

Reducing the amount of required propane refrigerant in the condenser of a commercial air-conditioner by increasing the inlet temperature

¹Jeri Tangalajuk Siang and ²Ahmad Sharifian

^{1,2}Computational Engineering and Science Research Centre (CESRC), University of Southern Queensland, Toowoomba, Australia,

¹Jeri.TangalajukSiang@usq.edu.au

²sharifia@usq.edu.au

The use of synthetic refrigerants in the refrigeration and air conditioning sector is now obsolete due to the fact that they are not environmental friendly. They damage ozone layer and cause global warming which have both direct and indirect adverse effects on humans and environment. Today, the use of alternative refrigerants is well accepted. Hydrocarbon refrigerants are natural compounds, which do not damage the ozone layer, and have very little impact on global warming. The use of a simple hydrocarbon, propane, as a refrigerant is becoming increasingly popular these days due to its high heat capacity and its short lifetime in the atmosphere. However, since propane is extremely flammable, it is prudent to minimize the amount of propane in the system in order to reduce the risks associated with leakage of the explosive gas. In this research, the possibility of reducing the mass of propane in the condenser without sacrificing the heat transfer capacity of the system has been investigated. In an air-conditioner or refrigeration system, condenser accommodates the most mass of the refrigerant compared with those in the other parts of the system. A MATLAB script has been developed which model the performance of a commercial portable air-conditioner. The results show that by increasing the working temperature of condenser from 30°C to 46°C at the ambient temperature of 27°C, about forty percent propane mass saving is achievable. These temperatures are still far below the critical (370°C) and auto-ignition (540°C) temperatures of propane.