ABSTRACT

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PROBLEM STATEMENT:

Minimum boiling point separation of azeotropic mixture of tri-chloromethane/methyl alcohol

➢ **OBJECT USED:**

1. Distillation column
2. Material Stream
3. Recycle block
4. Valve

INTRODUCTION:

Methanol is a simple alcohol which is light, volatile and colorless. Trichloromethane is an organic compound which has application. Anesthetic preserver in production of polytetraflouroethane. And reagents in several processes. The mixture of tri-chloromethane – methyl alcohol forms a minimum boiling point

azeotropic with 34 mole percent methyl alcohol at 327 K under 1 atm pressure. In order to separate the mixture efficiently we use pressure swing distillation because it is more economical as compared to other processes. It is process in which distillation uses two columns operating at two different pressure to separate mixture by recycling the distillate streams.

PROCESS:-

In this process stream FEED having 0.5 mol fraction of methanol and 0.5 mol fraction of chloroform in distillation column which has 24 stages. The feed is fed to 9th stage. And recycled one at 3rd stage. The flow rate is 100 kmol/hr at 300 k. whereas recycle ratio is 0.64. The first distillation bottom product contains 0.995 mol % of methanol and temperature is 337.738 K. The distillate from first column is send to the second column using pump having 810600 Pascal pressure difference from distillate. The feeding stage in second column is at 20th stage. And the number and stages and reflux ratio is 25 and 0.95. The distillate2 from second column is recycled and fed back to first distillation column of stage 3 and the bottom product contain 0.995 mol% chloroform with 49.32 kmol/hr.

Here first column is at low pressure i.e at 1 atm and second column is at 9.99 atm pressure.

FLOWSHEET:
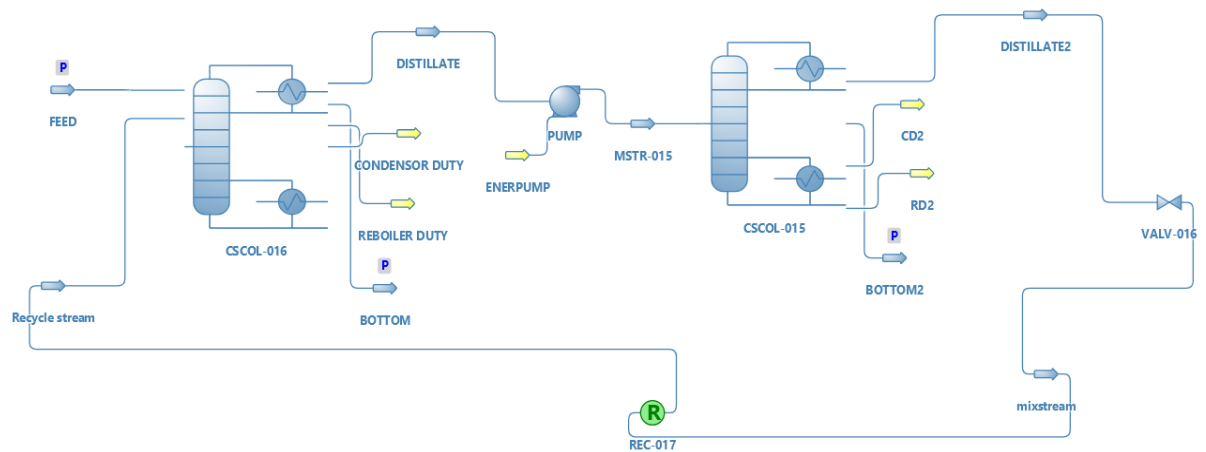
VALUES OF STREAMS:

	FEED	DISTILLATE	BOTTOM	BOTTOM2	DISTILLATE2	FFED2	mixstream	Recycle
Temperature (K)	300	335.461	337.738	426.498	415.941	335.681	336.262	336.262
Pressure (Pa)	101325	101325	101325	1.0132E+06	1.0132E+06	1.01325E+06	101275	101275
Mass Flow (kg/s)	2.09716	3.31076	0.4464	1.63768	1.67308	3.31076	1.67308	1.67308
Molar Flow (mol/s)	27.7	37.6493	13.7444	13.7688	23.8805	37.6493	23.8805	23.8805
Volumetric Flow (m3/s)	0.00205824	0.00312755	0.000618948	0.00131946	0.00211655	0.00310087	0.216472	0.216472
Mixture Density (kg/m3)	1018.91	1058.58	721.223	1241.17	790.474	1067.69	7.72885	7.72885
Mixture Molar Weight (kg/kmol)	75.7097	87.9367	32.4785	118.941	70.0606	87.9367	70.0606	70.0606
Mixture Specific Enthalpy (kJ/kg)	-454.423	-333.222	-1033.55	-121.706	-285.606	-332.073	-285.606	-285.606
Mixture Specific Entropy (kJ/[kg.K])	-1.40067	-0.873509	-3.04662	-0.405917	-0.810689	-1.08709	-0.73496	-0.73496
Mixture Molar Enthalpy (kJ/kmol)	-34404.3	-29302.4	-33568.3	-14475.9	-20009.7	-29201.4	-20009.7	-20009.7
Mixture Molar Entropy (kJ/[kmol.K])	-106.044	-76.8135	-98.9497	-48.2802	-56.7974	-95.5947	-51.4917	-51.4917
Mixture Thermal Conductivity (W/[m.K])	0.139946	0.123554	0.190328	0.0924419	0.118523	0.123508	0.0968453	0.0968453
Vapor Phase Density (kg/m3)	0	3.29397	0	0	0	0	2.6076	2.6076
Vapor Phase Molar Weight (kg/kmol)	0	90.6681	0	0	0	0	71.9825	71.9825
Vapor Phase Specific Enthalpy (kJ/kg)	0	24.8163	0	0	0	0	29.5114	29.5114
Vapor Phase Specific Entropy (kJ/[kg.K])	0	0.19191	0	0	0	0	0.20414	0.20414
Vapor Phase Molar Enthalpy (kJ/kmol)	0	2250.05	0	0	0	0	2124.3	2124.3
Vapor Phase Molar Entropy (kJ/[kmol.K])	0	17.4001	0	0	0	0	14.6945	14.6945
Vapor Phase Thermal Conductivity	0	0.0119901	0	0	0	0	0.0142511	0.0142511
Vapor Phase Kinematic Viscosity (m2/s)	0	3.60614E-06	0	0	0	0	4.50304E-06	4.50304E-06
Vapor Phase Dynamic Viscosity (Pa.s)	0	1.18785E-05	0	0	0	0	1.17421E-05	1.17421E-05
Vapor Phase Heat Capacity (Cp)	0	0.682732	0	0	0	0	0.795725	0.795725
Vapor Phase Heat Capacity Ratio (Cp/Cv)	NaN	1.15515	NaN	NaN	NaN	NaN	1.1698	1.1698
Vapor Phase Mass Flow (kg/s)	0	8.23571E-05	0	0	0	0	0.561315	0.561315
Vapor Phase Molar Flow (mol/s)	0	0.000908336	0	0	0	0	7.79794	7.79794
Vapor Phase Volumetric Flow (m3/s)	0	2.50024E-05	0	0	0	0	0.215261	0.215261
Vapor Phase Compressibility Factor	0	1	0	0	0	0	1	1
Vapor Phase Molar Fraction	0	2.41262E-05	0	0	0	0	0.32654	0.32654
Vapor Phase Mass Fraction	0	2.48756E-05	0	0	0	0	0.335498	0.335498
Vapor Phase Volumetric Fraction	0	0.00799425	0	0	0	0	0.994406	0.994406
Liquid Phase (Mixture) Density (kg/m3)	1018.91	1067.08	721.223	1241.17	790.474	1067.69	918.158	918.158
Liquid Phase (Mixture) Molar Weight	75.7097	87.9367	32.4785	118.941	70.0606	87.9367	69.1287	69.1287
Liquid Phase (Mixture) Specific Enthalpy	-454.423	-333.231	-1033.55	-121.706	-285.606	-332.073	-444.705	-444.705
Liquid Phase (Mixture) Specific Entropy	-1.40067	-0.873535	-3.04662	-0.405917	-0.810689	-1.08709	-1.2091	-1.2091