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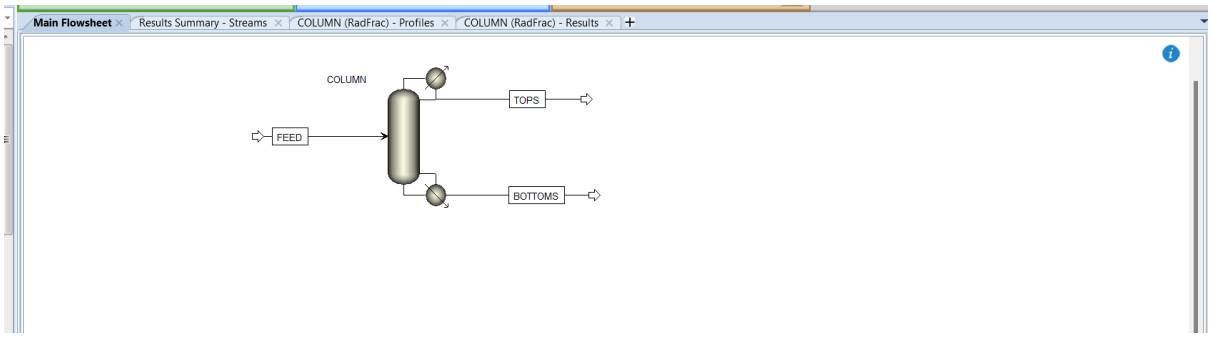
CH18B020

ASSIGNMENT-1 Process Engineering

P = 1 + 0.20 = 1.2 atm

Flowsheet



Mass balance

$$mass\ of\ species\ j\ in\ feed = mass\ of\ species\ j\ in\ distillate + mass\ of\ species\ j\ in\ bottoms$$

Results

Species	units	Feed	Bottoms	Distillate
acetone	kg/hr	14.5200	0.02021	14.4998
ethanol	kg/hr	11.5173	0.01734	11.4999
n-butanol	kg/hr	18.5307	18.4770	0.05369
phenol	kg/hr	23.5283	23.5283	1.88E-09
Total	kg/hr	68.0962	42.0428	26.0534

The concentrations (mole fraction) of the distillate and bottoms streams

	$x_{Acetone}$	$x_{Ethanol}$	$x_{Butanol}$	x_{Phenol}
Distillate	0.4993	0.4992	0.0014	4.00E-11
Bottoms	0.00070	0.00075	0.49855	0.50000

Vapor and liquid composition profile along the column

	Vapor				Liquid			
	$y_{Acetone}$	$y_{Ethanol}$	$y_{Butanol}$	y_{Phenol}	$x_{Acetone}$	$x_{Ethanol}$	$x_{Butanol}$	x_{Phenol}
Distillate	0.6934	0.3065	0.0002	6.50E-14	0.4993	0.4992	0.0014	4.00E-11
Tray 1	0.4993	0.4992	0.0014	4.0E-11	0.2633	0.7264	0.0103	1.19E-08
Tray 2	0.3051	0.6861	0.0088	9.81E-09	0.1244	0.8258	0.0498	1.62E-06
Tray 3	0.1937	0.7654	0.0409	1.32E-06	0.0678	0.7487	0.1834	1.35E-04
Tray 4	0.1507	0.7008	0.1484	1.09E-04	0.0459	0.4888	0.4597	0.0056
Tray 5	0.1374	0.4909	0.3673	0.0045	0.0441	0.2214	0.6415	0.0930
Tray 6	0.0530	0.2670	0.6710	0.0089	0.0157	0.0859	0.8021	0.0963
Tray 7	0.0188	0.1036	0.8652	0.0125	0.0052	0.0282	0.8678	0.0988
Tray 8	0.0061	0.0339	0.9443	0.0157	0.0017	0.0087	0.8796	0.1100
Tray 9	0.0020	0.0103	0.9588	0.0289	0.0008	0.0026	0.8131	0.1835
Bottoms	0.0008	0.003028	0.88112	0.115053	0.0007	0.00075	0.49855	0.50000