

Effect of air maldistribution on performance of an evaporator

Abstract:

An experimental facility has been constructed to enable the effects of air flow non-uniformity on the transfer performance of refrigerant evaporators to be investigated. This is based on an open-circuit wind tunnel, which is equipped with a single component traversing LDA system, capable of determining local mean velocities and turbulence levels. The refrigerant circuit uses R134a and has been designed to allow maximum flexibility in setting test conditions. Preliminary results are presented from tests on a single circuit finned-tube evaporator with 33 tubes, 300 mm long, arranged in an in-line matrix 4 rows deep, with 25 mm spacing. The height of the fin block was 225 mm, the fin spacing and tube external diameter were 4 mm and 9.5 mm respectively. Contrary to expectations, increases in heat transfer duty and overall heat transfer coefficients were recorded as air flow non-uniformities were artificially introduced, whilst a constant mean air velocity was maintained.