

## Project 2

### Instruction:

- 1) This project can be conducted in a group of maximum 5 members
- 2) Report Structure – Students should Consider Following Criterion in the Report:
  - Elaboration of Understanding on the Given Situation.
  - Theoretical which Related to the Condition.
  - Assumption of Related Parameters
  - Drawing and Calculation.
  - Performance or Significant Indicator of the System.
  - Conclusion.
  - Other Related Section.
- 3) The Report should be Prepared 5 to 7 Pages only with 12 pt, Times New Roman and 1.5 spacing.

### QUESTION 1

- a) Design a vapor compression refrigeration system that will maintain a refrigerated space at  $-15^{\circ}\text{C}$  while operating in an environment of  $20^{\circ}\text{C}$  using refrigerant R134a as the working fluid. Floor area of the refrigerated space is  $15\text{ m} \times 10\text{ m}$ .
- b) A large refrigeration plant is to be maintained at  $-10^{\circ}\text{C}$ , and it requires refrigeration capacity at a rate of 100 kW. The condenser of the plant is to be cooled by liquid water, which taken from river nearby with the plant at temperature of  $20^{\circ}\text{C}$  as. By assuming the plant operates on the ideal vapor-compression cycle using refrigerant R134a, propose a suitable design of the refrigeration plant which completed with cooling water for the condenser.
- c) A transportation company requires transporting fresh meat from Kuantan to Singapore by using a lorry. The weight of the meet is 4000 kg and temperature of the meet must be constant at  $0^{\circ}\text{C}$ . Propose a design of a refrigeration system to transport the meat as required by the above condition.

## **QUESTION 2**

- a) A natural gas-fired furnace in a textile plant is used to provide steam at 250°C. At times of high demand, the furnace supplies heat to the steam at a rate of 30 MJ/s. The plant also uses up to 10 MW of electrical power purchased from the local power company. The plant management is considering converting the existing process plant into a cogeneration plant to meet both their process-heat and power requirements. Your job is to come up with some designs. The design should base on a gas turbine or a steam turbine are to be considered. First decide whether a system based on a gas turbine or a steam turbine will best serve the purpose and considering the complexity. Then propose your design for the cogeneration plant complete with pressures and temperatures and the mass flow rates. Show that the proposed design meets the power and process-heat requirements of the plant.

## **QUESTION 2**

- b) A natural gas-fired furnace in a textile plant is used to provide steam at 250°C. At times of high demand, the furnace supplies heat to the steam at a rate of 35 MJ/s. The plant also uses up to 15 MW of electrical power purchased from the local power company. The plant management is considering converting the existing process plant into a cogeneration plant to meet both their process-heat and power requirements. Your job is to come up with some designs. The design should base on a gas turbine or a steam turbine are to be considered. First decide whether a system based on a gas turbine or a steam turbine will best serve the purpose and considering the complexity. Then propose your design for the cogeneration plant complete with pressures and temperatures and the mass flow rates. Show that the proposed design meets the power and process-heat requirements of the plant.