

Unit-III

Topic -5 Energy Efficiency in Thermal Devices-I

Boiler:

1. Name three factors affecting the boiler efficiency and explain briefly?
2. Discuss the various types of heat losses in a boiler?
3. How do you measure boiler efficiency using direct method?
4. What do you understand by term evaporation ratio? What are the typical values for coal and oil-fired boiler?
5. What do you understand by the term 'Turn Down Ratio'?
6. What are the methods available for assessing the boiler efficiency and explain briefly?
7. List the 5 energy conservation measures in improving the boiler efficiency without investment.
8. What is blow down process? Explain methods of blowdown.?
9. Is moisture in coal wasteful?
10. What are the causes for heavy black smoke in a boiler?
11. For boiler at 8 kg/cm² (g) steam pressure. The following details are given, Saturation temperature of steam = 170°C, Sensible heat of water = 171 kCal/kg, Latent heat of evaporation = 490 kCal/kg, Moisture content in the steam = 4%. What is the total heat content of the steam?
12. The following are the ultimate analysis for coal: Calculate the stoichiometric air requirement. Carbon-38%, Ash-35%, Hydrogen-5% , Sulphur-2%. For the same data, calculate the theoretical CO₂. If the actual measured CO₂ is 8%, find out the excess air levels?

Furnace:

1. What are the parameters to be considered in the design of an efficient furnace?
2. Why do furnaces operate at low efficiency? What are the methods by which furnace efficiencies can be improved?
3. What are the major losses in a furnace?
4. How is the furnace performance evaluated by direct and indirect method?
5. What are the instruments required for undertaking performance evaluation of the furnace?
6. What are the methods of waste heat recovery in a furnace?

Topic -6 Energy Efficiency in Thermal Devices-II

Insulator and Refractoriness:

1. What are parameters of wall heat loss and the methods by which wall losses can be reduced?
2. What are the benefits of insulation other than heat loss / heat gain?
3. Explain the term economic thickness of insulation.
4. Explain the advantages of ceramic fiber with respective properties.
5. State briefly the criteria of selection of refractories.

Waste Heat Recovery:

1. What do you understand by the term waste heat? What are the direct and indirect benefits of waste heat recovery?
2. How will you go about developing a waste heat recovery system?
3. Explain the operating principle of a waste heat recovery boiler with examples.
4. Explain following devices with neat sketch
 - (a) Recuperator
 - (b) Economizer
 - (c) Heat pipe
 - (d) Shell and tube heat exchanger
 - (e) run around coil exchanger

Unit-IV

Topic -7 Energy Efficiency in Thermal Devices-III

Heating, Ventilation, Air conditioning (HVAC) and Refrigeration system:

1. Explain with a sketch the working principle of a vapour compression refrigeration plant.
2. Explain the working principle of vapour absorption refrigeration system.
3. List a few energy efficiency improvement options in a refrigeration plant.
4. Explain the term Integrated Part Load Value (IPLV).
5. Explain the impact of condensing and evaporation temperatures on compressor power consumption.
6. Briefly list various energy conservation opportunities in a refrigeration plant.
7. Explain Principle of Heating in a winter days.
8. Explain need of ventilation and methods of ventilation?
9. What is the refrigeration load in TR when 15 m³/hr of water is cooled from 21°C to 15°C? If the compressor motor draws 29 kW, chilled water pump draws 4.6 kW, condenser water pump draws 6.1 kW and Cooling Tower fan draws 2.7 kW, what is overall kW/TR?

Topic 8 Energy, Environment and Climate Change:

1. Explain effect of climate change due to conventional energy utilization.
2. Role of United Nations Framework Convention on Climate change (UNFCCC) in climate change policy forming.
3. Explain in detail Kyoto Protocol.
4. Explain concept of carbon credit in detail.
5. Explain following terms in detail.
(a) Conference of Parties (COP), (b) Clean Development Mechanism (c) Prototype Carbon Fund
6. What are the national action plans for climate change?
7. Write procedures case of CDM.
8. Write short note on ECBC code for Building construction.