METHANOL-WATER-DISTILLATION

Background: Preheating of the feed in distillation columns is done usually for the following reasons

1) To save energy: Feed pre-heater normally uses the residue/bottoms from the tower or uses waste heat or low pressure steam, with little value, this saves more valuable re-boiler steam.
2) Supplements re-boiler capacity: If the tower is not condenser limited, but limited by the capacity of the re-boiler, then more feed pre-heat will permit higher reflux rates and hence better fractionation efficiency.
3) Stops flooding in bottom section trays: If the tower is limited by flooding or entrainment in the bottom stripping trays, then more feed preheat which reduces the re-boiler duty will improve fractionation.

Description of the flow-sheet: The feed is sent to a heat exchanger where it is heated by the recycled bottoms from the distillation column. Preheated feed is now sent into the distillation column and the reflux ratio is changed until the required output product composition is obtained.

Results:

The distillate has a weight fraction of 0.95 methanol or a mole fraction of 0.919532

The residue has a mole fraction of 0.002260

Feed enters the heat exchanger at 26.7 degrees Celsius and leaves it at 51.64 degrees Celsius

Bottoms enters the distillation column at 99 degree Celsius and leaves at 55 degree Celsius.

Reference:

Mass Transfer Operations by Robert E Treybal (3rd Edition)

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