

**Proceedings of
ASME 2022 International Mechanical
Engineering Congress and Exposition
(IMECE2022)**

Volume 6

**October 30-November 3, 2022
Columbus, Ohio**

Conference Sponsor
American Society of
Mechanical Engineers

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Two Park Avenue * New York, N.Y. 10016

© 2022, 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: 978-0-7918-8668-7

TABLE OF CONTENTS

Comparative Analysis of Coefficient of Performance (COP) Correlations of Single-Effect Vapor Absorption Refrigeration (VAR) Cycle	1
<i>Muhammad Saad Khan, Sambhaji T. Kadam, Alexios-Spyridon Kyriakides, Ibrahim Hassan, Athanasios I. Papadopoulos, Mohammad Azizur Rahman, Panos Seferlis</i>	
Research on Coarse Granularity Data Sample Completion Method for District Heating System	9
<i>Zheng Luo, Encheng Feng, Xiaojie Lin, Wei Zhong</i>	
Effect of Flapper Valve on the Performance of a Hydraulic Ram Pump	17
<i>Ashokkumar M. Sharma, Dipak K. Banerjee, Srikanth B. Pidugu</i>	
Exergy Analysis of Photovoltaics Coupled With Electrochemical Energy Storage for Lunar Power Applications.....	22
<i>Phillip Dyer, Griffin Smith, George Nelson</i>	
Exergy Analysis of Kilowatt Nuclear Reactor Systems for Lunar Power Applications	33
<i>Griffin Smith, Phillip Dyer, George Nelson</i>	
A Computationally Efficient Approach for the Simulation of Silicon Anodes in Lithium-Ion Cells	40
<i>Rebecca Webb, Xiaoling Chen, Sandip Mazumder, Marcello Canova</i>	
Combustion and Vaporization of Deformable Fuel Droplets Using Direct Numerical Simulation	51
<i>Meha Setiya, John A. Palmore Jr.</i>	
Techniques for High-Speed Measurement of Accelerating Flame	61
<i>James Shaffer, Omid Askari</i>	
Combustion Characteristics of Single Isolated Fuel Droplets of Different Diesel-Biodiesel Blends Derived From Waste Vegetables Oil and Animal Fat	67
<i>A. S. M. Sazzad Parveg, Albert Ratner</i>	
Ammonia for Industrial Combustion.....	74
<i>Steve Londerville, Matt Whelan, Charles Baukal, Ali Gueniche, Michel Haag, Paul Newman</i>	
Application of Artificial Neural Network to Predict the Performance of Thermoelectric Power Plants at Design Conditions.....	84
<i>Roberto Carapellucci, Lorena Giordano</i>	
Optimization of Supercritical CO ₂ Cycle Combined With ORC for Waste Heat Recovery	94
<i>Roberto Carapellucci, Davide Di Battista</i>	
Optimal Design of Integrated Solar Combined Cycle and Desalination Systems	104
<i>Ariana M. Pietrasanta, Sergio F. Mussati, Pio A. Aguirre, Tatiana Morosuk, Miguel C. Mussati</i>	
Design, Construction, and Thermodynamic Analysis of a Direct-Expansion Solar Assisted Heat Pump for Cold Climates	112
<i>Nadia Elgamal, Jessica Sambhi, Dhruvi Patel, Charuka Marasinghe, Edwin Pulikkottil, Kerwin Virtusio, Aggrey Mwesigye, Simon Li</i>	
Three-Dimensional Computational Fluid Dynamics Modeling of the Combustion Process of a MAN L21/31 Marine Diesel Engine	122
<i>Yuchao Yan, Ruomiao Yang, Zhentao Liu, Jinlong Liu</i>	

Multi-Regional Design and Analysis of Biomass-Driven Combined Cooling, Heating and Power Systems for Rural Communities.....	132
<i>Philippe C. Schicker, Heejin Cho</i>	
A Method to Account for the Effects of Thermal Osmosis in PEM Fuel Cells	145
<i>Nicholas Ingarra, Krzysztof (Chris) Kobus, Jonathan Maisonneuve</i>	
Thermoelectric Generation From Exhaust Heat in Electrified Natural Gas Trucks - Part1: Modeling and Analysis on Engine System Efficiency Improvement.....	152
<i>Ratnak Sok, Jin Kusaka, Hisaharu Nakashima, Hidetaka Minagata</i>	
Prediction of Electrical Energy Consumption in University Campus Residence Using FCM-Clustered Neuro-Fuzzy Model	164
<i>Oluwatobi Adeleke, Tien-Chien Jen</i>	
Investigation of Adsorption, Dissociation, and Hydrogen Diffusion Through V-Ni-Zr Alloys Surface for Hydrogen Purification: First Principle Method	171
<i>Oriyomi Opetubo, Sunday Temitope Oyinbo, Peter Ozaveshe Oviroh, Ibitoye Ayotunde, Tien-Chien Jen</i>	
Opportunities for Energy Efficiency Improvements in Craft and Micro-Breweries.....	178
<i>Laryssa Sueza Raffa, Nick S. Bennett, Lee Michael Clemon</i>	
A Method to Account for the Effects of Electro-Osmotic Drag and Back Diffusion in PEM Fuel Cells.....	188
<i>Nicholas Ingarra, Krzysztof (Chris) Kobus, Jonathan Maisonneuve</i>	
50kW PEMFC Hybrid Energy Management System Driving Strategies	196
<i>Younghyeon Kim, Sangseok Yu</i>	
Flame Propagation Analysis of Anhydrous and Hydrous Ethanol in an Optical Spark Ignition Engine.....	204
<i>Fernanda Pinheiro-Martins, Pedro Teixeira Lacava</i>	
Performance Assessment of Tri-Reforming of Methane	214
<i>Azharuddin Farooqui, Tariq Shamim</i>	
Analyzing the Process of Seaweed Drying in a Drying Cabinet	223
<i>Mohiodin Nazemi, Runar Unnthorsson, Christiaan Richter</i>	
Producing High-Strength Pellets From Seaweed, Sawdust, and Hay for Gasification.....	231
<i>Mohiodin Nazemi, Aysan Safavi, Eyja Camille P. Bonthonneau, Christiaan Richter, Runar Unnthorsson</i>	
Improving the Yield of Biodiesel Production Using Waste Vegetable Oil Considering the Free Fatty Acid Content.....	237
<i>Saanyol Ityokumbul Igbax, Daniel Swartling, Ahmed ElSawy, Stephen Idem</i>	
Electrical Power Generation From Biogas Upgrading	246
<i>Morgan Smith, Zachary Musgrove, Yuxin Song, Hao Hu, Shawn Duan</i>	
The Potential and Limitations of Using Geothermal-Sourced Chiller Plants to Eliminate Cooling Towers	254
<i>Ahmed Farag, Mahmoud Ahmed, Shinichi Ookawara, Mohamed Emam</i>	

Variation of Power Output From an OTEC Power Plant Based on Longterm Sea Surface Temperature Data Analysis.....	266
<i>Melvin Costa, Reemal Prasad, Muzammil Ali, M. G. M. Khan, Antoine De Ramon N'Yeurt, Mohammed Rafiuddin Ahmed</i>	
Modeling Effects of Occupants' Time-Off Behavior in Buildings on Load Calculation and Energy Modeling	275
<i>Lakshmi Prasanna Pedarla, Javad Khazaii</i>	
Design Strategies for Flywheel Energy Storage Systems in EV Fast Charging	283
<i>Francisco Basaure, Pierre Mertiny</i>	
Waste Disposal Plant Application of Overhauled and Regenerated Steam Turbine	292
<i>Roberto Capata, Alfonso Calabria, Michele Reale</i>	
Optimized HVAC Air Distribution for Improved Air Quality Using CFD Analysis	299
<i>Hussein Kokash, Mihai G. Burzo, Gbemeh Agbaglah, Fardeen Mazumder</i>	
Design and Fabrication of an Atmospheric Water Generator Based on Vapor Compression Refrigeration Cycle	311
<i>Saad Alshahrani</i>	
Development of a Holistic Data-Driven Detection and Diagnosis Approach for Operational Faults in Public Buildings	321
<i>Ashraf Alghanmi, Akilu Yunusa-Kaltungo, Rodger Edwards</i>	
Investigation of Emission Reduction and Power Generation on Electrochemical Catalytic Membranes With the Addition of Perovskite Nanocrystals.....	331
<i>Aliza M. Willsey, Cassidy Fields, Thomas S. Welles, Hanjie Lin, Weiwei Zheng, Jeongmin Ahn</i>	
A Data Driven Analysis on the Energy Performance and Efficiency of Water Treatment Plants	338
<i>Alex Callinan, Hamidreza Najafi, Aldo Fabregas, Troy Nguyen</i>	
Lifecycle Analysis to Improve the Sustainability of the United States Army's Non-Tactical Vehicle Fleet.....	346
<i>Madison Faust, Zachary Ortman, Austin Chambers, Mark Fitzpatrick, Jamir Gibson, Forde Norris, Matthias Williams, Adam D. Johantges, Jae Kim, Brian Riser, Brad McCoy, F. Todd Davidson</i>	
Modeling Analysis on Combined Effects of VVT/VCR Engine Technology to Reduce Fuel Consumption of Light-Duty Parallel Hybrid CNG Trucks.....	355
<i>Ratnak Sok, Jin Kusaka, Hisaharu Nakashima, Hidetaka Minagata</i>	
Maintenance Centered on Exergy and Exergoeconomic Indicators of a Preheat Train of a Crude Oil Distillation Unit.....	365
<i>Juan Fajardo, Camilo Negrette, Camilo Cardona, Daniel Yabrudy, Deibys Barreto</i>	
Energy Efficiency Condition-Based Maintenance Methodology for Computer Room Air Conditioners	380
<i>Juan Fajardo, Hermes Ramirez-Leon, Deibys Barreto, Carlos Rico, Camilo Cardona</i>	
An Experimental Setup to Study the Fundamental Phenomena Associated With Biomass Combustion	390
<i>Joao Pedro Silva, Senhorinha Teixeira, Jose Carlos Teixeira</i>	
Hybrid Parallel Feed Multi-Effect Evaporation Desalination System With Adsorption Cycle	398
<i>Hassan Al-Khalifah, Rached Ben-Mansour, Mohamed A. Antar</i>	

Overview of the Base Model for the Parametric Sensitivity Studies Specific to Performance Assessments of U-Mo Fuel Plates	408
<i>Hakan Ozaltun, Hee Seok Roh, Walid Mohamed</i>	
Computational Modeling of Multi-Pass Rolling Parameters Effect on Resulting Fuel Foil Shape	418
<i>Taylor Mason, Kyoo Sil Choi, Ayoub Soulami, Kenneth Johnson, Kriston Brooks, Naveen Karri, Vineet Joshi</i>	
Assessing the Potential for Implementation of Distributed Ledger Technology in the Nuclear Power Plant Lifecycle.....	424
<i>Priyanka Pandit, Daniel Nevius, Vibhav Srivaths, Mihai A. Diaconeasa</i>	
Adsorption of Hydrogen Isotopes on Novel Nanomaterials.....	433
<i>Suheyl Polat, Aaron Stinebaugh, Jungkyu Park</i>	
Assessment of Cooling Technologies for Solar Photovoltaic Panels Accounting for Local Solar Irradiance and Ambient Temperature Conditions	438
<i>Marcelo Lucas Aguilar, Cesar Celis</i>	
Optical and Heat Transfer Performance of Conical Receivers for Desalination Application	451
<i>Abhinay Soanker, Alparslan Oztekin</i>	
Efficient Solar Thermochemical Hydrogen Production in a Reactor Train System With Thermochemical Oxygen Removal	461
<i>Aniket S. Patankar, Xiao-Yu Wu, Wonjae Choi, Harry L. Tuller, Ahmed F. Ghoniem</i>	
Simulation and Parametric Studies of a Linear Fresnel Solar Concentrator Using Air As HTF for Agricultural Drying Applications	474
<i>Daniela Jaramillo-Cobos, Emerita Delgado Plaza, Galo Durazno-Palacios, Juan Peralta-Jaramillo</i>	
Performance Enhancement of New Concentrator Photovoltaic System Using Phase Change Material/Water Cooling Technique.....	484
<i>Mohamed M. Elsabahy, Mahmoud Ahmed, Mohamed Emam</i>	
Integration of Hybrid Porous Casting in Solar Receivers to Increase Solar Systems Efficiency	497
<i>Sara Goren, Flavia Barbosa, Erany Constantino, Helder Puga, Jose Teixeira</i>	
Potentials and Limitations of Concentrator Silicon Solar Cells Energy Utilization	508
<i>Mohamed M. Elsabahy, Mohamed Emam, Hidetoshi Sekiguchi, Mahmoud Ahmed</i>	
Heat Flux Analysis of a Solar Thermal Collector Incorporated With Optimized Involute Reflectors.....	521
<i>Celine S. L. Lim, Sarvenaz Sobhansarbandi</i>	
Design and Operational Analysis of a Photovoltaic Irrigation System.....	528
<i>Juseny Moura, Ana Cristina Ferreira, Carlos Fernandes Costa, Luis Barreiros Martins</i>	
Performance Evaluation of a Solar Thermal Collector With Custom-Made Reflector: An Experimental Study in Midwest Region.....	535
<i>Arman Nokhosteen, Onur Ozkaya, Sarvenaz Sobhansarbandi</i>	
Thermal Analysis of a Fiber Optic Cable for a Vertical Farming Application.....	542
<i>Sevki Cesmeci, Mohammad Towhidul Islam, Stephen Horowitz</i>	
A Systematic Literature Review of Passive Energy Consumption Optimisation Strategies in Buildings and Their Selection Criteria	555
<i>Amirhossein Balali, Akilu Yunusa-Kaltungo, Rodger Edwards</i>	

Using Machine Learning Methods Towards Identifying College Campus Load Profiles and Energy Storage Application for Reducing Peak Energy Demand From the Utility Grid.....	567
<i>Christopher J. Sweeny, Jackson R. Smith, Afsaneh Ghanavati, James R. McCusker</i>	
Feasibility Study and Design of a Seawater Air-Conditioning System for a University Building in Fiji	575
<i>Muzammil Ali, Reemal D. Prasad, Mohammed Rafiuddin Ahmed</i>	
Thermal Performance of Phase Change Material Based Heat Exchangers	584
<i>Abhinav Soanker, Alparslan Oztekin</i>	
Review of Wave Energy Converter Power Take-Off Systems, Testing Practices, and Evaluation Metrics.....	592
<i>Nathan Tom</i>	
A Robust Hybrid Machine Learning-Based Modeling Technique for Wind Power Production Estimates	604
<i>Amit Banerjee, Issam Abu-Mahfouz, Jianyan Tian, A. H. M. Esfakur Rahman</i>	
Development of a Control Co-Design Modeling Tool for Marine Hydrokinetic Turbines.....	610
<i>Hannah Ross, Matthew Hall, Daniel R. Herber, Jason Jonkman, Athul Krishna Sundarajan, Thanh Toan Tran, Alan Wright, Daniel Zalkind, Nick Johnson</i>	
An Efficient Time-Domain Model to Simulate Parametric Resonances in a Floating Body Free to Move in Six Degrees of Freedom.....	620
<i>Adi Kurniawan, Thanh Toan Tran, Yi-Hsiang Yu</i>	
Investigation of the Leading-Edge Erosion of Wind Turbine Blades Using Multivariant Analysis Method	632
<i>Abdullah F. Alajmi, M. Ramulu</i>	

Author Index