Material and Energy Balances

Major Exam 11/01/2020

Time: 2Hour M. Marks:50

1. Examine Figure 1. What is the quantity of the recycle stream in kg/h? In stream C, the composition is 4 % water and 96 % KNO₃. (12)

2. If C_P of SO₂ is 10 cal/gmol.K, what is its value in FPS units? (6)

- 3. In an insulated storage room, 52 pallets, each containing 24 boxes of potatoes, are stacked. Each box corresponds to 2.1 kg of cardboard and 20 kg of potatoes. The respective specific heats are 1.7 kJ/(kg)(°C) for the cardboard, and 3.05 kJ/(kg)(°C) for the potatoes. If the potatoes are cooled at the rate of 0.3°C/h, how much heat must be removed from the room in kW? Neglect the effect of air in the room. (12)
- 4. If CO at constant pressure was burned with excess air to achieve complete combustion and the measured temperature of the exit gases was 1000°C. What was the percentage of excess air used? The reactants entered at 100°C. (20) Standard Heat of Formation:

 $CO_2 = -393.5 \text{ kJ/mol.};$ CO = -110.52 kJ/mol.

Additional Data provided at the bottom.

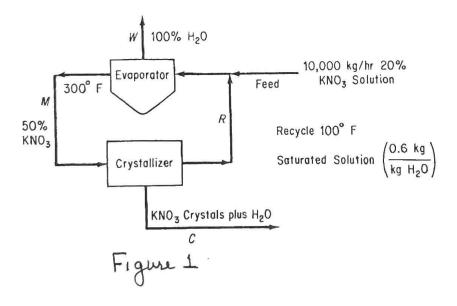


Table B.8 Specific Enthalpies of Selected Gases: SI Units

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