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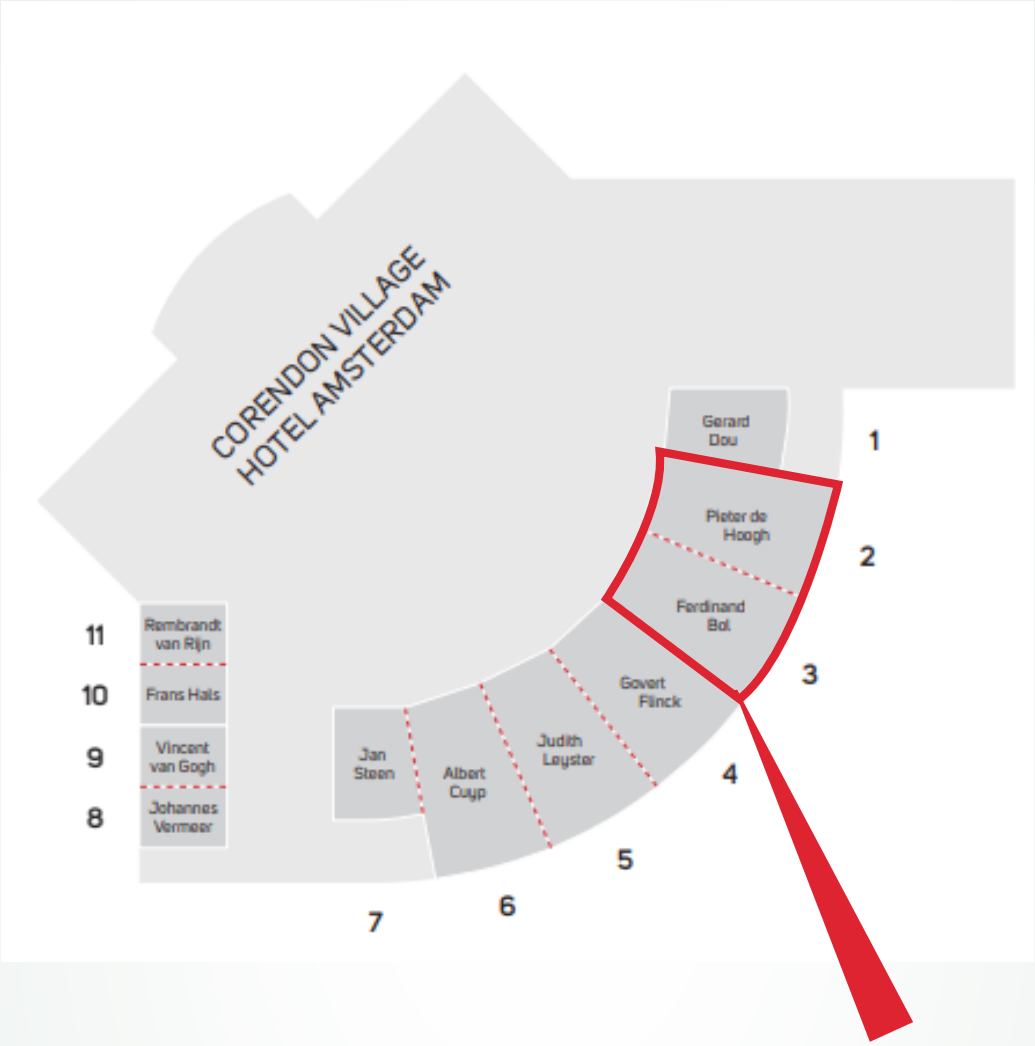
6th International Conference on

RENEWABLE ENERGY, RESOURCES AND SUSTAINABLE TECHNOLOGIES

September 26-27, 2024

Corendon Village Hotel Amsterdam, Amsterdam, Netherlands

Floor Map



Conference Hall

Wi-Fi Details:

Username: Corendon Village
Password not required - Open Wi-Fi

Scientific Program

6th International Conference on

Renewable Energy, Resources and Sustainable Technologies

Day-1 : September 26, 2024	
Meeting Hall : MR 2+3	
08:30 - 08:45	Registration
08:45 - 09:00	Introduction
Keynote Presentations	
09:00 - 09:40	How to Overcome the Limitations Inherent in Sustainable Development
	Dai-Yeun Jeong, Asia Climate Change Education Center, South Korea
09:40 - 10:20	Analyses and 4E Comparative Assessments of the Alternative Scenarios for Energy Transition and Decarbonization of a Chocolate Factory Utilities in a State of Brazil
	José Joaquim C. Soares Santos, Federal University of Espírito Santo, Brazil
Networking & Refreshments 10:20 - 10:50 @ Foyer	
Oral Presentations	
Session Chair	**Dai-Yeun Jeong,** Asia Climate Change Education Center, South Korea
Session Chair	**Sushant B. Wath,** Council of Scientific and Industrial Research - National Environmental Engineering Research Institute (CSIR-NEERI), India
Sessions:	Sustainable Engineering and Energy Technologies | Bioenergy and Biotechnology | Hydro Energy | Solid and Waste Management | Wind Energy | Sustainable Energy Policies | Hydrogen Energy & Fuel Cells | Nanosafety and Nanotoxicology
10:50 - 11:20	Sustainability of Clean Hydrogen
	Lydia Maketo, Technical University of Munich, Germany
11:20 - 11:50	Life Cycle Assessment of Aeroponics Production of Short Rotation Coppice Willow Cuttings For Rapid Upscaling of Biomass Production
	James Suckling, University of Surrey, United Kingdom
11:50 - 12:20	Experimental Investigation of Torque/Power Fluctuation for Crossflow Turbines Operating In an Open Channel
	Sunil Kumar Singal, Indian Institute of Technology Roorkee (IIT Roorkee), India
12:20 - 12:50	Aramco's SAOO TSD Waste Management Initiatives & Achievements
	Ahmad Al-Otaibi, Meshaal Al-Uthman & Saeed AlAbsi, ARAMCO, Saudi Arabia
Group Photo: 12:50 - 13:00	
Lunch 13:00 - 14:00 @ Restaurant	
14:00 - 14:30	Stitching Wind Generator Blade Images by Width-Angle Matching
	Dmitriy Slutskiy & Pavel Chizhov, ENGIE Lab CRIGEN, France
14:30 - 15:00	Sustainable Cleaning Technology for the Photovoltaic Solar Panels
	Sushant B. Wath, Council of Scientific and Industrial Research - National Environmental Engineering Research Institute (CSIR-NEERI), India
15:00 - 15:30	The Effect of the Nanoemulsion of 1,8 Cineole on *Rhyzopertha dominica* (F. 1792) (Coleoptera: Bostrichi-Dae)
	Abes Ibtissem Fatma Zahra, Echahid Cheikh Larbi Tebessi University, Algeria
15:30 - 16:00	Optimizing Energy Allocation Criteria in Collective Self-Consumption Communities
	Javier Serrano Gonzále, University of Seville, Spain

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Networking & Refreshments 16:00 - 16:30 @ Foyer	
16:30 - 17:00	Hybrid Solar Flameless Combustion System
	Seyed Ehsan Hosseini, Arkansas Tech University, USA
Panel Discussion @ 17:00 - 18:00	
17:00 - 18:00	PANEL SESSION: Shaping the Future: Sustainable Energy and Developments with New Technologies
	"Topics: **-"Strategies for Activating Sustainable Energy"** **-"The Positive and Negative Contribution of Technology to Sustainable Development",** **-"What Technologies are Desirable to be Developed for Overcoming their Negative Impact on Sustainable Development"**
Panelists:	**Dai-Yeun Jeong,** Asia Climate Change Education Center, South Korea
	Sunil Kumar Singal, Indian Institute of Technology Roorkee (IIT Roorkee), India
	Seyed Ehsan Hosseini, Arkansas Tech University, USA
	Lydia Maketo, Technical University of Munich, Germany
	Sushant B. Wath, Council of Scientific and Industrial Research - National Environmental Engineering Research Institute (CSIR-NEERI), India
Day 1 Concludes followed by Certificate Felicitation	

Scientific Program

Friday
September 27, 2024

6th International Conference on

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Day 2 - September 27, 2024	
Meeting Hall : MR 2+3	
Keynote Presentations	
09:00 - 09:40	Hydrogen Diplomacy
	Seyed Ehsan Hosseini, Arkansas Tech University, USA
09:40 - 10:20	Entrepreneurs Facing Grid Congestion Help Drive the Energy Transition
	Heleen Groenenberg, SustainBrain, Netherlands
Networking & Refreshments 10: 20 - 10: 50 @ Foyer	
Oral Presentations	
Session Chairs	**Dai-Yeun Jeong,** Asia Climate Change Education Center, South Korea
Session Chairs	**Seyed Ehsan Hosseini,** Arkansas Tech University, USA
Sessions:	Sustainable Energy Policies | Biomass and Biofuels | Waste-to-Energy | Hydrogen Energy & Fuel Cells | Power and Energy Engineering | Energy Storage and Conservation | Environmental Impact Assessment | Solid and Waste Management
10:50 - 11:20	Methodological Solutions for Assessing the Impact of Energy Transformation on Regional Development
	Mantas Švažas, Vytautas Magnus University, Lithuania
11:20 - 11:50	Fate of Heavy Metals during Gasification of Contaminated Biomass for Biofuel Production
	Marcel Dossow, Technical University of Munich, Germany
11:50 - 12:20	Subcritical and Supercritical Biomass Hydrothermal Liquefaction for Biofuel Production
	Christyfani Sindhuwati, University of Leeds, United Kingdom
12:20 - 12:50	Supercritical Water Liquefaction of Waste Plastics to Produce High Value Fuels and Chemicals
	Maria Mathew, University of Leeds, United Kingdom
Lunch 12:50 - 14:00 @ Restaurant	
14:00 - 14:30	Mitigating the Effect of Carbon Deposition on the Performance of Solid Oxide Fuel Cell
	Godwin Mong Kalu-Uka, Indian Institute of Technology Bombay (IIT Bombay), India
14:30 - 15:00	Design and Development of A Multipulse DC AC Converter to Obtain the Maximum Power Transfer in A Photovoltaic System
	Pedro Rocha Hernández, Universidad de Guadalajara, Mexico
15:00 - 15:30	Pyrolysis-Non-Thermal-Plasma-Catalysis Processing of Biomass and Wastes for Upgraded Oil and Gas Production
	Maryam Khatibi, University of Leeds, United Kingdom
15:30 - 16:00	Design and Construction of a Low-Scale Flywheel Energy Storage System
	Abraham Sánchez Alavez, Universidad de Guadalajara, Mexico
Networking & Refreshments 16:00 - 16:30	

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16:30 - 17:00	Integrated Combat on Climate Change in Nepal **Ramesh Babu Shrestha,** Environment Nepal, Nepal
17:00 - 17:30	Appraisement and Categorization of Compostable and Non-Compostable Plastic Bags Using HHXRF Spectrophotometer, A Study on Brands in Islamabad, Pakistan **Said Akbar Khan,** Bahria University Islamabad, Pakistan
	Video Presentation
VP - 01	Recycling and Accumulation of Thermal Waste at Industrial Enterprises **Lyudmila V Plotnikova,** Kazan State Power University, Russia
	Day 2 Concludes followed by Vote of Thanks & Awards Ceremony

Day-1
Keynote Presentations

HOW TO OVERCOME THE LIMITATIONS INHERENT IN SUSTAINABLE DEVELOPMENT

Dai-Yeun Jeong
Asia Climate Change Education Center, South Korea

Abstract

Sustainable development is the ideology and practical strategy of the present and future socio-economic development in harmony with nature. A wide range of policies and practical activities have been launched at a global, national and regional level for achieving sustainable development since WCED suggested its concept and implication in 1987. In 2015, United Nations adopted a set of sustainable development goals to be achieved over the next 15 years as a follow-up action plan of millennium development goals. However, it is true that sustainable development is not achieved as successfully as planned. Its evidences are the facts that we are still faced with serous climate change and natural disasters. This would mean that sustainable development has limitations in its concept and implication. Nonetheless, it is quite rare to conduct a research on the limitations. In such a context, this presentation aims at exploring the limitations and how to overcome them.

This paper will first review the concept and implications of sustainable development and the critical debates on sustainable development from the 19th century and to the 2000s, and then will draw the limitations inherent in sustainable development from the review.

The limitations are synthesized into four categories – horizontal perspective, not inclusive coverage of social sector as a conceptual component, less efficient approach to the achievement of sustainable development, and no mechanism for drawing social consensus necessary for achieving sustainable development. Then, this paper examines what and how to overcome the limitations in a way to focus on what the existing concept and implications of sustainable should be modified and/or supplemented. Finally, this paper lies in proposing a new direction of the coexistence between humans and nature for achieving sustainable development.

Biography

Dai-Yeun Jeong is presently the Director of Asia Climate Change Education Center and an Emeritus Professor of Environmental Sociology at Jeju National University (South Korea). He received BA and MA Degree in Sociology from Korea University (South Korea), and PhD in Environmental Sociology from University of Queensland (Australia). He was a Professor of environmental sociology at Jeju National University (South Korea) from 1981 to 2012. His past major professional activities include a Teaching Professor at University of Sheffield in UK, the President of Asia-Pacific Sociological Association, a Delegate of South Korean Government to UNFCCC and OECD Environmental Meeting, etc. He has published 13 books including Environmental Sociology, and has conducted 95 environment-related research projects funded by domestic and international organizations.

ANALYSES AND 4E COMPARATIVE ASSESSMENTS OF THE ALTERNATIVE SCENARIOS FOR ENERGY TRANSITION AND DECARBONIZATION OF A CHOCOLATE FACTORY UTILITIES IN A STATE OF BRAZIL

José Joaquim C. Soares Santos, Audrey Novelli Gonçalves and Alexandre Persuhn Morawski

Federal University of Espírito Santo, Brazil

Abstract

Background: The government of the state of Espírito Santo, Brazil, has established that minimizing emissions and energy efficiency are two of the four strategies for industries to competitively achieve the energy transition and decarbonization. A major chocolate factory in the state produces its demand for chilled water and hot water using grid electricity and natural gas boilers, respectively. In this case, the systems combining Organic Rankine Cycle (ORC) and Vapor Compression Refrigeration (VCR) allows alternative scenarios to produce, besides surplus electricity, chilled water and/or hot water.

Objective: To carry out some comparative analyses of three alternative scenarios of systems, based on ORC and/or VCR, considering a 4E (energetic, exergetic, environmental and economic) assessment.

Methods: From the nominal and operational data, thermodynamic and environmental modeling of the current and alternative scenarios are carried out, resulting in mass, energy and exergy balances, besides CO_2 emissions, using EES Software. The economic analysis is based on operational cost and a method of parametric equations to calculate the costs of each piece of equipment, obtaining the total initial investment, allowing calculate the feasibly indicators: payback, net present value and internal rate. Results: The results show that VCR, without ORC, is the best scenario, with an initial investment cost of US$ 2,679,611.98, payback of 2 years and 3 months, internal rate of 51.40% and representing the lowest CO_2 emission scenario, 0.6018 tons per hour, due to the elimination of the natural gas boiler.

Conclusion: Due to the low emission factors of the interconnected national electric grid and the low prices of electricity, in Brazil, electrification of some industry utilities sectors is a promising strategy for decarbonization, in this case, using VCR to produce simultaneously both chilled and hot water.

Biography

José Joaquim Conceição Soares Santos has his expertise in thermoeconomics and exergoeconomics, combining thermodynamics and cost concepts, not only the economic cost, but also energetic, environmantal and exergetic cost, for cost allocation, optimization and diagnosis of energy systems and thermodynamic cycles. He has more than 22 years of experience in research, teaching and administration in education and reasearch institutions, focussing his recent research and teaching ativities in energy transition and decarbonization, mainly, in waste heat recovery (WHR), concentrating solar power (CSP), biomass energy conversion (BEC) and all clean energy sources.

Day-1
Oral Presentations

SUSTAINABILITY OF CLEAN HYDROGEN

Lydia Maketo

Technical University of Munich, Germany

Abstract

Background: Clean hydrogen holds a crucial position in the European Union's (EU) strategy for mitigating greenhouse gas emissions. The EU currently uses about 9.7 million tonnes of hydrogen. However, the majority of this is produced from fossil fuels and therefore the supply of hydrogen needs to be decarbonized. Clean hydrogen energy technologies (HETs) continue to garner interest from policy makers as a solution to not only reduce carbon emissions but also strengthen energy security.

Objective: To investigate sustainability-related opportunities and challenges of clean HETs.

Methods: Twenty-five semi-structured interviews were conducted in Europe mostly in Germany. Semi-structured interviews allow the design of a catalog of questions, without appointing a strict procedure or unique set of questions. By employing a qualitative approach, this research seeks to unearth valuable insights into the sustainability-related opportunities and challenges of green HETs.

Results: The main benefit for the environment would be reducing carbon emissions and the challenges raised are associated with water, biomass and metals required for green hydrogen production and the carbon-footprint in transporting green hydrogen. Socio-economic benefits include value creation through employment, social acceptance and introduction of new energy players. The potential downside is job losses in some sectors and cost of green hydrogen.

Conclusion: Sustainability of clean HETs will depend on how the environmental and socio-economic conditions are mitigated which may be dependent largely on policies, good governance and stakeholder engagement.

Biography

Lydia Maketo is a Core Scientist for the REDEFINE H2E Project at Technical University of Munich. Lydia holds a Ph.D. from Curtin University, specializing in the intersection of technology acceptance and societal impacts. Her current research focuses on issues surrounding actors and acceptance in hydrogen technologies, leveraging her background in investigating public attitudes toward technology adoption. With a fervent passion for understanding and promoting new technology uptake, Lydia delves into the socio-economic implications of emerging technologies. Her interests extend to sustainability and energy policies, where she actively seeks innovative solutions to address contemporary environmental challenges. Through her interdisciplinary approach, Lydia aims to contribute to shaping a more sustainable and technologically inclusive future.

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LIFE CYCLE ASSESSMENT OF AEROPONICS PRODUCTION OF SHORT ROTATION COPPICE WILLOW CUTTINGS FOR RAPID UPSCALING OF BIOMASS PRODUCTION

James Suckling[1], Foy A[1], Horler M[2], Jolayemi O[1], Khandaker M[1], Murphy R[2], Sahu P P[1], Stormonth-Darling J M[2], Stangaciu S[1], Zacharaki K[2], Agarwal A[1] and Harris Z M[1]

[1]University of Surrey, United Kingdom
[2]UKUAT Ltd, United Kingdom

Abstract

Background: The UK Government has set a target for achieving Net Zero by 2050, but to do so, some form of bioenergy with carbon capture and storage (BECCS) is needed. One bioenergy crop is short rotation coppice willow (SRCW), but to produce enough to meet targets, more land must be planted to grow it, and quickly. Traditional methods of producing SRCW planting stock (cuttings) are too slow. Therefore, aeroponics technology is being explored as a means of producing cuttings faster. There is likely a trade-off in environmental impact of producing the cuttings faster, but how great is that tradeoff?

Objective: To quantify the environmental impact of producing SRCW cuttings using aeroponics technology, compare that impact to traditional cutting production, and identify potential benefits from producing SRCW biomass faster than by traditional methods.

Methods: Data were collected from research-scale aeroponics SRCW cutting production. The data included materials used for infrastructure and equipment, and consumables. Data relating to field growth of biomass from those cuttings were collected via interview with growers in the UK. The data were used in an ISO 14040/44 aligned life cycle assessment to quantify impact of producing 1 kg woody biomass. This was further extended to consider final use of that biomass, e.g., heat energy production.

Results: Land upscaling is projected to be 2.0-2.7x faster using aeroponics compared to field cutting production. When co-producing heat and electricity, environmental impact of heat using SRCW from aeroponic cuttings is 25.0 g CO_2-eq/kWhheat, 38% greater than heat derived from field propagated cuttings (18.1 gCO2-eq/kWhheat). However, it is still markedly lower than the 70.1 g CO_2-eq/kWhheat for natural gas.

Conclusion: Using aeroponics instead of traditional cutting production methods, has great potential to more rapidly upscale land area used for producing biomass, and therefore, bring forward the benefits of replacing fossil fuels with biomass.

Biography

James Suckling is a Research Fellow at both the Centre for Environment and Sustainability, and Institute for Sustainability, at the University of Surrey. James has background in technology development, having worked in R&D in Sharp Corporation for several years. Since 2014 he has used life cycle assessment to research the sustainability of a diverse range of subjects, including smartphones, smart energy systems, rearing insects for feed or food, and replacing added sugar in food and drink with sweetener. His current project is environmental impact of using aeroponics to produce planting stock short rotation coppice willow and potential for more rapid upscaling of production land area of biomass. The research has been funded by the Department for Energy Security & Net Zero through the Net Zero Innovation Portfolio.

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EXPERIMENTAL INVESTIGATION OF TORQUE/POWER FLUCTUATION FOR CROSSFLOW TURBINES OPERATING IN AN OPEN CHANNEL

Sunil Kumar Singal[1], Manoj Sood[2] and Upendra Bajpai[1]

[1]Indian Institute of Technology Roorkee (IIT Roorkee), India
[2]NSUT, Delhi, India

Abstract

Background: Instream technology is the upcoming new sustainable approach in hydro sector for energy harness. With well-known cross-section and regulated supply, open channels are the most prominent locations for the installation of hydrokinetic turbines. The fluctuation in generated torque varies with site condition (flow depth and flow velocity), as well as with type of turbine.

Objective: The present experimental study aims to investigate the torque/power fluctuations of different cross flow hydrokinetic turbine with same blockage ratio operating in an open channel.

Methods: An experimental investigation has been carried out for cross flow turbines operating in an open channel on torque/power fluctuation. The complete experimental assembly includes an open channel having dimensions of 0.3 m (depth) x 0.71 m (width) x 4.5 m (length) along with a lifting mechanism for varying the channel slope, a digital transducer for monitoring the torque, power and rpm, a digital handheld water velocity meter for measuring the flow velocity.

Results: A time series of torque, power and rpm is determined and plotted showing continuous operation of turbine. A comparison of Savonius, Darrieus and their improved twisted and helical blades is also carried out in this study.

Conclusion: The comparison of Savonius, Darrieus and their improved twisted and helical blades will be very useful in decision making process at actual project site.

Biography

Sunil Kumar Singal graduated in Civil Engineering from Indian Institute of Technology, Roorkee in 1983. Then he obtained M.E. and Ph.D. from IIT Roorkee. He joined Alternate Hydro Energy Centre (AHEC), IIT Roorkee in 1984 as scientist. AHEC, IIT Roorkee, established in 1982, has been renamed as "Hydro and Renewable Energy Department" (HRED) in April 2019 under his leadership. He has been HEAD of the Department from Jan. 2018 to Jan. 2022. Presently he is working as Professor in HRED, IIT Roorkee. He has research, teaching and consultancy experience of more than 37 years in the field of Small Hydropower. He has widely travelled to Canada, USA, Norway, Germany, Uganda, Zambia, Nepal, China, Cambodia, Singapore, UAE and Sri Lanka for SHP development. He has guided 09 Ph.D. and more than 90 M Tech thesis, Contributed more than 200 research papers in International and national journals and conferences.

ARAMCO'S SAOO TSD WASTE MANAGEMENT INITIATIVES & ACHIEVEMENTS

Ahmad Al-Otaibi, Meshaal Al-Uthman and Saeed Absi
ARAMCO, Saudi Arabia (KSA)

Abstract

In support of Aramco's corporate objective of minimizing waste, optimizing consumption of a nonrenewable natural resource and decreasing associated concerns, the Southern Area Oil Producing Technical Support Department (SAOP TSD) managed to develop four effective waste minimization plans to reduce the risk associated with day-to day activities and improve the process safety within the lab. This is to protect the environment and preserve the resources for future generations, and it follows the Kingdom's regulations and Aramco's waste management program and policy.

SAOP TSD handles hundreds of thousands of samples per year for analysis of hydrocarbons and water that serves Southern Area Producing facilities. Without identifying the appropriate handling and disposal procedures and practices, it can impose safety, health, and environmental concerns.

The presentation describes the four initiatives and details the achievements made to reduce laboratory waste, the risks associated with day-to day activities and improve process safety within the lab.

Biography

Ahmad Al-Otaibi is a Chemical Engineer and certified Environmental Professional at Aramco with over 17 years of experience. As the Engineering Specialists unit Supervisor, he oversees process enhancement, environmental compliance and energy efficiency within the admin area operations. Ahmad applies his engineering expertise and certifications to ensure the highest standards of operational excellence and sustainability. He is a certified Environmental Management system lead auditor from BSI and Intertek, holding Environmental Professional Intern from the Institute of professional Environmental practice (IPEP). Additionally, he is a certified GHG verifier from ERM and led various initiatives to improve environmental awareness, efficiency, and optimization.

Meshaal Al-Uthman works as a reliability engineer at Saudi Aramco Abqaiq Plants with over 7 years of experience. He began his career with Saudi Aramco as a technical support engineer for different oil and gas fields. He then joined Khurais oil Jeld expansion projects and the commissioning activities of Hawiyah Gas Storage Development projects. Currently, he is working as an asset performance group leader. His area of expertise is focused on asset managements, reliability improvements, project management, and energy excellence. He Holds a Master degree in engineering management from king Fahd university of petroleum and Minerals (KFUPM). He is also Certified Maintenance and Reliability Professional (CMRP) by SMRP and hold an asset management qualification from the Institute of Assets Management (The IAM) in UK.

Saeed Absi is a Science professional with rich experience in leading Oil and Gas technical support services. He is a Chief Position Holder (CPH) and offers experience of 25+ years with a proven track record in leveraging domain expertise to lead an operation teams specialized in maintaining integrities of processes and assets as well. He has led an HSE process improvements initiatives such as Waste Management Minimizations and Control.

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STITCHING WIND GENERATOR BLADE IMAGES BY WIDTH-ANGLE MATCHING

Pavel Chizhov[1] and Dmitriy Slutskiy[2]

[1]Technische Hochschule Würzburg-Schweinfurt, Germany
[2]ENGIE Lab CRIGEN, France

Abstract

Background: Wind generator imaging is part of the wind generator inspection process, where a wind turbine and its blades are photographed with high-resolution professional cameras. The photos are mainly used for remote inspections, allowing experts to review the images to identify defects.

Objective: Image stitching helps to localize defect positions on a blade. Due to indistinguishable repetitive patterns and a lack of key points, blade image series are not suitable for classical image stitching algorithms. The authors introduce a new image stitching algorithm that does not require key points but performs matching based on the comparison of blade widths and angles.

Method: The preprocessing step of the algorithm involves finding blade contours in an image. This can be performed using various techniques, such as classical Canny edge detection for images with the sky as the background or blade segmentation models from deep learning for drone-based inspections with various image backgrounds.

The algorithm iteratively computes absolute transformations to stitch images together. Initially, the first image's transformation is an identity matrix. For each consecutive image pair (Image A and Image B), the algorithm identifies a "blade slice" in Image A, defined by specific points and tangent vectors. It then searches for a matching slice in Image B. If an exact match isn't found, the closest slice is used. The relative shift and rotation between the images are calculated and accumulated. Finally, an absolute affine transformation for Image B is constructed based on these accumulated values.

Conclusion: The described algorithm demonstrated its efficiency for smooth blade parts but may fail for images depicting parts of blades with trailing edge serration or those close to rotors. In such cases, classical stitching algorithms can help.

Biography

First author: Pavel Chizhov is experinced in classical computer vision methods, as well as in modern neural network architectures for computer vision and natural language processing, including Transformer. The areas of expertise include but are not limited to self-supervised learning, image restoration, representation learning, natural language tokenization, machine translation.

Corresponding author: Dmitriy Slutskiy is a research engineer at ENGIE CRIGEN. He specializes in Computer Vision, LIDAR data treatment, and graph representation learning. He has led AI projects for automatic defect detection on wind turbines, underground pipeline detection, social distancing control, biodiversity control, traffic prediction. Dmitriy has a PhD degree in Mathematics and he regularly supervises Master's and PhD students in Data Science.

SUSTAINABLE CLEANING TECHNOLOGY FOR THE PHOTOVOLTAIC SOLAR PANELS

Sushant B Wath and Piyush Kokate

Council of Scientific and Industrial Research National Environmental Engineering Research Institute (CSIR-NEERI), India

Abstract

Background: Around the world, Solar PV energy generation is now an affordable alternative. At the global level, it is predicted that PV installations could reach up to 2840GW by 2030. Achieving maximum efficiency is a challenge due to multiple factor like fabrication process, irradiance, temperature etc. Solar panel efficiency and its performance is significantly impacted by various meteorological factors. However, other external factors like smog, particulate matter, sand, dirt, bird excrement, snow are also contributing to significantly degrade/lower the panel efficiency after onsite installation. Accumulation of dust particles not only decreases module output but also increases the temperature of the solar panel up to 10%, which also decrease the power output over the time period. The studies concluded that the efficiency decreased by around 30-40%, and accumulation of moss could reduce the output power by up to 86%. Therefore, regular and sustainable cleaning of installed panel is significantly needed.

Objective: To develop a Sustainable Cleaning Technology for the Photovoltaic Solar Panels

Methods: An automated mechanical cleaning system is designed and develop which is Lightweight low-cost and its movement has been controlled by Atmega 328 microcontroller.

Results: The novel design and timer-based operation of the system saves energy for cleaning of the solar panels. The energy output and panel efficiency of solar panels can fluctuate noticeably before and after cleaning.

- Reduction in Water Usage: Traditional cleaning methods consume approximately 1000 litres of water annually per panel. The developed system can significantly cuts down this usage, contributing to substantial cost savings and environmental benefits.
- Labor Cost Reduction: The automation of the cleaning process reduces the need for manual labour, which typically accounts for 60-70% of the total operational and maintenance costs in solar power plants.
- Energy Production Gains: Automated cleaning systems can increase the frequency of cleanings without additional labour costs, potentially improving overall power output and reducing maintenance and repair costs.
- Longevity and Maintenance: Enhanced cleaning techniques extend the lifespan of solar panels by preventing damage and reducing the frequency of costly repairs.

Conclusion: This patented sustainable cleaning technology can be fitted/retrofitted on the Solar Panel(s) for cleaning purpose with lesser water requirement. This sustainable technology can be programmed to function remotely and automatically at the pre-set input condition for optimum cleaning of panel surface for increasing its power generation efficiency.

Biography

Sushant B. Wath (Principal Scientist, CSIR-NEERI) has undertaken R&D in the field of E-Waste Management, Sanitation and Engineering Technologies, Water & Energy Conservation and Management, and has related more than 20 national & international publications in reputed journals and Chapters in books. He holds 7 patents to his name, including 3 international and 3 National Granted Patents. And also has 5 design registrations to his name. He has designed and developed technologies & know-how, which were field deployed, of which some were licensed to industry. He has delivered number of invited talks and lectures in national and international conferences, forums, symposiums, workshops within and outside the country. He is presently the Intellectual Property Rights (IPR) Coordinator of CSIR-NEERI and looking after the IPR management and related activities of the CSIR-NEERI.

THE EFFECT OF THE NANOEMULSION OF 1,8 CINEOLE ON RHYZOPERTHA DOMINICA (F. 1792) (COLEOPTERA: BOSTRICHI-DAE)

ABES Ibtissem Fatma Zahra, SOLTANI Meriem, TINE Samir, TINE-DJEBBAR Fouzia, SOLTANI Noureddine

Echahid Cheikh Larbi Tebessi University, Algeria

Abstract

Background: The extensive use of synthetic pesticides in agriculture has led to significant environmental and health issues. In recent times, there has been a rapid increase in the adoption of essential oils and their bioactive compounds as "green pesticides" to curtail the usage of harmful synthetic pesticides. Essential oil-based green pesticides are emerging as a viable alternative to synthetic pesticides for managing pre- and post-harvest pests that impact agriculture-based food commodities.

Objective: The purpose of this study is to evaluate the insecticidal activity of 1,8 cineol as nano emulsion formulation, against a specific pest species. *Rhzopertha dominica* (F. 1792) (Coleoptera: Bostrichidae).

Methods: Rhyzopertha dominica adults were obtained from a farmer located in Tébessa, Algeria and 1,8 cineole was bought from sigma Aldrich, France. The nano formulations were prepared in the faculty of pharmacy in the university of camerino, Italy and the fumigant toxicity has been carried out following the method described by Huang et al.

Results: Our bioactive molecule were found to exhibit insecticidal activity depending on the concentration and exposure period.

Conclusion: Our 1,8 cineole bioactive molecules in his nano form demonstrated fumigant toxicity against adults of the lesser grain borer, affirming their potential as a natural substitute for synthetic insecticides in managing pest insects of stored products.

Biography

Abes Ibtissem Fatma Zahra, D., Trad, M. and Tine, A., (2023) Efects of menthol on nutritional physiology and enzyme activities of the lesser grain borer, *Rhyzopertha dominica* (F. 1792) (Coleoptera: Bostrichi-dae) Journal of Plant Diseases and Protection. Guettal, S., Tine, S., Tine-Djebbar, F., Soltani, N. (2021b) Repellency and toxicity of azadirachtin against granary weevil *Sitophilus granarius* L. (Coleoptera: Curculionidae).

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OPTIMIZING ENERGY ALLOCATION CRITERIA IN COLLECTIVE SELF-CONSUMPTION COMMUNITIES

Javier Serrano González, JT Villalonga Palou, J Riquelme Santos and JM Roldán Fernández

University of Seville, Spain

Abstract

Background: The expansion of collective self-consumption is a fundamental pillar for the development of energy communities. In Spain the regulation establishes a scheme for the allocation of self-consumed and surplus energy based on distribution coefficients. This implies that the members of the self-consumption community must decide the distribution coefficients assigned to each of the consumers for the management of the energy generated by the self-consumption system, as well as for the allocation of the surplus.

Objective: In this work, the behavior of several algorithms based on heuristic techniques has been analyzed, with the aim of achieving an adequate economic optimization focused on obtaining the distribution coefficients that maximize the net present value of the collective installation.

Methods: The modeling of the problem is carried out under totally realistic conditions considering hourly consumption data, electricity prices for domestic consumers, as well as irradiation and photovoltaic production.

Results: The base case has considered a power of the collective PV plant of 25 kW. For this case, the NPV corresponding to the default approach was initially determined (i.e., the distribution coefficients obtained through the regulation) and then through the optimized approach by means of the two implemented algorithms: genetic algorithm and pattern search. The results obtained are shown in Table 1, it can be seen how the two optimization approaches improve appreciably the profitability obtained from the default approach, being the genetic algorithm the one that provides better results.

Approach	NPV (€)
Default	50340.9168
GA	52499.3485
PatternSearch	52438.8217

Table 1. Comparison of results obtained by the optimization approaches proposed and the default criterion established in Spanish regulation.

Conclusion: This work has presented and analyzed several approaches to optimize the allocation coefficients for the allocation of self-consumed energy and energy surpluses, according to the regulations currently in force in Spain. The results obtained from the comparison between two optimization strategies show that the genetic algorithm optimization method allows obtaining the best solution, which improves the economic performance obtained by means of the default coefficients established in the regulation.

Biography

Javier Serrano received the B.S., M.S. and PhD degrees from the University of Seville in 2008, 2010 and 2012, respectively. He is currently Associate Professor in the Department of Electrical Engineering at the University of Seville. In 2014 and 2015 he served as Wind Energy Analyst at the Joint Research Centre of the European Commission and during 2018 and 2019 he was Senior Advisor to the Spanish Secretary of State for Energy. His main areas of interest are planning and integration of renewable generation plants, optimization of energy communities and regulatory analysis of the electricity system.

HYBRID SOLAR FLAMELESS COMBUSTION SYSTEM

Seyed Ehsan Hosseini

Combustion and Sustainable Energy Laboratory (ComSEL), Arkansas Tech University, USA

Abstract

The feasibility of using flameless mode in a hybrid solar combustion power generation system is investigated by modeling and thermodynamically analyzing a gas turbine system. The gas turbine is integrated with hybrid solar flameless combustion involving a heliostat solar field, central receiver, and flameless combustor to generate green power. In conditions where solar power is not adequate to heat up the combustion oxidizer over the self-ignition temperature of the fuel, the oxidizer is passed through the first-stage combustor. To provide a basic cycle for comparison, a common gas turbine with a preheater is modeled as well. The results indicate that NO_x formation in hybrid solar flameless combustion is significantly lower than in common gas turbine systems. While the gas turbine with preheater generates 67 μg NO_x per kWh, the hybrid solar combustion system produces less than 7 μg NO_x per kWh. Compared to gas turbine systems, fuel consumption decreases in hybrid solar flameless combustion systems by about 14.7% when solar share is considered to be just 40%. Since the inlet air of the flameless combustor is charged from the solar heater outlet, increasing air temperature enhances the share of solar energy in the system, which results in overall exergy reduction in the system. The proposed system illustrates significant environmental benefits, and based on the available technologies, it is suitable for high-temperature solar towers.

Biography

Seyed Ehsan Hosseini is an Associate Professor in the Department of Mechanical Engineering at Arkansas Tech University (ATU). He established the Combustion and Sustainable Energy Laboratory (ComSEL) at ATU, working on several energy-related projects. Dr. Hosseini has published three books and more than 100 scientific papers, and his research has been funded by NASA and the Department of Transportation (DoT). In 2020, 2021, 2022, and 2023, Dr. Hosseini was on the Elsevier Stanford list of 2% of most cited scientists globally. Before joining Arkansas Tech University, Dr. Hosseini was a postdoctoral research fellow in the Combustion and Solar Energy Laboratory with the Department of Mechanical Engineering at San Diego State University, working on a hybrid solar thermal energy generation system funded by the Department of Energy (DOE).

Day-2
Keynote Presentation

HYDROGEN DIPLOMACY

Seyed Ehsan Hosseini

Combustion and Sustainable Energy Laboratory (ComSEL), Arkansas Tech University, USA

Abstract

"Hydrogen Diplomacy" provides a comprehensive examination of the global transition towards hydrogen as a pivotal energy carrier, emphasizing its urgency amidst environmental crises stemming from fossil fuel usage. This presentation delves into the potential of hydrogen as a clean and sustainable alternative, elucidating its benefits while navigating the challenges impeding its widespread adoption. From exploring various hydrogen production methods, including fossil fuel-based and renewable-driven approaches, to scrutinizing the intricate facets of the hydrogen economy, transportation systems, and advancements in storage and delivery mechanisms. Moreover, regional strategies and international collaborations are discussed, showcasing the United States' endeavors to leverage hydrogen for decarbonization, the European Union's ambitious hydrogen strategy, and the Middle East and Asia-Pacific's vision for a cleaner future. Hydrogen Diplomacy involves international cooperation and strategic policymaking surrounding the global hydrogen economy. It focuses on building partnerships between countries to promote hydrogen technology development, facilitate cross-border hydrogen trade, and establish global standards for hydrogen production and use, especially in pursuing decarbonization and energy security.

Biography

Seyed Ehsan Hosseini is an Associate Professor in the Department of Mechanical Engineering at Arkansas Tech University (ATU). He established the Combustion and Sustainable Energy Laboratory (ComSEL) at ATU, working on several energy-related projects. Dr. Hosseini has published three books and more than 100 scientific papers, and his research has been funded by NASA and the Department of Transportation (DoT). In 2020, 2021, 2022, and 2023, Dr. Hosseini was on the Elsevier Stanford list of 2% of most cited scientists globally. Before joining Arkansas Tech University, Dr. Hosseini was a postdoctoral research fellow in the Combustion and Solar Energy Laboratory with the Department of Mechanical Engineering at San Diego State University, working on a hybrid solar thermal energy generation system funded by the Department of Energy (DOE).

ENTREPRENEURS FACING GRID CONGESTION HELP DRIVE THE ENERGY TRANSITION

Heleen Groenenberg
SustainBrain, Netherlands

Abstract

As the energy transition continues more and more sustainable energy enters the system. At the same time, electricity consumption by mobility, industry and households has grown to an extent that the Dutch network is reaching its limits. As a result, many entrepreneurs must wait for a new or larger connection to start, scale up or make their business more sustainable. Developers of new residential areas also face difficulties because vital retail cannot be connected.

Some entrepreneurs have taken the initiative to secure their access to energy through solar PV generation and storage on their own premises. In addition, there is growing interest in industrial estates to jointly shape energy management. Pilots have been started at various industrial estates to gain experience with this, including near Schiphol Airport, in the port of Amsterdam and in various regions in the country. Sustainable generation, demand and storage are balanced here and placed behind a joint connection. New contract forms are also being developed by network operators to make this possible.

In this way, grid congestion in the Netherlands becomes an important driver for further sustainability of the system. The Netherlands can therefore be an example for other countries with congestion problems.

Key message

Grid congestion appears a showstopper for a fully sustainable energy system. Yet it can also drive the development of more local solutions and help unlock potentials for energy storage, low temperature heat, and demand side flexibility.

Biography

Heleen Groenenberg, PhD, MBA, specializes in tackling the complex challenges of grid integration within the context of energy system sustainability in the Netherlands. Drawing on her recent experience at TenneT TSO, she offers cutting-edge insights into optimizing grid efficiency through demand-side response, energy storage, congestion management, and energy hubs at business parks and industrial estates. Prior to this, Heleen successfully led numerous energy transition and decarbonization consulting projects, providing transformative advice across the energy, manufacturing, and building sectors. Renowned for her expertise in business strategy, Heleen excels in delivering large-scale solutions in collaboration with a broad network of partners. She is also the founder of SustainBrain, a company dedicated to energy and sustainability advisory.

Day-2
Oral Presentations

METHODOLOGICAL SOLUTIONS FOR ASSESSING THE IMPACT OF ENERGY TRANSFORMATION ON REGIONAL DEVELOPMENT

Mantas Švažas

Vytautas Magnus University, Lithuania

Abstract

The challenges of climate change prompt urgent solutions to drive the energy transformation. This process is significantly related to capital investments, conversions of existing assets to clean energy sources. In order to save resources, jobs and public favor, specific studies involving different data groups are necessary. This study presents key methodological solutions for analyzing the impact of energy transformation on regions. The economic, social and governance data combined in the presentation will allow to determine the perspectives of energy transformation in the regions. Energy transformation into green generation is a compelling necessity rooted in scientific principles and driven by the imperatives of sustainability and environmental preservation. This transformation involves the conversion of conventional, fossil-fuel-based energy sources into cleaner, renewable alternatives, such as solar, wind, hydro, and geothermal power. The energy transformation that began in 2022 led to a breakthrough in green energy. Green generation technologies often exhibit higher energy conversion efficiencies compared to traditional fossil fuel-based power generation. It has opened opportunities to develop regional areas, as they have the land needed to build wind and solar power plants, as well as biomass waste power plants. Energy transformation enables regions to solve long-standing social problems determined by the inconvenient geographical location and the growth of agglomerations. However, in order to assess the potential of the regions, it is necessary to use different methodological solutions, covering economic, social, environmental and governance aspects. The study revealed that consistent, measured actions ensure a smooth process of energetic transformation. The reorientation of resources towards the development of green energy capacities ensures the saving of resources, while also creating new economic prospects for the regions. At the same time, the agricultural sector is enabled - the waste generated on farms is used for the production of the necessary energy.

Biography

Mantas Švažas has the main directions of research are energy economy, regional economy, clusterization. M. Švažas has prepared more than 30 scientific articles, has contributed to the preparation of monographs and scientific studies. Currently, M. Švažas is working on energy transformation impact researches, evaluation of agricultural and energy synergies. The scientist shares his experience with the academic and business community - he is an independent member of the boards of municipal companies, a member of the organizing committees of scientific conferences.

FATE OF HEAVY METALS DURING GASIFICATION OF CONTAMINATED BIOMASS FOR BIOFUEL PRODUCTION

Marcel Dossow, Marlon Ritz, Hartmut Spliethoff and Sebastian Fendt
Technical University of Munich, Germany

Abstract

Background: To return contaminated land to agricultural production in the long term, the GOLD project at the Chair of Energy Systems aims to produce clean and sustainable biofuels with low indirect land use change from selected high-yield lignocellulosic plants. These plants, which are optimized for phytoremediation purposes, will be efficiently decomposed into synthesis gas using entrained-flow gasification. In this process, the synthesis gas is converted into hydrogen and higher alcohols such as ethanol, acetic acid, butanol, and butyric acid by acetogenic microorganisms in a bioreactor after gas purification.

Objective: The aim of this work is to predict the fate of heavy metal contaminants in the plants during gasification. This enables an assessment to where in the process chain heavy metals can be separated from the biomass, preferably in a non-leachable, vitrified form.

Methods: Contaminated biomass that was harvested from GOLD phytoremediation pilot sites is investigated experimentally. Using fuel analysis gasification test rigs, release kinetics are obtained. Using the contamination levels in the residue after gasification, the mass balance for heavy metals can be closed. The resulting temperature dependent release behavior of the contaminants is used to validate a previously developed model to predict the phase transitions of contaminants from solid phase to gas phase and back during entrained-flow gasification of contaminated biomass.

Results: Experimental and simulation results show that cadmium, lead and zinc show volatile behavior and are entirely volatilized during entrained-flow gasification. The other heavy metals are rather non-volatile and are only partially released during gasification. Non-volatile elements start to recondense in the gasification chamber and all heavy metals are entirely solidified in the water quench.

Conclusion: To understand the release behavior of heavy metals and metalloids during the gasification of contaminated biomass, this work allows to measure and predict their phase transition behavior under gasification conditions.

Biography

Marcel Dossow, a research associate and PhD candidate at the Chair of Energy Systems ("CES", Prof. Spliethoff) at the Technical University of Munich (TUM). Marcel Dossow graduated his M.Sc. in Energy and Process Engineering at TUM in 2020. Since March 2021, He has been working at CES to further explore biomass-to-liquid, power-to-liquid, and combinations of the two process routes (PBtL). In particular, biomass entrained flow gasification in combination with the integration of renewable electricity and the following fuel synthesis are simulatively investigated on a process level.

SUPERCRITICAL WATER LIQUEFACTION OF WASTE PLASTICS TO PRODUCE HIGH VALUE FUELS AND CHEMICALS

Maria Mathew, Mohammad A Nahil and Paul T Williams

University of Leeds, United Kingdom

Abstract

Background: Global plastic production approaches 400 million tonnes annually, with forecasts indicating a tripling by 2060. Inadequate recycling exacerbates waste accumulation, primarily disposed in landfills or ecosystems. Hydrothermal liquefaction (HTL) in supercritical water presents a promising avenue for converting plastic waste into valuable products such as liquid fuels and high value chemicals.

Objective: The objective of this research is to assess the feasibility and efficiency of supercritical hydrothermal liquefaction (HTL) for converting plastic waste, including low density polyethylene (LDPE), polypropylene (PP), and polystyrene (PS, into liquid fuels and chemicals, evaluating product yields and composition under varying process conditions, using thorough analysis to determine its effectiveness in addressing the impacts of plastic pollution.

Method: The experimental setup employed a 75 ml autoclave reactor with a thermowell and thermocouple for temperature measurement. Plastic pellets and water were added in varied ratios, not exceeding 24 ml per experiment. The reactor was sealed, purged with nitrogen, heated to 450°C and maximum pressure of 33 MPa, and maintained for 60 minutes. After cooling, gas and liquid samples were collected for analysis.

Results: The gas phase mainly consisted of light hydrocarbons such as methane, ethane, propane and butane, with propane found to be the most abundant gas component. High yields of oil (>97 wt.%) were obtained and contained a mixture of alkanes, alkenes, cyclic hydrocarbons, and aromatic hydrocarbons. The aromatic hydrocarbons and alicyclic hydrocarbons were the major products in the product oil from the supercritical water liquefaction of polystyrene and polypropylene whereas alkanes were predominant in the oil obtained from LDPE. Analysis of the oil obtained from binary (1:1) and ternary (1:1:1) plastic mixtures exhibited aromatic hydrocarbons as the major constituent, indicating synergistic interaction.

Conclusion: In conclusion, the study demonstrates the effectiveness of hydrothermal liquefaction (HTL) in converting various plastic wastes, including LDPE, PP, and PS, into valuable oil products. With high oil yields and diverse compositions observed, HTL emerges as a promising solution to address plastic pollution and resource recovery challenges without requiring catalysts.

Biography

Maria is a second year PhD student with a profound dedication to advancing sustainable technologies and waste management. Her research focuses on supercritical water liquefaction of waste plastics to produce high-value fuels and chemicals, aiming to combat environmental pollution while promoting resource efficiency. Her PhD is supported by the U.K. Engineering & Physical Sciences Research Council (EPSRC) - University of Leeds Doctoral Training Partnership Scholarship.

Coalesce Research Group

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SUBCRITICAL AND SUPERCRITICAL BIOMASS HYDROTHERMAL LIQUEFACTION FOR BIOFUEL PRODUCTION

Christyfani Sindhuwati, M Anas Nahil and Paul T Williams
University of Leeds, United Kingdom

Abstract

Background: Lignocellulosic biomass, as a potential feedstock, contains lignin, hemicellulose, and cellulose. Lignocellulosic biomass can be converted into liquid fuels using thermochemical conversion technologies that use heat to break down the lignocellulosic biomass into solid, liquid, and gaseous products. Hydrothermal Liquefaction (HTL) is a thermochemical conversion of biomass into liquid fuels by processing in hot (200-400°C), pressurized (5-25 MPa) water for sufficient time to break down the solid biopolymeric to mainly liquids. The temperature initiates the pyrolytic process, and the pressure maintains a liquid water phase. The target products are biogas, bio-oil, biocarbon, and the aqueous fraction (acid, phenols, and sugar). The advantages of using hydrothermal liquefaction to convert biomass into liquid fuels are that hydrothermal liquefaction generates higher energy density, has a shorter reaction period, is suitable for any biomass (e.g. lignocellulosic biomass, black liquor from pulp mills, wastewater sludge, food waste), does not require a catalyst and pre-drying in the biomass preparation step. Moreover, hydrothermal liquefaction can convert lipids, carbohydrates, and proteins. Hydrothermal liquefaction can be conducted and characterized by using subcritical and supercritical water. It promotes a change by its physicochemical properties, such as dielectric constant density ionic potential, and converts feedstock into a product of interest. The physicochemical properties of subcritical (14.07) and supercritical water (5.9) are very different from those of ambient liquid water (78.5). The temperature difference in the hydrothermal liquefaction process affects the dielectric constant of the water and can affect the hydrothermal liquefaction product distribution. A good understanding of the product distribution from the hydrothermal liquefaction process can be used to produce the target products and determine the suitable process conditions for certain products.

Objective: To study the product distribution of subcritical, supercritical, and the combination of sequential subcritical and supercritical hydrothermal liquefaction process.

Methods: The hydrothermal liquefaction reactor used for experiments was supplied by Parr Instrument Company Inc. Illinois, USA, series 4740 High-Pressure Vessel Systems with a volume capacity of 75 ml. Hydrothermal liquefaction was conducted under three process regimes, comprised of subcritical (250-350°C), supercritical (above 373°C), and the combination of sequential sub and supercritical conditions. The process parameters of the ratio of biomass and total water, hydrothermal liquefaction temperature and residence time were investigated. The feed for hydrothermal liquefaction was biomass in the form of wood pellets (< 0,5 mm size) and water with a total working volume of 25 ml. The hydrothermal liquefaction products were separated using filter paper to separate the liquid and solid phases. The gaseous product was analyzed using GC, while the liquid product was analyzed using an HPLC-UV detector.

Results: Water with a dielectric constant of about 78.5 at ambient conditions changes its properties in near-critical (subcritical conditions), which can be used as a solvent for ionic/polar species. However, as the temperature approaches the critical temperature (373°C, 22.1 MPa) and beyond (supercritical), the

dielectric constant will dramatically decrease to less than 10 (similar to methylene chloride), behaving like a non-polar solvent that can dissolve and degrade a variety of non-polar organic compounds. High temperature promotes the decomposition of organic compounds like cellulose and hemicellulose. The temperature transfers more carbon from the biomass to the gas phase. Increasing temperature was shown to increase the yield. However, higher temperature causes secondary decomposition of biomass and recombination of some free radicals, leading to gas and char formation.

Conclusion: Hydrothermal liquefaction conditions affect the product distribution in the bio-crude and liquid phases. Moreover, the difference in the hydrothermal liquefaction conditions affect the gaseous, crude, liquid, and solid product proportions.

Biography

Christyfani Sindhuwati is a PhD student in Chemical and Process Engineering at the University of Leeds, supported by the LPDP Indonesia Scholarship. With a research focus on biomass conversion for biofuel production, Christyfani holds a Master of Science degree in Chemical Engineering from Institut Teknologi Bandung, Indonesia. She has been serving as a lecturer in the Chemical Engineering Department at Politeknik Negeri Malang, Indonesia since 2017. Christyfani brings expertise in biomass conversion, biofuel production, chemical engineering, and academic instruction to her work.

MITIGATING THE EFFECT OF CARBON DEPOSITION ON THE PERFORMANCE OF SOLID OXIDE FUEL CELL

Godwin Mong Kalu-Uka and Sandeep Kumar

Energy Science and Engineering, Indian Institute of Technology Bombay (IIT Bombay), India

Abstract

Background: One of the sustainable technologies for the generation of electricity is the combined biomass gasification-SOFC (CBGS) systems. However, studies have shown that the overall efficiency of a CBGS system is significantly reduced by the contaminants (tar, H_2S, HCl, HCN, etc) which are present in biosyngas. Even though earlier studies have shown that the tar contaminant in biosyngas can be reduced/removed using gas cleaning technologies, recent studies have also shown that the reliability of the gas cleaning technologies is not always guaranteed. For this reason, we hereby propose a novel, zero-dilution, cost-effective and non-metallurgical solution for eliminating the formation of carbon deposits on the anode of CBGS systems.

Objective: To simulate the effect of suspended nanoparticles on the performance of biosyngas-fueled SOFC.

Methods: Computational software (ANSYS) was used to simulate the concurrent decomposition of methane in a bi-catalyzed, two-phase flow reaction media

Results: The results show that the suspension of nanoparticle catalyst in biosyngas helps to reduce (and possibly eliminate) the formation of carbon deposits on the SOFC anode. However, the experimental validation of this result is still an ongoing-research in our laboratory.

Conclusion: The suspension of nanoparticle catalysts in biosyngas is a novel, zero-dilution, costeffective and non-metallurgical solution for the problem of carbon deposition on the anode of CBGS systems.

Biography

Godwin Mong Kalu-Uka has a PhD in Materials Science and Engineering. He has received a number of research scholarships from different organizations and research institutes including the Nigerian Petroleum Technology Development Fund (PTDF), the Pan African Materials Institute (PAMI), and the Africa-India World Bank Forum Summit III Project. At present, he is a research fellow at the Department of Energy Science and Engineering, IIT Bombay; and his research interest cuts across waste and biomass valorisation, materials characterisation, and computational materials science.

PYROLYSIS-NON-THERMAL-PLASMA-CATALYSIS PROCESSING OF BIOMASS AND WASTES FOR UPGRADED OIL AND GAS PRODUCTION

Maryam Khatibi, Mohamad A Nahil and Paul T Williams

University of Leeds, United Kingdom

Abstract

Background: Waste biomass can be used to produce bio-oil, which is a renewable feedstock for the production of energy, fuels, and chemicals. It can be considered to solve energy and traditional fuel problems. However, bio-oil produced in the pyrolysis process cannot be used directly as a transport fuel due to its problematic properties such as being chemically complex, high oxygen content, acidic properties, and tendency to polymerize, so it needs to be upgraded to reduce or eliminate oxygenated compounds. Waste plastics can be used as a 'hydrogen donor' to aid the upgrading of bio-oil.

Objective: Improving the qualities of oil and gas, comprising in-situ (mixing biomass and plastic) and ex-situ (non-thermal plasma-catalysis) processes in a two-stage reactor system.

Methods: The pyrolysis-plasma-catalysis system used a novel two-stage laboratory scale reactor. In the first stage, pyrolysis of feedstock (biomass, plastic, mixture of biomass and plastic and mixed biomass/plastic in the form of refuse-derived fuel) took place in a fixed bed reactor at 650°C. In the second stage, the pyrolysis products were upgraded in a dielectric barrier discharge (DBD) non-thermal plasma-catalysis reactor at a temperature of 250°C and a range of different input powers and catalysts.

Results: Introduction of plasma and catalyst led to production of gas with higher hydrogen content and oil with lower amount of oxygenated compounds in comparison to pyrolysis alone. This could be due to the high-energy electrons in the non-thermal plasma environment that collide with pyrolysis volatiles and generate radicals and intermediates which causes recombination of products. Moreover, the synergistic effect between plasma and catalyst boosts active species production and reduces undesired products.

Conclusion: The co-pyrolysis-plasma process of biomass and plastic and pyrolysis-plasma-catalysis of mixed biomass/plastic in the form of refuse-derived fuel were shown to have a great influence on the yields of gas and oil and their compositions.

Biography

Maryam Khatibi has a strong passion for the production of gas and liquid fuels. She is currently a third year PhD student and works on improving the quality of oil and gas using Dielectric Barrier Discharge non-thermal plasma and catalyst. Her PhD is supported by the U.K. Engineering & Physical Sciences Research Council (EPSRC) Doctoral Training Partnership scholarship.

DESIGN AND DEVELOPMENT OF A MULTIPULSE DC-AC CONVERTER TO OBTAIN THE MAXIMUM POWER TRANSFER IN A PHOTOVOLTAIC SYSTEM

Pedro Rocha Hernández, Carlos E Castañeda, and Antonio Valderrabano-Gonzalez

Maestría en ingeniería en energías renovables, Universidad de Guadalajara, Mexico

Abstract

Background: Photovoltaic systems play a crucial role in renewable energy generation, offering a sustainable and environmentally friendly alternative to conventional power sources. However, the efficiency of PV systems can be limited by factors such as mismatch losses and suboptimal power conversion. One approach to address these challenges is the use of multipulse DC-AC converters, which are designed to optimize power transfer from PV panels to the load.

Objective: Design and develop a 36-pulse DC-AC converter to achieve maximum power transfer in a 2.56 kW photovoltaic system.

Methods: The design and development process of the multipulse DC-AC converter is centered around the integration of a twelve-pulse converter topology with a three-level converter. This combination incorporates neutral point injection to achieve a 36-pulse output. Such a configuration significantly diminishes the total harmonic distortion (THD) and facilitates optimal power transfer within the photovoltaic (PV) system. Furthermore, a comprehensive experimental prototype was meticulously constructed. This prototype encompasses a three-phase motor rated at 3 HP, a data acquisition board for signal coupling, and an advanced sensing stage equipped with precise instruments for measuring angular speed, voltage, and current. The deployment of this prototype enabled the acquisition of real-time data, which was instrumental in assessing the converter's operational efficiency.

Results: Total Harmonic Distortion (THD) of 6 % was obtained in simulation, indicating an efficiency of 93 %. In real-time implementation, less than THD of 7%.

Conclusion: The implementation of this inverter in an autonomous Photovoltaic system is highly viable due to its THD of less than 7%. Furthermore, by implementing advanced control in this system, an increase in energy quality can be achieved by controlling the active and reactive power generated by systems such as motors. Another highly impactful application can be hybrid systems that act as backup systems and inject energy into the grid.

Biography

Pedro Rocha Hernández is an expert in photovoltaic installations, having been an entrepreneur since 2018. He has installed over 250 kW of photovoltaic power, which has generated more than 500 MWh of energy to date. He is pursuing a master's degree in Renewable Energy Engineering at the Universidad de Guadalajara, Centro Universitario de Los Lagos. He has experience in installation photovoltaic systems connected to the grid and autonomous projects. Pedro's commitment to both practical application and academic advanced showcases his dedication to the field of renewable energy and his desire to make meaningful impact in sustainable energy solutions.

DESIGN AND CONSTRUCTION OF A LOW-SCALE FLYWHEEL ENERGY STORAGE SYSTEM.

Abraham Sánchez Alavez, Carlos E. Castañeda and Juan Cristóbal Alcaraz
Centro Universitario de los Lagos Universidad de Guadalajara, México

Abstract

Background: Electricity generation has perennially grappled with the challenge of energy storage. However, the advent of innovative Energy Storage Systems (ESS) has marked a significant breakthrough. These systems encompass a spectrum of technologies, including electrochemical, electrical, chemical, thermal, and mechanical modalities. Our research has delved into one mechanical system in particular: the Flywheel Energy Storage System (FESS). FESS emerges as a compelling alternative energy solution, boasting high power density and utilization of conventional materials. Notably, FESS operates without producing any pollutants and can sustain over 10 million operational cycles. At the culmination of their lifecycle, FESS units are disassembled, allowing for the recycling of components, which are then repurposed into new mechanical parts.

Objective: To design and construct a prototype of a low-scale flywheel energy storage system using readily available materials, aiming to quantify its energy storage and generation capabilities through rigorous testing and analysis, thereby contributing to sustainable energy solutions.

Methods: We have meticulously engineered and fabricated a bespoke prototype FESS to conduct a comprehensive evaluation of its performance on a reduced scale. Our assessment focused on the system's proficiency in accumulating rotational kinetic energy, its power generation capacity, the duration of sustained power output, and the overall energy density. To derive these insights, we employed a robust data acquisition system, a signal coupling stage, a potent 3 HP three-phase motor, and advanced sensors for precise measurement of angular speed, voltages, and currents.

Results: The prototype underwent a series of rigorous tests, producing quantifiable data that was meticulously charted. These results were then methodically analyzed against established ESS benchmarks to gauge performance. Furthermore, we conducted scaled-down trials, replicating the operation of the FESS in the capacity of an Uninterruptible Power Supply (UPS). This allowed us to evaluate the prototype's efficacy in a simulated UPS mode. The comprehensive data collected from these tests were not only measured and graphically represented but also subjected to a comparative analysis with other storage systems, serving as a benchmark. The low-scale testing phase particularly focused on the system's functionality as a UPS, ensuring a thorough examination of its operational capabilities.

Conclusion: Flywheel storage systems represent a cutting-edge alternative for the storage and generation of clean and sustainable energy across various industries. By harnessing the kinetic energy of a rotating mass, these systems offer a reliable and efficient solution for energy management. Their potential to integrate seamlessly with renewable energy sources makes them a pivotal element in the global shift towards moe sustainable and eco-friendly energy practices. As the world increasingly prioritizes green energy, the strategic implementation of flywheel technology could be instrumental in propelling this transition and ensuring a stable and resilient energy future.

Biography

Abraham Sánchez Alavez has a bachelor's degree in mechanical engineering and is currently pursuing a master's degree in renewable energy engineering. Through the experience acquired in jobs such as mechanical maintenance, operation of industrial machinery, precision machinery, design, manufacture and assembly of metal structures has focused on the study of renewable and alternative energies to develop prototypes and systems with applications in energy quality, which benefit the quality of life of the population and to implement these systems to reduce the use of fuels that produce greenhouse gases.

INTEGRATED COMBAT ON CLIMATE CHANGE IN NEPAL

Ramesh Babu Shrestha
Environment Nepal (EN), Nepal

Abstract

If people are poor, they won't be able to cope with climate change impacts, and if the country is poor, it won't be able to help its people cope with that impact. This is the situation of my country, Nepal, and a global issue. We educate our community of the imminent global climate crisis, we promote and demonstrate green entrepreneurial solutions, and we deliver IMPACT by incubating, supporting, and sustaining social entrepreneurial initiatives. Our mission is to promote sustainable solutions to address the social and environmental challenges in economically feasible ways.

Introduction:

Country Background; Nepal is predominantly a small mountainous and landlocked country situated in the central part of the Himalayas between 260 22' and 300 27' N latitudes and 800 04' and 880 12' E longitudes, covering an area of 147,181 sq. km and divided into five physiographic regions, viz High Himalayas, Lesser Himalayas (High Mountains), Middle Mountains (The Mahabharat Range), Siwaliks (The Churia Range) and the Tarai plains. The country is around 850 km long (east-west) and experiences a wide range of climates varying from the sub-tropical to the alpine type as the elevation varies from 64 meters (m) above sea level to 8,848 m (world's highest mountain peak, Mt Everest) within a span of less than 200 km. It experiences heavy rains from June to September due to the south-easterly monsoon, which accounts for 80% of the total rainfall, and winter rains, from November to January and pre-monsoon rains from April to May accounts for the rest of the rainfall.

Climate Change & Nepal: Nepal, the home to the Himalayas, Nepal's low level development, complex topography, and variability in climate and micro-climate within shorter distance makes it vulnerable to climate change. Nepal ranks fourth in the global climate risk index of the most vulnerable countries. Nepal is highly vulnerable to climate change in this region as our country lies mostly within the fragile Himalayas. Vulnerability is measured in terms of ability to cope with climate induced disasters, poverty status, technicality of climate change, and forest and geography and biodiversity. If people are poor, they won't be able to cope with climate change impacts. And if the country is poor it won't be able to help its people cope with that impact. But there is no reason for alarm as well. For the last decade or so Nepal has been doing rather well in terms of adaptation. There have seen good intervention efforts by the government as well as by various non-governmental actors. In fact, Nepal is leading the adaptation process globally. Nepal was rated as the best country last year in one climate change negotiation. Ministry of Population and Environment was also awarded for this.

Effect of Climate Change in Nepal: The consequences of global warming have had the most impact in developing and mountainous countries like Nepal, which has high intensity rainfall during the rainy season. It has resulted in heavy floods, landslides and soil erosion. The low income & subsistence users are about 38% of total population Nepal lies below the poverty line have hard time to afford for their livelihoods in Nepal. That is a great challenge to cope with climate change induced hazard & extreme

events. The livelihoods of more than 80% local people of hilly region are heavily depending on climate sensitive area such as agriculture, forest and livestock and on other natural resources such as water & irrigation. Glaciers are melting, sea levels are rising, cloud forests are dying and wildlife is scrambling to keep pace. It has become clear that humans have caused most of the past century's warming by releasing heat-trapping gases as we power our modern lives. Called greenhouse gases, their levels are higher now than at any time in the last 800,000 years.

Climate Change and its impact in Nepal: The Earth's climate is unique as it supports life due to the availability of oxygen in atmosphere, water on its surface and the occurrence of reasonable range of surface temperature due to the presence of naturally occurring greenhouse gases (water vapor, carbon dioxide, methane, and nitrous oxide). Climate thus, has been playing central role in human societies since long. Global warming due to climate change means a bleak future. Since all the species exist in the complex web of interaction between them and climate, global warming will affect the entire plant kingdom in unpredictable ways. Annually in Nepal, natural hazard causes loss of 500 lives on average and property worth several millions. Majority of these losses occur due to hydro-climatic disaster such as torrential rain, floods, soil erosion and landslides. Forested hill slopes are now in the process of turning into bare hills due to excessive soil erosion caused by rains. This process would then finally intensify desertification. In such a disaster scenario increase of monsoon precipitation may add more catastrophes in the country. Global climate change model has predicted that the rainy season in Nepal will be extended to June from July with more rainfall and the winter will be drier. Twenty-four hours of extreme precipitation analyses indicate the whole of the Terai, which is the food bowl of Nepal, is susceptible to floods. Changes in the position of glacier terminus reflect the mass balance condition of past years, and a general tendency of glacier fluctuation indicates a corresponding change in the climate. Study of glaciers in Nepal revealed that 66 per cent of the observed 494 glaciers had retreated during 1958-92. If these glaciers, which are the sources of our principal rivers (Koshi, Gandaki and Karnali) will keep receding in such a fashion, they might no longer remain perennial. On the other hand, the amount of water from melting glaciers, released into the ocean will have a drastic effect on man and other species due to sea level rise. Besides, the glacier lake outburst flood is one of the most disastrous and significant phenomena affecting current and future developments of water resources in the mountain region of Nepal. It is clear that environment in Nepal, which is highly vulnerable to natural hazards and disaster, could face serious impact due to climate change.

Windstorm, Thunderbolt and Hailstorm; occur mainly during the dry season between March to May. Thunderbolts occur during the monsoon and hailstorm takes place during the beginning and end of the monsoon. Hailstorm causes heavy losses of agricultural crops though human life loss is seldom. Windstorm and thunderbolt causes the loss of human life as well as physical property. Drought; some parts of the country face the problem of drought. Uneven and irregular monsoonal rainfall is the main factor of drought. The mountainous region (the northern belt) of Nepal is generally dry. The lack of irrigation facilities make the problem even more serious as prolonged drought condition has adverse effect in crop production. Avalanche; as the northern part of the country is covered with snow peaks, avalanche is very common and sometimes it claims the life of human being as well. The avalanche 25 April 2015 killed very people including some foreign trekkers at Everest base camp. Glacier Lake Outburst Flood (GLOF); in the Himalayan region of Nepal glacier lakes is common. A total of 159 glacial lakes have been found in Koshi basin and 229 in Tibetan Arun basin. Among them 24 are potentially dangerous. The areas like: Upper Barun, Lower Barun, Chamlangtsho, Tsho Rolpa, Sabou, Dudh Kunda, Majang, Inja, Thulari have potentially dangerous glacier lakes. These lakes contain huge volume of water and remain

in unstable condition, as a result, they can burst any time and a natural catastrophe may cause loss of life and physical property. About 14 such glacier lake outburst flood has already been experienced between 1935 A.D. to 1991 A.D.

Climate Change and Mountains of Nepal: The concerns of the world's mountain regions and the amplified impact of global warming on the world's mountains were mentioned only tangentially in the last two IPCC report. This assessment, in which IPCC scientists also took part, is expected to put the Himalayan region firmly on the global agenda as well. Himalayan countries have always struggled against poverty, marginalization, state neglect, inequality, discrimination, out migration, and these problem predate climate change. What global warming does is make all the existing structural problems worse. For example, the assessment shows that half the children living in Himalayan villages are undernourished. Nepal's national poverty rate is 23%, but 42% of the country's mountain dwellers are poor. Because they have fewer choices, the poorest are already beginning to suffer from erratic weather and other impacts of climate change, adding to the push-factors in outmigration. Two of ICIMOD's member countries, China and India, are both suffering the impact of climate change along their common mountain frontier. Together, the two giants are the biggest emitters of greenhouses gases in the world. It no longer makes sense now to talk only about adapting to climate change, Himalayan countries need to also start mitigating their carbon emissions and switching to renewables.

Climate Change and Tourism of Nepal: Climate change is a burning issue which had affected different sectors of the environment. It is observed in Nepal in the form of increased frequency of natural disasters, rise in temperature and change in rainfall patterns, shifting of tree line and unfavorable weather change phenomena. It had affected agriculture, hydropower, tourism and livelihood of people in Nepal. Tourism is a travel to a place for the purpose of business, vacation and other activities. It generates enterprise and employment, increases income and helps in sustaining livelihood of local people. There is a close relationship between climate and tourism in ecosystem tourism, coastal tourism, mountain tourism and nature-based tourism. Climate change brings more risks than opportunities by causing regional and seasonal shifts in tourist flows. This paper is based on the review of researches on climate change and tourism. Climate change had caused shift in destination choice of tourists. It had reduced barrier of winter tourism in Nepal in short term. But, unfavorable weather change phenomena had taken lives of many tourists in Nepal and had caused discomfort in transportation in mountain regions. It would decrease the flow of tourists in long term and decrease the income from tourism. It will further cause adverse impact on livelihood of tourism dependent people. To minimize the adverse impact of climate change on tourism, appropriate preventive measures, rescue measures and early warning systems should be implemented in mountain tourism in Nepal.

Climate Change and Agriculture in Nepal: Nepal is a little land bolted nation with a region of 1,47,181 sq. km. The mountain locale involves around 35.2% of the land region. The bumpy district involves around 41.2% of land zone though Terai Region possesses just 31.2% of the land zone. As said, guaranteeing food security is becoming an increasing challenge in Nepal. This is partly due to population growth, to an increase in the demand for food and to insufficient growth in farm productivity. Changes in the country's climate have also aggravated concerns over rice production and food security. For instance, the maximum temperature in Nepal increased by 1.8o Cover the period between 1975 and 2023, and rainfall has become more erratic. Climate-related changes have also been observed in high intensity floods, landslides, erosion and increased sedimentation. Changes in seasonality have also been observed. Given the subsistence nature of Nepal's economy, a slight decline in rice yields can have a devas-

tating impact on household food security. Most of the Nepalese from urban or rural, wood is usually the principal source of energy for cooking food and for keeping warm. Data collected on an economic survey conducted by J.E.M. Arnold and Jules Jongma from FAO shows that an estimated 86 percent of all the wood consumed annually is used as fuel. Agricultural Engineer design and built agricultural infrastructure such as dams, water reservoirs, warehouses, and other structures. Some agricultural engineers are developing new forms of biofuels from non-food resources like algae and agricultural waste. Such fuels could economically and sustainably replace gasoline without jeopardizing the food supply trees).

Natural Science Education in Nepal: We were the inherited people of our great ancestors and our residing place is also the Himalayan region along with the valley and bank of rivers originating from Manashsabar. But if I recall the status of natural science education in Nepal in my childhood time, Natural sciences were taught just to produce "Science teachers" who had got higher value in our society. The curriculum and teaching methodology was traditional, critical thinking, analysis & research part was completely missing in it. University-level technical education was started only after the establishment of Institutions on TU i.e. after 1972. After the establishment of these institutions, within the last 50 years, almost all institutions, undergraduate, master, postgraduate, and even doctorate programs are started and all programs are continued as international academic norms. But the research part is still missing in these institutions as per our expectations, despite of tremendous desire by the faculties working in these fields. Likewise, scientific teaching and research are gradually incorporated not only in the technical fields but also in the Natural sciences too. For the last 25 years, it is gradually progressing and we hope that research, critical thinking, innovations, and their outcomes in all fields of natural sciences must be applied in day-to-day life, industry, and national constructions which could boost the economy of the country. Moreover, natural science research should be in priority of our university as well as the national priority of our education systems. We must have to attract brilliant students to the field of natural sciences and provide them with a good platform for research. For this, Nepal Government must invest and increase the national budget in the field of natural science education. University is not only a place for sharing knowledge & skill but also a place for research & innovations. Innovations could be applied in the national building process, industry, agriculture, environment, health sector, social security & so on which will ultimately lead the country forward toward prosperity. Once the country will be prosperous, citizens will be empowered. In this way, we can compete natural science education in Nepal with countries rest of the world.

Challenges of Natural Science Education in Nepal:

- Lack of motivation among students
- Traditional curriculum
- Traditional science labs
- Lack of integrated laboratories
- Lack of research labs, and their infrastructures
- Lack of teaching/research motivation in teachers
- Lack of research-oriented training and research culture
- Lack of research funds/ research exposure
- Lack of social security/prizes for researchers
- Natural Science Education is not in Govt. priority (minimum budget)
- Brain drain due to lack of opportunity

Minimize Negative Impacts of Climate Change in Nepal: Based on the Paris Agreement, developed countries have committed to supporting developing and poor countries to combat climate change impact. It is up to developing countries like Nepal how to best utilize the grants and support pledged by developed countries. Adaptation should be Nepal's priority, not mitigation as we do not emit much carbon. Our consumption of fossil fuel is much lower compared to developed countries. We have already adopted the National Adaptation Plan (NAP), which has identified eight key areas like agriculture, food security, forest and biodiversity, water resources and energy. We need to work to keep these areas immune from climate impact or find ways to adapt. We need to get to the ground to understand how climate change affects the livelihood of the poor and vulnerable communities. The CBS report says 49 percent of people are not aware about climate change. This is because we have kept our efforts limited to Kathmandu. We have not been able to raise awareness on the ground. We need to work with new local governments across the country. We need to take actions to revitalize availability of water resources at the grassroots. Now is the time for some action. We also need better coordination among institutions working on climate change and other governmental and nongovernmental bodies working on infrastructure development. In other words, we need a holistic approach. Nepal is located in a geographic region prone to natural disaster. Loss of lives and property are a regular phenomenon, and the number of such events is on the rise due to natural as well as man-made causes. Among the main reasons of natural disasters in Nepal are active tectonic and geomorphic processes, young and fragile geology, variable climate conditions, unplanned settlement, increasing population, weak economic condition and low literacy rate. Nepal is therefore geologically found to be vulnerable to various types of natural disaster such as flood, landslide, Fire, Epidemic, earthquake, Avalanche, Windstorm, Hailstorm, Lightening, Glacial Lake Outburst, Flood, Drought etc. Apart from another reason, lack of good governance practices and public awareness contribute significantly to this problem. Among the most devastating natural disasters experienced by the country are the earthquakes of 1833, 1934, 1980, 1998, 2015 and the flood of July 1993, which not only cause heavy loss of human lives and property but also adversely affected the development process of the country as a whole. In the year 2003 alone, 232 people lost their lives in a landslide and flood, and above 10,000 in 2015 earthquake. Historically, it has been observed that there is significantly dangerous seismic activity every seventy to hundred years in Nepal. Disaster often has significant impact on Social, Economic, Cultural and environmental system. Thus, there is an urgent need to redress the proactive policies related to natural disasters, with emphasis on Preparedness, Rescue, Relief Management and Rehabilitation. Natural disaster cannot be prevented, but their effect can certainly be greatly minimized if there is a right amount of preparedness, and it is for that reason that the Nepal Centre for Disaster Management exists today. We firmly believe that helping to empower people and enhancing the capacity of the local communities in disaster preparedness and management by way of training and increased awareness is the most effective means to mitigate the effects of natural disaster in the country.

Conclusion: Traditional top-down decision-making processes have become inadequate, due to their inability to create appropriate solutions for local communities. Nepal's forest cover, condition and quality are being improved. This is the success of only through three way partnership such as communities from bottom-up function, government & donor from top-down function and NGOs, civil society network from outside-in. In this situation, CFUGs have to be involved in mainstreaming to implement climate change adaptation. It is due to they are playing the key role in proactive in investing their funds, climate change knowledge transfers and policy feedback to adopt to the impact of climate change. Policy shall be emphasized the establishing groups around the resources that are indispensable for the livelihoods

of poor and vulnerable groups to access diversification opportunity. It is necessary to bridge this gap; bottom-up approaches may produce the best results by building on local experiences and knowledge. For this, building-up the capacity of groups and their poor and vulnerable communities on climate change mitigation and adaptation is pertinent. In addition to this, focus needs to be given on institutional development, capacity building and awarding CFUGs for their good work on forest development and bio-diversity protection which ultimately contributes to ecological and environmental balance.

Biography

Rameshbabu Shrestha is from Nepal, and He is an environmental activist. Nepal is a natural beauty country, with 68% total area covered by mountains, and among the 14 highest peaks in the world above 8000 m, 8 of them are situated in Nepal, including the highest peak in the world, Mt. Everest 8848 m. Nepal is highly vulnerable to climate change in this region, as our country lies mostly within the fragile Himalayas. Glaciers are melting, sea levels are rising, cloud forests are dying, and wildlife is scrambling to keep pace. It is observed in the form of increased frequency of natural disasters, rise in temperature and change in rainfall patterns, shifting of tree line, and unfavorable weather change phenomena. Climate change is a global challenge induced by humans that has no borders, and to combat it, it requires coordinated work by all of us.

APPRAISEMENT AND CATEGORIZATION OF COMPOSTABLE AND NON-COMPOSTABLE PLASTIC BAGS USING HHXRF SPECTROPHOTOMETER, A STUDY ON BRANDS IN ISLAMABAD, PAKISTAN

Said Akbar Khan and Rohana Bibi

Bahria University Islamabad, Pakistan

Abstract

The rapid development in industries manufacturing plastic bags is taking serious consideration to save the environment and human health, one way or the other. This study examines the composition of degradable and non-degradable plastic bags collected from the markets of different sectors of Islamabad. Hundred samples of both Degradable and non-degradable plastic bags were collected from the open market. The concentrations, proportion, and patterns of different heavy metals (additives) were used in the production of both degradable and non-degradable plastic bags by using the standard method with the help of Hands Held X-Ray Fluorescent (HHXRF) instrument. Samples results of the study showed Titanium, Calcium and Copper used in massive amounts, some of the toxic metals i.e., Arsenic, Lead, Cadmium, Chromium and Mercury were also detected. This study also reveals that degradable plastic bags might be more hazardous than non-degradable plastic bags because due to the Photolytic properties of additives used in degradable plastic bags when the chains of polymers break, the heavy metals are released in environment and become the part of it. So, concern department like Ministry of climate change and Pakistan Environmental Protection Agency should take serious step to control these serious issues.

Biography

Said Akbar Khan is an esteemed environmental scientist, acknowledged for achievements both nationally and internationally. Made significant contributions to human resource development, research, and technical assistance in sustainable development.

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RECYCLING AND ACCUMULATION OF THERMAL WASTE AT INDUSTRIAL ENTERPRISES

Lyudmila Plotnikova and Yu Vankov
Kazan State Power University, Russia

Abstract

Background: Today, a pressing issue for plants is increasing the energy efficiency of technological processes. Plants have a significant amount of low-potential waste energy in the form of condensate heat, circulating water heat, etc. Returning waste energy to the production line will improve the energy efficiency of the enterprise. As a result of the analysis of a number of plants, it was revealed that each of them has a significant amount of unused condensate heat. Condensate is a low-temperature secondary energy resource, and therefore it can be used to heat low-temperature process streams or for heating and hot water supply. In the absence of such measures, the condensate is discharged into a sewer or reservoir, since condensate is not accepted back to the power plant due to possible contamination.

Objective: Development of an energy-efficient option for returning heat from waste energy to the enterprise circuit. At the same time, through the use of thermal accumulators, a balance must be ensured between the consumption and production of secondary energy.

Methods: Recycling schemes have been developed that use flash separators to produce flash steam from waste energy. Schemes for recycling waste energy have been developed using a steam jet compressor to generate steam at a higher pressure, which is required by the plant's technological processes. The possibility of using a steam accumulator to maintain a balance between consumption and secondary production of water vapor is considered. A combined scheme has been proposed that allows the use of condensate and the production of secondary steam of the required parameters in the required quantity.

Results: In the developed scheme for recycling waste thermal energy with a steam jet compressor or steam accumulator, secondary steam of the required pressure is generated. Steam consumption was 68.9 tons per hour. This value fully meets the production need for it. The reduction in thermal energy discharges into the environment amounted to 11.66 MW.

Conclusion: Energy-technological combination in the form of combining the operation of a steam accumulator with the utilization of waste thermal energy makes it possible to reduce the energy intensity of the production process, as well as provide a reliable source of secondary steam.The work was supported by state assignment (No. 075-03-2024-226).

Biography

The authors have a large scientific background in matters of increasing the energy efficiency of industrial thermal technology schemes through the recycling of waste energy. Lyudmila Plotnikova has experience in developing energy recycling systems through the inclusion of recycling equipment. Yuri Vankov is the author of ideas for creating new configurations of thermal energy accumulators. The combination of recycling and storage equipment in a single scheme makes it possible to increase the energy efficiency of production while maintaining its stable operation. Such developments are based on methods of system analysis and methods for assessing thermodynamic and exergy efficiency. These methods and developments are used by the authors when conducting training sessions with students, when writing scientific articles and monographs, and when conducting research work for the petrochemical industry.

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