Bio-diesel production from vegetable oil deodorization distillate VOOD using NaOH as catalyst.

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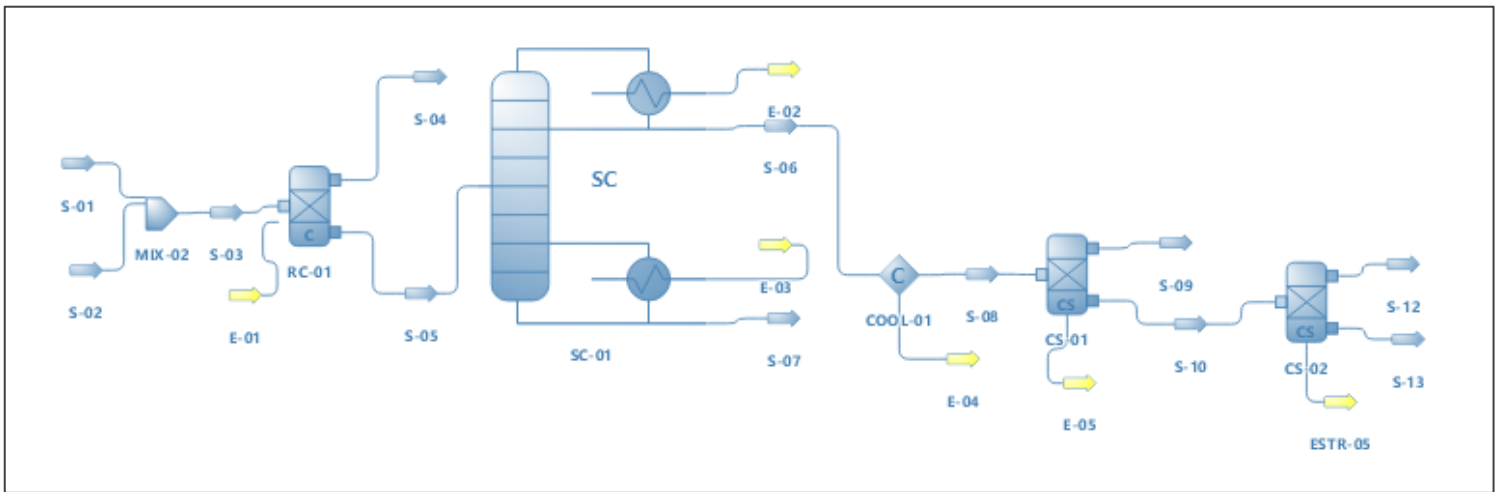
Background & Description:

The byproducts resulting from vegetable oil processing stage, vegetable oil deodorization distillate have been recognized as a potential raw material of producing bio diesel. During this simulation of study, we choose VOOD to be composed of mainly two acids i.e. linoleic acid and oleic acid. The property package that was optimum for the process was UNIFAC as most of the components were polar in nature. The biodiesel that is product of the overall process mainly represented as ethyl linoleate and ethyl oleate. The main operational units in the process included conversion reactors, extraction columns, and separators according to the flowchart of the simulation processes

The process flowchart consisted of the reaction step (oil trans-esterification) and separation of the ethyl esters produced, excess ethanol and purification of biodiesel via separators.

The feed S-01 mainly composed of ethanol and sodium hydroxide in 5% wt. ratio and S-02 composed of linoleic acid with fractions of glycerol and water. The material is mixed well and goes into the reactor where esterification takes place. The stream (stage 5) coming out from the reactor is composed of ethanol, sodium hydroxide and ethyl linoleate is passed on to distillation column (stage 10) to make the stream free from ethanol solution, that can be observed from S-06 is further cool down using a heat exchanger. The stream is further passed on to two separators to make the stream free from sodium hydroxide and glycerol respectively. The resulting stream is purified bio-diesel.

Flowsheet:



Result:

Stream Summary							
Object	S-13	S-10	S-06	S-05	S-02	S-01	
Temperature	710.15	710.15	503.644	343.15	343.15	343.15	K
Pressure	101325	101325	101325	101325	101325	101325	Pa
Mass Flow	38.8094	38.9285	41.7861	92.2524	35.7791	56.4733	kg/s
Molar Fraction (Mixture) / Ethanol	0	0	0.01	0.762307	0	0.944	
Molar Fraction (Mixture) / Sodium Hydroxide	0	0	0.348094	0.050684	0	0.056	
Molar Fraction (Mixture) / Ethyl Linoleate (EtLi)	0.996332	0.98623	0.633055	0.09303	0.01	0	
Molar Fraction (Mixture) / Linoleic Acid	0	0	0	0	0.97	0	

Table 1: Simulation Results

Variable	Description	DWSIM	Rodrigues(2017)	Error
Ethyl Linoleate	Mole Fraction	0.996332	0.9974	1.08%

Table 2: Validation

Hence our results validate with the scientific reference that we have used.

Reference:

Process simulation of biodiesel production from vegetable oil deodorization distillate using hydrotalcite-hydroxyapatite as catalyst -http://dx.doi.org/10.33448/rsd-v10i6.15452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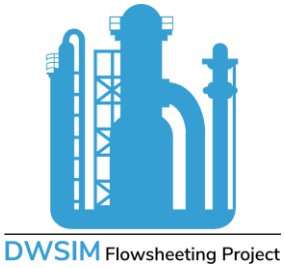
DWSIM Flowsheeting Project