

A Comparative Study between Ionic Wind and Conventional Fan

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Abstract : Ionic wind is developed when high voltage is supplied to an anode and a grounded cathode in a gaseous medium. This paper studies the ionic wind profile with different anode configurations, the relationship between electrode gap against the voltage supplied and finally a comparison of the heat transfer coefficient of ionic wind over a horizontal flat plate against a conventional fan experimentally. It is observed that increase in the distance between electrodes decreases at a rate of $1-e^{-0.0206x}$ as the voltage supply is increased until a distance of 3.1536cm. It is also observed that the wind speed produced by ionic wind is stronger, 2.7ms^{-1} at 2W compared to conventional fan, 2.5ms^{-1} at 2W but the wind produced decays at a fast exponential rate and is more localized as compared to conventional fan wind that decays at a slower exponential rate and is less localized. Next, it is found out that the ionic wind profile is the same regardless of the position of the anode relative to the cathode. Lastly, it is discovered that ionic wind produced a heat transfer coefficient that is almost 1.6 times higher compared to a conventional fan with Nusselt number reaching 164 compared to 102 for conventional fan.

Keywords : conventional fan, heat transfer, ionic wind, wind profile

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