Development of Nanolubricant Automotive Air Conditioning (AAC) Test Rig

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ABSTRACT

Nanolubricant been introduced in compressor might improve the performance of automotive air conditioning system. Prior testing of the nanolubricant enhancement performance, an automotive air conditioning (AAC) system test rig base on compact car has to be developed; therefore this paper presented the development process of AAC test rig. There are 15 thermocouples, 2 pressure gauges and power analyzer were assembled on the system in order to analyse its performance. The experiment was conducted with four different charged of refrigerant. The charging was based on initial weight charged. At each quantity of refrigerant charge, performance of the AAC system was evaluated by determining three important parameters which is cooling capacity, compressor work and coefficient of performance (COP). The maximum average COP is achieved at 900 RPM is 7.07. The average and maximum COP enhancement of 7.07 % and 13.34 % were achieved by applying SiO2 nanolubricant inside the compressor.

Keywords: Nanolubricant; Automotive air conditioning (AAC) system; Coefficient of Performance (COP); refrigerant charged.

INTRODUCTION

The air conditioning systems were recognized in past as a luxury item concerning the automotive industry, but nowadays it is considered to be the most essential and important equipment in the field [1]. The automotive air-conditioning (AAC) is become a need to give thermal comfort in passenger's cabin especially in equatorial countries experiencing hot and humid climate throughout a year. The AAC is expected to be able to remove the heat produced in the passenger compartments of the cars as quickly as possible under any given environmental condition. In automotive sectors, air conditioning compressor is the single largest auxiliary load on an automotive engine [2]. Extra load use by the AAC system implies less efficiency, more fuel consumption and more greenhouse gas discharges. A study in 2001 show ACC utilization decreases mileage by around 20% and builds discharges of nitrogen oxides (NOx) by around 80% furthermore, carbon dioxide (CO) by around 70% [2] [3].

One of the best ways to improve the efficiency of AAC is by implementing nanofluids in the refrigeration system; by replacing conventional lubricant with nanolubricant. Adding nanoparticles to the base liquids can altogether increase their transport