PERFORMANCE OF AN EVAPORATOR IN AN AUTOMOTIVE HEATINGVENTILATING AND AIR CONDITIONING UNIT

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Thermal performance of an evaporator used in the automotive air conditioning system was experimentally analyzed. For this aim, an experimental setup that was available in the lab has been modified with the new evaporator, matching condenser, compressor andexpansion device along with instrumentation to measure. The tests were performed at two different conditions of the return air namely (1) 27oC and 40% RH and (2) 40oC and 40% RH for 5 air flow rates typically 2 kg/min, 4 kg/min, 6 kg/min, 8 kg/min and 10kg/min. However for some of the air flow rates the load taken by the evaporator was too low and the R.H was increased up to 60 %. While doing so the evaporator and condenserpressures were maintained. For each test condition the compressor speed and condenser air flow rates were adjusted to achieve a discharge pressure of 17 bar, suction pressure of
3 bar and temperature at TXV inlet to be 45 0C. The air side pressure drop and temperatures across the evaporator, the refrigerant side temperature and pressures across evaporator, TXV and condenser were measured. The power consumed by the compressor was also measured. The refrigerating capacity of the system was estimated from the observed data. Generally the refrigerant mass flow rate increases with air flow rates over the evaporator. The refrigeration effect as well as the work of compression increases with mass flow rates. The degree of sub cooling as well as the suction superheat also have been studied. The maximum refrigerating capacity was found to be
3.8 kW at 10 kg/min air flow rate.

Keywords: Automotive Air Conditioner, COP, Thermal performance, Refrigeration effect, Mass flow rates.

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