

**Proceedings of
ASME 2021 International Mechanical
Engineering Congress and Exposition
(IMECE2021)**

Volume 8A
November 1-5, 2021
Virtual, Online

Conference Sponsor
American Society of
Mechanical Engineers

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Two Park Avenue * New York, N.Y. 10016

© 2021, The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA
(www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel: 978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: <https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions>

ISBN: 978-0-7918-8563-5

CONTENTS

Proceedings of ASME 2021 International Mechanical Engineering Congress and Exposition Volume 8A

Energy

4E Analysis and Optimization of Thermodynamic Systems

IMECE2021-68569	V08AT08A001
Control Temperature of the Air Conditioning System of a Vessel From Exergoeconomic Analysis <i>Deibys Barreto, Juan Fajardo, Julián Berrio, Rosa Torres, Yimy Gordon, and Carlos Vidal</i>	
IMECE2021-68722	V08AT08A002
Sizing Optimization of District Energy Systems Considering Meteorological, Demand, and Electricity Emission Factor Uncertainties <i>Zahra Ghaemi, Thomas T. D. Tran, and Amanda D. Smith</i>	
IMECE2021-69292	V08AT08A003
Methods of Dealing With Co-Products in a Life-Cycle Assessment of Biodiesel Fuel Produced From Waste Cooking Oil <i>Hannah Torres and Nelson Macken</i>	
IMECE2021-69900	V08AT08A004
A Study on the Performance of Solar Driven Absorption Chiller in Terms of Coefficient Of Performance and Exergy Efficiency <i>M. T. Nitsas and I. P. Koronaki</i>	
IMECE2021-70886	V08AT08A005
Thermodynamic, Environmental and Cost Evaluation of Compression-Absorption Parallel and Cascade Refrigeration Chiller <i>Sambhaji Kadam, Muhammad Saad Khan, Alexios-Spyridon Kyriakides, Athanasios I. Papadopoulos, Ibrahim Hassan, Mohammad Azizur Rahman, and Panos Seferlis</i>	
IMECE2021-71428	V08AT08A006
Mixed-Integer Nonlinear Programming (MINLP) Based Optimization of Refrigeration Systems <i>Sergio F. Mussati, Tatiana Morosuk, and Miguel C. Mussati</i>	

CMS-Biomass and Waste Gasification and Combustion

IMECE2021-71635	V08AT08A007
Predicting Steam-Gasification Output Using Artificial Neural Networks <i>Yunye Shi, Diego Yepes Maya, and Albert Ratner</i>	
IMECE2021-73567	V08AT08A008
Survey of Existing Literature Data on the Biomass Combustion Behavior in Industrial Grate-Fired Boilers <i>João Pedro Silva, Senhorinha Teixeira, Bernhard Peters, and José Carlos Teixeira</i>	
IMECE2021-73595	V08AT08A009
Physicochemical Characterization of the Rejected Waste From the Mechanical and Biological Treatment of Municipal Solid Waste <i>Victor Oliveira, Fernando Castro, Jose Carlos Teixeira, Jorge Araujo, Andre Ribeiro, Joana Carvalho, and Maria Cândida Vilarinho</i>	

CMS-General Combustion and Fire

IMECE2021-70615	V08AT08A010
Experimental Investigation of the Combustion Behavior of Jet-A/Water Emulsified Fuel and Ethanol-Blended Jet-A/Water Emulsified Fuel Droplets <i>A. S. M. Sazzad Parveg, Nicholas Hentges, and Albert Ratner</i>	

IMECE2021-72127	V08AT08A011
Kinetic Study of Nitric Oxide Formation at Atmospheric and High-Pressure Conditions for Different Primary Gaseous Fuels	
<i>Fahd Alam</i>	
IMECE2021-73533	V08AT08A012
Hydrogen: Fuel of the Future?	
<i>Charles Baukal, Matt Whelan, Steve Londerville, Michel Haag, Gilles Theis, and Bill Johnson</i>	
Design and Analysis of Energy Conversion Systems	
IMECE2021-66983	V08AT08A013
Supercritical Carbon Dioxide Power Cycle Integrated With Solar Power Tower and Oxy-Combustor	
<i>Ahmad K. Sleiti, Wahib A. Al-Ammari, Ahmed I. Gamil, and Mohammed Al-Khawaja</i>	
IMECE2021-67711	V08AT08A014
Three-Dimensional Computational Fluid Dynamics Modeling of a 6V150 Diesel Engine	
<i>Zhentao Liu, Yu Zhang, Jiahong Fu, and Jinlong Liu</i>	
IMECE2021-67973	V08AT08A015
Biogas Upgrading System for the Generation of Electricity From Methane Combustion	
<i>Lee Duan, Lawrence Newcomer, Alice Thompson, and Shawn Duan</i>	
IMECE2021-69240	V08AT08A016
Experimental Investigation on the Effects of Direct Fuel Injection Into Low-O ₂ Recompression Interval of an HCCI Engine	
<i>Ratnak Sok and Jin Kusaka</i>	
IMECE2021-69358	V08AT08A017
Theoretical Investigation on the Printed Circuit Heat Exchanger (PCHE) Based S-CO ₂ Brayton Cycle	
<i>Huaitao Zhu, Han Yuan, and Gongnan Xie</i>	
IMECE2021-69775	V08AT08A018
Shock Wave Heating: A Novel Method for Low-Cost Hydrogen Production	
<i>Pejman Akbari, Colin D. Copeland, Stefan Tüchler, Mark Davidson, and Seyyed V. Mahmoodi-Jezech</i>	
IMECE2021-69878	V08AT08A019
Study on the Operation Strategy Based on Multi-Objective Optimization Considering Power and Emission Performance for a Gas Turbine	
<i>Bei Li, Jinwei Chen, and Huisheng Zhang</i>	
IMECE2021-69941	V08AT08A020
On the Maximization of the Waste Heat Recovery From Exhaust Gases of Internal Combustion Engines	
<i>Davide Di Battista and Roberto Carapellucci</i>	
IMECE2021-70253	V08AT08A021
Investigation of Data-Driven Modeling in District Heating Substations	
<i>Encheng Feng, Zaihua Wang, Xiaojie Lin, and Guangyao Ying</i>	
IMECE2021-70852	V08AT08A022
Analysis of Traction Electric Motors Used in Commercial HEV and BEV	
<i>Alfonso Arriaga-Vigil, Eleftherios Karamanis, Marcelo Lopez-Parra, and Osiris Ricardo-Torres</i>	
IMECE2021-70992	V08AT08A023
A Numerical Study Into the Importance of Equivalence Ratio Measurement Accuracy for Spark Ignition Engines	
<i>Ruomiao Yang, Xiaoxia Sun, Zhentao Liu, Yu Zhang, and Jiahong Fu</i>	

IMECE2021-71047	V08AT08A024
Emissions Reduction of a Direct Injection Diesel Marine Engine by Adding Hydrogen to the Inlet Manifold	
<i>Carlos Tealdo and Jorge Alex Deutsch</i>	
IMECE2021-71237	V08AT08A025
Effect of Leg Topologies on Thermal Reliability of Thermoelectric Generators Systems	
<i>Mutabe Aljaghtham and Emrah Celik</i>	
IMECE2021-71418	V08AT08A026
Evaluation of "Natural Gas/Hydrogen" Mixtures for Power to Gas Application	
<i>Jimena Incer-Valverde, Oyeniyi Olaniyi, Tatiana Morosuk, and George Tsatsaronis</i>	
IMECE2021-72033	V08AT08A027
Effect of Source Tank Configuration on the Performance of a Hydraulic Ram Pump	
<i>Ashokumar M. Sharma, Jacob H. Jackson, Pablo J. Centeno, and Srikanth B. Pidugu</i>	
IMECE2021-73229	V08AT08A028
Analysis and Design Software for Integration of Renewable Energy and Energy Storage With CHP Devices	
<i>Yasin Naman, Gregory J. Kowalski, and Mansour Zenouzi</i>	
IMECE2021-73353	V08AT08A029
Experimental Study of a Piezoelectric Strain-Based Energy Harvester for Intelligent Tires of Autonomous Vehicles	
<i>Haniph Aliniagerdroudbari, Roja Esmaeeli, and Siamak Farhad</i>	
IMECE2021-73370	V08AT08A030
Geothermal Heat Exchanger Performance With Nanofluids Containing Ceramic MgO and Al ₂ O ₃ Particles	
<i>Himel Barua, Maryam Younessi Sinaki, and Siamak Farhad</i>	
Design and Analysis of Energy Recovery Systems	
IMECE2021-68202	V08AT08A031
Simulated Model for a New Design of Thermal Energy Storage System	
<i>Mahmoud Elsharafi, Ali Elmozughi, Pranaya Pokharel, Clayton Holmes, Madison Krahl, Musaad Aldawsari, and Theo Rolle</i>	
IMECE2021-69855	V08AT08A032
Performance Analysis of Zeotropic Organic Rankine Cycle for Marine Diesel Exhaust Heat Recovery	
<i>Qizhi Gao and Han Yuan</i>	
IMECE2021-70001	V08AT08A033
Cascade Utilization of Geothermal Waste Heat for Enhanced Outdoor Crop Production	
<i>Christopher Mignano, Enea Dushaj, Rúnar Unnþorsson, and Robert Dell</i>	
IMECE2021-70509	V08AT08A034
Development and Performance Assessment of a Hydraulic Hybrid System	
<i>D. L. Wressell, L. K. Tartibu, and F. K. Tekweme</i>	
Electrochemical Energy Conversion and Storage	
IMECE2021-68046	V08AT08A035
Experimental Measurement of CID- and Vent-Activation in Cylindrical Lithium-Ion Batteries	
<i>Weisi Li, K. R. Crompton, and Jason Ostaneck</i>	
IMECE2021-68768	V08AT08A036
Parameter Optimization of a New Battery Model	
<i>Cameron Rose and Ben Pence</i>	

IMECE2021-68795	V08AT08A037
An Atomic-Scale Investigation of the Temperature Influence on the Reactivity of Alkaline Water Electrolysis on an Optimized Nickel-Iron Catalyst Surface for the Hydrogen Generation	
<i>Sunday Temitope Oyinbo, Tien-Chien Jen, Patrick Ehi Imoisili, and Peter Ozaveshe Oviroh</i>	
IMECE2021-69786	V08AT08A038
Water Management for an Electrochemical Gas Separation and Inerting System	
<i>Utsav Raj Aryal and Ajay K. Prasad</i>	
IMECE2021-69959	V08AT08A039
Probing the Role of Venting and Evaporative Cooling in Thermal Runaway for Small Format Li-Ion Cells	
<i>Mohammad Parhizi, K. R. Crompton, and Jason Ostaneck</i>	
IMECE2021-70418	V08AT08A040
Computational Model for an Electrochemical Hydrogen Compressor	
<i>Majid Aziz, Utsav Raj Aryal, and Ajay K. Prasad</i>	
IMECE2021-73345	V08AT08A041
Mathematical Modelling of Semi-Solid Electrodes for Flexible Lithium-Ion Batteries	
<i>Waleed Zakri, Hassan Fagehi, Muapper Alhadri, Ahmed Abutaleb, and Siamak Farhad</i>	
IMECE2021-73606	V08AT08A042
A Study on Degradation of Lithium-Ion Batteries for In Aircraft Applications	
<i>Muapper Alhadri, Waleed Zakri, Roja Esmaeeli, and Siamak Farhad</i>	
IMECE2021-73728	V08AT08A043
Effect of LiNbO_3 Coating on Capacity and Cycling of Nickel-Rich NMC Cathode Active Material	
<i>Dominic Frisone, Mahdi Amiriyan, Eman Hassan, Joshua Dunham, Rashid Farahati, and Siamak Farhad</i>	
IMECE2021-73735	V08AT08A044
Effect of Pressure and Temperature on the Performance of Argyrodite $\text{Li}_6\text{PS}_5\text{Cl}_{0.5}\text{Br}_{0.5}$ Electrolyte for All-Solid-State Lithium Battery	
<i>Joshua Dunham, Dominic Frisone, Mahdi Amiriyan, Eman Hassan, Jung Feng Hu, Rashid Farahati, and Siamak Farhad</i>	

Energy Systems Components

IMECE2021-68935	V08AT08A045
Turbocharged Decoupling and Turbine Electrification Design for Mild-Hybrid Vehicle	
<i>Roberto Capata</i>	
IMECE2021-69605	V08AT08A046
Optimization of Powertrain Energy Management for Range Extended Electric Vehicle Using Modified Particle Swarm Algorithm	
<i>Omkar Parkar, Benjamin Snyder, and Sohel Anwar</i>	
IMECE2021-69948	V08AT08A047
Developing HVAC System Terminal Units Control Sequence Utilizing Game Theory Rules	
<i>Javad Khazaii and Ali Khzaei</i>	
IMECE2021-70740	V08AT08A048
Numerical Study of the Effect of Burner Position and Reformer Tubes on the Design of an Annular Steam Methane-Reforming Reactor for Hydrogen Production	
<i>Ajith Krishnan Rohini and Hee Joon Lee</i>	
IMECE2021-72295	V08AT08A049
Analyzing the Effects of HVAC Equipment Uncertainty in Building Energy Modeling for Professional Environment	
<i>Miseker Birega and Javad Khazaii</i>	

IMECE2021-72388	Modelling Economic Life Cycle Investment in Natural Gas Pipelines and Power Plants Availability for a Nigerian National Gas Company	V08AT08A050
	<i>Kingsley E. Abhulimen</i>	
IMECE2021-72694	Comparative Evaluation of Some Energy Policies in Abu Dhabi Using EnergyPlan Program	V08AT08A051
	<i>Moza Salim Al Naimi and Mohamed I. Hassan Ali</i>	
Energy-Related Multidisciplinary		
IMECE2021-69036	Investigation of a Coanda-Effect Enhanced HVAC Diffuser Using CFD Analysis	V08AT08A052
	<i>Hussein Kokash, Mihai G. Burzo, Khalil Khanafer, and Bharat Gokeda</i>	
IMECE2021-70096	Climate Change and Global Warming - The Forgotten Factors	V08AT08A053
	<i>Gary K. Conkol</i>	
IMECE2021-70122	Residential Appliance Usage Patterns From Overall Energy Consumption Data: A Statistical Machine Learning Approach	V08AT08A054
	<i>Arkasama Bandyopadhyay and Anirban Bhattacharya</i>	
IMECE2021-70318	3D Printed and Nickel-Coated Electrodes for Photocatalytic Electrolysis for Hydrogen Generation	V08AT08A055
	<i>Babacar Ndoye, Noufou Ouedraogo, Wondwosen Demisse, Andrew Grizzle, Eva Mutunga, and Pawan Tyagi</i>	
IMECE2021-70839	A Methodology for Risk Assessment to Improve the Resilience and Sustainability of Critical Infrastructure With Case Studies From the United States Army	V08AT08A056
	<i>Neil Blackwell, Aubrey Evans, Phoebe Lee, Christine Panlasigui, Duncan Russell, Ke'Shaun Wells, Stephen McCarthy, Brad McCoy, and F. Todd Davidson</i>	
IMECE2021-70959	Energetic Management of Power Plant Protection and Control Activities by Applying Maintenance Principles Based on Reliability	V08AT08A057
	<i>Victorita Radulescu</i>	
IMECE2021-72215	A Long-Term Assessment of the Impact of Natural Gas Production in North Texas Influencing Urban and Regional Air Quality	V08AT08A058
	<i>Kuruvilla John, Guo Quan Lim, and Jithin Kanayankottupoyil</i>	
IMECE2021-72382	Water Fuel Development: Part 1 - Clean Energy Production From Water Splitting High Temperature Electrolysis Process in Hydrogen Internal Combustion Engines	V08AT08A059
	<i>Kingsley E. Abhulimen</i>	
IMECE2021-73143	Demand Response Analysis for Different Residential Personas in a Comfort-Driven Behavioral Context	V08AT08A060
	<i>Opeoluwa Wonuola Olawale, Benjamin Gilbert, and Janet Reyna</i>	
IMECE2021-73358	Study of Defect Morphology and Density on Mechano-Electrochemical Effect of Pipeline Corrosion	V08AT08A061
	<i>Sedigheh Rashidi, Ardavan Zandiatashbar, and Siamak Farhad</i>	