REFRIGERANT CHARGE PREDICTION BASED ON DYNAMIC CHARACTERISTICS OF AN AIR CONDITIONER

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ABSTRACT

Refrigerant leakage is one of the most common faults occurred in refrigeration system. Refrigerant charge reduction due to leakage increases the energy consumption and may fatally damage the system. Refrigerant leakage is difficult to detect and diagnose until the refrigerant charge has reached a severe quantity. Various models have been proposed to predict the refrigerant charge using steady-state experimental data under various operating conditions; however, it is known to be costly and time consuming to obtain sufficient steady-state data to develop prediction models for the refrigerant charge. In this study, the dynamic characteristics is assumed to be varied depending on refrigerant charge. Refrigeration charge prediction was carried out based on dynamic models developed using condensation temperature, degree of subcooling, compressor discharge temperature, and power consumption. The dynamic models for the condensation temperature and degree of subcooling can predict the dynamic characteristics with the estimated root mean square error (RMSE) of 0.53 and 0.84°C, respectively. When dynamic characteristics of the condensation temperature and degree of subcooling are used together, the refrigerant charge can be estimated within average prediction error of 2.5% by minimizing the differences between dynamic models and experimental data. The proposed method in this study is considered as an effective technique for predicting the refrigerant charge and fault detect of refrigerant leakage

KEYWORDS: Refrigerant charge, Refrigerant leakage, Dynamic characteristics, Dynamic model, Air conditioner