

## VAPOR PHASE PRODUCTION OF ETHYLBENZENE FROM ETHYLENE AND BENZENE

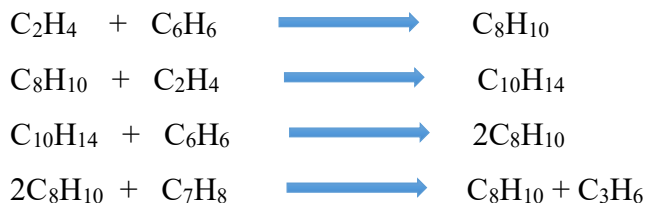
### INTRODUCTION:

Ethylbenzene is an organic compound with the formula C<sub>8</sub>H<sub>10</sub>. It is highly flammable, colorless liquid with an odor similar to that of gasoline. This monocyclic aromatic hydrocarbon is important in the petrochemical industry as an intermediate in the production of styrene. In 2012 more than 99% ethyl benzene produced was consumed in the production of styrene. Less than 1% of ethylbenzene produced is used as paint solvent or as an intermediate for production of di-ethylbenzene and acetophenone.

### ABSTRACT:

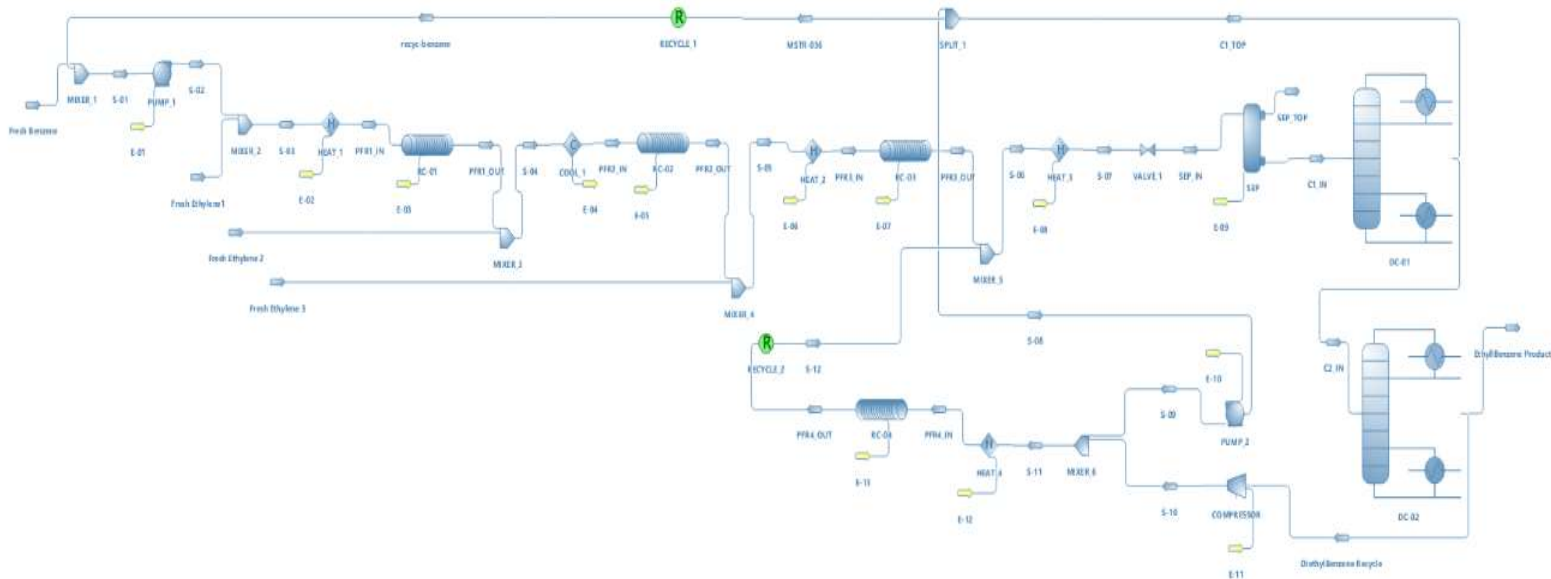
This simulation is conducted to optimize the process of production of vapor phase production of ethylbenzene using ethylene and benzene with the aid of DWSIM software. This process is about production of EB using a zeolite catalyst in which molecular sieve catalyst is considered. This process includes four plug flow reactors, gas-liquid separator and two distillation columns and also two recycle logical operations are used.

And four reactions occur in this process as mentioned below:



Benzene is the excess reactant and benzene is continuously recycled from first distillation column to the front end of process and diethylbenzene from second distillation column is sent to a plug flow reactor and then added to effluent of third reactor. All the reactors operate at high temperatures and pressure and heaters and coolers are provided for intermediate heating and cooling purpose.

## FLWSHEET:



## RESULTS TABLE:

Master Property Table								
Object	recyc-benzene	Fresh Ethylene1	Fresh Ethylene 3	Fresh Ethylene 2	Fresh Benzene	EthylBenzene Product	DiethylBenzene Recycle	
Temperature	327.02436	298.15	298.15	298.15	298.15	412.46039	417.353	K
Pressure	105325	2000000	2000000	2000000	110000	110000	125000	Pa
Mass Flow	2.8164747	0.23495933	0.27411923	0.27411922	2.1692258	2.6453167	0.58067941	kg/s
Molar Flow	36.131217	8.3333333	9.7222225	9.7222222	27.77	24.917032	5.4695923	mol/s
Mixture Density	816.82925	26.018203	26.018203	26.018203	852.63478	3.5680724	4.0253548	kg/m <sup>3</sup>
Mixture Specific Enthalpy	-375.9961	-36.17317	-36.17317	-36.17317	-427.2659	158.31615	165.88088	kJ/kg
Mixture Specific Entropy	-1.027598	-0.89390116	-0.89390116	-0.89390116	-1.2145559	0.44468252	0.45338243	kJ/(kg.K)
Molar Fraction (Mixture) / Ethylene	7.2024673E-11	0.93	0.93	0.93	0	0	0	
Molar Fraction (Mixture) / Benzene	0.96564305	0	0	0	1	3.9493861E-16	3.6622382E-21	
Molar Fraction (Mixture) / EthylBenzene	0.019553575	0	0	0	0	1	0.99999908	
Molar Fraction (Mixture) / O-diethylbenzene	6.1644164E-12	0	0	0	0	2.7181668E-15	9.1771093E-07	
Molar Fraction (Mixture) / Ethane	0.014803378	0.07	0.07	0.07	0	1.1316202E-22	5.4989909E-23	
Molar Fraction (Mixture) / Toluene	5.2577376E-22	0	0	0	0	3.4994909E-20	1.2315431E-19	