Introduction:

Methanol and Methyl acetate use as an organic solvent in chemical industry and pharmaceutical industry. Due to great application prospect in industry. It is attractive and necessary to separate them in this flowsheet high purity separation of ternary mixture. Methanol/water/methayl acetate is not separate use a common operation. So i have two distillation column for separation of this ternary mixture. Otherwise i have use three distillation column for separation of this ternary mixture. But I have used two distillations for separate this ternary mixture because main reason is cost is low, time consumption and good purity. Methanol, water and methayl acectate are feed and solvent is used water in the first exrective distillation column in this column above product is methyl acetate and below mixture of water and methanol. This mixture pressure increases by pump after this mixture is added feed in second simple distillation column. In this above product is methanol and below separate water

Process:

The ternary mixture is fed at 3500 kg/h with the mass fraction of 45 wt. % methyl acetate, 40 wt. % methanol, and 15 wt. % water.the mixture is fed in first column c1.the first column pressure 20 kpa. here i have using NRTL thermodynamics properties.They are distilled to methyl acetate 99.9% and residue product are methanol and water mixture. The mixtures are 54 kpa increase pressure by pump. they mixture are fed in column c2.they are distilled to methanol 96% and water 99.9%. The boiling points of methyl acetate, methanol and water are 330.2 K, 337.68 K and 373.15 K, respectively.

Result:

Object	Water product	Water feed	Methyl acetate	Methanol	Feed 2	Feed 1	Bottom product
Temperature	83.21049	83.04804	17.130086	46.83839	43.30503	25	43.28493

(c)	8	7		5	4		5
Pressure (bar)	0.54	0.54	0.2	0.54	0.74	0.0101325	0.2
Mass flow (kg/h)	3709.7745	3183.8742	1432.5467	1541.5531	5251.3275	3500	5251.3275
Molar flow(kmol/h)	205.90362	176.7362	19.349075	45.578051	251.48167	94.096121	251.48167
Molar fraction of methyl acetate	2.1482373E-06	0	**0.99900002**	0.04236509	0.0079926	0.22595072	0.007679926
Molar fraction of methanol	0.00013710282	0	0.00099997838	**0.95758974**	0.17366397	0.46434064	0.17366397
Molar fraction of water	**0.999986075**	1	6.0318613E-20	4.5170208E-05	0.81865611	0.30970864	0.81865611

Conclusion:

The simulated results manifested that water is the best solvent for separation of ternary mixture containing methyl acetate, methanol and water which originated from chemical waste. the feasibility of simple distillation was analyzed at different pressures by DWSIM and purity of methyl acetate/methanol/water in distillation reached 99.9 wt.%, 96 wt.%, and 99.9 wt.%, respectively.the lower-pressure column and solvent are beneficial to increase the relative volatility of methyl acetate-methanol mixture and reduce the energy consumption.

References:

Xiaoxin gao, biyun zhu, jiangqan ma, deming yang, a combination of pressure swing and extractive distillation for separating complex binary azeotropic system, chemical engineering and processing https://doi.org/10.1016/j.cep.2017.10.012