

CONFERENCE
Nov 11 – 17, 2016

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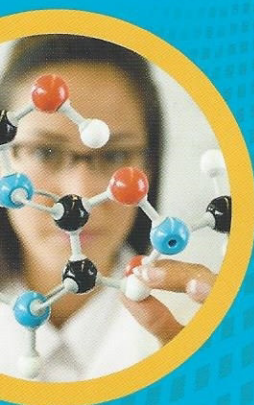
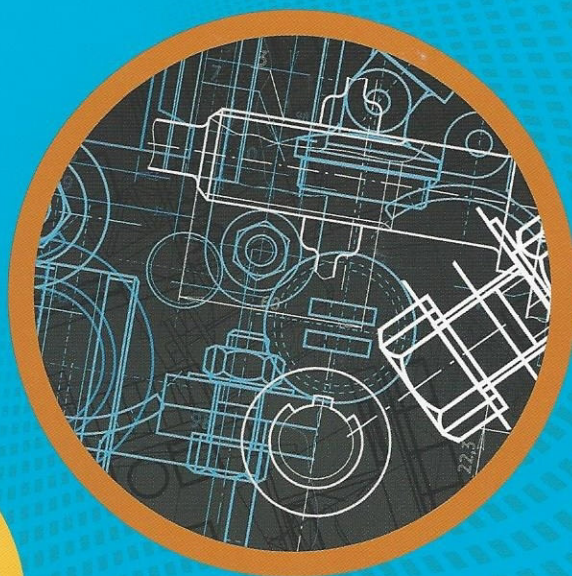
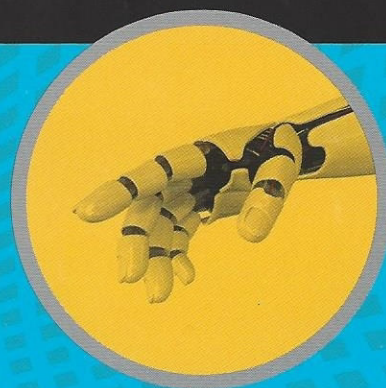
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A Study on the Feasibility of Generating Power Using Tidal Energy

Poster Presentation. IMECE2016-65494 – Satya Prasad Paruchuru, Siva Kalyani Koneti, Deepthi Jammula, VNR VJIET, Hyderabad, India

Numerical Studies of the Effectiveness of Electrodes with Conductive Dots in Flow Batteries

Poster Paper Publication. IMECE2016-65931 – Xuyang Zhang, Song Luo, Hongtan Liu, University of Miami, Coral Gables, FL, United States, Conghua Wang, TreadStone Technologies, Inc., Princeton, NJ, United States

Wind Effects on Blower Door Testing

Poster Presentation. IMECE2016-66988 – Wesley Russelburg, Robert Choate, Western Kentucky University, Bowling Green, KY, United States

Fast and Accurate Calculation of Thermodynamic and Transport Properties with the Spline-Based Table Look-Up Method (SBTL) ? Applied in Heat-Cycle Calculations

Poster Presentation. IMECE2016-67137 – Matthias Kunick, Zittau/Goerlitz University of Applied Sciences, Zittau, Germany, Hans-Joachim Kretzschmar, Zittau/Goerlitz University of Applied Sciences, Zittau, Germany, Francesca di Mare, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Cologne, Germany, Uwe Gampe, Dresden University of Technology, Dresden, Germany

Waste Methane-based Atmospheric Water Harvesting (AWH) for Shale Oil Production

Poster Presentation. IMECE2016-68487 – Enakshi Wikramanayake, The University of Texas At Austin, Austin, TX, United States, Vaibhav Bahadur, University of Texas at Austin, Austin, TX, United States

Experimental and numerical investigation of oxygen transport membrane under pressurized feeding condition

Poster Presentation. IMECE2016-68527 – WooNam Jung, Sungkook Hong, Kwang Sup Song, Daekeun Lee, Jihaeng Yu, Korea Institute of Energy Research, Daejeon, Korea (Republic)

Energy Analysis of Dodecane Combustion in a Heterogeneous/Homogeneous Heat-Recirculating Microreactor for Portable Power Applications

Poster Presentation. IMECE2016-68545 – C. Mike Waits, US Army Research Laboratory, Adelphi, MD, United States, Erik D. Tolmachoff, US Naval Air Systems Command, China Lake, CA, United States, William R. Allmon, Noah E. Zecher-Freeman, US Army Research Laboratory, Adelphi, MD, United States

Preliminary cycle design for a stand-alone oxygen generation system using a ceramic membrane

Poster Presentation. IMECE2016-68590 – Dong Hyun Lee, Jinyoung Jang, Sungkook Hong, Jihaeng Yu, Korea Institute of Energy Research, Daejeon, Korea (Republic)

Ethanol Autothermal Reforming On Rh/CeO₂ Coated Monolith Reactor: A CFD Study Using Porous Media Approximation

Poster Presentation. IMECE2016-68607 – Renika Baruah, Marm Dixit, Pratik Basarkar, Sudhanshu Sharma, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

Development of a Cool Flame Based Vaporizer System for Diesel Autothermal Reformer: Preliminary Experimental Results

Poster Presentation. IMECE2016-68608 – Marm Dixit, Anand Parejiya, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Manjeet Chaudhary, Sai Mani Prudhvi Valleti, IIT Gandhinagar, Gandhinagar, India, Pratik Basarkar, Dhwanil Shah, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

Understanding the negative temperature coefficient phenomenon in methane-air mixtures at high pressures

Poster Presentation. IMECE2016-68609 – Anand Parejiya, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Manjeet Chaudhary, Sai Mani Prudhvi Valleti, IIT Gandhinagar, Gandhinagar, India, Marm Dixit, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

An Experimental Investigation of Effective Diffusivities in Rh/CeO₂ Coated Monolith Layer

Poster Presentation. IMECE2016-68610 – Sai Mani Prudhvi Valleti, IIT Gandhinagar, Gandhinagar, India, Marm Dixit, Anand Parejiya, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Manjeet Chaudhary, IIT Gandhinagar, Gandhinagar, India, Sudhanshu Sharma, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

Numerical Modelling of Heptane Autoignition: Determination of stable working zone for cool flame vaporizer

Poster Presentation. IMECE2016-68611 – Anand Parejiya, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Manjeet Chaudhary, Sai Mani Prudhvi Valleti, IIT Gandhinagar, Gandhinagar, India, Marm Dixit, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

Non-Catalytic Modelling of Reactor for Autothermal Reforming of a Diesel-based System

Poster Presentation. IMECE2016-68613 – Vikas Sharma, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Marm Dixit, Anand Parejiya, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Sai Mani Prudhvi Valleti, IIT Gandhinagar, Gandhinagar, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India

Miniaturized Redox Flow Batteries for Electronic Applications: CFD and Thermal Modeling

Poster Presentation. IMECE2016-68621 – Nehakausar Pinjari, Brijesh Kumar, Indian Institute of Technology, Gandhinagar, Gandhinagar, India, Atul Bhargav, Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat, India, Patrick Ruch, IBM Research Zurich, Zurich, Switzerland

Fast and Accurate Calculation of Thermodynamic and Transport Properties with the Spline-Based Table Look-Up Method (SBTL) – Applied in Heat-Cycle Calculations

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- **Prof. Hans-Joachim Kretzschmar**
Professor, *Zittau/Goerlitz University of Applied Sciences*
- **Prof. Francesca di Mare**
Professor, *Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)*
- **Prof. Uwe Gampe**
Professor, *Dresden University of Technology*

The optimization of non-stationary processes in power plants and their components with heat-cycle calculation software, Computational Fluid Dynamics (CFD), and real-time process simulations requires accurate and extremely fast algorithms for computing thermodynamic and transport properties of the applied working fluids. To fulfill these requirements, the Spline Based Table Look-up Method (SBTL) has been developed in a project of the International Association for the Properties of Water and Steam (IAPWS). This method has been applied to the Industrial Formulation IAPWS-IF97 and the Scientific Formulation IAPWS-95 for the thermodynamic properties of water and steam and the latest IAPWS formulations for the transport properties. SBTL functions of specific volume and specific internal energy (v,u), as well as of pressure and specific enthalpy (p,h) have been generated. With these functions, thermodynamic and transport properties, as well as their derivatives are calculable in the single-phase region and in the two-phase region. Furthermore, numerically consistent inverse functions of pressure and specific volume (p,v) and specific internal energy and specific entropy (u,s) are obtained from the (v,u) SBTL functions. Analogously, inverse functions of pressure and temperature (p,T), pressure and specific entropy (p,s), and specific enthalpy and specific entropy (h,s) are obtained from the (p,h) SBTL functions. The properties calculated from the SBTL functions are in agreement with those of IAPWS-IF97 or IAPWS-95 within a maximum relative deviation of 10 to 100 ppm depending on the property and the range of state. In the single-phase region, computations from the (v,u) spline functions are between 130 and 470 times faster than those from IAPWS-IF97 and are between 240 and 430 times faster than calculations with IAPWS-95. The (p,h) spline functions are between 3 and 30 times faster than calculations with IAPWS-IF97 and are more than 6000 times faster than calculations with IAPWS-95. The SBTL method is successfully applied in several process simulation tools. In KRAWAL, the heat-cycle design software of SIEMENS, the overall computing time is reduced by 50% with regard to calculations based on IAPWS-IF97. In RELAP-7, the leading nuclear reactor system safety analysis software of the Idaho National Laboratory (INL), the simplified property calculation algorithms have been replaced with much more accurate SBTL functions. In the CFD software TRACE of the German Aerospace Agency (DLR), the computing times for flow simulations of steam turbine stages are reduced by a factor of 10 in comparison to those based on the direct application of IAPWS-IF97. The numerical results of all these process simulations show negligible differences from those obtained through the direct application of the underlying property formulations. For generating spline functions for fluid property calculations, the software FluidSplines has been developed. This software enables the application of the SBTL method to all kinds of property functions. The developed method is subject of the "IAPWS Guideline on the Fast Calculation of Steam and Water Properties with the Spline-Based Table Look-Up Method (SBTL)".