

## Exercises

**Problem (2.1)** Boiler produces 4 kg of steam per kg of coal from feed water at 45°C. The steam pressure is 10.5 bar. If the dryness fraction of steam is 0.98, determine the equivalent evaporation from and at 100°C. [Ans. 4.52kg]

**Problem (2.2)** Boiler raises 3.7 kg of water per kg of coal from feed water at 54.5°C, to steam at the pressure of 34 bar and temperature of 370°C. Calculate the equivalent evaporation per kg of coal.

**Problem (2.3)** In a boiler trial, the following observations were recorded:

Boiler pressure=10 bar; dryness fraction of steam=0.95; coal consumption=500 kg/h; calorific value of coal=30500 kJ/kg; feed water temperature=50°C; feed water supplied=4 ton/h.

Find the evaporation factor and equivalent evaporation from and at 100°C in kg per kg of fuel. [Ans. 1.09; 8.7 kg/kg of fuel]

**Problem (2.4)** Boiler produces 9000 kg of steam while 1 ton of coal is burnt. The steam is produced at 10 bar from water at 15°C. The dryness fraction is 0.9. Determine the efficiency of the boiler when the calorific value of coal is 32000 kJ/kg. [Ans. 70.65 %]

**Problem (2.5)** A boiler delivers steam at 100 bar and 500°C. The feed water inlet temperature is 160°C. The steam is produced at a rate of 100 ton/h and the boiler efficiency is 88%. Estimate the fuel burning rate in kg/h, if the calorific value of fuel is 21 MJ/kg. [Ans. 14.6 ton/h]

**Problem (2.6)** A steam power plant consisting of boiler, economizer, and superheater. It has the following particulars: steam pressure=12.6 bar; temperature of steam leaving the superheater=245°C; Fuel used per hour=1000 kg; feed water per hour=9000 kg; temperature of feed water entering the economizer=40°C; temperature of feed water leaving the economizer =115°C; dryness fraction of steam leaving the boiler=0.9; calorific value of fuel used=30240 kJ/kg.

Calculate: (1) Overall efficiency of the plant, and (2) Percentage of heat in fuel used in the boiler, economizer, and, superheater.

[Ans. 81.3%; 62.6%; 9.37%; 9.33%]

**Problem (2.7)** During a boiler trial for 24 hour the following is observed; Steam generated = 160000 kg; Mean steam pressure = 12 bar; State of steam generated = 0.85; Feed water temperature = 30°C; Coal burnt = 16000 kg; C.V. of coal = 33400 kJ/kg; Determine equivalent evaporation from and at 100°C and efficiency of boiler.

[Ans.10.45 kg/kg of coal, 70.65%]

