Proposal for a presentation within a TC 1.1 seminar in Houston, TX, USA at the 2018 ASHRAE Annual Conference

Transport Properties of Moist Air (ASHRAE RP-1767)

This presentation provides the state of the art calculation method for transport properties of moist air carried out within ASHRAE Research Project RP-1767. Starting with the recent transport properties research for the two components of moist air, dry air, and water, these results are included into the mixture model for transport properties of the mixture moist air. The results are compared against experimental data used to adjust the mixture model. New tables of transport properties as well as two new diagrams for viscosity and thermal conductivity for the ASHRAE Handbook of Fundamentals are under discussion developed as a part of ASHRAE RP-1767.

Authors:

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Presenters Biography:

Sebastian Herrmann is a post-doctoral scientific co-worker at the Zittau/Görlitz University of Applied Sciences, Zittau, Germany. He is working in the research fields of moist air properties as well as in developing viscosity formulations for working fluids. In 2011, he was the recipient of the Homer Addams Award for his findings of ASHRAE RP-1485 and he is an active ASHRAE member.

Learning Objectives:

1. Learn the state of the art models for the calculation of the transport properties of the pure components of the mixture moist air, dry air, and water.
2. Understand the method for calculating transport properties of moist air.
3. Understand the differences between the new diagrams for viscosity and thermal conductivity for moist air compared with those from the current ASHRAE Handbook of Fundamentals.

Question/Answer

1. What are the input values for calculating moist air transport properties?
   (Dry bulb) Temperature T, mixing density ρ_m, and humidity ratio W or mole fraction of water, whereas the mixing density is a function of pressure p, temperature T, and humidity ratio W.
2. What is the most accurate equation set for evaluating moist air transport properties?
   The ones presented in the final report of ASHRAE research project RP-1767.
3. What are the names of the regions of supersaturated moist air ($W > W_s$)?
   Liquid fog for supersaturated states at temperatures above freezing (≈0°C) and ice fog for supersaturated states at temperatures below freezing (≈0°C).
4. What is the reason for the need of an accurate model for thermodynamic properties to calculate transport properties?
   Since most of experimental data are given as function of as well as input values are often temperature, pressure, and a value for the humidity, an accurate equation of state is needed to calculate the mixture density as input value for the transport properties calculation.