Production Of Toluene By Dehydration of N Heptane

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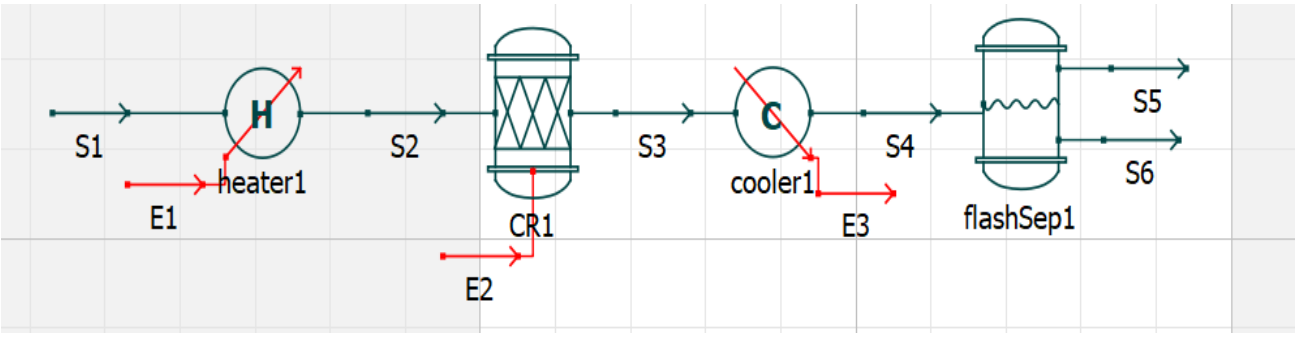
Introduction :

Toluene or methylbenzene is a colourless, water insoluble aromatic hydrocarbon which is mainly used in the industry as a precursor and as a solvent. It is mainly used as a solvent in adhesives paint,thinners,ink and disinfectants. It is also used for the production of xylene and benzene.

In this process toluene is produced from n-heptane by the use of Cr_2O_3 as a catalyst. N-heptane undergoes dehydrogenation to form toluene. The following reaction takes place

$$CH_3CH_2CH_2CH_2CH_2CH_2CH_3 \rightarrow C_6H_5CH_3 + 4H_2$$



Flowsheet Description:

In this flowsheet liquid n-heptane(S1) acts as a feed and is fed as an input to the heater1 where is heated to around 699.817 K before feeding to the reactor (CR1). The reactor(CR1) is operated isothermally and a conversion of 15 % takes place in order to form toluene. The product is cooled using a cooler(cooler1) and then subjected to a flash (flashsep1) where the liquid and the vapour can be separated. All the operations are carried out at atmospheric pressure.

Results:

	OpenModelica			DWSIM		
Stream	**S1**	**S3**	**S6**	**S1**	**S3**	**S6**
Temperature(K)	291.483	699.817	291.483	291.483	699.817	291.483
Pressure (Pa)	101325	101325	101325	101325	101325	101325
Mole Flows(mol/s)	9.97984	15.9677	9.73103	9.97984	15.9677	9.73119
Molar Composition						
N-heptane	1	0.53125	0.848705	1	0.53125	0.848693
Toluene	0	0.09375	0.151295	0	0.09375	0.151293
Hydrogen	0	0.375	1.49E-15	0	0.375	1.43E-05

Conclusion:

The following flowsheet is built where 15 % conversion of N-heptane takes place to produce Toluene.

References:

1. "HYSYS:An Introduction to Chemical Engineering Simulation " by Mohd Kamaruddin Abd Hamid Chapter-13 Page no-146.