The Effect of Relative Humidity on Performance of an Automotive Air Conditioning System

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A steady state computer simulation model has been developed for the refrigeration circuit of automotive air conditioning systems. This model includes a compressor, parallel flow condenser, thermostatic expansion valve, laminate type evaporator, pipes and hoses. The condenser and evaporator's models have been evaluated with manufacturer experimental data. The effect of relative humidity on the performance of system has been investigated. The effect of water vapor condensation outside of the evaporator surface has been considered. In this regard, performance of louver fins under wet condition has been studied, and a wet multiplier for the Colburn factor extracted from open literature. Results showing that the effect of relative humidity on the COP of the system depends on the geometry of the louvers are variable, but generally this effect is negligible. On the other hand, as expected, reduction of sensible heat is significant.