CHAPTER 8

RESULTS AND DISCUSSION ON NANOFLOWID-COOLED CONDENSER

8.1 INTRODUCTION

Tests were conducted using R407C with CuO/water nanofluid-cooled condenser. During first trial the condenser temperature was maintained constant at 40°C, 45°C and 50°C and the evaporator temperature was varied of 5°C, 10°C and 15°C. Tests were repeated with condenser temperatures of 40°C, 45°C and 50°C while maintaining the evaporator temperature at 5°C, 10°C, and 15°C.

Coefficient of performance of the air conditioning system with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser are compared and results were analyzed for R407C.

8.2 EFFECT OF EVAPORATOR TEMPERATURE ON R407C SYSTEM WITH AIR-COOLED, WATER-COOLED AND CuO/WATER NANOFLOWID-COOLED CONDENSER

The coefficient of performance for R407C system with air-cooled, water-cooled and nanofluid-cooled condenser are shown in Figures 8.1 – 8.3 for the experiments conducted at constant condenser temperature of 40 °C, 45 °C and 50 °C and by varying the evaporator temperatures. The COP is found to increase as the evaporator temperature increases.
Figure 8.1  Effect of evaporator temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser

Figure 8.2  Effect of evaporator temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser
Figure 8.3 Effect of evaporator temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser

From the Figure 8.1 – 8.3, the average increase in COP with the condenser temperature of 40°C, 45°C and 50°C in nanofluid-cooled condenser are 28.4%, 91.4% and 167% respective condenser temperature as compared with air-cooled condenser. The comparison of nanofluid-cooled condenser and water-cooled condenser shows that the increases in COP are 9.47%, 9.11% and 8.86% with respect to 40°C, 45°C and 50°C of condenser temperature. The increase in COP is mainly due to the higher heat capacity of the nanofluid.

8.3 EFFECT OF CONDENSER TEMPERATURE ON R407C SYSTEM WITH AIR-COoled, WATER-COOLED AND CuO/WATER NANOFLUID-COOLED CONDENSER

The coefficient of performance for R407C system with air-cooled, water-cooled and nanofluid-cooled condenser are shown in Figures 8.4 – 8.6
for the experiments conducted at constant evaporator temperature of 5°C, 10°C and 15°C and by varying the condenser temperatures. The COP is found to increase as the condenser temperature increases only in air-cooled condenser and in water-cooled and nanofluid-cooled condenser the COP is increasing with increase in condenser temperature. The increase in trend is mainly based on the outlet conditions of the refrigerant from condenser. Water and Nanofluid absorbs more heat and the outlet condition of the refrigerant of the condenser is in the region of sub-cooling.

Figure 8.4  Effect of condenser temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser
Figure 8.5  Effect of condenser temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser

Figure 8.6  Effect of condenser temperature on COP of R407C with air-cooled, water-cooled and CuO/water nanofluid-cooled condenser
From the figure 8.4 – 8.6, the increase in COP with the evaporator temperature of 5°C, 10°C and 15°C in nanofluid-cooled condenser are 181.94%, 131.5% and 92.19% respective evaporator temperature as compared with air-cooled condenser. The comparison of nanofluid-cooled condenser and water-cooled condenser shows that the increases in COP are 9.01%, 9.02% and 8.96% with respect to 5°C, 10°C and 15°C of evaporator temperature. The higher heat capacity is the main factor to increase in COP.

8.4 CONCLUDING REMARKS

i) The COP is found to the remarkable increase when using the nanofluid-cooled condenser as compared to air-cooled condenser and water-cooled condenser.

ii) The consumption of energy is reduced due to the increase in COP.