

Comparative study of controller performance for variable speed compressor using R600a refrigerant

Abstract

R600a is a refrigerant that is more environmental-friendlier compared to other types of refrigerant (Borokinni et al. in NAŠE MORE 65:11–17, 2018). However, it required the use of a Variable Speed Compressor (VSC) in order to be able to regulate its thermophysical properties, which vary the temperature drastically with the slight change in pressure (ASHRAE: 2009 ASHRAE Handbook—Fundamentals (SI). SI edn. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., United States (2009).). In order to efficiently control the speed of VSC, three types of controllers, namely, Adaptive Proportional Controller (P-ARMAX), Fuzzy-Logic (FL) controller and Sliding Mode Controller (SMC) are studied and compared the performance of each controller. The performance of each type of controller was evaluated based on the criteria of its settling time, steady state error, control effort and response temperature. From the studied conducted, it was found that the fuzzy logic controller has the most efficient control effort between the three with an acceptable settling time and steady state error.

Keywords

Adaptive proportional controller; Fuzzy logic controller; Sliding mode controller; Variable speed compressor