

Refrigerated-Purge Distillation Column

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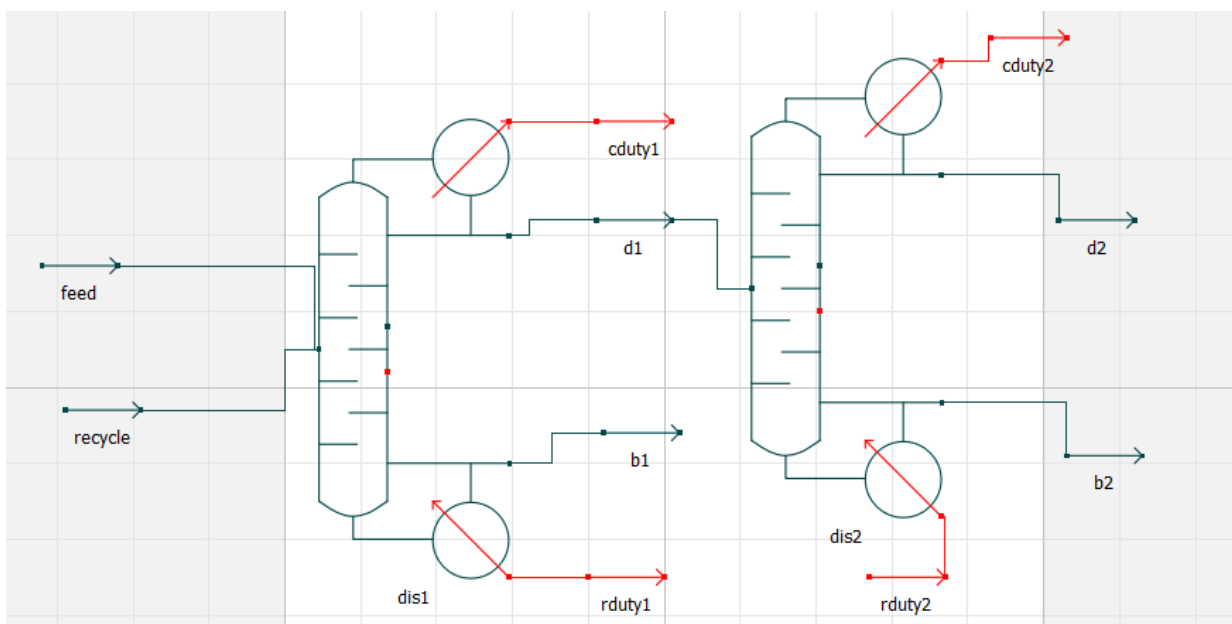
Background & Description:

It is often seen that in industry, to remove the heat from the condenser of distillation column cooling water is used because of its less expansive nature. But when the distillate contains low boiling compound then it requires a high pressure inside the column; the high column pressure makes the separation between the light- and heavy-key components difficult, which results in high energy consumption. To avoid this, there is one alternative solution named Refrigerated-Purge Distillation Columns.

In the flowsheet, the fresh feed stream is mixed with the recycle stream to become final feed to the distillation column (dist1). The recycle is at 321.037 K temperature and 137895 Pa of pressure while that of feed with 310.928 K of temperature and 101325 Pa of pressure. In the distillation column (dist1) we try to achieve the 60 mol/mol% useful light-key component in distillate stream (d1). This distillate stream is feed into the second column and condensation is done. In the distillation column (dist2) 137895.2 Pa is maintained.

From the distillation column (dist2) 98 mol/mol% light key compound is obtained at distillate (d2) and the bottom product (b2) is again recycled near to the top of the first columns.

Flowsheet:



Results:

1) DWSIM Result:

material stream					
Object	waste	acetaldehyde	MSTR-007	MSTR-003	
Temperature	341.437	305.095	321.037	326.008	K
Pressure	151685	137895	137895	151685	Pa
Molar Flow	119.58	6.41515	11.5203	17.9354	mol/s
Molar Fraction (Mixture) / Acetaldehyde	0.0001	0.98	0.388395	0.6	
Molar Fraction (Mixture) / Methyl acetate	0.525859	0.018016	0.423363	0.278379	
Molar Fraction (Mixture) / Methanol	0.474041	0.00198403	0.188242	0.121621	

2) OpenModelica Result:

COMPONENT	B1	B2	D1	D2
Acetaldehyde	9.98589e-05	0.388395	0.6	0.98
Methyl acetate	0.526103	0.420931	0.276758	0.0178527
Methanol	0.473795	0.190673	0.123242	0.00214735