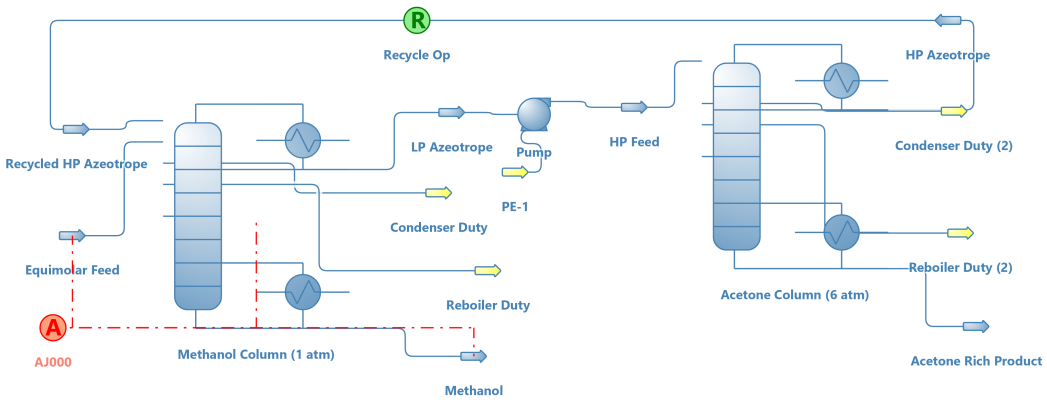
Pressure Swing Azeotropic Distillation of Methanol-Acetone

Priyam Nayak
Indian Institute of Technology Bombay

Background & Description:
Pressure swing distillation is one of the most common methods for separating a binary homogeneous azeotrope. This method is preferred when the composition of the azeotrope changes with pressure.

In this process, equimolar amount of methanol - acetone mixture enters a low pressure column (LPC) at 300 K temperature and 1 bar pressure. The column consists of 52 stages including the condenser and reboiler. Feed enters at the 37^{th} stage. The low pressure column operated at 1 bar. The column is operated at reflux ratio of 2.36. The distillate from the first column gives an azeotrope with 75% acetone (mol basis). The temperature of the top product is around 314 K. The bottoms from the column gives methanol with 99.5% purity. The top product from the LPC is pumped into a high pressure column (HPC) operating at 10 bar. The HPC consists of 62 stages with the pumped feed entering at 41^{st} stage. The column is operated at reflux ratio of 3.11. The bottoms from the HPC gives 99.4% acetone. The distillate from the HPC comprising 60% methanol is recycled to the LPC at the 41st stage.



Results:

Object	Recycled HP Azeotrope	Methanol Methanol	LP Azeotrope LP Azeotrope	HP Feed HP Feed	HP Azeotrope HP Azeotrope	Equimolar Feed	Acetone Rich Product	
Temperature	394.949	337.9007	329.8019	330.0324	394.949	300	394.949	K
Pressure	607950	101325	101325	607950.1	607950	101325	607950	Pa
Mass Flow	0.11068	0.01602	0.13975	0.13975	0.11068	0.045	0.02904	kg/s
Molar Flow	1.90569	0.5	2.40619	2.40619	1.90569	0.9986	0.5	mol/s
Molar Fraction (Mixture) / Methanol	0	1	0	0	0	0.5	0	
Molar Fraction (Mixture) / Acetone	1	0	1	1	1	0.5	1	

Table 1: Streamwise Results for Pressure Swing Distillation of Methanol-Acetone