HEAT BALANCE

Reactor:C_P data is obtained from Smith & Van Ness

Assumptions:The reactant stream is heated to a temperature of 100^oC by heat exchange with product stream.Reaction takes place at temperature of 340C.The temp. of product

Gases reduces 200^o C due to coolant & reactant stream.

Heat i/p + Heat generated = Heat o/p + Heat removed by coolant + Heat to waste heat boiler

Heat i/p $Qi = [mC_P\Delta T]CO + [mC_P\Delta T]H_2$

CO,C_P = 30.142 kJ/kmolesK

H_2 , C_P=29.98 kJ/kmolesK

$\Delta T = 100 – 25 = 75\ ^oC$; 25^oC = reference temperature

then Qi = 1702472.244 kJ/hr

Heat generated = $\sum(\Delta H)n = 20101 \times 10^3$ kJ/kmolesK

Heat o/p, Qo = $\sum[mCP\Delta T]$

	C_P, kJ/kmolesK
CH_3OH	**69.86**
CO	30.83
H_2	29.346
CH_4	53.67
H_2O	36.507
CO_2	48.135

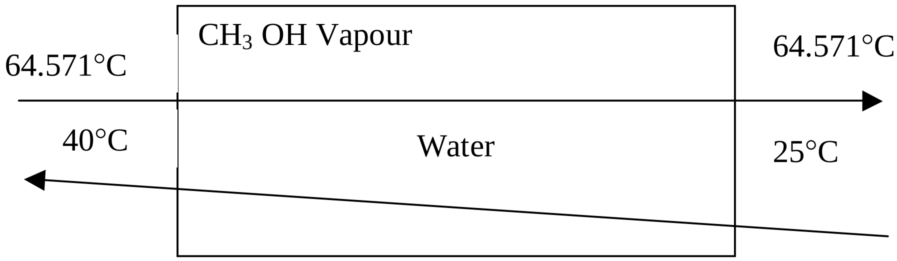
$\Delta T = 340 – 200 = 140\ ^oC$

then Qo = 4239286.35 kJ/hr

Heat removed by coolant water,Qw = 3391429.08 kJ/hr

Then heat sent to waste heat boilerQb = 14172756.8 kJ/hr

Condenser of Distillation column-2



Heat Q = [m λ]CH_3OH = [$mC_P\Delta T$]H_2O

Mass flow rate of methanol = 1.157 kg/s

λ = 1737.522 kJ/kg K

then Q = 2010.72 kW

mass flow rate of coolant water = 32.069 kg/s

log mean temperature difference = 31.4775 ^{o}C