Sour Water Stripping

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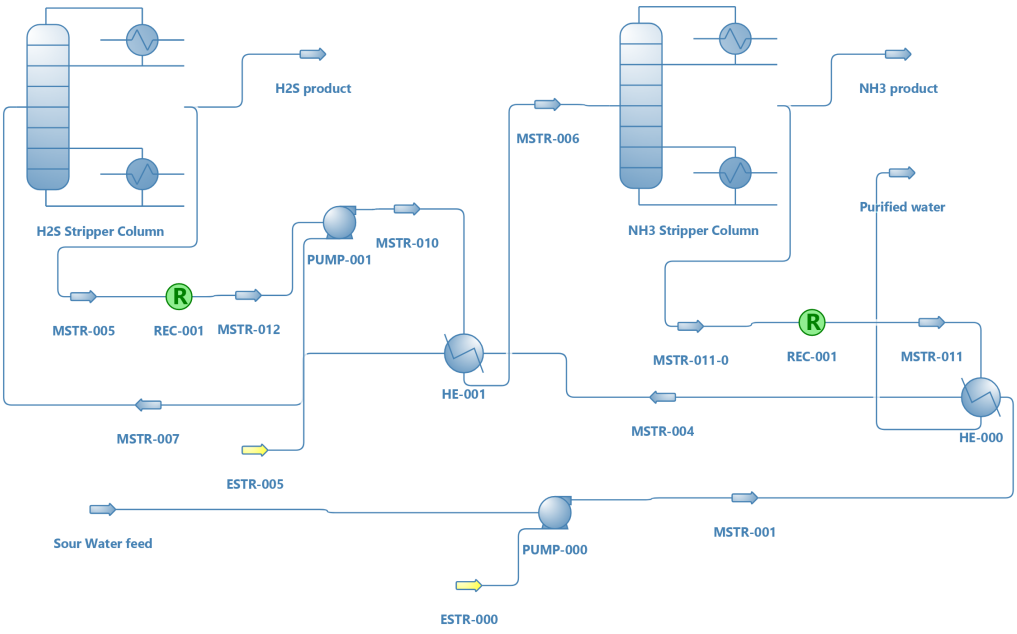
Background & Description:
Sour Water is the wastewater that is produced from atmospheric and vacuum crude columns at refineries. Hydrogen sulfide (H_2S) and ammonia (NH_3) are typical components in sour water that need to be removed before the water can be reused elsewhere in the plant. Removal of these components is done by sending the sour water from the process to a stripping tower where heat, in the form of steam, is applied. The ammonia and hydrogen sulfide contained in the water is released by the heat and exits the top of the tower. The gases removed from sour water received from the refinery are known as sour Gas and are pumped off to the Sulfur Recovery Unit (SRU). This degassed sour water is pumped into a storage tank that serves to dampen the flow rate and facilitates removal of entrained oil and solids.

The first step in this process is known as hydrogen sulfide stripping. The degassed sour water is fed to the acid gas or H_2S stripper column, which is a steam-reboiled distillation column. The hydrogen sulfide, which is stripped overhead, is of high purity - an excellent feed for sulfur recovery units or sulfuric acid plants. The column used for the purpose of H_2S stripping has 20 stages and is operated with reflux ratio of 2.

Next, the hydrogen sulfide stripper stream, containing all the ammonia in the feed water and some hydrogen sulfide, is fed directly to the NH_3 stripper column, which is a refluxed distillation column. In this column, essentially all ammonia and hydrogen sulfide are removed from the water. This column has 12 stages with feed entering at 2nd stage. After exchanging heat with the hydrogen sulfide stripper feed, the stripped water is cooled and sent off for either reuse or treating.



Results:

Object	NaOH + EtOH	NaOH + EtOH + Oil	Reaction Products (M1)	M1**	
Temperature	25.06392	51.07824	51.20892	44.67	C
Pressure	1	1	1	0.296077	atm
Mass Flow	79.030073	303.2891	303.2891	303.2891	g/s
Molar Flow	1.722756	2.000534	2.000539	2.000539	mol/s
Mass Fraction (Mixture) / Ethanol_BD	0.971569	0.253168	0.132914	0.132914	
Mass Fraction (Mixture) / EtP	0.000031	0.000008	0.742583	0.742583	
Mass Fraction (Mixture) / PPP	0	0.739423	0.036971	0.036971	
Mass Fraction (Mixture) / NaOH_BD	0.028369	0.007392	0.007392	0.007392	
Mass Fraction (Mixture) / Glycerol_BD	0.000031	0.000008	0.080139	0.080139	

Object	M1**	Biodiesel + Impurities	Bottoms (Biodiesel)	Water + Impurities	Biodiesel Product	
Temperature	44.67	214.6771	60.00389	147.0185	25	C
Pressure	0.296077	0.296077	1	1	1	atm
Mass Flow	303.289073	263.5016	224.3065	305.2663	224.3065	g/s
Molar Flow	2.000539	1.136907	0.781696	15.12477	0.781696	mol/s
Mass Fraction (Mixture) / Ethanol_BD	0.132914	0.001988	0.000519	0.001334	0.000519	
Mass Fraction (Mixture) / Water_BD	0	0.09224	0	0.871618	0	
Mass Fraction (Mixture) / Glycerol_BD	0.080139	0.85471	0	0.079613	0	
Mass Fraction (Mixture) / EtP	0.742583	0.008509	0.982058	0.016165	0.982058	
Mass Fraction (Mixture) / NaOH_BD	0.007392	0.042554	0	0.007343	0	
Mass Fraction (Mixture) / PPP	0.036971	0.042554	0.017423	0.023926	0.017423	

Table 1: Streamwise Results for Biodiesel Production