Thesis:

Design Specifications for Wet-Bulb Aspirator Apparatus

Project Description:

The thermodynamic state of a pure substance requires the measurement of two properties, often temperature and pressure. For a substance such as moist air, which consists of dry air and water vapor, three properties must be measured to determine its thermodynamic state. The third property required provides information about the concentration of water vapor in the air. One property that can be used to provide the concentration of water vapor in the air is the wet-bulb temperature. The wet-bulb temperature along with the dry-bulb temperature and pressure are enough properties to thermodynamically define the state of a moist air stream. It is important to be able to accurately measure the properties of moist air to establish the required conditions for the testing of HVAC&R equipment.

The focus of this research is on the accurate measurement of the wet-bulb temperature. Currently ASHRAE Standard 41.6, *The Standard Method for Measurement of Moist Air Properties*, and ASHRAE Standard 41.1, *Standard Method for Temperature Measurement*, specify detailed guidelines for the creation of an aspirated psychrometer. Many devices can be created that adhere to the guidelines specified in the standards, but do not produce accurate and repeatable results. A goal of the research is to determine what factors contribute most to the uncertainty in the measurement of the wet-bulb temperature and to determine the ways in which these can be reduced. Once experimental data is obtained that enforces computer models, in regards to the largest forms of uncertainties in the wet-bulb temperature measurement, the final milestone of the research will be to improve upon the guidelines set forth in ASHRAE Standards 41.6 and 41.1.