SEPARATION OF METHANOL, WATER AND DIMETHYL FORMIDE

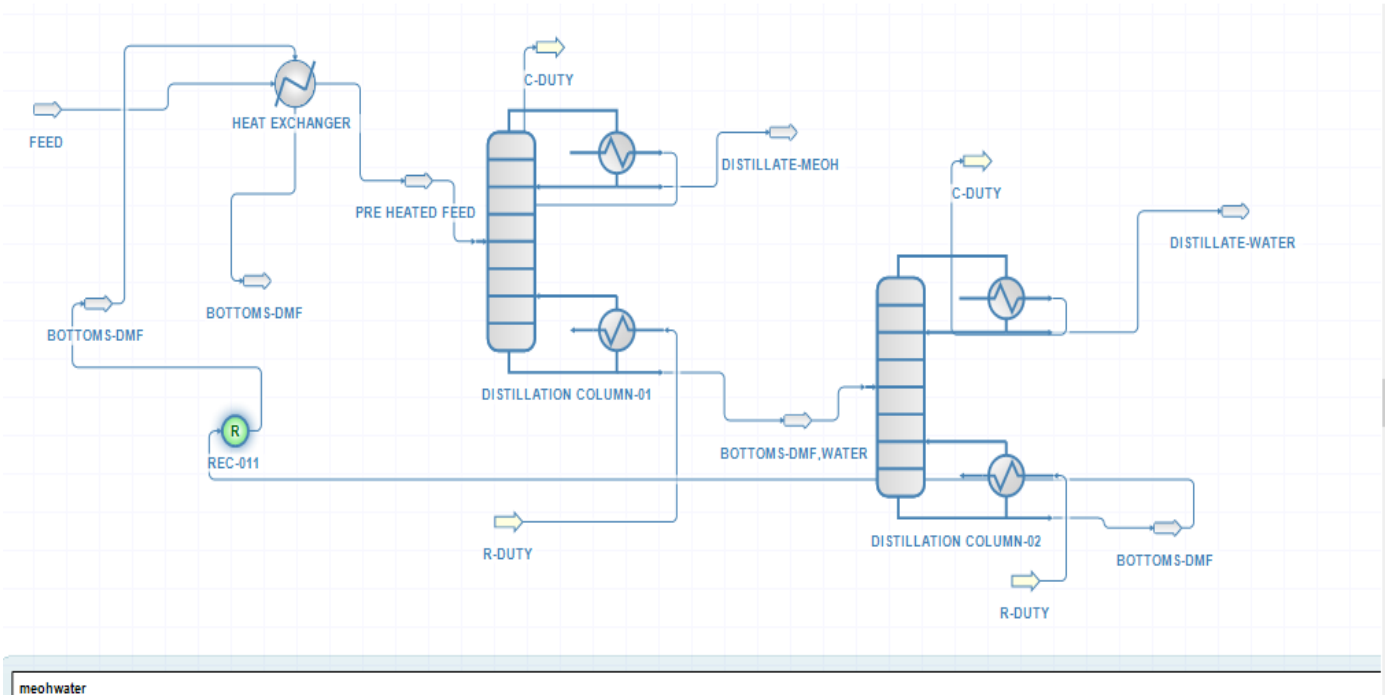
Introduction:

This flow sheet is drawn based upon my working organization. We have daily separation of 48kl of spent, In which we have 70% of methanol, 20% of water and 10% of DMF. We have to maintain the purity of methanol with not less than 95 percent. In this process I used two distillation columns, one heat exchanger and one recycle stream.

Description of flow sheet:

In this process initially Methanol, water and DMF taken with 0.7, 0.2 and 0.1 mole fractions respectively.The feed was taken as 3600 kg/hr. The initial temperature of feed was 25^0c and it was pre heated by using the BOTTOMS-DMF. After raising the temperature it was sent to distillation column-01 in which methanol and water, DMF separated. In the distillation column-01 the distillate temperatures not maintain more than 65^0c because methanol boiling point is 64.6^0c .Put the temperature indicator at the top of distillation column-01. DMF and water is separated in the distillation column-02. In the distillation column-02 water and DMF are separated. BOTTOMS-DMF is used to pre heat the feed.

Flow sheet:



Separation of methanol, water and DMF

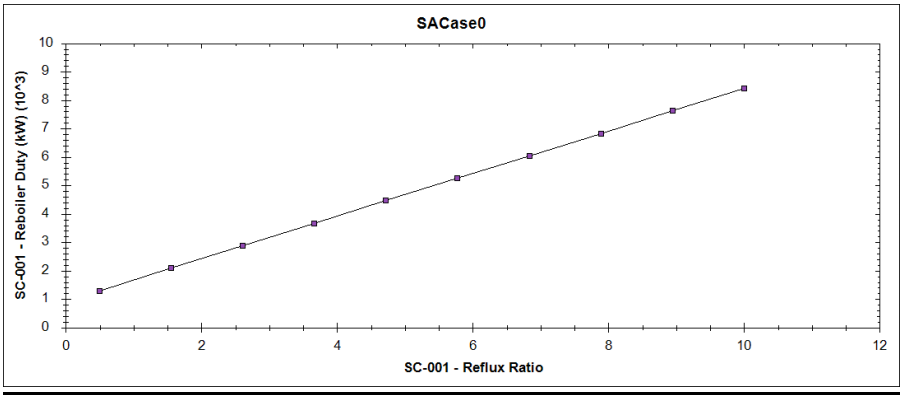
Results:

meohwater							
Object	PRE HEATED FEED	FEED	DISTILLATE-WATER	DISTILLATE-MEOH	BOTTOMS-DMF,WATER	BOTTOMS-DMF	
Temperature	42.1946	25	97.6149	64.7514	107.861	45.5793	C
Pressure	1.033	1.033	1.033	1.033	1.033	1.033	kgf/cm2
Mass Flow	3600	3600	399.218	2425.22	1174.78	775.602	kg/h
Molar Flow	62334.8	62334.8	12273.5	43888.8	18446.1	6173.79	m3/d @ BR
Volumetric Flow	4.37267	4.29185	0.421035	3.53084	1.31618	0.833377	m3/h
Mixture Density	823.295	838.798	948.184	686.869	892.572	930.673	kg/m3
Mixture Molar Weight	33.3418	33.3418	18.7784	31.9018	36.7679	72.5277	kg/kmol
Mixture Specific Enthalpy	-1147.28	-1200.38	-2036.68	-1055.07	-987.178	-607.852	kJ/kg
Mixture Specific Entropy	-3.39643	-3.78656	-5.41945	-3.08791	-2.36621	-1.88186	kJ/[kg.K]
Mixture Molar Enthalpy	-38252.2	-40022.7	-38245.5	-33658.7	-36296.5	-44086.1	kJ/kmol
Mixture Molar Entropy	-113.243	-126.251	-101.769	-98.5097	-87.0005	-136.487	kJ/[kmol.K]
Mass Flow (Mixture) / Water	389.025	389.025	373.44	13.6953	375.33	1.9265	kg/h
Mass Flow (Mixture) / Methanol	2421.76	2421.76	10.2388	2411.53	10.2378	2.35342E-05	kg/h
Phases	Liquid Only	Liquid Only	Liquid Only	Mixed	Liquid Only	Liquid Only	
Energy Flow	-1147.28	-1200.38	-225.855	-710.774	-322.144	-130.959	kW

Separation of methanol, water and DMF-Results

Analysis:

Reflux vs Re-boiler duty for distillation column-01



x-axis: Reflux ratio y-axis: Re-boiler duty

Conclusion: Separation of methanol from water and DMF is very important process in so many chemical and Pharmaceutical companies.So this flow sheet give basic idea of separating the solvents for industrial purposes. Reference: Covalent laboratories pvt ltd