Research Activities on the Thermodynamic Properties of Water and Steam of the German National Committee in the Period 2016/2017

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Chair: Ingo Weber, Siemens Power and Gas, Erlangen

Vice Chair: Prof. Dr. Hans-Joachim Kretzschmar, Zittau/Goerlitz University of Applied Sciences, Zittau

Annual Meeting of the German National Committee

The 2017 Annual Meeting of the German National Committee took place at the Helmut Schmidt University in Hamburg on 17th March 2017. 25 Colleagues attended this meeting. Six papers were presented in the scientific session.

In the following, activities of certain members of the German National committee are summarized.

Zittau/Görlitz University of Applied Sciences
Department of Technical Thermodynamics
Prof. Dr. Hans-Joachim Kretzschmar, Dr. Sebastian Herrmann, Matthias Kunick

Projects

1. Development of fast property calculation algorithms based on spline interpolation
    o The Spline-Based Table Look-Up Method (SBTL) is being applied to the mixture humid air.

2. Application of the developed SBTL method for calculating thermodynamic properties

    The developed spline-based property libraries have been implemented into the following process simulation codes:
    o Non-stationary thermo-hydraulic codes SubChanFlow and TwoPorFlow of the Karlsruhe Institute of Technology KIT
    o Non-stationary thermo-hydraulic code RELAP-7 of the Idaho National Laboratory INL
    o Heat-cycle simulation program EBSILON of STEAG Energy Services
    o Heat-cycle simulation program KRAWAL of Siemens Energy Solutions
    o Non-stationary heat-cycle simulation program DYNAPLANT of Siemens Energy Solutions.

3. Development of algorithms for the transport properties of moist air, ASHRAE Research Project 1767.

4. Preparation of a new ASHRAE standard for calculating moist air properties, ASHRAE Project SPC 213P.

5. Reworking on the 3rd edition of the book "International Steam Tables".

Recent Publications
    o Kunick, M.; Berry, R. A.; Martineau, R. C.; Kretzschmar, H.-J.; Gampe, U.:
      Application of the new IAPWS Guideline on the fast and accurate calculation of steam and water properties with the Spline-Based Table Look-Up Method (SBTL) in RELAP-7.
      Kerntechnik 82/3 (2017), 264-279.

o Herrmann, S.; Kretzschmar, H.-J.; Gatley, D. P.:
   In: 2017 ASHRAE HANDBOOK FUNDAMENTALS, SI and I-P Editions, Chapter 1
   PSYCHROMETRICS, Table 2 Thermodynamic Properties of Moist Air at Standard
   Atmospheric Pressure. Table 3 Thermodynamic Properties of Water at Saturation.
   American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA
   (2017), ISBN 978-1-939200-58-0.
   www.ashrae.org

o Kunick, M.; Kretzschmar, H.-J.; Gampe, U.; di Mare, F.; Hrubý, J.; Duška, M.; Vinš, V.;
   Singh, A.; Miyagawa, K.; Weber, I.; Pawellek, R.; Novi, A.; Blangetti, F.; Wagner, W.;
   Friend, D. G.; Harvey, A. H.:
   Fast Calculation of Steam and Water Properties with the Spline-Based Table Look-Up Method
   (SBTL).
   J. Eng. Gas Turbines Power, in preparation.

o Kunick, M.:
   Fast Calculation of Thermophysical Properties in Extensive Process Simulations with the
   Spline-Based Table Look-Up Method (SBTL).
   Fortschritt-Berichte VDI, in preparation.

o Vogel, E., Herrmann, S.:
   New Formulation for the Viscosity of Propane.
   J. Phys. Chem. Ref. Data 45 (2016), 043103.

o Hellmuth, O.; Feistel, R.; Lovell-Smith, J. W.; Kalová, J.; Kretzschmar, H.-J.; Herrmann, S.:
   Virial Approximation of the TEOS-10 Equation for the Enhancement Factor of Water in
   Humid Air.
   N.N. (2017), in preparation.

o Hellmuth, O.; Feistel, R.; Lovell-Smith, J. W.; Kalová, J.; Kretzschmar, H.-J.; Herrmann, S.:
   Digital Supplement to "Virial Approximation of the TEOS-10 Equation for the Enhancement
   Factor of Water in Humid Air".
   N.N. (2017), in preparation.