, the thermodynamic models used in the process were NRTL and Peng-Robinson (PR), due to their use for work with organic components.

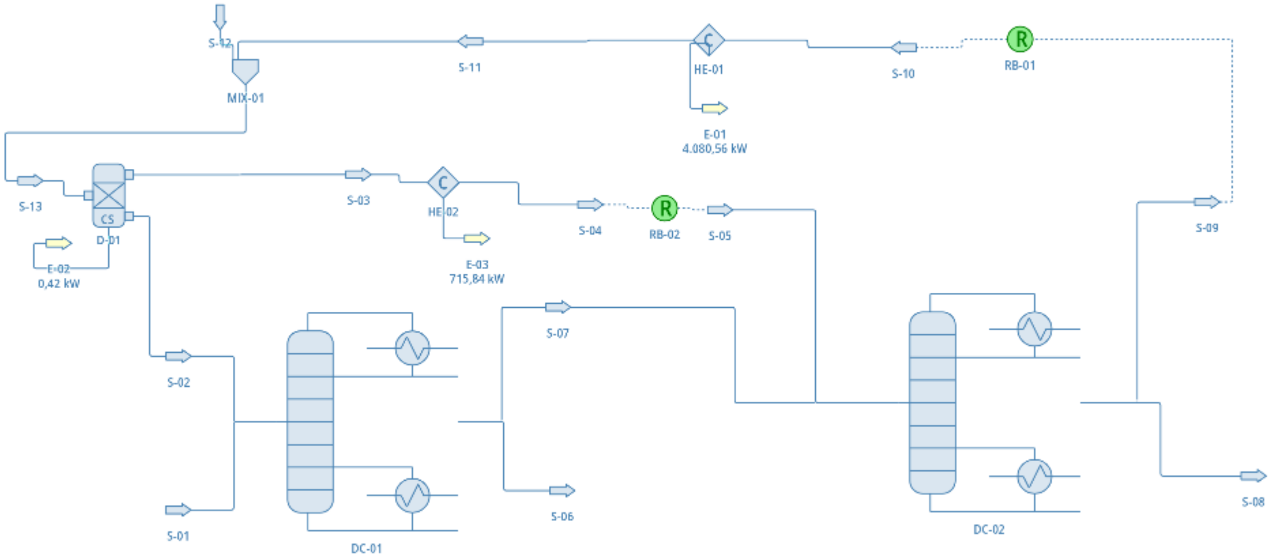

Fig. 1. Flowsheet of Heterogeneous Azeotropic Distillation (HAD) for Dehydration of Ter-t Butanol.

Results:

Heterogeneous Azeotropic Distillation Conventional (HAD) for Dehydration of Tert-Butanol									
Object	**S-12**	**S-09**	**S-08**	**S-07**	**S-06**	**S-03**	**S-02**	**S-01**	
Temperature	298,15	349,296	354,729	347,335	369,773	347,505	291,545	303,15	**K**
Pressure	101325	101325	101325	101325	105459	101325	101325	101325	**Pa**
Molar Flow	0,00111111	96,6446	14,3269	27,0092	12,8726	84,5416	12,104	27,7778	**mol/s**
Volumetric Flow	1,20923E-07	2,68916	0,002555	0,00171754	0,000243098	0,00874307	0,000303929	0,00146254	**m3/s**
Specific Enthalpy (Mixture)	-388,875	72,3511	-407,438	-717,674	-2191,27	-344,525	-1966,81	-913,942	**kJ/kg**
Specific Entropy (Mixture)	-1,10249	0,439514	-1,11572	-1,85954	-5,80992	-0,806987	-5,323	-2,36648	**kJ/[kg.K]**
Molar Enthalpy (Mixture)	-32727,5	5060,62	-30154,2	-35299,4	-39722,3	-26398,4	-45845	-42103,9	**kJ/kmol**
Molar Entropy (Mixture)	-92,7849	30,7419	-82,5739	-91,463	-105,319	-61,8334	-124,076	-109,02	**kJ/[kmol.K]**
Molecular Weight (Vapor)	0	69,9453	73,6329	0	0	0	0	0	**kg/kmol**
Specific Enthalpy (Vapor)	0	72,3511	89,3813	0	0	0	0	0	**kJ/kg**
Molar Fraction (Vapor)	0	1	0,00268914	0	0	0	0	0	

Table N.1: Streamwise Results for Tert-Butanol Dehydration Conventional Process Flowsheet.