Proceedings of
One-week Short-term Staff Training Program on
"Recent Trends in Energy Conversion Technologies"
(SSTP-RTECT 2020)
July 13-19, 2020

Organised by
Curtin University Malaysia
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Sarawak, Malaysia

In collaboration with
The Institution of Engineers, Malaysia
One-week Short-term Staff Training Program on
"Recent Trends in Energy Conversion Technologies"
(SSTP-RTECT 2020)

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Convener

Dr. Sukanta Roy
Head of Department, Mechanical Engineering
Curtin University Malaysia
Preface

With the rapid techno-industrial growth and energy intensive human lifestyle over last few decades, the needs for different approaches to meet the ever-growing energy demands have also been amplified significantly. However, the depletion of natural resources like fossil fuels, oil and gas reserves and the associated high CO$_2$ emission are the major concerns of the global society, which drives the interest in the experts and researchers of industry and academia for further deliberation and efforts on reliable, efficient, and sustainable energy technologies.

With this global context, SSTP-RTECT2020, the short-term staff training program has been intended to create a platform for sharing the knowledge and deliberations on recent trends in different energy technologies to the global community. The basic objective of this short term training program is to apprise the academicians, research scholars, and professionals working on different energy technologies, such as solar energy, bioenergy, wind energy, hydro energy, CO$_2$ capture, energy storage, fuels & combustion, energy efficient buildings, energy sustainability and lifecycle analysis, energy simulation and modeling etc.

Based on the expertise, the speakers from different national and international universities such as Curtin University Malaysia, Curtin University Australia, University of Technology Sydney, The University of Tokyo, Indian Institute of Technology Roorkee, Universiti Malaysia Terengganu, Indian Institute of Technology Delhi, Asian Institute of Technology Thailand, Indian Institute of Technology Mandi, University of Malaya, Indian Institute of Technology Indore, Indian Institute of Technology Jodhpur and CADFEM SEA Pte. Ltd., Singapore will deliver technical sessions in SSTP-RTECT 2020 from their research and job experiences.

I wish you enjoy and explore your valuable engagement with the expert ideas in sustaining your own professional development in the field of different energy conversion technologies as mentioned above.

Thank you.

Dr. Sukanta Roy

Convener, SSTP-RTECT 2020
SSTP-RTCET2020
July 13-19, 2020

SPEAKERS

Dr. Suvash Saha
University of Technology Sydney
(Australia)

Dr. Aziz Muhammad
The University of Tokyo
(Japan)

Dr. Sunil K. Singal
Indian Institute of Technology Roorkee (India)

Dr. Mohd Zamri Ibrahim
Universiti Malaysia Terengganu (Malaysia)

Dr. Dibakar Rakshit
Indian Institute of Technology Delhi (India)

Dr. Wahidul K. Biswas
The University of Tokyo
(Japan)

Dr. P. Abdul Salam
Asian Institute of Technology (Thailand)

Dr. Md. Hasanuzaman
University of Malaya
(Malaysia)

Dr. Atul Dhar
Indian Institute of Technology Mandi (India)

Dr. Bridgid Chin Lai Fui
Curtin University
(Malaysia)

Dr. Devendra Deshmukh
Indian Institute of Technology Indore (India)

Dr. Sumedha Rajakaruna
Curtin University
(Australia)

Dr. R.P. Saini
Indian Institute of Technology Roorkee (India)

Dr. Agus Saptoro
Curtin University
(Malaysia)

Dr. Lee Jun Yi
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(Singapore)

Dr. Aja Ogboo Chikere
Curtin University
(Malaysia)

Dr. Sudipto Mukhopadhyay,
Indian Institute of Technology Jodhpur (India)

Dr. Raoof Gholami
Curtin University
(Malaysia)

Dr. Jibrail Kansedo
Curtin University
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Inauguration Ceremony:

July 13, 2020, Monday:

11:00 – 11:10  Inaugural Speech by Pro Vice-Chancellor & President, Curtin University Malaysia
11:10 – 11:20  Welcome Speech by Dean of Faculty of Engineering and Science, Curtin University Malaysia
11:20 – 11:30  Introductory Speech by Convener, SSTP-RTECT2020

Expected Attendees: PVC, DPVC, COO, Dean (FOES), Dean (R&D), Convener, Invited Speakers, Academicians, Research scholars, and Professionals working on different energy technologies.

Speaker Sessions:

Day 1: July 13, 2020 Monday

11:30 – 13:00: Session 1  Modelling of Thermal Energy Storage using Phase Change Material (PCM)
   Dr. Suvash Saha, University of Technology Sydney, Australia

13:30 – 15:00: Session 2  Carbon-free Secondary Energy Sources in the Future Energy Systems
   Dr. Aziz Muhammad, The University of Tokyo, Japan

15:30 – 17:00: Session 3  Resources Assessment and Investigations for Hydro Power
   Dr. Sunil K. Singal, Indian Institute of Technology Roorkee, India

Day 2: July 14, 2020 Tuesday

11:30 – 13:00: Session 4  Wind Energy Research in Malaysia
   Dr. Mohd Zamri Ibrahim, Universiti Malaysia Terengganu, Malaysia

13:30 – 15:00: Session 5  Recent Advances in Energy Efficient Buildings
   Dr. Dibakar Rakshit, Indian Institute of Technology Delhi, India

15:30 – 17:00: Session 6  Life Cycle and Sustainability of Renewable Energy Systems
   Dr. Wahidul K. Biswas, Curtin University, Australia

Day 3: July 15, 2020 Wednesday

11:30 – 13:00: Session 7  Bioenergy with Carbon Capture and Storage (BECCS) for Sustainable Development and Climate Change Mitigation
   Dr. P. Abdul Salam, Asian Institute of Technology, Thailand

13:30 – 15:00: Session 8  Global Advancement of Solar Thermal Energy Technologies, Future Prospects and Challenges
   Dr. Md. Hasanuzzaman, University of Malaya, Malaysia

15:30 – 17:00: Session 9  Waste Heat Recovery Options for Transportation Sector
   Dr. Atul Dhar, Indian Institute of Technology Mandi, India
Day 4: July 16, 2020 Thursday

11:30 – 13:00: Session 10  Recent Advances in Thermochemical Conversion of Biomass  
Dr. Bridgid Chin Lai Fui, Curtin University, Malaysia

13:30 – 15:00: Session 11  Advances and Challenges in I.C. Engine and Petroleum Fuel  
Dr. Devendra Deshmukh, Indian Institute of Technology Indore, India

15:30 – 17:00: Session 12  Low cost Hydro Power Development using Induction Generators  
Dr. Sumedha Rajakaruna, Curtin University Australia

Day 5: July 17, 2020 Friday

11:30 – 13:00: Session 13  Technology for Hydro Power Development  
Dr. R.P. Saini, Indian Institute of Technology Roorkee, India

13:30 – 15:00: Session 14  Energy Efficient Process Modifications of CO2 Capture Systems  
Dr. Agus Saptoro, Curtin University, Malaysia

15:30 – 17:00: Session 15  Simulation Solutions for Energy Conversion and Energy-efficient Buildings  
Dr. Lee Jun Yi, CADFEM SEA Pte. Ltd., Singapore

Day 6: July 18, 2020 Saturday

11:30 – 13:00: Session 16  Historic and Recent Progress in Solar Chimney Power Plant Enhancing Technologies  
Dr. Aja Ogboo Chikere, Curtin University, Malaysia

13:30 – 15:00: Session 17  Modeling Of Combustion & Emissions In Gas Turbines  
Dr. Sudipto Mukhopadhyay, Indian Institute of Technology Jodhpur, India

15:30 – 17:00: Session 18  Characterization of CO₂ storage sites for a safe implementation of Carbon Capture and Storage Technology  
Dr. Raoof Gholami, Curtin University, Malaysia

Day 7: July 19, 2020 Sunday

11:30 – 13:00: Session 19  Recent Trends in Palm Oil based Bio-diesel  
Dr. Jibrail Kansedo, Curtin University, Malaysia

13:30 – 15:00: Session 20  Application of Vertical Axis Wind Turbines for Alternative Energy Generation  
Dr. Sukanta Roy, Curtin University, Malaysia

Closing Ceremony:

July 18, 2020, Saturday:

15:05 – 15:15  Closing Remarks by Dean of Research and Development, Curtin University Malaysia

15:15 – 15:20  Vote of Thanks by Convener, SSTP-RTECT2020
Speaker: Dr. Suvash Saha, University of Technology Sydney, Australia
Session Title: "Modelling of Thermal Energy Storage using Phase Change Material (PCM)"

Abstract

Due to rising energy demands and limited resources, interest in designing energy storage systems for heating and cooling applications has rapidly increased in different many industries. To this end, Latent Heat Storage (LHS) is one of the most promising techniques. In particular, the application of Phase Change Materials (PCMs) as LHS is well-established due to their large energy capacity, modest temperature fluctuation, chemical stabilities and small vapor pressure at their working temperature. These specifications have made PCMs promising for many applications such as building structures, electronic cooling devices, recovering waste heat and lots of other applications. Several recent studies regarding thermal energy storage systems (particularly their latent form) have optimized the amount of exchanged energy and improved their thermal conductivity. However, there are few studies, which include multi-layer arrangements of PCMs, which have significant potential to enhance the thermal performance of PCMs. PCMs possess the benefit of saving and releasing the thermal energy at a fixed temperature which has made them a useful material in the relevant industrial cases. Measures to examine the heat storage capability of the system will then be advantageous to the overall energy saving. In this talk, solidification and melting processes of different types of PCMs employed in a multi-layer annulus with various thicknesses will be discussed. Various numerical technique is applied to solve the governing equations in which the natural convection heat transfer is also considered. Simulation results are presented in the forms of liquid fraction, average temperature and their contours. It is found that using more layers of different PCMs leads to fluctuation of liquid fraction and average temperature of layers with wider amplitude.

Biography of the Speaker: Dr. Suvash C. Saha is presently working at the University of Technology Sydney, Sydney, Australia as a Senior Lecturer of Mechanical Engineering. He has also worked as a postdoctoral research fellow for more than 6 years at the School of Chemistry, Physics and Mechanical Engineering of Queensland University of Technology, Brisbane, Australia. Dr. Saha received his PhD in Computational Fluid Dynamics applications to heat transfer in buildings from the School of Engineering and Physical Sciences of James Cook University, Australia in 2009. His current research interests are: Thermal storage using Phase Change Materials (PCM); Solar thermal energy technology; Natural convection heat transfer in buildings and other confined geometries; Scale analysis for the transient flow; Computational biomechanical engineering etc. Dr. Saha has more than 200 publications including 120 journal papers mostly published in high impact journals. Total citations of Dr. Saha is 1720 (Google Scholar) and 1153 (Scopus) with h-Index of 21 (Google Scholar) and 19 (Scopus). He has more than $1.4m funding including 2 ARC (Australian Research Council) Linkage grants, one Australia-India Strategic Research Fund by Australia Academy of Science and is involved in two National Natural Science Foundation of China (NSFC) funding.
Day 1: July 13, 2020 Monday
13:30 – 15:00: Session 2

Speaker: Dr. Aziz Muhammad, The University of Tokyo, Japan
Session Title: “Carbon-free Secondary Energy Sources in the Future Energy Systems”

Abstract
Energy security, energy equity, and environmental sustainability are the important pillars toward the sustainability in energy system. In order to strengthen these pillars, clean and renewable energy sources have been gradually adopted. High dependency on carbon-based primary energy sources has led to several problems, including environmental and economic. The utilization of carbon-based fuels exhausts CO2, which is one of greenhouse gases in this earth. In addition, various types of primary energy sources are basically converted to secondary energy sources, such as electricity and other chemicals, before being used. In this presentation, potential carbon-free secondary energy sources are introduced, including their production, storage, transportation/distribution, and utilization. Hydrogen is the most abundant element in this universe, although it is mostly available in its oxidized state. Although its gravimetric energy density is very high, it suffers very low volumetric energy density, leading to the barrier in its introduction in the energy system. In addition, ammonia is also considered as very potential fuel, as well as hydrogen carrier. Hydrogen and ammonia can be produced from various kinds of primary energy sources through many available technologies. Potential scenarios for optimally utilizing both hydrogen and ammonia, in terms of mutual coexistence with the electricity, are also discussed.

Biography of the Speaker: Dr. Aziz is currently an Associate Professor at Institute of Industrial Science, The University of Tokyo, Tokyo, Japan. He received B. Eng., M. Eng., and D. Eng. degrees from Kyushu University, Japan, in 2004, 2006 and 2008, respectively, in the field of mechanical engineering. He was working previously as associate professor (2015-2019) and assistant professor (2011-2015) at Tokyo Institute of Technology. In April 2019, he was selected as UTokyo Young Excellent Researcher 2018 promoting him for the current position. His general research areas are advanced energy conversion systems. His research interest includes power generation, renewable energy utilization, process modeling, smart grid, electric vehicle, battery, and hydrogen production and utilization. He has published more than 100 peer-reviewed journals, 16 books and book chapters, and more than 200 proceedings. In addition, he is also active as a reviewer for more than 50 distinguished journals related to energy research. He also owns Japanese patent related to mechanical movement (drive) adopted until today. He has received several awards including Young Researcher Award from Asian Pacific Confederation of Chemical Engineering Congress in 2012, Outstanding paper award from Journal of Chemical Engineering of Japan in 2013, Japan Institute of Energy Award for Encouragement from Japan Institute of Energy in 2016, The Best Paper Award from Japan Society of Energy and Resources in 2018, and UTokyo Young Excellent Researcher 2018 in 2019.
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Day 1: July 13, 2020 Monday
15:30 – 17:00: Session 3

Speaker: Dr. Sunil K. Singal, Indian Institute of Technology Roorkee, India
Session Title: "Resources Assessment and Investigations for Hydro Power"

Abstract

Power is the engine of growth of any developing economy. Consumption of electrical energy is universally accepted indicator of progress in the agricultural, industrial and commercial sectors, as also of the wellbeing of the people of the state. Hydropower is considered the most reliable, predictable and clean source of energy among various renewable resources. Hydropower can be planned with multipurpose objectives such as flood mitigation, supply of water for domestic, industrial and agriculture needs in addition to power generation. Systematic resource assessment and support for identification of new sites including preparation of plan, detailed survey & investigation (DSI) and detailed project report (DPR)/ feasibility report (FR) is required to be done by the central / state government department or private agencies for development. The successful development of hydro power scheme depends upon their techno-economic viability and ruggedness for operation and maintenance. Cost effectiveness would depend largely on proper selection of site, good planning of the layout of the scheme on optimization basis, competent hydrological and power potential studies, careful and correct designs of structures, proper estimates with realistic rates and use of appropriate construction techniques and efficient execution. Data collection or investigation is a very important fundamental work for the project design. The scope and extent of the site investigations depend partly on the availability and reliability of existing published data, nature and size of proposed development and opportunities/difficulties presented by the existing topographical and geological features which in turn will affect the number of alternatives which have to be carried out. A well prepared design, an evaluated project and proper planning will be the key parameters of hydropower plants for the new projects in coming decades. Consideration of all these variable factors provides large flexibility and further helps to modernize the entire hydropower system.

Biography of the Speaker: Dr. Sunil K. Singal presently working as a Professor and Head of Department, Department of Hydro and Renewable Energy, Indian Institute of Technology Roorkee, India. Prof. Singal has obtained his PhD on optimization of low head small hydro installations from Indian Institute of Technology (IIT) Roorkee. He has started his professional career as a Scientist at IIT Roorkee in 1984 and later promoted to associate professor in 2015. He has working experience on the hydro energy for more than 35 years, and successfully supervised 8 PhD students, 80 Masters students in the fields of hydro energy and other renewable sources. Prof. Singal has published more than 200 technical manuscripts in the form of books, book chapters, journals, conference proceedings etc. His research interest includes small hydropower resource assessments and planning, designs of civil works, cost optimization and tariff analysis, integrated renewable energy systems, planning of water resources etc. He has a vast experience on conducting 68 short term courses, and delivered more than 200 invited lectures or keynotes in national, international conference, seminars, and workshops. Prof. Singal has successfully completed many national and international research and development grants, and consultancy projects, and member of many advisory and editorial boards. He is a proud recipient of Distinguished Scientist award- VIFRA 2015, Best Citizens of India Award – 2016, The Institution of Engineers (India) Excellence Award 2018 and Research Peace Award 2019-20 etc. He is a Fellow of Institution of Engineers (India) and Indian Society of Earthquake Technology, life member of a number of national and international professional bodies.
Abstract

In year 2011, Malaysia government has introduced the Renewable Energy Act 2011, which an Act is to provide the establishment and implementation of a special tariff system as a catalyst for generating renewable energy and related matters. As today, amongst the renewable energy resources, which already had the tariff under this Renewable Energy Act, are biomass, biogas, small hydropower, and solar photovoltaic. Meanwhile, there are many others potential renewable energy resources namely wind, ocean energy including wave, tidal current and ocean thermal, which are not fully developed and explored. These resources perhaps can be considered as one of new sources that could be proposed a reasonable Feed in Tariff, FIT rate under this renewable energy act in future, as their technology had already been proven viable economical as well as technological aspects. Wind energy research particularly in resource assessment in Malaysia has roughly begun in year 1980s. Mostly, carried out by the researcher from the higher learning institutions such as Universiti Kebangsaan Malaysia (UKM), Universiti Teknologi Malaysia (UTM), and others. At the early stage, most of the wind energy potential studies were based on the secondary data of wind speed, which are obtained from the meteorology station of Malaysia. In addition, there are also simulations studies conducted previously, for wind energy assessment was based on the secondary data of wind speed via opened access from the available website link satellite data. However, a study which is based on secondary data wind speed is not really accurate as it is expected. Universiti Malaysia Terengganu (UMT) is amongst of higher learning institutions that have used the primary wind speed data, which is measured from the insitu wind mast. Therefore, this paper will share wind energy research in Malaysia, especially in wind energy assessment study for selected onshore potential sites in Malaysia as well as their acceptable range of FiT rate proposed based on the capacity factor and wind turbine technology.

Biography of the Speaker: Dr. Mohd Zamri bin Ibrahim is presently working as Professor and Dean, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, Malaysia. He obtained his PhD in Renewable Hydrogen Energy Production System in 2007 at National University of Malaysia (UKM) Malaysia. Prior to PhD, he received his first Degree in Mechanical Engineering from University of Sunderland, United Kingdom, in 1996 and his Master degree in Advanced Mechanical Engineering at University of Warwick, United Kingdom. In 1999, he has joined Universiti Malaysia Terengganu as a Lecturer. In 2008, Prof. Mohd Zamri was appointed as a Head of Department of Engineering Science, Universiti Malaysia Terengganu, later appointed as the Deputy Dean of Faculty of Science and Technology in 2010 and also promoted to Associate Professor. His recent research work focuses on the renewable energy particularly, in the design, development and Techno-economics studies of the Renewable Energy System application such as wind, solar, wave and ocean current energy. He has received research grants of more than RM 5 million from various agencies as a project leader and co-researcher, and supervised a number of Masters and PhD students in the area of Renewable Energy Technology systems. He has presented and published many technical papers at various international and local refereed journals, symposiums and conferences. He is a proud recipient of numerous awards for excellence in teaching and exhibition competition at national and international level including UMT Excellence Service Award. In addition, Prof. Mohd Zamri is a member of Institute Engineers Malaysia (IEM), Board of Engineers Malaysia (BEM), IMECE (UK) and World Wind Energy Association (WWEA).
We are now living in the world where energy utilization per capita defines economy and living standard of people within a country. Therefore, countries are now aiming to increase the rate of energy production year after year. The major problem to it is the limited available resources. They also pose a great deal of threat to our environment. Thus, there is an immediate need to think on the aspect of renewable sources and also conserving energy. In developing economy, energy consumption is rising due to sharp urbanization, population explosion, and intensive economic growth. Generally, the electricity demand in buildings accounts for around 40% of the total electricity consumption. Building being a foundation element in human civilization urges extreme importance in its design and construction. Buildings alone are consuming a huge portion of the total electricity produced and major share of this is used for air conditioning and domestic space heating. From thermodynamic point of view, building is one of the most common elements where macro scale heat transfer phenomena can be observed. Although heat transfer is prevalent in industrial processes and equipment, the most common experience of “heat” is felt inside buildings where thermal comfort is always a major concern. Heat transfer is experienced by each and every human being as the interior temperature of a house fluctuates. Therefore, heat transfer in buildings is a major topic of practical heat transfer scenarios. One significant endeavour for optimizing building heat transfer is the application of phase change materials (PCMs) in building walls and roofs. My talk will pivot around the basic theme of building energy conservation through various passive solar technologies. Highlights of the topic will be to explore the basic concepts of solar energy utilization for building energy conservation. During my sessions, I would touch base on analysis based design of buildings to mitigate the solar heat gain and directional optimization of building heating/cooling loads. I will also give an insight on appropriateness of employing PCM for the purpose of building envelope design and avenues related to building holistic comfort.

Biography of the Speaker: Associate Professor Dibakar Rakshit is having sixteen years of experience in thermofluid sciences pertaining to design and optimization of energy systems. His special interests lie in thermofluid studies of solar energy coupled heat exchanger designs, energy conservation in buildings, solar assisted refrigeration systems, multiphase flows and emission control system designs. His PhD at The University of Western Australia involved studies of multiphase mass transfer phenomenon related to thermal diffusion of Liquefied Natural Gas (cryogenic fluids). From there, he developed deep interest for thermal energy storage and pursued it further in his post-doctoral research at Australian Solar Thermal Research Initiative (ASTRI), CSIRO, Australia. He was mainly involved in characterizing the thermal behaviour of the solar receiver heat transfer fluid required for power generation. After joining IIT Delhi as an Assistant Professor he continued his study of thermal energy storage capacity of materials that can be utilized for building energy conservation. He then started pursuing his further research in the area of characterization of Nano Enhanced Phase Change Materials (NEPCM) for thermal energy storage in building envelopes. At IIT Delhi, his research has been sponsored by the Indo-Trento ITPAR program which is working on a sustainable grid free village, Indo-Japan SPARC platform to work in the area of green refrigerants. Besides these he is involved in a collaborative project with The University of Queensland, Australia in the area of thermal battery. At IIT Delhi, he developed a laboratory for building material characterization.
Abstract

The recent concept of life-cycle is a "cradle to cradle" approach recognizing environmental economic and social impacts of all life-cycle stages (extracting and processing raw materials, manufacturing, transportation and distribution, use, and end of life use/reuse, recovery and recycling strategies). Policy makers, industries and private organizations can apply the life-cycle assessment (LCA) tool to help them make decisions about sustainable product design fulfilling triple bottom line (TBL) objectives of sustainability (i.e. environmental, economic and social). As well, the life-cycle approach was found as a scientific tool for gathering quantitative data to inventory and, weigh and rank the environmental, economic and social impacts of products, processes and services. Any rigorous and meaningful comparison of energy supply options must be done using a life cycle approach. While renewable energy technologies are generally environmentally friendlier than conventional fossil fuels, they are not entirely sustainable from the aforementioned TBL perspectives. LCA has been widely applied to an increasing number of conventional and renewable energy generation systems in an increasing range of countries to identify TBL hotspots for developing sustainability strategies.

Firstly, the basic concept of LCA that follows ISO 14040-44 will be discussed. Secondly, this presentation will introduce a newly developed life cycle sustainability assessment (LCSA) framework using environmental life cycle assessment (ELCA), life cycle costing (LCC) and Social Life Cycle Assessment (SLCA) tools for determining TBL objectives of renewable energy technologies and comparing their sustainability performance. Secondly, SLCA for assessing the social impacts of renewable energy will be discussed. Thirdly, the presentation will discuss as to how LCA approach has been used in the Eco-Efficiency assessment framework to determine cost-competitive and environmentally friendly renewable energy technologies.

Biography of the Speaker:

Dr Wahidul Biswas is presently working as an Associate Professor at the Sustainable Energy Group, Curtin University, Western Australia. Dr. Wahidul was trained as a Mechanical Engineer, researching the performance of diesel engines using biogas fuel. He has a Masters in Environmental Technology from Imperial College, London, and a PhD in Sustainable Futures from the University of Technology, Sydney. A/Prof Biswas teaches and coordinates postgraduate units on Life Cycle Management, Eco-Efficiency Strategies, Industrial Ecology, Environmental Systems, and Sustainable Energy and a core undergraduate Engineering unit, Engineering for Sustainable Development. He has so far carried out extensive life cycle assessment, industrial symbiosis and sustainability related research projects for the Australian agricultural, alternative fuels, building and construction, manufacturing, livestock, mining, gas and water sectors in collaboration with the Department of Climate Change, the Grains Research and Development Commission, Department of Agriculture and Food, University of Western Australia, Department of Primary Industries, Meat and Livestock Australia, Worley Parsons, Water Corporation, Alcoa World Alumina, Enterprise Connect, Recom Engineering, Cedar Woods, Earth Care, Department of State Development, Kwinana Industrial Council, Cockburn Cement and Waste Authority. A/Prof Biswas expanded his LCA research overseas as he completed the LCA of water treatment process and developed environmental product declaration (EPD) of building materials for Gulf Organization of Research and Development (GORD), Qatar. He is the recipient of USD545K competitive grant provided by Qatar National Research Fund to carry out a project entitled, “Techno-economic and environmental assessment of future water supply options for Qatar’s water supply”.

Day 2: July 14, 2020 Tuesday
15:30 – 17:00: Session 6

Speaker: Dr. Wahidul K. Biswas, Curtin University, Australia
Session Title: “Life Cycle and Sustainability of Renewable Energy Systems”
Abstract

Carbon dioxide is one of the most important contributors for the increase of the greenhouse effect which lead to the climate change. Currently around 80% of the energy generated using fossil fuels which is contributing to much of the Carbon dioxide to the atmosphere. Biomass is the only carbon-based renewable energy source which can directly substitute fossil fuels. Biomass is also the only renewable energy source that can be stored and converted to heat, electricity and fuels (i.e. solid, liquid and gaseous) when they are needed. The demand for energy produced from biomass (bioenergy) is constantly growing due to its wider applications. There are numerous technologies for the conversion of biomass into useful forms of energy. In the case of Bioenergy with Carbon Capture and Storage (BECCS), the carbon dioxide is not released to the atmosphere but is captured, transported and permanently stored in a suitable geological formation. BECCS can offer permanent net removal of carbon dioxide from the atmosphere. This presentation reviews the challenges and opportunities of BECCS in terms of its potential contribution to the sustainable development and climate change mitigation.

Biography of the Speaker: Dr. Abdul Salam is currently serving as Head of Department of Energy, Environment and Climate Change and Associate Professor of Renewable Energy and Energy Efficiency at Asian Institute of Technology (AIT), Bangkok, Thailand. Dr. Salam has around 25 years of international experience in research, consultancy and capacity building in the areas of bioenergy (biomass, biofuel, biogas), waste to energy, renewable energy, energy efficiency, and climate change mitigation. He has published more than 100 internationally refereed journal articles, conference papers, and books, and presented his research findings in more than 40 countries. He also has three years of working experience as the General Manager and Chief Design Engineer of an energy service company. He has obtained Master of Engineering (1994) and Doctor of Engineering (2005) in Renewable Energy and Energy Technology, respectively, from AIT. Prior to this, Dr. Salam had completed his bachelors of engineering in Mechanical Engineering from University of Peradeniya, Sri Lanka, in 1991. He is a proud recipient of the Thailand Frontier Researcher Award for 2016 in Engineering, in recognition of pioneering a new frontier research, by Thomson Reuters and Office of Higher Education Commission of Thailand. Apart from teaching and research, Dr. Salam is an active member of several professional bodies such as International Solid Waste Association (ISWA), World Bioenergy Association (WBA), American Society of Mechanical Engineers (ASME), and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
Abstract

Global energy supply predominantly comes from fossil fuels that are depleting very fast. Again, burning of fossil fuels are the major contributor of CO₂ emission leading to global warming. To overcome these issues, solar energy comes in the first place due to its inexhaustible supply and environmental friendly nature. Among other solar energy harnessing technologies solar thermal is growing rapidly due to its better energy conversion efficiency bid. Presently, most industries burn oil, natural gas, coal or use electricity to produce process heat for the preparation or treatment of materials and 32-35% of the total global energy supply is consumed in this sector. However, a large portion of industrial process heat is sufficiently low temperature that can easily be supplied by solar thermals. Facile contrivances such as flat-plate or evacuated-tube thermal collectors are promising alternatives for generating process heat as they can meticulously cover a wide temperature range of industrial requirements from low to medium temperature applications through well-engineered integration. On the other hand, concentrated solar thermal technologies including parabolic trough, linear Fresnel reflector, dish Stirling and solar tower with efficient sun tracking and thermal storage allows up to 24-hours electricity generation. Despite of advancement of in these technologies issues like lack of robustness, higher cost, etc. still need to be addressed more intricately and immensely. This article overviews current global status of solar thermal technologies focusing these challenges and aiming towards the future prospect.

Biography of the Speaker: Dr. Md. Hasanuzzaman holds a PhD and an M. Eng. Sc. from University of Malaya, Malaysia and a B. Sc. in Mechanical Engineering from Bangladesh University of Engineering and Technology (BUET), Bangladesh. He is currently Associate Professor and Program Coordinator (Master of Renewable Energy) in the UM Power Energy Dedicated Advanced Centre, Higher Institution Centre of Excellence (HiCoE), University of Malaya, Malaysia. He is an Associate Editor of the Alexandria Engineering Journal, Elsevier; Associate Editor in Chief of the International Journal of Renewable Energy Resources; and has been a Guest Editor for Renewable Energy, Elsevier. He is an editor and author of the book Energy for Sustainable Development (Elsevier). His research interests include thermal engineering, renewable energy, solar energy, solar thermal energy, energy and buildings, energy policy, transport and electric vehicles. He has also author and co-authored more than 110 research papers and 50 conference proceedings. Dr. Hasanuzzaman has more than 2850 citations with an h-index of 28 in Scopus index and 2150 citations with an h-index of 27 in ISI index. Dr. Hasanuzzaman has supervised and supervising more than 45 postgraduate students. He has secured and managed more than 7 million Ringgit national and international research grants as a PI & co-PI. He received a University of Malaya Excellence Award 2012 for his outstanding achievement in PhD, Bangladesh Scholarship Council and the Nippon Foundation, Japan, 2003-2004.
Abstract

Currently internal combustion engines are the dominating prime movers for road and rail transport. For all reciprocating engines, at least 30% fuel heat is lost as waste heat discharged to the environment. Sustainability of these engines can be improved by recovering this waste heat and converting that into useful power. Variety of methods such as low temperature organic Rankine cycles, turbo generators, thermoelectric generators can be employed for recovering upto 10% waste heat loss and using that for driving the auxiliaries of the engine or feeding the recovered power to the wheel. Depending upon the end usage of the engine, space availability at the end use system and cost considerations are the deciding factors for selecting the method of exhaust heat recovery. This lecture will summaries the basic working principles of exhaust heat recovery methods along with comparison of various exhaust heat recovery strategies specific to end usage.

Biography of the Speaker: Dr. Atul Dhar is presently working as an Associate Professor in the School of Engineering, Indian Institute of Technology (IIT) Mandi, India. He has joined IIT Mandi in 2013 after completing his PhD and Masters from Indian Institute of Technology Kanpur in 2013 and 2006, respectively. Prior joining to IIT Mandi, he worked as a Post-Doctoral Fellow at Ecole Centrale de Nantes, France from June 2014 to December 2014, and as a Senior Research Associate (Pool Scientist- CSIR) in IIT Kanpur from December 2011-November 2013. Dr. Dhar has published 3 edited books, 12 book chapters, more than 30 refereed journal articles and many conference proceedings at national and international level. He is a proud recipient of Shell India Research Fellowship (2007-2011), CSIR Senior Research Associateship-Pool Scientist Scheme (2011-2013), ISEES Young Scientist Award (2015). He has delivered a number of invited talks at various national and international seminars and workshops and presently managing a number of Govt. and industry funded research and development projects. His research interest includes alternative fuels, energy Systems, waste heat recover and pollution control technologies. Apart from teaching and research, Dr. Dhar is also an active of Member Society of Automotive Engineers (SAE) and International Society for Energy Environment and Sustainability (ISEES).
Speaker: Dr. Bridgid Chin Lai Fui, Curtin University Malaysia

Session Title: “Recent Advances in Thermochemical Conversion of Biomass”

Abstract

Environmental pollution, diminishing supply of fossil fuels, and uncertainty of world’s energy prices are the key drivers to seek alternative energy resources known as renewable energy. Presently, fossil fuels still play a major contribution towards the world’s energy consumption although there are many studies and initiatives have been carried out to find alternative renewable energy resources. However, it is still not practiced commercially due to its no competitiveness when compared with fossil fuels. Hence, continuous development of renewable energy is encouraged and vital to buffer the long-term impact of higher global energy price, and aid to reverse fossil fuel dependency.

Biomass is said to provide a huge prospect for utilization and can be converted to solid, liquid or gaseous fuels. It has been reported that United States contribute the highest fraction among the various sources of renewable energy in year 2016 and it is expected that 50% of the global energy demand are from biomass by 2050. The advantages of biomass utilization help to mitigate environmental pollution and resolve biomass waste disposal issues due to its carbon neutrality with almost zero net carbon dioxide (CO2), carbon monoxide (CO), NOx and SOx emissions into the atmosphere. The biomass conversion to energy can be achieved via two main process technologies which are thermochemical and biochemical conversion. Thermochemical conversion is normally represented either by combustion, gasification, or pyrolysis whereas biochemical conversion consists of fermentation, anaerobic digestion, or mechanical extraction. Recently, many researchers had been attracted to focus on thermochemical conversion of biomass due to its promising bioenergy and biochemical production. Hence, this session will provide some recent insights and progress for various biomass thermochemical conversion technologies and key generation pathways for biofuels and bioenergy production.

Biography of the Speaker: Dr Bridgid Chin is currently a senior lecturer for the Department of Chemical Engineering, Curtin University Malaysia campus. She had achieved her PhD in Chemical Engineering from Universiti Teknologi PETRONAS (UTP), Malaysia in 2015. Her area of specialization includes thermochemical conversion specifically on pyrolysis and gasification process of biomass and plastic waste, as well as syngas cleaning technologies. Prior to joining Curtin University Malaysia, she worked as a research assistant for Biomass Processing Laboratory research group, Centre of Biofuel and Biochemical Research (CBBR) in UTP. She is presently involved in numerous international and national grants from International Foundation of Science (IFS), ASEAN Science, Technology and Innovation Fund (ASEAN-ASTIF), Japan-ASEAN Science, Technology, and Innovation Platform (JASTIP), and Fundamental Research Grant Scheme (FRGS). She is also a Chartered Professional Engineer with Engineers Australia and Senior Research Fellow for Resilience Development Initiative (RDI), Indonesia.
Day 4: July 16, 2020 Thursday  
13:30 – 15:00: Session 11

Speaker: Dr. Devendra Deshmukh, Indian Institute of Technology Indore, India  
Session Title: “Advances and Challenges in I.C. Engine and Petroleum Fuel”

Abstract
Internal Combustion Engines are integral part of transport sector. The fuel conversion efficiency of I.C. Engine and exhaust emission poses serious question on their continued use. The engine emission is a serious threat to environment and human health. These challenges demand advanced techniques for improving fuel conversion efficiency of I.C. Engine and reducing hazardous emissions. The dependence of I.C. engine on limited fossil fuel for energy source is another constraint that needs to be studied simultaneously.

The lecture looks into two aspects of the problem. The advances in powertrain for improving combustion efficiency and overall engine performance are explored. The engine emissions are looked into in view of future fuels. Special attention is given to in-cylinder combustion process. The other aspect explored is diverse fuel sources for I.C. Engines and their implications on in-cylinder process. The analysis is presented on how renewable fuels can be considered for future I.C. Engines.

Biography of the Speaker: Devendra Deshmukh received his B. Tech. degree in Mechanical Engineering from Nagpur University in 2000 and Master of Science in Engineering from Indian Institute of Science Bangalore in 2002. He has worked in TVS Motor Company and General Motor Technical Center Bangalore as research engineer for engine and powertrain development between 2002 to 2007. Later, he obtained PhD. from Indian Institute of Science Bangalore in 2012. He joined Indian Institute of Technology Indore in 2012 as an Assistant Professor in discipline of Mechanical Engineering. His research interests are spray measurements using optical diagnostics, renewable fuel for I.C. Engine and advanced combustion techniques in diesel engine. He is involved in development of high pressure spray chamber with optical access and optical diesel engine for spray and combustion diagnosis.
Abstract
Amongst all the forms of renewable energies, hydro is making the largest contribution to the world energy needs. It is one of the oldest and proven technologies in use. Most such hydro power developments are large scale projects developing tens to thousands of megawatts. Due to the exhaustion of economically feasible large hydro power sites, it has now become imperative to develop hydro power at smaller scales from a few kilowatts to a few megawatts. With the reduced output power, such micro or mini hydro projects become viable only if equipment costs can be reduced significantly. After discussion of the essential components of large hydro power plants, this talk will focus on how costs can be reduced by replacing the conventional synchronous generator by commonly available induction motors, working as generators. The theory of operation of grid-connected induction generators in mini hydro power plants as well as the design and control of isolated micro-hydro power plants will be discussed. Recent research in the field as well as by the presenter will also be presented.

Biography of the Speaker: Dr. Sumedha Rajakaruna received the degrees B.Sc. Eng., M.Sc. and Ph.D., from University of Moratuwa, Sri Lanka in 1986, University of Calgary, Canada in 1989 and University of Toronto, Canada in 1993 respectively, all in the area of electrical engineering. He was a recipient of Prof Ted Parish award for the Best Graduate in Electrical Engineering from University of Moratuwa and Canadian Commonwealth Scholarship for graduate studies in Canada from 1987 to 1993. From 1986 to 2000, he was with the Department of Electrical Engineering, University of Moratuwa, Sri Lanka at the levels of lecturer and senior lecturer. From 2000 to 2007, he was with Nanyang Technological University, Singapore as an Assistant Professor. Since 2007, he is employed at the Discipline of Electrical and Computer Engineering at Curtin University, Perth, Western Australia where he is currently an Associate Professor. From Feb. 2018 to June 2019 he was the Head of the Discipline of Electrical and Computer Engineering. From 2010 to 2012, he designed and built ‘Green Electric Energy Park’, an innovative renewable energy laboratory at Curtin University as the Founding Director. He has supervised about 13 PhDs to graduation and published some highly cited research articles. His present research interests are in integration of renewable energy sources in grids and microgrids and energy storage. Dr Rajakaruna is a member of Institution of Engineers, Australia (MIEAust) and a Senior Member of IEEE (SMIEEE).
Abstract

Hydropower is the most promising among all the renewal energy sources. It is a clean source and has most efficient of power producing system when the water turns a hydraulic turbine. It provides the electricity essential for the economic and social development of society. The most important fact to be noticed is that the maximum potential of the hydro power is yet to be harness in many countries. Through hydropower development started with small units in the beginning, harnessing medium and small hydro because of their comparative economics. The inherent drawbacks associates with large hydro are the large period; large area along with the vegetation has to be submerged. Political and environmental implications have compelled the planners to think for some other alternative of this large hydro resulting in the emergence of small hydro power (SHP) resulting in the emergence of small hydro. A lot of potential of hydro power exist in many countries of the world. However, hydro power in developing and underdeveloped countries remains untapped. This untapped hydro potential exists in small hydro range. Usually when we talk about hydro power the first thing that comes to our mind is the image of a typical dam releasing water. But, nowadays the major focus of the governments is to develop SHP so as to reduce energy insecurity in inaccessible areas without large investments as in the case of conventional dams. Although hydro power technology is well matured, however there are some potential sites especially in the range of small capacity plants where technology advancement is still needed. Even after a century of proven experience with this reliable renewable resource, significant opportunities still exist to expand the hydropower resources through non-powered dams, water conveyance systems, pumped storage hydropower, and new site development. This lecture covers the main components of hydropower (civil works, hydro-mechanical equipment and electrical equipment) with respect to their selection procedure, existing and emerging technology, deployment of new technologies especially hydro turbines. The lecture covers opportunity to add new hydropower generating capabilities at low-head sites, at sites of practically zero head. The lecture also covers the scope of R&D on hydro turbines related to their new designs and the problems being encountered in operation.

Biography of the Speaker: Dr. R.P. Saini is presently working as Professor in Department of Hydro and Renewable Energy of IIT Roorkee. He obtained his Bachelor of Engineering in Mechanical from University of Mysore in 1982, Master of Engineering and Ph.D. in Mechanical Engineering from IIT Roorkee in the years of 1989 and 1996 respectively. He has research and teaching experience of more than 30 years and has been working in the research areas of renewable energy especially Hydro Power, Solar and Wind. He is also working as MNRE Chair Professor (Renewable Energy) for the Ministry of New and Renewable Energy, Government of India. Prof. Saini has published more than 320 Research Papers in International/National Journals and Seminars/Conferences, 1 Book and 2 Manuals. 25 Ph.D. thesis have been completed and another 18 are in progress under his supervision. He has guided 142 M.Tech. dissertations and 66 M.Tech. Projects. Two patents on Micro Hydro Turbines have been granted from his research. More than 268 Consultancy and Sponsored R&D projects in the area of hydro power and other renewable energy have been handled by him. He has also coordinated about 35 International/National training courses. He has visited more than 22 countries for different activities in the area of hydro power and other renewable energy. He also undertook administrative responsibilities at Institute level from time to time including Head of the Department. He has received several awards including “Best Teacher award of IIT Roorkee” in 2012, “Bharat Jyoti Award” by India International Friendship Society in 2015, “Lifetime Achievement Award” by Venus International Foundation in 2016, “Leading Educationist of India Award” by Friendship Forum in 2018. He was also adjudged as “star performer of IIT Roorkee” in 2003-04 and 2004-05. Prof. Saini is member of several societies including Fellow of Institute of Engineers India.
Speaker: Dr. Agus Saptoro, Curtin University Malaysia
Session Title: “Energy Efficient Process Modifications of CO2 Capture Systems”

Abstract

It has been acknowledged that increasing emission of greenhouse gases, particularly CO₂, to our atmosphere is the primary contributor to global climate change. In this regard, CO₂ capture systems at major emitters such as coal-fired power plants play a vital role in combating global warming. While various carbon dioxide capture technologies have been proposed for the last decades, most of these technologies are still associated with the technical and economic issues in their practical implementations. The most developed CO₂ technology by far is post-combustion capture using solvent. Nonetheless, more efforts should be directed to make this technology more energy efficient and having minimal solvent related operating issues such as corrosion, solvent degradation and loss and generating of toxic waste products. This lecture covers the state-of-the-art of the post-combustion CO₂ technology using solvent and the current status on how to make this technology more energy saving with less operating issues. Recommendations on the remaining research needs and future research directions are also discussed and highlighted.

Biography of the Speaker: Dr. Saptoro is currently an Associate Professor at Curtin University Malaysia. He received Bachelor of Engineering (first class honours) in chemical engineering from Gadjah Mada University Indonesia and obtained his PhD in chemical engineering (process system engineering) from Curtin University Australia. He had also research fellowship experiences with University of Hyogo, Japan and University of Aberdeen, UK. His research expertise and interest include intelligent data and image analysis, process modelling, simulation and optimisation, energy efficient CO2 capture processes, and thermal engineering especially microwave assisted crystallisation technology. Dr. Saptoro is a Chartered Professional Engineer with Engineers Australia and is holding a position as Deputy Dean of Research and Development and Chair of Graduate Studies Committee at Curtin University Malaysia.
The increasing worldwide need for reliable energy at a reasonable cost, combined with growing environmental concerns, has brought energy science and engineering into the global spotlight. The energy industry has been facing challenges in improving existing power generation technologies and developing innovative solutions to produce clean and green energy. Applying engineering simulation early in product and project development enables cost effective ways to evaluate new concepts, faster and with greater frequency than with traditional prototyping and testing methods. Therefore, energy-based projects benefit from the high-fidelity, full functionality and multidisciplinary capabilities of engineering simulations. Ansys has an established leadership position in providing simulation solutions for energy and related industries. Its solutions have been applied in energy production and power generation projects—including renewable, fossil fuels, as well as energy reduction and efficiency projects. Ansys engineering simulation for energy expands across product and process design, pollution reduction and control, carbon reduction and separation, improved fuel efficiency, reduced packaging weight, new fuel development, and meeting energy efficiency and regulatory requirements. In this webinar, an overview of simulation solutions for energy conversion will be presented. This will be followed by a focus on simulation for energy-efficient buildings, which is growing with ever-increasing customer expectations, improvements in computer hardware, and the rapid development of simulation technology.

Highlights:
- Introduction to energy conversion systems simulation solutions with Ansys
- Case studies for energy conversion systems
- Demonstration of simulation for energy-efficient buildings
- Discussions on the Ansys products for energy conversion systems' simulation

Biography of the Speaker
Dr. Lee Jun Yi has completed a Doctor of Philosophy (Maritime Engineering) at the University of Tasmania, Australia focusing on scour beneath offshore pipelines. Prior to his PhD, he has completed his first Degree in Naval Architecture from Australian Maritime College, Australia. He is currently associated with CADFEM SEA Pte. Ltd. as an Application Engineer in the Computational Fluid Dynamics (CFD) domain, and a ANSYS Certified Professional for Fluids, Structures, Turbulence, High and Low Frequency, Granta CES, VRXPERIENCE SOUND etc. CADFEM is a world-leading simulation technology company established in 1985. Today, CADFEM is the largest Ansys partner worldwide with 500 employees working in 30 different locations in 17 countries. In Southeast Asia, CADFEM SEA Pte. Ltd. operates in Singapore, Malaysia, Indonesia, Thailand, Philippines, and Vietnam, providing simulation solution from structural mechanics to fluid dynamics, electromagnetics, and optical stimulation as well as embedded software to local customers with comprehensive technical support and know-how knowledge transfer.
Abstract

The solar chimney power plant, SCPP, a potential commercial solar energy technology is favored by long lifespan but heavily disadvantaged by low plant efficiency and variation in solar radiation intensity at different time of the day. The total efficiency of the SCPP is the product of the efficiencies of the three technologies (open-solar-air-collector, chimney and turbine), which form the operation of the plant. The poor performance of SCPP is attributed to its serial energy conversion process leading to plant efficiency below 2%. The collector and chimney components of the SCPP which are responsible for the generation and sustenance of buoyant air are face with high thermal loss and extremely low efficiency respectively. The turbine component of the plant indicates that the energy conversion efficiency of the turbine is dependent on the available kinetic energy in the buoyant air. This work reviews previous studies with focus on performance enhancement of the SCPP. The review showed that the major challenge of the SCPP is the chimney component because the efficiency depends on its height. At the collector, the design to optimize performance at low and high solar radiation intensity leads to high thermal loss at high solar irradiance. Study has shown that the turbine efficiency has been maintained above 60% while major improvement has centered on stability and pressure drop control. Some of the recent models which involved integration of the collector with plant cultivation, distillation and desalination reduced the expected efficiency of the collector. Integration of the collector with solar thermal energy storage media improve the night operation while the integration with external heat source improved the total daily power output but with high thermal losses. This review recommends that chimney enhancement should be considered a priority in the enhancement of SCPP.

Biography of the Speaker: Dr. Aja Ogboo Chikere joined Curtin University, Malaysia in August 2015 as lecturer with the Department of Mechanical Engineering, Faculty of Engineering and Science. He was promoted to Senior Lecturer December 2017. Dr. Aja obtained his PhD in Mechanical Engineering from Universiti Teknologi PETRONAS (UTP), Malaysia. He holds MSc. in Energy Technology from University Kebangsaan Malaysia (National University of Malaysia), MSc. in Project Management from Curtin University and BEng. in Mechanical/Production Engineering from Enugu State University of Science and Technology, Nigeria. Dr. Aja is currently Chartered Engineer registered with the Engineering Council of United Kingdom and Engineers Australia. He holds Professional Memberships with Institution of Mechanical Engineers, IMechE, Institution of Engineers Australia, IEAust, American Society of Mechanical Engineers (ASME), International Solar Energy Society (ISES), Society of Petroleum Engineers (SPE), and Institute of Electrical & Electronic Engineers (IEEE). He has one-year working experiences as a Postdoctoral Researcher with the Crude Oil Research Center, Universiti Teknologi PETRONAS. Dr. Aja has 6-year experiences as project manager with ROKNET KONSULT, 5-year experiences as tutor in UTP, and about 10-year experience as a researcher. His research areas revolve around renewable energy, waste management and environment sustainability, sustainable development, and flow assurance.
Gas turbines (GT) are widely used in propulsion and power generation such as in aircrafts, electrical generators, ships, tanks etc. For the design and development of the GT, modeling plays an important role as experimentation is very costly as well as time consuming. The combustor is an important part of GT and turbulent combustion modeling approaches are crucial to their design. Potential emissions from gas turbines include oxides of nitrogen (NO and NO₂, collectively referred to as NOx), carbon monoxide (CO), unburned hydrocarbons (UHC), oxides of sulfur (SO₂ and SO₃) and particulate matter (PM). These emissions are a growing cause of concern for land based GTs as well as aircraft GTs. Thus, predicting emissions through simulations is also of great interest. The basics of turbulent combustion as well as emission generation will be discussed. This will be followed by discussion on the popular modeling approaches available in popular software. Computationally low cost modeling techniques with good accuracy like Flamelet Generated Manifold will be also covered.

**Biography of the Speaker:** Dr. Sudipto Mukhopadhyay is presently working as an Assistant Professor at the Department of Mechanical Engineering in IIT Jodhpur. His research interests are broadly in energy and propulsion. Before starting at IITJ, he was a postdoctoral researcher at Eindhoven University of Technology and Delft University of Technology, Netherlands. His postdoctoral research focused on sprays and thermo-acoustics for energy and propulsion. He earned his PhD in turbulent combustion modeling at Eindhoven University of Technology. His PhD research at TU Eindhoven was based on combustion modeling technique – Flamelet Generated Manifold (FGM) and was in collaboration with Rolls Royce Aero Engines, Berlin. He completed his MTech from IIT Madras and BTech from Kalyani Government Engineering college. Prior to his PhD at TU Eindhoven, Dr. Sudipto was working in Engineering and Industrial Services division of Tata Consultancy Services, a leading Indian MNC. He has around 7+ years of industrial experience in varied domains spanning many facets of engineering consultancy. This includes consultancy in the areas of Finite Element Analysis (FEA) and in Computational Fluid Dynamics (CFD) for several leading industrial houses spanning across India and USA. Dr. Sudipto is also an active member of Society of Automotive Engineers (SAE), American Institute of Aeronautics and Astronautics (AIAA).
Abstract  Carbon capture and Storage (CCS) has been recognized as one of the effective technologies to reduce the amount of greenhouse gases released into the atmosphere. It generally consists of three major steps of carbon capture, transportation and injection in geological sites. Depleted reservoirs, saline aquifers and coal beds are common geological formations chosen for CO$_2$ storage. However, there are many challenges and issues that need to be overcome for a successful implementation of CO$_2$ into these geological sites. In this talk, attempts are made to review the most important parameters/challenges that must be evaluated before the implementation of the CCS technology. We will talk about a screening criterion and discuss how the parameters included in that criterion can be properly assessed/determined. Different approaches proposed so far to determine those parameters are also highlighted followed by laboratory and numerical validation techniques.

Biography of the Speaker: Dr. Raoof Gholami is presently working as an Associate Professor and Associate Dean of Research & Development at Curtin University Malaysia. He received his PhD from Shahrood University of Technology in collaboration with Curtin University Australia in 2014. He has also done a post doctorate research studies on the characterization of Bakken Shale formation back to 2018 at University of North Dakota, USA. Before joining Curtin, Raoof was a Geomechanics engineer at Iranian Offshore Oil Company (IOOC) for four years where he carried out and supervised many projects on the wellbore stability, hydraulic fracturing and formation characterization. He is also a chartered professional engineer registered with the Engineers Australia and a professional member of Engineering Council of United Kingdom. Raoof had done several projects related to petroleum geomechanics for various companies and has also been a consulting engineer on various geomechanics related projects since 2013. His main research area of interests are wellbore stability and integrity issues, formation characterizations, carbon capture and storage (CCS) and geomechanics of unconventional resources.
Abstract

Biodiesel has been touted as one of the promising alternative energy sources to substitute the ever depleting fuel-based diesel. Biodiesel is non-toxic, safer, much greener than the conventional diesel fuel, and made of vegetable oils and animal fats which are renewable and sustainable. Palm oil is one of the most utilized feedstock for biodiesel due to its abundance and relatively cheaper compared to other vegetable oils. However, currently there are a lot of challenges in the utilization of palm oil for biodiesel production. These include concerns regarding rapid deforestation due to expansion of palm oil plantations, European Union (EU) plans to discontinue tax breaks and phasing out palm oil-based biofuels by 2030 which lead to weakened interest in those countries, and other technical issues such as poor cold flow properties of the unmodified palm biodiesel. Malaysia and Indonesia, both being the largest producers of palm oil in the world have been actively promoting regulations to ensure sustainability of palm oil plantation practices. Both countries are also currently implementing initiatives to support local market by increasing biofuel blend mandates (up to 30%, or B30 in Indonesia and up to 20%, or B20 in Malaysia, starting 2020). Shifting the markets to other regions or countries such as China and India may offset the decline in EU sales, however, the palm-based biofuel market may remain volatile due to rapid change in the current global economy. So far, China’s turn to palm oil biofuels has seen major boosts on Malaysian and Indonesian palm oil market. The shift in shipping and aviation industries to commit on decarbonization or carbon neutral growth starting 2020 onwards may also further boost the palm oil (biodiesel) market. However, despite the seemingly renewed and rejuvenated palm-based biofuel (biodiesel) markets, further development in palm biodiesel is still very much needed due to the technical limitations of the palm biodiesel itself. Unmodified palm biodiesel generally has poor cold flow properties due to its large composition of saturated fatty acids. This brings the palm biodiesel natural tendency for solidification at low temperature leading to engine operability problems in colder climate countries, which may pose new market limit. Researchers are currently trying to look for solutions to improve palm biodiesel cold flow properties to further boost its marketability around the world.

Biography of the Speaker: Dr. Jibrail Kansedo is presently working as a Lecturer in the Department of Chemical Engineering, Curtin University Malaysia. Dr. Kansedo completed his PhD in chemical engineering from Universiti Sains Malaysia (USM) in 2015, particularly focusing on bio-diesel production. Prior to his PhD, he worked as a Research Officer in Biodiesel production from 2009 to 2010. He has extensive experience in the field bio-diesel for last 10 years and published more 30 technical papers in reputed international journals and conferences. His research interests include bio fuel based renewable energy production, edible and non-edible sources of biodiesel production, heterogeneous catalytic reactions, reaction mechanism and kinetics modeling, plant oil extraction and fatty acids profile etc.
Abstract

For the last few decades, investigations and investments on the renewable energy technologies have been fast-tracked to curtail the reliance on the fossil fuel technologies and reduce the carbon emissions to the atmosphere discharged from these fossil fuels. Further, the rapid depletion of fossil fuel sources and the concerns of global warming commended the need of various alternative technologies to harness the different sources of clean energy. Among the prominent green and renewable energy sources, wind energy has been one of the global leaders that rapidly growing and started to play a vital role to address the need of clean alternative energy solutions and contribute to global economy. Considering the wind turbine technologies, these are classified into major two categories, namely Horizontal Axis Wind Turbine (HAWT) and Vertical Axis Wind Turbine (VAWT). In this talk, the topic will be focused on the VAWTs, mainly on the computational fluid dynamics (CFD) applications. Although, no means can substitute the need of full scale accurate experimental data, yet CFD can be treated as an alternative to complicated experimental measurement and control systems, where large scale experiments are limited due to time, cost, complexity and manpower constraints. It provides the flexibility to perform systematic analysis with lesser costs, particularly when a variety of VAWT parameters need to be studied for the design and performance optimization. Further, designing a wind turbine system for maximum efficiency needs a thorough understanding of the principles of aerodynamics and flow dynamics. Understanding of physical characteristics of fluid motion and interactions around the turbine, which not experimentally feasible unless the use of flow visualization, can be accurately obtained with the CFD to solve a wide range of wind turbines. The flow governing equations around VAWTs are being solved in the finite volume based CFD software such ANSYS Fluent, ANSYS CFX, and StarCCM+ etc. In this talk, the applications of CFD in my research on different designs VAWTs will be discussed. Major highlights of the lecture will include recent research and applications of VAWTs for small to medium scale energy generation.

Biography of the Speaker:

Dr. Sukanta Roy is presently working as the Head of Department and Senior Lecturer of Mechanical Engineering, Curtin University, Malaysia Campus. He has joined Curtin University, Malaysia Campus in September 2017. Prior to joining Curtin University, he worked as a Post-Doctoral Fellow in IRPHE, Aix Marseille University, France from November 2015 to June 2017 on the variable pitch control of vertical axis wind turbines. Dr. Roy has also worked as a Post-Doctoral Fellow in LHEEA, Ecole Centrale de Nantes, France from September 2014 to October 2015 through Erasmus Mundus Post-Doctoral Fellowship (Asia to Europe) from European Commission on flow physics analysis of micro wind turbines. Prior to working in France, he has completed his PhD in Mechanical Engineering from Indian Institute of Technology Guwahati, India (2010-2014). Dr. Roy is a Fellow of Advance Higher Education (HEA), UK and award winner of Curtin Citations for Outstanding Contributions to Student Learning 2019. Dr. Roy presently supervising a number of PhD and MPhil students and recognized reviewer for more than 10 reputed international journals. His research interests include Experimental and Computational Fluid Dynamics, Wind Turbine Aerodynamics and Hydro-kinetic Turbines, Turbo-machinery, Renewable Energy, and Heat Transfer Applications.
Registration and Certification:

Registration:
The Registration to the One-week Short-term Staff Training Program on “Recent Trends in Energy Conversion Technologies” (SSTP-RTECT 2020) will be online.

The Registration link will be open online on June 25, 2020 to July 10, 2020.

The details of the registration will be updated online: https://sstp-rtect.curtin.edu.my/

All the registered participants will receive the Board of Engineers Malaysia (BEM) approved 25 CPD hours for their professional training in this One-week SSTP-RTECT 2020 starting from July 13-19, 2020. However, assessment completion (as mentioned below) is compulsory for the award of the E-certificate.

Assessment:
To keep the program integrity intact, this training program contains structured assessments on each session. Five (5) quiz questions (multiple choice type) on each online session will be available after each session and the registered participants need to complete the assessments with at least 60% score (3/5) on the respective session for successful completion of the session. All the assessments will be available online until July 22, 2020.
Inauguration Ceremony:

July 13, 2020, Monday:
11:00 – 11:10  Inaugural Speech by Pro Vice-Chancellor & President, Curtin University Malaysia
11:10 – 11:20  Welcome Speech by Dean of Faculty of Engineering and Science, Curtin University Malaysia
11:20 – 11:30  Introductory Speech by Convener, SSTP-RTECT2020

Expected Attendees: PVC, DPVC, COO, Dean (FOES), Dean (R&D), Convener, Invited Speakers, Academicians, Research scholars, and Professionals working on different energy technologies.

Speaker Sessions:

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<tr>
<th>Day</th>
<th>11:30 – 13:00*</th>
<th>13:30 – 15:00*</th>
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| **Day 1**  | **Session 1:** Energy Storage  
Dr. Suvash Saha  
University of Technology Sydney, Australia | **Session 2:** Energy Sustainability-1  
Dr. Aziz Muhammad  
The University of Tokyo, Japan | **Session 3:** Hydro Energy-1  
Dr. Sunil K. Singal  
Indian Institute of Technology Roorkee, India |
| July 13, 2020 Monday | | | |
| **Day 2**  | **Session 4:** Wind Energy-1  
Dr. Mohd Zamri Ibrahim  
Universiti Malaysia Terengganu, Malaysia | **Session 5:** Energy Efficient Buildings  
Dr. Dibakar Rakshit  
Indian Institute of Technology Delhi, India | **Session 6:** Energy Sustainability-2  
Dr. Wahidul K. Biswas  
Curtin University, Australia |
| July 14, 2020 Tuesday | | | |
| **Day 3**  | **Session 7:** Bio Energy-1  
Dr. P. Abdul Salam  
Asian Institute of Technology, Thailand | **Session 8:** Solar Energy-1  
Dr. Md. Hasnuzaman  
University of Malaya, Malaysia | **Session 9:** Waste Heat Recovery  
Dr. Atul Dhar  
Indian Institute of Technology Mandi, India |
| July 15, 2020 Wednesday | | | |
| **Day 4**  | **Session 10:** Bio Energy-2  
Dr. Bridgid Chin Lai Fui  
Curtin University, Malaysia | **Session 11:** Fuels and Combustion-1  
Dr. Devendra Deshmukh  
Indian Institute of Technology Indore, India | **Session 12:** Hydro Energy-2  
Dr. Sumedha Rajakaruna  
Curtin University, Australia |
| July 16, 2020 Thursday | | | |
| **Day 5**  | **Session 13:** Hydro Energy-3  
Dr. R.P. Saini  
Indian Institute of Technology Roorkee, India | **Session 14:** CO₂ Capture-1  
Dr. Agus Saptoro  
Curtin University, Malaysia | **Session 15:** Energy Modelling and Simulations  
Dr. Lee Jun Yi, CADFEM SEA Pte. Ltd., Singapore |
| July 17, 2020 Friday | | | |
| **Day 6**  | **Session 16:** Solar Energy-2  
Dr. Aja Ogboo Chikere  
Curtin University, Malaysia | **Session 17:** Fuels and Combustion-2  
Dr. Sudipto Mukhopadhyay  
Indian Institute of Technology Jodhpur, India | **Session 18:** CO₂ Capture-2  
Dr. Raoof Gholami  
Curtin University, Malaysia |
| July 18, 2020 Saturday | | | |
| **Day 7**  | **Session 19:** Bio Energy-3  
Dr. Jibrail Kansedo  
Curtin University, Malaysia | **Session 20:** Wind Energy-2  
Dr. Sukanta Roy  
Curtin University, Malaysia | Closing Ceremony |
| July 19, 2020 Sunday | | | |

*Note: All in Malaysian time (GMT +8)

Closing Ceremony:

July 19, 2020, Sunday:
15:05 – 15:15  Closing Remarks by Dean of Research and Development, Curtin University Malaysia
15:15 – 15:20  Vote of Thanks by Convener, SSTP-RTECT2020