The Institution of Engineers Pakistan
Karachi Centre

NED University of Engineering & Technology

ASHRAE Pakistan Chapter

Jointly Organizing

15th imec 2026

International Mechanical Engineering Conference

Theme: Innovative and Sustainable Practices in Mechanical and Allied Disciplines

30-31 JANUARY 2026 | KARACHI - PAKISTAN

BOOK OF ABSTRACTS

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Fortnightly Engineering Review

Publication Note

This book comprises abstracts of papers accepted for presentation at the 15th International Mechanical Engineering Conference (15th IMEC 2026), held on 30–31 January 2026 in Karachi, Pakistan.

All submitted abstracts were reviewed by the Technical Review Committee for relevance, originality, and alignment with the conference theme and scope. This publication contains abstracts only and does not constitute publication of full-length papers.

The views and opinions expressed in the abstracts are those of the authors and do not necessarily reflect the views of the organizers, co-organizers, or collaborating institutions.

15th International Mechanical Engineering Conference (IMEC-2026)

Dates

January 30–31, 2026

Venue

NED University of Engineering & Technology
Institution of Engineers Pakistan (IEP Karachi Centre)

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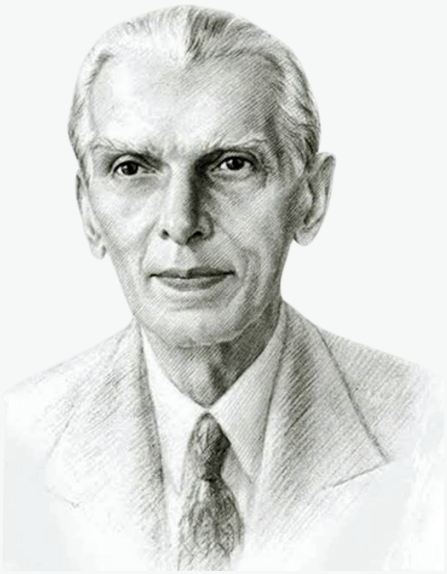
Fortnightly Engineering Review

FATHER OF THE NATION

Quid-e-Azam Muhammad Ali Jinnah

Message on the occasion of the Foundation Stone Laying Ceremony of the Institution of Engineers Pakistan Headquarters at Dacca on 30th May 1948.



"If Pakistan is to take its proper place among the progressive nations of the world, it will have to take up a good deal of leeway in the realm of scientific and technical education which is so necessary for the proper development of the country and the utilization of its resources. The establishment of institution like the Institute of Engineers will greatly stimulate technical research and help in disseminating available information.

The Institute of Engineers will not only benefit the engineers themselves by improving their technical knowledge but also bring lasting benefits to public services which they are called upon to perform.

I wish the Institute every success"

FOREWORD

The 15th International Mechanical Engineering Conference (IMEC-2026) provides a multidisciplinary forum for researchers, academicians, industry professionals, and policymakers to present and exchange recent advances, emerging technologies, and practical applications in mechanical engineering and allied fields. The conference emphasizes innovation, sustainability, and industry–academia collaboration, with a particular focus on energy systems, advanced manufacturing, materials engineering, and intelligent technologies.

IMEC-2026 aims to foster knowledge sharing, encourage high-quality research dissemination, and strengthen collaboration between academia and industry at national and international levels. The technical program includes keynote lectures, invited talks, peer-reviewed technical sessions, and a poster session, reflecting current global research trends and practical engineering challenges.

Engr. Farooq Arbi
Chairman
Institution of Engineers Pakistan (IEP Karachi Centre)

ACKNOWLEDGEMENTS

The Organizing Committee of IMEC-2026 gratefully acknowledges the valuable contributions and dedicated efforts of all individuals and institutions who made this conference possible. We extend our sincere appreciation to the members of the Advisory Committee, Organizing Committee, Technical Program Committee, and various sub-committees for their commitment and professional support throughout the planning and execution of the conference.

We are thankful to the session chairs, reviewers, and evaluators for their time and expertise in maintaining the technical quality of the conference program. Special appreciation is extended to the keynote speakers, invited speakers, and authors for their scholarly contributions.

The organizers also acknowledge the support of collaborating institutions, professional bodies, and sponsors whose cooperation and encouragement significantly contributed to the success of IMEC-2026.

Organizers:

- Institution of Engineers Pakistan
- NED University of Engineering & Technology
- ASHRAE Pakistan Chapter

Co-Supported by:

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In Collaboration with

- Federation of Engineering Institutions of South & Central Asia (FEISCA)
- Baluchistan University of Engineering & Technology, Khuzdar
- University of Engineering and Technology, Taxila
- Federation of Engineering Institutions of Islamic Countries (FEIIC)
- Pakistan Society of Plumbing Professionals

MESSAGE FROM THE CHIEF MINISTER OF SINDH

Engr. Murad Ali Shah
Chief Minister of Sindh

I congratulate The Institution of Engineers Pakistan (IEP) Karachi Centre, NED University of Engineering and Technology, and the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Pakistan Chapter for jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026). The conference theme, “Innovative and Sustainable Practices in Mechanical and Allied Disciplines,” is both timely and forward-looking.

This prestigious event, convened in collaboration with Getinnovative 4Impact, the European Union, the Federation of Engineering Institutions of Islamic Countries (FEIIC), the Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology Khuzdar, University of Engineering and Technology Taxila, and the Pakistan Society of Plumbing Professionals (PSPP), reflects an exemplary spirit of cooperation. Such partnerships highlight a collective commitment to advancing engineering excellence and sustainable development.

Mechanical engineering is central to global challenges like energy security, climate resilience, and sustainable infrastructure. IMEC-2026’s focus on innovation grounded in sustainability encourages solutions that are technologically robust, environmentally responsible, and socially inclusive. This platform for exchanging ideas, presenting research, and discussing policy is invaluable for Pakistan’s progress toward a greener, more competitive economy.

I commend the organizers for bridging academia and industry, nurturing young engineers, and promoting interdisciplinary collaboration. By bringing together experts, practitioners, and students from Pakistan and abroad, IMEC-2026 will cultivate the skills and partnerships needed to translate research into real-world impact—strengthening manufacturing, enhancing energy efficiency, and advancing sustainable development.

The Government of Sindh strongly supports innovation, higher education, and research that drives inclusive growth and environmental stewardship. We recognize the critical role of engineers in building resilient infrastructure, advancing renewable energy, and modernizing industrial systems. Knowledge-sharing forums like IMEC are essential for building human capital and positioning Pakistan as a contributor to global engineering solutions.

I am confident the 15th IMEC-2026 will be a resounding success, yielding meaningful outcomes and lasting collaborations. I extend my best wishes to the organizers, speakers, delegates, and partners for a productive and inspiring conference.

MESSAGE FROM THE SENIOR VICE CHAIRMAN, PAKISTAN ENGINEERING COUNCIL

Engr. Dr. Sarosh Hashmat Lodi
Senior Vice Chairman, Pakistan engineering Council

I extend my heartiest congratulations to The Institution of Engineers Pakistan (IEP), Karachi Centre, and NED University of Engineering and Technology for jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026) on 30th and 31st January 2026. The continuity and growth of IMEC as a globally recognized technical forum is a testament to the unwavering commitment of these esteemed institutions toward academic excellence, research advancement, and professional development.

The chosen theme, “Innovative and Sustainable Practices in Mechanical and Allied Disciplines,” is both timely and profoundly relevant. As the world navigates complex challenges related to climate change, energy security, industrial transformation, and sustainable development, the role of mechanical engineers and allied professionals has never been more critical. Innovation rooted in sustainability is no longer an option; it is a responsibility that engineers must embrace to shape resilient economies and a greener future.

I commend the organizers for fostering international collaboration through the involvement of distinguished partners, including Getinnovateive Impact (European Union), Federation of Engineering Institutions of Islamic Countries (FEIIC), Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology, Khuzdar, University of Engineering and Technology, Taxila, ASHRAE Pakistan Chapter, and the Pakistan Society of Plumbing Professionals (PSPP). Such a diverse and inclusive collaboration strengthens knowledge exchange, promotes cross-border cooperation, and elevates the global relevance of this conference.

I am confident that IMEC-2026 will provide a vibrant platform for researchers, academicians, industry experts, policymakers, and young engineers to share innovative ideas, present cutting-edge research, and deliberate on practical solutions for sustainable industrial growth. Conferences of this caliber play a pivotal role in bridging academia and industry, nurturing future leaders, and aligning engineering practices with national and international development goals.

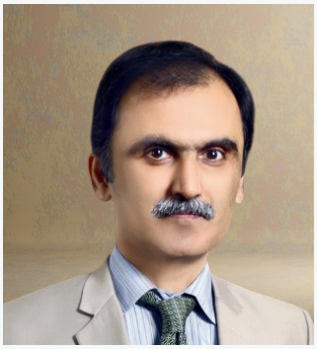
The Pakistan Engineering Council fully supports initiatives that advance engineering knowledge, uphold professional standards, and contribute to socio-economic progress. I sincerely hope that the deliberations and outcomes of IMEC-2026 will inspire meaningful research, impactful policies, and transformative engineering solutions for Pakistan and beyond.

I wish the organizers every success in hosting this prestigious event and extend my best wishes to all participants for a productive, insightful, and memorable conference.

Pakistan Zindabad.

MESSAGE FROM THE VICE CHANCELLOR, NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

Engr. Prof. Dr. Muhammad Tufail
Vice Chancellor, NED University of Engineering & Technology
Patron-in-Chief, IMEC-2026



It is a great pleasure to extend sincere felicitations to The Institution of Engineers Pakistan, Karachi Centre, NED University of Engineering & Technology, and the ASHRAE Pakistan Chapter on jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026).

I am grateful to team GetInnovative4Impact which is the Erasmus+ CBHE project and have been supporting the conference for past three years in terms of international or local mobility, peer – reviewing the articles, research collaboration.

The theme, “Innovative and Sustainable Practices in Mechanical and Allied Disciplines,” addresses pressing global challenges, including energy efficiency, environmental sustainability, and resilient engineering systems. In today’s evolving technological landscape, mechanical and manufacturing engineers stand at the forefront of developing solutions that are technically robust, environmentally responsible, and socially beneficial.

IMEC-2026 provides an international platform for academicians, researchers, industry professionals, and policymakers to exchange knowledge, present pioneering research, and foster interdisciplinary collaboration. The involvement of renowned organizations, including FEIIC, FEISCA, Baluchistan University of Engineering & Technology, Khuzdar, UET Taxila, and the Pakistan Society of Plumbing Professionals, enhances the global reach and impact of the conference.

I commend the organizers and supporting partners for their vision and dedication. I am confident that the deliberations of IMEC-2026 will advance mechanical and allied disciplines and inspire meaningful collaborations.

I wish the conference every success and all participants a productive and enriching experience.

MESSAGE FROM THE PRESIDENT INSTITUTION OF ENGINEERS PAKISTAN (IEP)

Engr. Sohail Bashir
President, Institution of Engineers Pakistan (IEP)

It gives me immense pleasure to extend my warm felicitations to the organizers and participants of the 15th International Mechanical Engineering Conference (IMEC-2026) on the theme “Innovative and Sustainable Practices in Mechanical and Allied Disciplines.”

This prestigious conference, being jointly organized by The Institution of Engineers Pakistan – Karachi Center, NED University of Engineering & Technology, Karachi, and ASHRAE Pakistan Chapter, with the valued support of Getinnovative 4Impact and the European Union, reflects a strong commitment toward promoting innovation-driven and sustainability-focused engineering solutions. The collaboration with esteemed national and international bodies including FEIIC, FEISCA, Balochistan University of Engineering & Technology Khuzdar, University of Engineering & Technology Taxila, and the Pakistan Society of Plumbing Professionals further enhances the academic depth and global relevance of this event.

Mechanical engineering and its allied disciplines remain at the forefront of industrial development, energy efficiency, climate resilience, and technological transformation. In today’s rapidly evolving world, engineers are entrusted with the responsibility of developing sustainable systems that balance economic growth with environmental stewardship. Conferences such as IMEC provide an invaluable platform for researchers, academicians, professionals, and students to exchange knowledge, share research findings, and foster meaningful collaboration across disciplines and borders.

The Institution of Engineers Pakistan firmly believes that innovation, digital transformation, and sustainable engineering practices are key enablers for national development and industrial competitiveness. This conference strongly aligns with IEP’s vision to promote professional excellence, research culture, and industry–academia linkage for addressing emerging engineering challenges.

I commend the organizing committees, partners, and contributors for their dedication and professionalism in arranging this significant international gathering.

I am confident that the deliberations, technical sessions, and research presentations will generate impactful outcomes and contribute meaningfully toward advancing mechanical engineering practices in Pakistan and beyond.

I wish the conference every success and hope that all participants find the deliberations enriching, inspiring, and productive.

MESSAGE FROM VICE-PRESIDENT (MECHANICAL & ALLIED), INSTITUTION OF ENGINEERS PAKISTAN (IEP)

Engr. Ayaz Mirza
Vice-President (Mechanical & Allied) IEP

I extend my heartfelt congratulations to The Institution of Engineers Pakistan, Karachi Centre, and NED University of Engineering and Technology for jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026) on “Innovative and Sustainable Practices in Mechanical and Allied Disciplines”. This landmark event, taking place on 30th and 31st January 2026, reflects the unwavering commitment of our engineering community to advance knowledge, foster innovation, and promote sustainability in the mechanical and allied sectors.

IMEC-2026, in collaboration with esteemed organizations including Getinnovative Impact, the European Union, Federation of Engineering Institutions of Islamic Countries (FEIIC), Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology-Khuzdar, University of Engineering and Technology-Taxila, ASHRAE Pakistan Chapter, and Pakistan Society of Plumbing Professionals (PSPP), provides a unique platform for engineers, researchers, and industry professionals to share ideas, explore cutting-edge technologies, and engage in meaningful dialogue on challenges and solutions shaping our future.

Mechanical engineering has always been at the forefront of innovation, driving industrial growth, technological progress, and sustainable development. IMEC-2026 exemplifies this spirit by emphasizing not only the advancement of engineering practices but also the integration of sustainable solutions that positively impact society and the environment.

I am confident that the knowledge exchange, networking, and collaborations emerging from this conference will inspire transformative projects and empower the next generation of engineers to embrace innovation responsibly and creatively. Let us continue to strive for excellence, uphold the highest professional standards, and contribute to a sustainable and prosperous future for our nation and the global community.

Once again, congratulations to all organizers, participants, and collaborators for making IMEC-2026 a platform of inspiration, innovation, and excellence.

MESSAGE FROM SECRETARY GENERAL, INSTITUTION OF ENGINEERS PAKISTAN (IEP),

Engr. Amir Zameer Ahmad Khan
Secretary General, IEP

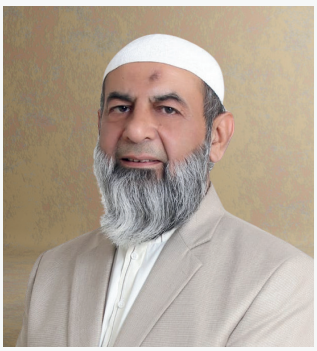
It gives me great pleasure to welcome the participants, researchers, and professionals to the International Mechanical Engineering Conference (IMEC 2026), organized under the auspices of the Institution of Engineers Pakistan (IEP), Karachi Centre. Conferences of this nature provide an essential platform for the dissemination of technical knowledge and the strengthening of professional engagement within the engineering community.

IEP has consistently worked towards the promotion of engineering standards, continuing professional development, and the encouragement of research activities across Pakistan. IMEC 2026 reflects these objectives by bringing together academicians, industry practitioners, and young researchers to share their work in key areas of mechanical engineering, including energy systems, manufacturing technologies, thermal sciences, and computational and applied engineering.

Such technical forums not only enhance professional learning but also promote collaboration between academia and industry, which is vital for addressing practical engineering challenges. I appreciate the efforts of the organizing and technical committees for developing a comprehensive technical program and for maintaining academic rigor through a structured peer-review process.

I am confident that the technical exchanges and professional interactions at IMEC 2026 will contribute positively to the growth of engineering knowledge and practice in Pakistan.

MESSAGE FROM THE CHAIRMAN, INSTITUTION OF ENGINEERS PAKISTAN (IEP), KARACHI CENTRE



Engr. Farooq Arbi
Chairman, IEP Karachi Centre

It gives me immense pride and pleasure, in my capacity as Chairman, IEP Karachi Centre, and host of this prestigious international conference, to warmly welcome all distinguished delegates, researchers, academicians, industry professionals, policymakers, and students to the 15th International Mechanical Engineering Conference (IMEC-2026). Your esteemed presence is a testament to the shared commitment of the global engineering community toward innovation, sustainability, and technological excellence.

IMEC-2026, being held on 30th and 31st January 2026, under the theme “Innovative and Sustainable Practices in Mechanical and Allied Disciplines” provides a significant platform for intellectual exchange, collaborative learning, and constructive dialogue. At a time when the world is confronted with complex engineering, environmental, and sustainability challenges, such forums are vital in shaping resilient, efficient, and future-ready engineering solutions.

This conference brings together a diverse and accomplished gathering of minds, fostering the exchange of ideas across academia, industry, and policy spheres. I am confident that the technical sessions, keynote addresses, and interactive discussions will inspire innovative thinking, promote interdisciplinary collaboration, and contribute meaningfully to the advancement of mechanical and allied engineering disciplines.

I would like to express my sincere appreciation to the Organizing Committee for their tireless efforts, meticulous planning, and dedication—particularly in ensuring the high quality of the conference proceedings, which will serve as a valuable resource for researchers, professionals, and practitioners. Their commitment and professionalism have been instrumental in shaping this conference into a forum of international repute.

I am also pleased to acknowledge the valuable collaboration and support extended by Getinnovative Impact, European Union; Federation of Engineering Institutions of Islamic Countries (FEIIC); Federation of Engineering Institutions of South and Central Asia (FEISCA); Balochistan University of Engineering and Technology, Khuzdar; University of Engineering and Technology, Taxila; ASHRAE Pakistan Chapter; and the Pakistan Society of Plumbing Professionals (PSPP). Their partnership has greatly enriched the scope, diversity, and impact of IMEC-2026.

I am confident that IMEC-2026 will serve as a catalyst for meaningful discussions, strengthen academic-industrial linkages, and contribute positively to sustainable development and engineering progress at both national and international level.

MESSAGE FROM VICE CHAIRMAN, (MECHANICAL & ALLIED) INSTITUTION OF ENGINEERS PAKISTAN (IEP), KARACHI CENTRE

Engr. Muhammad Abbas Sajid
Vice Chairman (Mechanical & Allied), IEP Karachi Centre

It gives me great pleasure to welcome all participants and contributors to the International Mechanical Engineering Conference (IMEC 2026), hosted by the Institution of Engineers Pakistan (IEP), Karachi Centre. This conference represents a significant effort toward strengthening the role of mechanical engineering and its allied disciplines in addressing contemporary industrial and societal challenges.

Mechanical engineering continues to serve as a backbone of national development through its contributions to energy systems, manufacturing, materials engineering, thermal sciences, and emerging technologies. IMEC 2026 provides an important platform for researchers, academicians, and practicing engineers to share innovative ideas, present technical advancements, and engage in constructive professional dialogue.

The Mechanical & Allied Division of IEP is committed to promoting research-driven engineering practice and to fostering meaningful collaboration between academia and industry. I commend the organizing and technical committees for designing a high-quality technical program and for maintaining academic rigor through a structured peer-review process.

I am confident that the technical exchanges at IMEC 2026 will stimulate innovation, strengthen professional linkages, and contribute positively to the advancement of mechanical engineering and allied fields in Pakistan.

MESSAGE FROM CONVENER, 15TH INTERNATIONAL MECHANICAL ENGINEERING CONFERENCE (IMEC-2026)

Engr. Prof. Dr. Syed Amir Iqbal
Dean, Faculty of Mechanical & Manufacturing Engineering
NED University of Engineering & Technology
Convener, 15th International Mechanical Engineering Conference
(IMEC-2026)

It gives me immense pleasure and a deep sense of pride to extend my heartiest congratulations to The Institution of Engineers Pakistan (IEP), Karachi Centre, and NED University of Engineering and Technology for jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026), scheduled to be held on 30th and 31st January 2026. Reaching the fifteenth milestone of this prestigious conference series is a testament to the sustained commitment, vision, and collaborative spirit of all the institutions involved.

The theme of IMEC-2026, “Innovative and Sustainable Practices in Mechanical and Allied Disciplines,” is both timely and highly relevant. In an era marked by rapid technological advancement, climate challenges, and evolving industrial needs, mechanical engineering stands at the forefront of driving sustainable development, energy efficiency, smart manufacturing, and resilient infrastructure. This conference provides an excellent platform for researchers, academicians, industry professionals, and policymakers to exchange ideas, present cutting-edge research, and explore practical solutions that address global and regional challenges.

I would like to acknowledge and appreciate the valuable collaboration of Getinnovateive Impact, European Union, Federation of Engineering Institutions of Islamic Countries (FEIIC), Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology, Khuzdar, University of Engineering and Technology, Taxila, The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Pakistan Chapter, and the Pakistan Society of Plumbing Professionals (PSPP). The collective support of these esteemed national and international partners significantly enriches the scope, quality, and global outreach of IMEC-2026.

As Dean, Faculty of Mechanical and Manufacturing Engineering, NED University of Engineering and Technology, and Convener of IMEC-2026, I firmly believe that this conference will serve as a catalyst for meaningful dialogue, interdisciplinary collaboration, and knowledge dissemination. The technical sessions, keynote addresses, panel discussions, and research presentations will not only highlight emerging trends but also inspire innovative thinking among young engineers and researchers.

I commend the organizing committees, reviewers, authors, and volunteers whose dedicated efforts have made this event possible. I am confident that IMEC-2026 will be a memorable and impactful forum, contributing significantly to the advancement of mechanical and allied engineering disciplines, while fostering sustainable and innovative practices for a better future.

I wish the conference every success and extend a warm welcome to all participants.

MESSAGE FROM CHAIRMAN, DEPARTMENT OF MECHANICAL ENGINEERING, NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY

Engr. Prof. Dr. Mubashir Ali Siddiqui
Chairman, Department of Mechanical Engineering
NED University of Engineering and Technology
Co-Convener, IMEC-2026

It gives me immense pleasure to extend my heartfelt congratulations to The Institution of Engineers Pakistan, Karachi Centre, and NED University of Engineering and Technology for jointly organizing the 15th International Mechanical Engineering Conference (IMEC-2026) on the theme of "Innovative and Sustainable Practices in Mechanical and Allied Disciplines" scheduled for 30th and 31st January 2026.

This conference represents a remarkable platform for academics, researchers, and industry professionals to come together and exchange knowledge, insights, and innovations in the field of mechanical engineering and allied disciplines. Such collaborative endeavors not only strengthen professional networks but also foster a culture of research, sustainability, and innovation that is vital for addressing the technological and societal challenges of our time.

I am especially proud that this conference is being organized in collaboration with Getinnovative Impact, the European Union, the Federation of Engineering Institutions of Islamic Countries (FEIIC), the Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology-Khuzdar, University of Engineering and Technology-Taxila, ASHRAE Pakistan Chapter, and the Pakistan Society of Plumbing Professionals (PSPP). The participation of these esteemed organizations highlights the global significance and interdisciplinary nature of IMEC-2026.

I am confident that the conference will serve as an inspiring forum for knowledge dissemination, innovation, and collaboration among professionals, academicians, and students. I look forward to the valuable contributions and discussions that will emerge, paving the way for innovative and sustainable practices in mechanical and allied engineering disciplines.

I wish IMEC-2026 great success and hope that it continues to be a source of inspiration, learning, and advancement for the engineering community both in Pakistan and internationally.

MESSAGE FROM THE SECRETARY, INSTITUTION OF ENGINEERS PAKISTAN (IEP), KARACHI CENTRE

Engr. Muhammad Aijaz ul Haq
Secretary, IEP Karachi Centre

It gives me immense pleasure and a profound sense of honor to welcome all distinguished delegates, researchers, academicians, industry professionals, and students to the 15th International Mechanical Engineering Conference (IMEC-2026), scheduled to be held on 30th and 31st January 2026 in Karachi. This prestigious conference is jointly organized by The Institution of Engineers Pakistan (IEP), Karachi Centre and NED University of Engineering and Technology, under the theme “Innovative and Sustainable Practices in Mechanical and Allied Disciplines.”

In an era marked by rapid technological transformation and increasing global sustainability challenges, the role of mechanical engineering and its allied disciplines has become more important than ever. IMEC-2026 aims to provide an international forum for the exchange of knowledge, research findings, and practical insights that promote innovation, sustainability, energy efficiency, climate resilience, and responsible engineering practices. The conference theme reflects our collective responsibility to develop solutions that are not only technologically advanced but also environmentally and socially sustainable.

I am particularly pleased that IMEC-2026 is being organized in collaboration with esteemed national and international partners, including Getinnovative Impact (European Union), Federation of Engineering Institutions of Islamic Countries (FEIIC), Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology, Khuzdar, University of Engineering and Technology, Taxila, The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Pakistan Chapter, and the Pakistan Society of Plumbing Professionals (PSPP). This broad collaboration highlights the global relevance of the conference and reinforces the spirit of shared learning and professional cooperation across borders.

The Institution of Engineers Pakistan, Karachi Centre remains committed to fostering professional excellence, promoting research culture, and strengthening academia–industry linkages. IMEC-2026 is envisioned as a platform where emerging researchers can engage with experienced professionals, innovative ideas can be translated into practical applications, and meaningful collaborations can be developed to address present and future engineering challenges.

I extend my sincere appreciation to the organizing committees, technical reviewers, keynote speakers, sponsors, and volunteers whose dedication and hard work have made this event possible. I also commend the authors and presenters for their valuable contributions, which will undoubtedly enrich the technical depth and overall impact of the conference.

On behalf of IEP Karachi Centre, I warmly welcome all participants and wish you a highly productive, intellectually stimulating, and memorable experience at IMEC-2026. May this conference inspire new ideas, strengthen professional bonds, and contribute meaningfully to the advancement of innovative and sustainable engineering practices.

With best wishes for the success of IMEC-2026.

MESSAGE FROM THE PRESIDENT, ASHRAE PAKISTAN CHAPTER (2025–2026)

Shuja Khalid
President, ASHRAE Pakistan Chapter (2025–2026)

It is a pleasure to extend my warm greetings to all participants, authors, reviewers, and organizers of the International Multidisciplinary Engineering Conference (IMEC 2026). Hosting this conference at NED University of Engineering & Technology and the Institution of Engineers Pakistan (IEP), Karachi Centre, reflects the ASHRAE Pakistan Chapter's commitment, alongside its partner institutions, to advancing engineering education, research, and professional practice in Pakistan.

IMEC 2026 provides a timely and valuable platform for the exchange of ideas across diverse engineering disciplines, addressing critical themes such as sustainability, innovation, energy systems, advanced manufacturing, artificial intelligence, and HVACR technologies. The multidisciplinary scope of the conference encourages collaboration and dialogue that are essential for solving today's complex engineering and societal challenges.

The strong focus on technology readiness, policy relevance, and academia–industry collaboration aligns closely with ASHRAE's mission to promote sustainable, efficient, and resilient engineering solutions. I commend the organizing and technical committees for ensuring a rigorous peer-review process and maintaining high academic standards.

I am confident that IMEC 2026 will foster meaningful discussions, inspire future research, and strengthen professional networks within the global engineering community. I wish the conference every success.

MESSAGE FROM THE SECRETARY CONFERNCE

Engr. Dr. Tariq Jamil
Secretary Conference, NED University of Engineering & Technology

I am delighted and grateful to The Institution of Engineers Pakistan, Karachi Centre, and ASHRAE Pakistan Chapter for collaborating with NED University of Engineering & Technology, Karachi to organize the 15th International Mechanical Engineering Conference (IMEC-2026) on the theme “Innovative and Sustainable Practices in Mechanical and Allied Disciplines”, which is held on the 30th and 31st of January 2026.
This prestigious conference represents a decent platform for researchers, academicians, and industry professionals to come together, exchange knowledge, and explore advancements in the field of mechanical engineering and related disciplines.

I am being the primary participant of the project GetInnovative4Impact that is co-funded by European Union, grateful to all the collaborators including Federation of Engineering Institutions of South and Central Asia (FEISCA), Balochistan University of Engineering and Technology-Khuzdar, University of Engineering and Technology - Taxila, and Pakistan Society of Plumbing Professionals (PSPP). This institution and the project have been supporting the IMEC in regards of the publication in reputed journal, and peer-reviewing process of the manuscripts to be presented in the conference.

I take this opportunity to commend all the organizers, speakers, participants, and supporting institutions for their relentless efforts in making this conference a reality. I am confident that IMEC-2026 will be a grand success, leaving a lasting impact on the engineering community and inspiring future innovations in mechanical and allied disciplines.

As Conference Secretary, I wish IMEC-2026 every success and am fully committed to raising it to an even higher international level.

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About the Conference

The International Mechanical Engineering Conference (IMEC 2026) was held on **January 30-31, 2026**, at **NED University of Engineering & Technology** and **the Institution of Engineers Pakistan (IEP)**, Karachi Centre. The conference provides a scholarly forum for researchers, academicians, and industry professionals to present and exchange advances across multiple engineering disciplines, with an emphasis on innovation, sustainability, and industrial relevance.

The technical program of IMEC 2026 covers a broad range of contemporary themes, including **advanced and smart materials, artificial intelligence and multi-physics simulations, smart and sustainable manufacturing, energy systems, HVACR technologies, indoor environmental quality, and sustainable engineering solutions.** The sessions are designed to encourage interdisciplinary interaction while addressing emerging challenges in engineering research and practice.

IMEC 2026 places particular focus on **technology readiness, policy considerations, and academia–industry collaboration,** highlighting research that bridges fundamental theory and practical implementation. Contributions include experimental studies, numerical and computational modeling, machine-learning-based approaches, and system-level assessments relevant to modern industrial and societal needs.

All papers included in the conference program were subjected to a **peer-review process** to ensure originality, technical merit, and relevance. The accepted papers reflect current research trends and demonstrate the multidisciplinary scope of the conference.

The IMEC 2026 proceedings aim to serve as a lasting technical record and a reference for future research, supporting knowledge dissemination and cross-disciplinary collaboration within the global engineering community.

Conference Committees

Advisory Board

Engr. Farooq Abri
Chairman, IEP Karachi Centre

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President NEDIAN Association Pakistan

Engr. Muhammad Abbas Sajid
Vice-Chairman (Mechanical & Allied), IEP, Karachi Centre

Engr. M. Aijaz Ul Haq
Secretary IEP Karachi Centre

Engr. Prof. Dr. Muhammad Tufail
Patron-In-Chief IMEC 2026
Vice-Chancellor, NED University of Engineering & Technology

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Convener 15th IMEC-2026
Dean, Department of Mechanical Engineering, NEDUET

Engr. Prof. Dr. Mubashir Ali Siddiqui
Co-Convener 15th IMEC-2026
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Mr. M. Shuja ul Haq Siddiqui,
CEO, Pak Orient Industries

Inaugural Session Programme

Friday January 30, 2026 at **Ashraf Habibullah Video Conferencing Hall, NEDUET, Karachi**

Time	Activity
2:30 PM	Guests to be Seated
3:00 PM	Recitation from the Holy Quran – Engr. Shaukat Ali Shaikh
3:05 PM	National Anthem
3:10 PM	Conference Briefing – Prof. Engr. Dr. Syed Amir Iqbal, Dean Mechanical & Manufacturing Engineering, NEDUET & Convener, IMEC 2026
3:15 PM	Welcome Address – Engr. Dr. Tariq Jamil, Secretary, 15th IMEC 2026, NEDUET
3:20 PM	Keynote Speech I – Engr. Faisal Iqbal Siddique, Vice President (Technical), Sindh Engro Coal Mining Company Title: Unlocking the Potential of Thar Coal
3:45 PM	Keynote Speech II (Online) – Ir. Dr. Hj. Salimi Bin Md Saleh, Vice President, IEM Pahang Title: Sustainability Flood Mitigation Strategies in Malaysia: Mechanical Engineers' Perspectives
4:05 PM	Address by Guest of Honor – Engr. Faisal Rahman Atique, Vice President, Lucky Motor Corporation
4:15 PM	Address – Prof. Engr. Dr. Muhammad Tufail, Vice-Chancellor, NEDUET & Partron-in-Chief, IMEC 2026
4:25 PM	Address by the Chief Guest – Engr. Fahim Iqbal Siddiqui, CEO, FND (Pvt.) Ltd. Consulting Engineers
4:35 PM	Presentation of Conference Mementos
4:45 PM	Vote of Thanks – Engr. Muhammad Aijaz ul Haq, Secretary, IEP Karachi Centre
5:00 PM	Asr Prayer & Refreshments

Technical Sessions Schedule

Saturday, January 31, 2026 | **IEP Karachi Centre**

Morning Sessions

- **Breakfast**: 8:30 AM – 09:30 PM (at 5th Floor)

Time	Convention Centre A	Convention Centre B	Dr. S. A. Hasan Hall
9:30 – 11:10 AM	Technical Session-1 **Theme:** Innovative & Smart Materials	Technical Session-2 **Theme:** AI & Multi-Physics Simulations	Technical Session-3 **Theme:** Sustainable Energy & Systems
11:00 – 11:30 AM	Tea Break		

Late Morning Sessions (11:30 AM – 1:10 PM)

Time	Convention Centre A	Convention Centre B	Dr. S. A. Hasan Hall
11:30 AM – 1:10 PM	Technical Session-4 **Theme**: Technology Readiness, Policy & Academia–Industry Collaboration	Technical Session-5 **Theme**: Design & Smart Manufacturing	Technical Session-6 **Theme**: Building Energy Efficiency, HVACR Systems & Indoor Environmental Quality

Afternoon

Time	Event & Location
1:10 PM – 2:30 PM	Lunch & Prayer Break
2:30 PM onwards	Closing Ceremony – Convention Centre A

Parallel Event

- **Poster Session**: 9:30 AM – 05:00 PM (Dining Hall)

Detailed Technical Sessions

Saturday, January 31, 2026 | **IEP Karachi Centre**

TECHNICAL SESSION - 1

Convention Centre A | Innovative & Smart Materials | 9:30 – 11:10 AM

SESSION CHAIRS

Prof. Dr. Syed Murtuza Mehdi
Department of Mechanical Engineering, NEDUET

Engr. Ghulam Farooq Mainar
Member Central Council, IEP

Engr. Dr. Muhammad Muzamil
Department of Mechanical Engineering, NEDUET

Time	Paper Title	Presenter	Affiliation
9:30 AM – 9:50 AM	Paper 1: Evaluation of Impact and Tensile Properties of 3 Different 3D-Printed Polymers at Varying Infill Densities	Muhammad ShahAreeb	NED University of Engineering & Technology, Karachi
9:50 AM – 10:10 AM	Paper 2: Heat Treatment Response of Steel Austenitized above A_3 Temperature under Different Quenching Conditions	Ali Azhar	DHA Suffa University, Karachi
10:10 AM – 10:30 AM	Paper 3: A Comparative Study to Investigate Influence of Laser Welding on Joint Integrity of SS 304	Lubna Sharif	DHA Suffa University, Karachi
10:30 AM – 10:50 AM	Paper 4: Mechanical Behavior of Laser-Welded Al 2024-T6 Joints	Muhammad Laique	Hamdard University, Karachi
10:50 AM – 11:10 AM	Paper 5: Multi-Objective Flexible Job-Shop Scheduling with Flexible Workers and Ergonomic Factors via an Improved NSGA-II	Shaban Usman	University of Electronic Science and Technology of China

Detailed Technical Sessions

Saturday, January 31, 2026 | **IEP Karachi Centre**

TECHNICAL SESSION - 2

Convention Centre B | AI & Multi-Physics Simulations | 9:30 – 11:10 AM

SESSION CHAIRS

Prof. Dr. Haider Ali
Department of Mechanical Engineering, NEDUET

Engr. Mustafa Hussain Khan
Member Central Council, IEP

Prof. Dr-Ing. Mushahid Hussain Hashmi
Department of Automotive & Marine Engineering, NEDUET

Time	Paper Title	Presenter	Affiliation
9:30 AM – 9:50 AM	Paper 1: Thermal Performance Analysis of $LaNi_5$ Metal Hydride Reactors Using Multiple Heating-Tube Configurations and Fin Enhancements	Muhammad Ahsan Jabbar	University of Engineering & Technology, Taxila
9:50 AM – 10:10 AM	Paper 2: Aeroacoustics Noise and Performance Analysis of Vortex Tube: A CFD Approach	Muhammad Anas Wazir (Online)	University of Peshawar
10:10 AM – 10:30 AM	Paper 3: Machine Learning-Based Predictive Modeling of Machining Performance of Ti-6Al-4V under MQL Lubricating Conditions	Dr. Muhammad Jawad	University of Engineering & Technology, Taxila
10:30 AM – 10:50 AM	Paper 4: Synergizing Industry 5.0 and Edge Intelligence: A Multi-Modal Object Classification Model Using Boosted Feature Cascades	Muhammad Danish Saleem	NED University of Engineering & Technology, Karachi
10:50 AM – 11:10 AM	Paper 5: Finite Element Analysis (FEA) of Electric Power Distribution Pole Geometries with Material Classification	Muhammad Taha Khan	NED University of Engineering & Technology, Karachi

TECHNICAL SESSION 3

Dr. S. A. Hasan Hall |Sustainable Energy & Systems | 09:30 AM – 11:10 AM

SESSION CHAIRS

Prof. Dr. Muhammad Uzair
Department of Mechanical Engineering,
NEDUET

Engr. Col (Retd) Syed Mukhtar Asif
Member Local Council,
IEP, Karachi Centre

Prof. Dr.-Ing Usman Allauddin
Department of Mechanical Engineering,
NEDUET

Time	Paper Title	Presenter	Affiliation
09:30 AM – 09:50 AM	Paper 1: Integrated Industrial Economic Design and Multi-Objective Optimization of a Sustainable Biomethane Production System for Decentralized Energy Generation	Muhammad Jawad	University of Engineering & Technology, Taxila
09:50 AM – 10:10 AM	Paper 2: Hybrid Low-Concentration PV/T System with Nano-PCM Cooling and Thermoelectric Energy Recovery	Muhammad Mateen Sultan	University of Engineering & Technology, Taxila
10:10 AM – 10:30 AM	Paper 3: Exploring Quality 4.0: A Systematic Review of Technological Enablers and Their Impact on Quality Management	Huzaif Sami	NED University of Engineering & Technology, Karachi
10:30 AM – 10:50 AM	Paper 4: Energy Auditing: A Mandatory Pathway for EDGE and LEED Green Building Standards	Syed Atif Naseem	Velosi Integrity & Safety Pakistan
10:50 AM – 11:10 AM	Invited Talk: The Rise of ESG Reporting in Pakistan: What Engineers Need to Know	Muhammad Adnan Javed	General Manager - Engineering, Projects & EHS, AGP Limited

Detailed Technical Sessions

Saturday, January 31, 2026 | **IEP Karachi Centre**

Technical Session - 4

Convention Centre A | Technology Readiness, Policy & Academia–Industry Collaboration | 11:30 AM - 01:00 PM

SESSION CHAIRS

Prof. Dr. Muhammad Wasif
Department of Mechanical Engineering,
NEDUET

Engr. Abdul Rahim
Member Local Council,
IEP, Karachi Centre

Dr. Maqsood Ahmed Khan
Department of Industrial & Manufacturing Engineering,
NEDUET

Time	Paper Title	Presenter	Affiliation
11:30 AM – 11:50 AM	Paper 1: Comprehensive HIRA of Paint Shop in Gas Meter Manufacturing Plant with Compliance of ISO Standards	Muhammad Hamid	NED University of Engineering & Technology, Karachi
11:50 AM – 12:10 PM	Paper 2: Capacity Degradation Estimation of Lithium-Ion Batteries Using Explainable Machine Learning	Qasim Masroor Mirza	College of Electrical & Mechanical Engineering, NUST
12:10 PM – 12:30 PM	Paper 3: In-Situ Decarbonization of SMR Hydrogen: A Comparative Exergy–Machine Learning Framework for Blue & Green Hydrogen Ascendancy	Abdullah Hasni	NED University of Engineering & Technology, Karachi
12:30 PM – 12:50 PM	Paper 4: Technical Assessment of a Catamaran-Based Offshore Floating Photovoltaic System for Sheltered Coastal Waters	Syed Hussain Momin Zaidi	DHA Suffa University, Karachi
12:50 PM – 1:10 PM	Invited Talk: From Lab to Plant : How Emerging Technologies Succeed or Fail in Heavy Industry	Muhammad Ziaullah Khan	Lead Strategy and Operational Excellence Power Cement Limited

TECHNICAL SESSION 5

Convention Centre B | Design & Smart Manufacturing | 11:30 AM – 1:10 PM

SESSION CHAIRS

Dr. Kashif Noor
Department of Mechanical Engineering,
NEDUET

Engr. Abdul Wahab Tajwani
Member Local Council
IEP, Karachi Centre

Dr. Shehroze Tahir Khan
Department of Mechanical Engineering,
NEDUET

Time	Paper Title	Presenter	Affiliation
11:30 AM – 11:50 AM	Paper 1: Design of Sensor-Based Hard Switching Collision Avoidance Strategy for a Hovering Autonomous Underwater Vehicle	Dr. Faheem Rehman	Pakistan Navy Engineering College, NUST
11:50 AM – 12:10 PM	Paper 2: Experimental Study to Compare Performance of Multi-Nozzle Solar-Powered Pesticide Spray with Manual Nozzle Spray System	Muhammad Maaz Husnain	DHA Suffa University, Karachi
12:10 PM – 12:30 PM	Paper 3: Experimental Evidence for Thrust Enhancement in Propellers Using Tubercle-Designed Blades	Ms. Aileen Saeed	Laboratory of Energy and Devices, PNEC, NUST
12:30 PM – 12:50 PM	Paper 4: Design and Development of an Uncrewed Surface Vessel (USV) for Hydrographic Survey	Mr. Bhupen Pervaiz Bheem	Pakistan Navy Engineering College, NUST
12:50 PM – 1:10 PM	Invited Talk: Smart Manufacturing Through Supplier Development: From Localization to Capability Building	Sara Saleem	Assistant Manager Indus Motors Company Ltd

TECHNICAL SESSION 6

Dr. S. A. Hasan Hall | Building Energy Efficiency, HVACR Systems and Indoor Environmental Quality | 11:30 AM – 01:10 PM

SESSION CHAIRS

Dr. Mumtaz Hussain Qureshi
Department of Mechanical Engineering, NEDUET

Dr. Syed Muhammad Asad Akhtar
Department of Mechanical Engineering, NEDUET

Time	Paper Title	Presenter	Affiliation
11:30 AM – 11:50 AM	Paper 1: Why Buildings Waste Energy: How HVAC Decisions Drive Long-Term	Tahir Raza	IES Consulting, Lahore
11:50 AM – 12:10 PM	Paper 2: Building Energy Efficiency, Sustainable Refrigerants and Electrification of Heating in Modern HVACR Systems (Online)	Remy Moussa	Trane Technologies, UAE
12:10 PM – 12:30 PM	Paper 3: Sustainable Energy & Systems	Fahad Hasan	YH Associates
12:30 PM – 12:50 PM	Paper 4: Emerging Technologies in the Built Environment	Engr. Zeeshan Siddiqui	Carrier Corporation
12:50 PM – 01:10 PM	Invited Talk: Indoor Air Quality for Hospital Buildings	Philip Curran	Powermech Engineering Solutions Pvt ltd

Closing Session Programme

Saturday January 31, 2026 at **Convention Centre A, IEP Centre Karachi**

Time	Activity
2:15 PM	Guests to be Seated
2:30 PM	Recitation from the Holy Quran (Engr. Dr. Saqib Sharif)
2:35 PM	National Anthem
2:40 PM	Conference Highlights by Engr. Prof. Dr. Mubashir Ali Siddiqui, Chairperson Department of Mechanical Engineering, NEDUET & Co-Convener, IMEC-2026
2:50 PM	Address by Engr. Farooq Arbi, Chairman, IEP Karachi Centre
3:00 PM	Address by Engr. Ayaz Mirza, Vice President (Mechanical & Allied), IEP Karachi Centre
3:10 PM	Introduction of Triple Helix E-Portal (Project: GetInnovative4Impact) by Engr. Dr. Muhammad Wasif, Professor, NEDUET & Participant Contact, GetInnovative4Impact
3:35 PM	Keynote Address by Timothy Wentz, P.E., Past President, ASHRAE
4:00 PM	Address by Engr. Sohail Bashir, President, Institution of Engineers Pakistan
4:10 PM	Address by Guest of Honor: Mr. Yousuf Hasan, President, Pakistan HVACR Society
4:25 PM	Address by Chief Guest: Engr. Prof. Dr. Sarosh Hashmat Lodi, Chairman, Charter Inspection and Evaluation Committee (CIEC)
4:35 PM	Chairman's Medal and IEP Award for Best Paper & Best Poster Presentation
4:45 PM	Conference Recommendations by Engr. Dr. Tariq Jamil, Secretary, IMEC-2026
4:55 PM	Vote of Thanks by Engr. Ghulam Farooq Maniar, Member Central Council, IEP
5:05 PM	Refreshments

Evaluation of Impact and Tensile Properties of 3 Different 3D-Printed Polymers at Varying Infill Densities

Muhammad Ahmer Iqbal[1], Atif Shazad[2*], Muhammad Maaz Husnain[1], Muhammad ShahAreeb[3], Alishba Shah[4]
[1]Department of Mechanical Engineering, Hamdard University, Karachi Pakistan
[2]Mechanical Engineering Department, DHA Suffa University, Karachi
[3]Department of Mechanical Engineering, NED University, Karachi, Pakistan
[4]Department of Management and Technology, Ziauddin University Faculty of Engineering, Science, Technology & Management
*Corresponding Author Email Address: atif.shazad@dsu.edu.pk

Abstract

Additive manufacturing has emerged as a widely accepted alternative to conventional fabrication techniques due to its exceptional design flexibility and capability to produce complex geometries without compromising mechanical performance. Among the various process parameters influencing the quality of 3D-printed components, infill density plays a particularly critical role, as it directly governs internal structure, mechanical integrity, and overall strength. In this study, the tensile and impact responses of PLA, ABS, and PTEG specimens printed at 25%, 50%, and 75% infill densities were comprehensively examined. The results demonstrated that tensile strength and stiffness increased steadily with higher infill levels across all materials. PLA and PTEG exhibited an approximate 30% rise in peak stress from 25% to 75% infill, while ABS showed an improvement of about 20–22%, attributed to reduced internal voids and enhanced interlayer bonding at higher densities. Impact testing further revealed that ABS achieved the greatest toughness at 75% infill, recording an 18% increase in absorbed energy compared with PLA. Conversely, PLA displayed nearly 33% higher impact resistance than ABS at both 25% and 50% infill levels.

Keywords: Toughness, 3D Printing, ABS, Tensile Strength, PLA

Heat Treatment Response of Steel Austenitized above A_3 Temperature under Different Quenching Conditions

Atif Shazad[1], Ali Azhar[1], Abdur Razzaq Ahmed Siddiqui[1], Saad Khan[1], M.Irfan Khan[1], and M.Taufeeq Buriro[1]
[1]Department of Mechanical Engineering, DHA Suffa University, Karachi, Pakistan
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Abstract

This work examines the effect of annealing, normalizing, and water quenching on the microstructure and mechanical properties of AISI 1025 steel heat treated at 950 °C. Furnace cooling produced a ferrite-rich structure with coarse pearlite, resulting in low strength and high ductility. Normalizing refined the microstructure, leading to moderate strength with balanced ductility. Rapid water quenching suppressed diffusion and promoted the formation of martensite in lower content due to lower percentages of carbon with retained ferrite. Martensite microstructure significantly increased hardness and tensile strength while reduced ductility and impact toughness. Mechanical testing confirmed a clear inverse relationship between strength and ductility, with quenched samples showing the highest yield and ultimate tensile strengths and annealed samples exhibiting the greatest elongation and toughness. Hardness results remained consistent across samples, indicating that heat treatment type was the primary controlling factor. Overall, the study demonstrates that cooling rate after austenitization plays a decisive role in tailoring the microstructure and performance of low-carbon steel.

Keywords: Austenite, Martensite, Low Carbon Steel, Tensile Strength

A Comparative Study to Investigate Influence of Laser Welding on Joint Integrity of SS 304

Muhammad Muawiyah Munawara[1], Atif Shazad[2], Muhammad Laique[1], Muhammad Tajammil[1] and Lubna Sharif[2]
[1]Department of Mechanical Engineering, Hamdard University, Karachi Pakistan
[2]Mechanical Engineering Department, DHA Suffa University, Karachi
*Corresponding Author Email Address: atif.shazad@dsu.edu.pk

Abstract

Stainless steels (SS) are extensively used worldwide owing to their superior mechanical strength and excellent corrosion resistance. Common welding techniques for SS include Shielded Metal Arc, Tungsten Inert Gas, laser, and friction stir welding. The first two processes often reduce joint performance because of high heat input and the formation of a wide heat-affected zone (HAZ). Although friction stir welding produces joints through plastic deformation without external heat, its industrial availability remains limited. Laser welding, on the other hand, is widely accessible and operates with a moderate heat input. Therefore, this study focused on evaluating the influence of this moderate thermal input on the mechanical and microstructural characteristics of SS 304. The results revealed a notable increase in hardness within both the weld zone (WZ) and HAZ. However, hardness increment negatively affected ductility and toughness. Slight improvements in tensile strength and yield strength were observed, attributed to crystal elongation and grain distortion. Overall, the study provides a comprehensive comparison between the properties of the base material and those of the laser-welded joints

Keywords: SS 304, Ultimate Tensile Strength, Ductility, Hardness

Mechanical Behavior of Laser-Welded Al 2024-T6 Joints

Atif Shazad[1], Abdul Rehman Khan[2], Talha Javaid[2], Muhammad Liaque[2], and Hateem Arif[3]
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[2]Department of Mechanical Engineering, Hamdard University, Karachi Pakistan
[3]Deprtment of Industrial Engineering, University of Naples Federico II
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Abstract

Aluminum alloy 2024 in the T6 temper is recognized as a high-performance, age-hardened material that is extensively utilized in aerospace and load-bearing structural components due to its excellent strength-to-weight characteristics. The strength of this alloy is mainly controlled by finely distributed copper-based precipitates but this strengthening mechanism simultaneously results in reduced ductility and comparatively lower resistance to corrosion. The joining method mostly employed for this alloy is Friction stir welding (FSW), however, FSW is not available in local industry so laser welding can be utilized for joining of Al 2024-T6 because of better heat concentration. The research findings indicated that laser welding had a pronounced effect on the mechanical behavior of Al 2024-T6 sheets due to highly concentrated heat input and rapid thermal cycles. The weld zone exhibited reduced hardness relative to the base material, while the heat-affected zone showed progressive hardness recovery with increasing distance from the fusion line. Impact testing revealed a significant decline in toughness of approximately 40% in the welded joints, accompanied by a marked reduction in ductility, with percent elongation decreasing by nearly 50%, suggesting a shift toward brittle fracture behavior originating in the HAZ. Tensile results further demonstrated reductions of approximately 16% in ultimate tensile strength and 20% in yield strength following laser welding, indicating the strong influence of thermal cycling on microstructural stability and residual stress evolution. Overall, although defect-free joints were achieved, laser welding led to notable degradation in mechanical properties, emphasizing the need for process optimization or post-weld treatments to enhance the structural performance of Al 2024-T6 components.

Keywords: Laser Welding, Impact Strength; Tensile Strength, Elongation, Toughness

Technical Session 1 Innovative & Smart Materials

Multi-Objective Flexible Job-Shop Scheduling with Flexible Workers and Ergonomic Factors via an Improved NSGA-II

Shaban Usman[1], Chunming Gao[1,2,3], Ping Zhang[1,2,3], Tianrun Ye[2], Qin Weiwei[1], Zhizhong Fu[4], Zhexian Li[2] Yafei Wang[2], Sajjad Ali[5*], Yanli Gong[3]
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[4]School of Information and Communication Engineering, University of Electronic Science and Technology of China
[5]Department of Civil Engineering, NED University of Engineering and Technology
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Abstract

The flexible job-shop scheduling problem with worker flexibility (FJSPW) has been a frequently researched topic in recent years. In FJSPW, the number of workers is generally fewer than the number of machines, and workers are flexible enough to perform operations on multiple machines, thereby improving productivity. However, the consideration of workers' well-being is generally overlooked. Worker well-being is crucial, particularly in manufacturing processes where frequent manual handling of tasks in awkward positions is involved, to prevent fatigue and work-related musculoskeletal disorders. This paper proposes an FJSPW model that considers ergonomic factors (FJSPW-Ergo) to improve workers' productivity and well-being simultaneously. The ergonomic load is measured using the rapid entire body assessment (REBA) score. An improved NSGA-II is employed to solve the FJSPW-Ergo model with a three-layer encoding method, two crossover operators and two mutation methods to minimize the makespan and maximum REBA score. Different combinations of jobs and machines with a variable number of workers are used to demonstrate the effectiveness of the proposed FJSPW-Ergo approach. The results show that FJSPW-Ergo is an effective method for simultaneously achieving productivity and ergonomic relief.
Keywords: Job-shop scheduling, ergonomics, NSGA-II, worker flexibility, REBA

Technical Session 2 AI & Multi-Physics Simulations

Thermal Performance Analysis of $LaNi_5$ Metal Hydride Reactors Using Multiple Heating-Tube Configurations and Fin Enhancements

Muhammad Ahsan Jabbar[1]*, Najam ul Hassan Shah[1], Muhammad Usman[1], Imran Shaban Bhatti[2], Muzaffar Ali[3,4]
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[3]Department of Energy Engineering, University of Engineering and Technology Taxila, Pakistan [4]Department of Mechanical Engineering, Engineering Faculty, Kocaeli University, Kocaeli, 41001, Turkiye
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Abstract

Metal hydrides such as $LaNi_5$ offer a compact and intrinsically safe hydrogen-storage solution for PEM fuel cells, but their endothermic desorption reaction requires efficient heat delivery to maintain acceptable release rates. This study numerically investigates the thermal performance of a cylindrical $LaNi_5$ metal hydride reactor heated using waste heat from an 80 °C PEMFC coolant stream. A three-dimensional slice of a 500 mm-diameter tank was modeled in SolidWorks and Space Claim, and transient CFD simulations were conducted in ANSYS Fluent using an Arrhenius-based temperature-dependent volumetric heat sink to represent desorption. Twelve aluminum tubes were arranged in square, triangular, and radial patterns, each examined with and without 10 mm fins. Temperature uniformity, heat absorbed, and statistical indicators were compared across six configurations. Results show that the square pattern yields the most uniform temperature field and the highest heat absorption, while the radial arrangement performs the poorest. In the un-finned cases, the square configuration showed the lowest temperature non-uniformity, with approximately 9% lower standard deviation and coefficient of variation compared to the radial arrangement, along with a marginal (~1%) increase in heat absorption The finned square configuration achieved up to 24% higher heat absorption compared to its un-finned counterpart and approximately 0.3% improvement over the finned triangular arrangement and about 1.5% over the finned radial arrangement, maintaining the lowest temperature non-uniformity between all the configurations. Validation against previous study trends and a grid-independence study confirm the reliability of the numerical model, offering guidance for optimizing metal hydride tank heating-tube configurations.
Keywords: Metal Hydrides, $Lani_5$, Hydrogen Desorption, Hydrogen Storage, Heating-Tube Configurations, Fin Enhancements, Thermal Performance, PEMFC Waste Heat, Temperature Distribution, Reactor Design

Aeroacoustics Noise and Performance Analysis of Vortex tube: A CFD Approach

Muhammad Aadil[1], Fawad Ali[2]*, and M Anas Wazir[3]
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[2]Faculty of Sciences - Marseille Etoile Campus, Aix-Marseille University.
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Abstract

The vortex tube is an eco-friendly and maintenance-free cooling device widely used in industries that separates high-pressure gas into hot and cold streams without the use of refrigerants or moving parts. Despite its benefits, the vortex generator induces aeroacoustics noise that poses a risk to human ears. Limited research exists on aeroacoustics noise levels and the impact of hot outlet valve length on the performance of the vortex tube. The present study explores the effects of inlet nozzles on flow-induced noise using the Broadband Noise Source Model and the hot outlet valve length on the Coefficient of Performance (COP) of vortex tube. The effect of pressures on the vortex tube performance is also investigated. A three-dimensional computational domain has been generated with a single vortex chamber having six nozzles and validated against literature experimental data. Results indicate that nozzle outlets near the cold orifice are a critical region for elevated noise levels and increasing with number of inlet nozzles, reaching a maximum Acoustic Power Level of 161.3 dB for six nozzles in radial direction. The Acoustic Power Level increases from 150 dB to 170 dB when the number of nozzles increases from 2 to 6 in axial direction. COP results show a maximum of 0.37 at 0.6 cold mass fraction and 6 bar pressure. Moreover, the hot outlet valve length shows minimal impact on COP, while pressure ratio (Rp) suggests the highest COP for 18mm hot outlet valve when exceeds 4.7 bar.

Keywords: Vortex tube, CFD Analysis, Aeroacoustics, COP, Broadband Noise Source Model

Machine Learning Based Predictive Modeling of Machining Performance of Ti-6Al-4V under MQL Lubricating Conditions

Muhammad Jawad[1], Um e Habiba[1], Bilal Hassan[1], Mirza Jahanzaib[1], Salman Hussain[1], Wasim Ahmed[1]
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Abstract

This study evaluates the performance of machined Ti-6Al-4V alloy under Minimum Quantity lubrication (MQL) using machine learning models to support sustainable and efficient milling. Experiments were conducted by varying cutting speed, feed rate, and their effects on surface roughness (Ra), material removal rate (MRR), and tensile strength (Ts) have been recorded. Using the experimental dataset, predictive models were developed using Random Forest (RF) and Artificial Neural Networks (ANN) to estimate machining responses. RF has employed a collection of decision trees to boost prediction stability, whereas ANN captured nonlinear. Models' performance was evaluated using R2, root mean square (RMSE) and mean absolute error (MAE) metrics. The outcomes showed that both models predicted machining responses under MQL conditions efficiently; however, the ANN model demonstrated superior accuracy, particularly for MRR and Ts. Statistical evaluation confirmed that the ANN achieved the highest predictive accuracy particularly for Ts with R2 = 0.9404, RMSE = 0.0737 and MAE = 0.038 while also demonstrating reliable prediction for Ra and MRR. The RF model showed lower accuracy particularly for MRR yet maintained stable regression behaviour which indicated its ability to capture non-linear patterns despite higher prediction errors. Overall, the developed models offer a reliable data-driven framework for optimizing machining parameters and improving sustainability. Keywords: Machine learning models, ANN, Random Forest, and MQL machining.

Keywords: Machine Learning Models, ANN, Random Forest, MQL Machining

Technical Session 2 AI & Multi-Physics Simulations

Synergizing Industry 5.0 and Edge Intelligence: A Multi-Modal Object Classification Model Using Boosted Feature Cascades

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Abstract

As the global industrial landscape advances from Industry 4.0 toward Industry 5.0, the focus has progressively shifted beyond automation to the development of human-centric, resilient, and sustainable cognitive manufacturing systems. Central to this transition is Edge Intelligence, which enables real-time processing of complex visual data directly on resource-constrained edge hardware, thereby reducing latency, enhancing data privacy, and improving operational robustness. This research presents a high-efficiency object detection and classification system utilizing the Haar Cascade Classifier, a machine learning technique rooted in boosted Haar-like features and AdaBoost training. Moving beyond binary detection, a multi-modal architecture was developed, capable of identifying and categorizing five distinct classes: cars, buses, motorcycles, heavy-duty trucks, and emergency response units. By utilizing a custom-curated dataset of positive samples and a vast repository of negative background images, a series of boosted cascades, optimized for rapid inference, was trained. The system employs an integral image representation to accelerate feature calculation, achieving processing speeds exceeding 25 frames per second on standard CPU architectures without the need for high-end GPU acceleration. Experimental results demonstrate that the system effectively distinguishes between diverse classes under varying environmental conditions and densities. This study contributes a scalable, cost-effective solution for automated flow monitoring in smart industrial zones, providing the granular data necessary for the cognitive infrastructure of Industry 5.0.

Keywords: Industry 5.0, Edge Intelligence, Classification, Haar Cascade

Technical Session 2 AI & Multi-Physics Simulations

Finite Element Analysis (FEA) of Electric Power Distribution Pole Geometries with Material Classification

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Abstract

Electric Power Distribution has become important with the rise in demand of electricity. Over the years, underground power distribution systems have been laid, which have high maintenance costs. Thus, overhead power distribution poles are easier to maintain and are an integral part of the distribution systems in Middle Eastern and South Asian Countries. The paper aims at studying the overhead electric power distribution poles employing the various pole geometries: hollow-straight, hollow-tapered, and hollow-stepped, over a steel and GFRP (Glass Fiber-Reinforced Polymer) to study the mechanical properties, such as Equivalent Stress, Equivalent Strain, and Directional Deformation, which exhibit details about the rigidity and the stiffness of the pole at the applied Transverse Loading Condition. Having tested the poles on ANSYS, treating the pole as a cantilevered structure, we can conclude that hollow stepped geometry is ideal for the overhead Electric Power Distribution Network, giving optimal Factor of Safety. However, GFRP stepped pole may have a higher Factor of Safety to than steel; it is still susceptible to UV radiation, making steel the best-suited option of the two materials. Furthermore, hybrid designs (with at least two materials joined together) can also be employed and tested to observe the change in design, the strength, and stiffness of the pole.

Keywords: Geometry Optimization, GFRP (Glass Fiber Reinforced Composite), Lattice Poles, Steel Tubular Poles.

Technical Session 3 Sustainable Energy & Systems

Integrated Industrial Economic Design and Multi-Objective Optimization of a Sustainable Biomethane Production System for Decentralized Energy Generation

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Abstract

The global demand for sustainable energy has intensified efforts to develop renewable solutions that minimize greenhouse gas emissions while meeting the increasing energy consumption. This research presents the design and multi-objective optimization of a sustainable biomethane production system aimed at decentralized power generation through biogas upgrading and valorization. The study evaluates four process configurations integrating anaerobic fermentation, gas purification via Pressure Swing Adsorption (PSA) using hydrochar, and optional CO_2 reuse for bioplastic synthesis alongside energy generation. Each configuration was analyzed using a quantitative scoring model incorporating nine “Q-factors”: waste heat recovery (Q1), environmental impact (Q2), plant turndown (Q3), preliminary RAM study (Q4), maintenance cost and frequency (Q5), overall plant dimensions (Q6), equipment delivery and installation time (Q7), CAPEX and OPEX (Q8), and profitability in terms of IRR and ROI (Q9). Process simulations were performed in Aspen HYSYS, while capital and operational cost analyses were conducted using CAPCOST software. Results showed that the fourth configuration, integrating biogas and flue-gas recovery with enhanced CO_2 reutilization for bioplastic synthesis, achieved the highest overall performance, obtaining a total score of 2.58 in the Q-factor evaluation. This configuration demonstrated superior waste heat recovery, higher profit margins, and lower environmental impact compared to other schemes. The optimized system produced 22 MW of combined electrical power with an estimated total capital investment of 400 million USD and a project lifespan of 22 years. Cash-flow analysis confirmed a positive net return beginning in year 3, with profitability stabilizing after 10 years. The proposed design provides a technically and economically feasible pathway toward sustainable, low-emission energy generation and resource circularity in future decentralized biogas infrastructure. Keywords: Biomethane, Renewable Energy, Pressure Swing Adsorption, Aspen HYSYS.

Keywords: Biomethane, Renewable Energy, Pressure Swing Adsorption, Aspen HYSYS

Technical Session 3 Sustainable Energy & Systems

Hybrid Low-Concentration PV/T with Nano-PCM Cooling and Thermoelectric Energy Recovery

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Abstract

This study presents an experimental evaluation of a hybrid low concentration photo voltaic/thermal (LCPV/T) system integrated with thermoelectric generators (TEGs), designed to address photovoltaic thermal degradation under subtropical climatic conditions. The system combines nano enhanced phase change material (PCM) for passive buffering with an active copper tube water loop for cooling, and further incorporates a thermoelectric array for waste heat recovery. Performance was assessed relative to a baseline uncooled photovoltaic module. The results demonstrate that the hybrid cooling configuration reduces the peak PV operating temperature by approximately 13°C compared to the uncooled baseline, while extending PCM melting duration and increasing electrical power output. The integration of the TEG array generates an additional 6 Wof electrical power during peak irradiance, yielding a total system output of 102 W a 95 percent increase over the baseline. Although the TEGs introduce a slight thermal resistance, the system achieves a net electrical gain and superior exergy efficiency relative to the cooling only configuration. An optimal coolant flow rate of 0.02 kg/s was identified to balance PV temperature regulation and TEG performance. The integrated LCPV/T TEG system thus achieves significant overall efficiency enhancement, validating its potential for effective and sustainable energy harvesting in high irradiance subtropical environments.

Keywords: Photovoltaic Thermal Hybrid (PV/T), Low Concentration PV, Thermoelectric Generator (TEG), Phase Change Material (PCM), Nano PCM, Copper Tube Cooling, Series-Parallel Array, Exergy Efficiency, Hybrid Solar Energy, Thermal Management.

Exploring Quality 4.0: A Systematic Review of Technological Enablers and their Impact of Quality Management

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Abstract

In this systematic review, the technological enablers of Quality 4.0 and their role in the quality management systems of Industry 4.0 are discussed. This study reviews the role of digital technologies such as Artificial Intelligence, Internet of Things, Big Data analytics, block chain technology, digital twins, and augmented reality in modifying the conventional quality management systems from an inspection-oriented paradigm to a predictive and proactive quality management paradigm. In this systematic review, the results of 21 peer-reviewed studies conducted using the PRISMA approach are compiled. These studies clearly indicate the effectiveness of the Quality 4.0 paradigm in improving the accuracy of defect identification, efficiency of operation processes, and sustainability in different manufacturing industries. However, the challenges in the adoption of the Quality 4.0 paradigm have been mentioned in the studies—the major challenges being the cost of implementation of the technology and the lack of security of the data generated in the manufacturing processes.

Keywords: Quality 4.0, Digital Quality Management, Quality Management Sustainability, Visual Inspection

Energy Auditing: A Mandatory Pathway for EDGE and LEED Green Building Standards

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Abstract

Electricity is one of the most popular energy types and its consumption is increasing due to in efficient equipment installed at sites or already completed their useful life which will result on the current economy of the state / province to procure the fossil fuel for its electricity generation and run the transportation system. In 2022, buildings are used one third (34 %) of the global energy, where majority of the energy used in the residential sector. Total energy consumption in the building sector increases with an average of 1% increase per year over the last decade. According to UN Environmental Global status report 2024, Out of Global energy consumes in the fiscal year 2022, which is 115GWh, almost 39 GWh were consumed in construction building sector having an energy utilization in construction material constitute is 4 % and residential is 21 %. Similarly, energy used in building is generated by fossil fuel burning and the energy pollution caused by buildings is often not obvious because it is removed from the point of use. It is belief and confirmed that almost half of the electricity produced in the world in 2022 was consumed by the building sector. Therefore In this paper, A Mall utility bill has been analyzed by demonstrating the load factor of the mall along with yearly Consumption of energy and costing has been shown / shared. In addition, Edge design software has been used to improve the building envelope as per Edge standard and power quality analysis has been performed

Keywords: SDG, Climate Action, Edge, Bench mark, Green Building, LEEDs, Energy Audit, Building Envelope

Technical Session 4 Technology Readiness , Policy & Academia – Industry Collaboration

Comprehensive HIRA of Paint Shop in Gas Meter Manufacturing Plant with Compliance of ISO Standards

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Abstract

Occupational health and safety are critical aspects of every industrial operation, specifically in areas where chemical and mechanical processes are involved, such as the paint shop in a meter manufacturing facility. This study applies Hazard Identification and Risk Assessment (HIRA) within the paint shop, aiming to systematically identify workplace hazards and assess associated risks, giving control measures in alignment with ISO 45001 and ISO 14001. Environmental parameters such as combined noise level, lighting, humidity, and temperature are also considered. Hazards which were identified, including ineffective spray booth, lack of PPE, inadequate ventilation, water cooler placement, unsafe grinding machining, slippery floors and insufficient lighting levels .Hazards were categorized and prioritized based on the severity and likelihood leading to recommendations for control measures. Control measures follow the hierarchy of control like elimination, substitution, engineering controls, administrative, and PPE's. This risk assessment not only ensures regulatory compliance with international standards but also promotes a proactive safety culture, which enables management to implement preventive measures and enhance worker health and safety by Regular Monitoring, Worker's Training etc. Findings provide a foundation for continual improvement in safety, environmental sustainability, and product quality.

Keywords: HIRA, Paint Shop, Hazard Identification, Risk Assessment, ISO Standards, Occupational Safety, Chemical Hazards, Environmental Hazards, light level, noise level, continual Improvements Process.

Technical Session 4 Technology Readiness, Policy & Academia – Industry Collaboration

Capacity Degradation Estimation of Lithium-Ion Batteries Using Explainable Machine Learning

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Abstract

Electric vehicles have emerged as a sustainable solution to reduce carbon footprint in the transport sector. However, a major challenge faced by EVs is their battery degradation. Among various battery's health indicators, capacity degradation serves as a crucial metric to quantify battery health. This research presents a machine learning approach to predict the capacity degradation of lithium-Ion battery, integrated with Explainable AI to improve model exploitability. Multiple supervised machine learning models including CatBoost, Extra Trees, LightGBM and Bagging Regressor were implemented and evaluated using performance metrics to determine the best-performing model. Furthermore, the Explainable AI (XAI) technique, Shapely Additive Explainable (SHAP), was applied to the best-performing model for exploitability and to show the contribution of different features on capacity degradation prediction. The methods used resulted in R^2 value of 0.974 using the CatBoost model and the information provided by SHAP show that charge time has the most impact on capacity degradation prediction.

Keywords: Lithium-Ion Battery, Capacity Degradation, ML, Explainable AI, EVs

Technical Session 4 Technology Readiness, Policy & Academia – Industry Collaboration

In-Situ Decarbonization of SMR Hydrogen: A Comparative Exergy - Machine Learning Framework for Blue & Green Hydrogen Ascendancy

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Abstract

With atmospheric CO_2 concentrations surpassing 420 ppm and carbon credit liabilities tightening toward 2030, grey-hydrogen facilities are becoming the single largest unmanaged CO_2 point sources inside refineries. Globally, refinery hydrogen networks continue to rely predominantly on grey hydrogen produced via SMR-PSA systems, making them among the largest concentrated industrial sources of unmanaged CO_2. Despite this, existing decarbonization studies remain largely based on idealized, steady-state representations that overlook the cycle-resolved PSA dynamics, purge gas variability, and fuel-integration feedbacks governing real refinery operation, thereby obscuring the true feasibility of blue hydrogen retrofits and limiting informed transition toward green hydrogen. In order to capture realistic syngas evolution, PSA depressurization asymmetry, and CO2 - rich tail gas behavior, this work analyzes in-situ heat and material balance data from an operational SMR-PSA unit. Exergy analysis combined with machine learning evaluates CO_2 capture and hydrogen-production efficiency across refinery conditions relying on grey hydrogen. Interpretable models identify key operational drivers, enabling data-driven decarbonization choices and supporting refinery-specific decisions on carbon capture and hydrogen storage, bridging theory and practical transition.

Keywords: Grey hydrogen, Blue hydrogen, Green hydrogen, CO_2 capture, Exergy analysis, Machine learning, Decarbonization, Carbon Credits

Technical Session 4 Technology Readiness, Policy & Academia – Industry Collaboration

Technical Assessment of a Catamaran-Based Offshore Floating Photovoltaic System for Sheltered Coastal Waters

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Abstract

Rapid growth in electricity demand and land scarcity in coastal regions have necessitated the exploration of marine renewable energy solutions. This study presents the conceptual design and simulation-based validation of a small-scale Offshore Floating Photovoltaic (OFPV) system optimized for Pakistan's sheltered coastal waters. The proposed platform features a Class-3 modular catamaran configuration supported by High-Density Polyethylene (HDPE) pontoons. A coupled multi-disciplinary framework integrating MAXSURF Software hydrostatic analysis and PVsyst for performance modeling is employed. Simulation results confirm satisfactory intact stability with positive righting lever characteristics and a projected annual energy yield of 5.8 MWh for the prototype unit. These findings validate the technical feasibility of OFPV system deployment in creek systems and inner harbors as a scalable alternative to terrestrial solar farms.

Keywords: Offshore Floating Photovoltaics; Catamaran Platform; Hydrodynamic Stability; Blue Economy; Monocrystalline PERC; HDPE Pontoons

Technical Session 5 Design & Smart Manufacturing

Design of Sensor Based Hard Switching Collision Avoidance Strategy for Hovering Autonomous Underwater Vehicle

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Abstract

Autonomous Underwater Vehicles (AUVs) play an increasingly important role in diverse underwater applications. Hovering Autonomous Underwater Vehicles (HAUVs) are particularly suited for missions requiring precise maneuvering and stable autonomous operation. This paper presents a sensor-based hard switching control strategy for HAUVs to achieve obstacle avoidance in underwater environments. The proposed approach employs two controllers: a Go-to-Goal controller, active when the vehicle is at a safe distance from obstacles, and an Avoid-Obstacle controller, activated upon obstacle detection. Simulation results demonstrate that while the hard switching strategy successfully prevents collisions, the resulting sharp maneuvers increase the travel distance and time required to reach the target location.

Keywords: Autonomous Underwater Vehicle (AUV), Hovering Autonomous Underwater Vehicle (HAUV), Hard-Switching, Collision Avoidance, Underwater Environment

Technical Session 5 Design & Smart Manufacturing

Experimental Study to Compare Performance of Multi-Nozzle Solar Powered Pesticides Spray with Manual Nozzle Spray System

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Abstract

The comparative evaluation of the Manual Nozzle Pesticide Spray (MNPS) and the Solar-Powered Nozzle Pesticide Spray (SNPS) demonstrated the superior operational characteristics and consistency of the motor-driven SNPS. The MNPS, reliant on human effort, exhibited noticeable variations in speed (ranging from 0.42 to 0.51 m/s, average 0.4675 m/s) and discharge (average 28.05 m/sec) due to operator fatigue and inconsistent pumping pressure, leading to non-uniform application; in contrast, the SNPS maintained a highly consistent performance across increasing distances, showing minimal speed variation (0.44 to 0.50 m/s, average 0.47m/s) and a stable, high discharge rate (average 3.84 m/sec), owing to its reliable motor-driven pump. The successful fabrication and testing of the SNPS confirmed its superior operational parameters, achieving a mean working speed of 0.467 m/s and a mean discharge rate of 28.05 significantly outperforming the MNPS's stated mean working speed of 0.19 m/s and mean discharge rate of 11.85 m/sec, ultimately resulting in an approximately five times faster working speed and a good mean field efficiency of 44% for the SNPS, highlighting its potential for efficient pest control with reduced operator fatigue.

Keywords: Pesticide Sprat, Manual Nozzle, Development, Frame Analysis, Discharge

Experimental Evidence for Thrust Enhancement in Propellers using Tubercle-Designed Blades

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Abstract

Aircrafts and ships depend greatly on the thrust force generated by the mechanical propeller for their commute. Hence, the role and mechanical properties (e.g. efficiency, thrust, lift and strength) of propellers become utmost important. The prevailing challenges for propellers include avoiding (a) stalling and (b) cavitation at higher speeds; both of these phenomena reduce the thrust and lift generated by the propeller. Literature suggests that stalling and cavitation can both be minimized by fabricating “tubercles” at the leading edge of the blades. Simulation based results have shown notable increment in thrust of the tubercle propeller as compared to straightedge propeller, however; the literature greatly lacks experimental evidence. In this report, we experimentally prove the advantage of tubercle propellers in terms of thrust generation. Once the straightedge propeller is coupled with a motor, it generates thrust of 6.8 mN at lowest speed (1900 rpm) which increases to 9.6 mN at 2200 rpm and 19.63 mN at 2450 rpm. On the contrary, tubercle propeller (Design 1) generates thrust of 8 mN, 15.1 mN and 29.03 mN at 1900 rpm, 2200 rpm and 2450 rpm, respectively. Thus, tubercle propellers are generating ~40% higher thrust than the conventional straightedge propellers. It is noteworthy that the tubercles fabricated in this report requires a simple, facile and economic synthesis route. This research provides a technique to reduce the fuel consumption in air/marine transportation; supporting the sustainable development goals (SDGs).

Keywords: Propeller, Thrust, Tubercles, Cavitation And Blue Economy

Design and Development of an Uncrewed Surface Vessel (USV) for Hydrographic Survey

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Abstract

Uncrewed Surface Vehicles (USVs) have emerged as versatile maritime platforms for autonomous operations in both civilian and defense applications. This study presents the design of a USV for hydrographic surveys that can operate autonomously or remotely in marine environments. With a stable catamaran hull, Brushless DC motor drive, and Lithium Polymer battery power, the USV has enhanced endurance, real-time data communication, and consistent performance. Paramarine software was used to conduct hydrostatic stability analyses, while CFD analyses were performed using OpenFOAM software. Simulations and field trials substantiated its effectiveness and underscored its applicability to marine research, monitoring, and commercial applications.

Keywords: Uncrewed Surface Vehicle, USV, Surveys, Hydrostatic Stability, Resistance, Computational Fluid Dynamics, RANSE, Autonomous, Remotely Operated Vessels

Technical Session 6 — Building Energy Efficiency, HVACR Systems and Indoor Environmental Quality

Why Buildings Waste Energy: How HVAC Decisions Drive Long-Term Electricity Costs

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Abstract

In commercial buildings, heating, ventilation, and air-conditioning (HVAC) systems are among the largest consumers of electricity, often accounting for 40–60 percent of total building energy use. Despite this significance, HVAC energy efficiency has frequently approached as an equipment selection exercise rather than as a sequence of decisions that influence operating costs over the entire life cycle of a building. This paper examines how HVAC-related decisions made during design, construction, commissioning, and operation directly affect actual energy consumption. It highlights commonly overlooked issues such as system oversizing, incomplete or poorly implemented control strategies, construction quality gaps, and operational drift, all of which can lead to buildings with modern HVAC systems consuming substantially more energy than anticipated. Based on practical examples and field observations, the discussion outlines how tools such as energy modeling, commissioning, and post-occupancy energy audits can be applied to verify design intent, identify performance gaps, and improve system operation. Emphasis is placed on practical and low-risk approaches that focus on informed decision-making rather than unnecessary capital expenditure. The paper is intended for both technical and non-technical stakeholders seeking a clearer understanding of how HVAC decisions translate into long-term electricity costs and how measurable energy savings can be achieved in real building operations.

Keywords: HVAC systems, Energy Efficiency, Building Performance, Commissioning, Energy Audits

Technical Session 6 — Building Energy Efficiency, HVACR Systems and Indoor Environmental Quality

Building Energy Efficiency, Sustainable Refrigerants and Electrification of Heating in Modern HVACR Systems

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Abstract

Buildings contribute significantly to global energy consumption and greenhouse gas emissions, making energy-efficient design and sustainable HVACR systems critical for climate and decarbonization goals. This paper examines strategies to enhance building energy performance through efficient HVACR systems while maintaining optimal indoor environmental quality (IEQ). Key factors discussed include system design, equipment selection, and operational strategies to reduce energy consumption without compromising thermal comfort, indoor air quality, or occupant well-being. The study emphasizes the adoption of low-global-warming-potential (GWP) refrigerants to minimize the environmental impact of HVACR systems. It reviews ASHRAE safety classifications and addresses technical challenges such as flammability, pressure variations, temperature glide, and retrofit limitations, highlighting safety and performance considerations for existing systems. Electrification of heating using heat pumps is presented as a vital pathway to decarbonization. The paper outlines how electric heat pump technologies can replace conventional fuel-based systems, improve energy efficiency, and reduce carbon emissions. Design strategies for diverse climatic conditions, system selection, and hybrid solutions are also discussed to ensure reliable operation. By integrating building energy efficiency measures, low-GWP refrigerants, and heat pump-based heating, this study provides practical guidance for engineers and designers to develop modern HVACR systems that meet energy, environmental, and safety requirements, supporting sustainable building practices and long-term climate action objectives.

Keywords: Building Energy Efficiency, HVACR Systems, Indoor Environmental Quality, Low-GWP Refrigerants, Heat Pumps, Electrification of Heating, Sustainability

Sustainable Energy & Systems

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Abstract

Sustainable MEP (Mechanical, Electrical, and Plumbing) systems play a critical role in reducing energy consumption and environmental impact in modern buildings. These systems account for substantial energy use for heating, cooling, and ventilation, contributing to high operating costs and carbon emissions. This paper highlights the adoption of sustainable MEP technologies that enhance energy efficiency while maintaining indoor comfort. Key strategies include the integration of energy-efficient equipment, smart controls, renewable energy solutions, and advanced ventilation methods such as heat recovery systems. The use of sustainable HVAC and MEP systems can significantly reduce greenhouse gas emissions, lower operational costs, and improve indoor air quality. Implementing these systems supports green building practices and advances long-term environmental sustainability, aligning with global energy and climate goals.

Keywords: Sustainable MEP Systems, Energy Efficiency, HVAC, Indoor Environmental Quality, Renewable Energy, Green Building, Environmental Sustainability

Technical Session 6 Building Energy Efficiency, HVACR Systems and Indoor Environmental Quality

Emerging Technologies in the Built Environment

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Abstract

Emerging technologies are reshaping building energy efficiency through the integration of advanced HVACR systems and sustainable energy solutions. The adoption of intelligent controls, predictive algorithms, and optimized energy management enables enhanced operational performance across building systems. High-efficiency HVACR Emerging technologies—such as heat recovery systems, magnetic bearing chillers, low-global-warming-potential refrigerants and System Part Load Value — significantly reduce energy consumption while minimizing environmental impact. In parallel, innovations in demand-controlled ventilation, advanced air filtration, and continuous indoor air quality monitoring improve occupant comfort, health, and productivity. The integration of renewable energy sources, energy storage systems, and smart grids further strengthens building decarbonization and operational resilience. Collectively, these emerging technologies accelerate the transition toward low-carbon, high-performance buildings by balancing energy efficiency, sustainability, and superior indoor environmental quality, thereby supporting global climate objectives and future urban development needs.

Keywords: HVACR Technologies, High Efficiency, Heat Recovery. Low GWP Refrigerants, Sustainability and Decarbonization.

LIST OF POSTER PRESENTATIONS

Poster Code	Title of The Poster Presentation	Names of Students
PP01	Experimental Investigation to Improve Heat Transfer in Paraffin Based PCMs.	1) Muhammad Hassan Irshad 2) Nayab Murtaza 3) Shaheer Ahmed 4) Syeda Raheen Hassan
PP02	AI-Driven Lifecycle Cost Analysis and Operational Optimization of Compressors at FPCL	1) Maaz Ahmed Siddiqui 2) Malik Muhammad Rafay 3) Ali Rashid 4) Muhammad Bilal Akber
PP03	Maintenance and Reliability Data Analysis, Optimization and Dashboard Generation Through CMMS Integration	1) Naveed Qamar 2) Ahmed Hassan Azeemi 3) Muhammad Ghayyour Khan 4) Aman Azhar Qadri
PP04	Techno-Economic Feasibility on the Total Potential for Wind Power Generation	1) Nabeel Mustafa 2) Hafiz Muhammad Bilal Qadri 3) Muhammad Huzaifa 4) Sheheryar Warsi
PP05	Development of A Sustainable Framework for Green Retrofitting in Existing Industrial Buildings	1) Abdul Subhan Khan 2) Muhammad Shafat 3) Muhammad Danish Mustafa 4) Ali Hamza Khan
PP06	Design of Two Paraxylene Above-Ground Storage Tanks (15,000 MT each) with Loading and Offloading Systems	1) Ebad Ur Rehman 2) Muhammad Athar Hussain 3) Abdul Sami 4) Abdullah Dareer Khan
PP07	Modelling of Integrated Cooling and Desalination System	1) Muhammad Asad Ali 2) Maham Sohail 3) Maidah Fahim 4) Muhammad Ahsan
PP08	Techno-Economic Analysis of Direct Air Capture Implementation in Pakistan	1) Faizan Raza 2) Zeeshan Hashmi 3) Sherafgan Khan 4) Maaz bin Zahid
PP09	Design and Trajectory Optimization of Robotic Arm for Lunar Rover	1) Muhammad Hashir 2) Muhammad Fozan 3) Muhammad Bilal Ansari 4) Ammar Ahmed Khan
PP10	Design of Stacking Machine for Filled PP Bags of Granular Products	1) M.Habib Ur Rahim Siddiqui 2) S.M.Hassan Abbas Kazmi 3) Zain Ali Khan

LIST OF POSTER PRESENTATIONS

Poster Code	Title of The Poster Presentation	Names of Students
PP11	Thermal Enhancement and Flow Structure Investigations in an Impinging Jet Using Inserts and Surface Enlargement Elements	1) Muhammad Talha Arshad 2) Zain Ul Abdin 3) Muhammad Talal Khan 4) Ayaan Habib
PP12	Design and Fabrication of a Muffle Furnace with a Capacity to Generate Heat upto 1200℃	1) Syed Ali Qamber Jaffery 2) Qazi Ahmad Ali 3) Muhammad Arham 4) Syed Hussain Mahmood
PP13	CFD Study of Battery Spacing and Airflow for Efficient Cooling of Li-Ion Packs	1) Asadullah Anis 2) Muhammad Ali 3) Ebadullah Shaikh 4) Noman Khan
PP14	Dynamic Modeling and Optimization of ESP Performance and Retrofit Solutions	1) S.Haseeb Ur Rehman 2) Muneeb Ur Rehman 3) M. Hassan Siddiqui 4) Muhammad Omer Khan
PP15	Design and Fabrication of a Smart and Energy Efficient Dehumidifier for Controlled Environments	1) Abdullah Arif 2) Iraj Kamran 3) Syeda Fatima 4) Agha Daniyal
PP16	Occupational Hazard Assessment And Risk Mitigation of Power Generation Systems at HO SSGCL	1) Areeba Siddiqui 2) Narmeen Naeem 3) Ibad Ahmed khan 4) Muhammad Yasir Tariq
PP17	Optimization of Repair operations through repair job tracking, Standardized work and defects outflow preventions	1) Wareesha Khalid 2) Zuifsha Naveed 3) Sakeena Maqsood 4) Arooba Noor
PP18	AI based Smart Predictive Maintenance System	1) Kisa Alam 2) Mutiba Iqbal 3) S.M. Huzaifa Khalid 4) Ifra Naz
PP19	Process Optimization and waste reduction in Diaper manufacturing	1.Urooba Tanveer 2.Abdulrehman Salim 3.Maaz Irfan 4.Mahrukh Khan
PP20	Development of Lean Management game using VR technique	1) Masooma Akram 2) Shaheer Qadri 3) Rameel Jawad 4) Zoha Moiz
PP21	Implementation of Lean Manufacturing Tools for Process Flow Improvement and Cycle Time Reduction at Loads Limited	1) Noor ul Huda 2) Muhammad Ahsan Ali 3) Yatiq Alam 4) Syed Abdullah Hakeem

List of Presented papers in

14th International Mechanical Engineering Conference

held on 25th & 26th April, 2025

Keynote Address by Prof. Dr. Ansul Hadi Bin Ahmed, UMPSA Malaysia

Plenary Talk " Artificial Intelligence Driven Innovations Transforming Advanced Manufacturing Processes by Dr. Inam ul Ahad, Co-Director, Advanced Processes Technology, Institute Dublin City, Ireland

Assessment of Impact Resistance Characteristics of 3D-Printed Polymers
By Shamsher Ali College of Electrical & Mechanical Engineering NUST, Islamabad.

A Study on the Influence of Metal Sheet Enclosure on Temperature Uniformity in FDM Printing Environments
By Mohd Haidiezul Jamal b. Ab Hadi, Universiti Malaysia Perlis
Impact of Industry 4.0 on Sustainability By Muhammad Danish Saleem NED University of Engineering & Technology, Karachi.

Navigating the Impact of AI Tools on Education: Exploring Challenges, Opportunities, and Strategies for Maintaining Quality Education in the Case of Engineering Universities
By Syeda Faiza , Institute of Business Management, Karachi

Address by Industrial Guest by Atif Munir, Utilities and facilities Manager ,GlaxoSmithKline Pakistan

Development of Mathematical Model Considering Russian Design Methodology with an Aim of Devising a Sizing Tool for Large Submarines
By Noor Muhammad Khan Pakistan Navy Engineering College NUST, Karachi

Electric-Field-Tuned Hydrogen Evolution Reaction on MoSi2N2P2: A Computational Blueprint for Low-Over potential Catalysts
By Rao Uzair Ahmad, Ghulam Ishaq Khan Institute, Swabi

A Numerical and Experimental Model for P-TIG Welded CpTi/v/Inconel 718 Joint Incorporating Represented Volume Elements (RVEs) and Nanoindentation
By Muhammad Akif, Ghulam Ishaq Khan Institute, Swabi

Fault Detection in Spur Gears through Vibration Signal Analysis and Machine Learning Techniques
By Muhammad Talha Asif, Ghulam Ishaq Khan Institute, Swabi

Address by Industrial Guest Muhammad Kashif General Manager SUPARCO

Optimization of Fused Deposition Modeling (FDM) Parameters Towards Dimensional Accuracy of Polylactic Acid (PLA) Stent
By Ng Kuang Yee Universiti Malaysia Perlis

IoT-Based Smart Energy Management for Smart Grids
By Abdullah Mushtaq , University of Engineering & Technology, Taxila

Adaptive and Time Efficient Robotic System for Warehouse Pick and Place Operations
By Khawaja Abdul Raffay College of Electrical & Mechanical Engineering NUST, Islamabad

Development of Sustainable Road Traffic Signs for Developing Countries
By Ashar Ahmed, NED University of Engineering & Technology, Karachi

Address by Industrial Guest, Salman Ahmed Khan, Deputy Manager, Spare Planning Amreli Steel

Performance Evaluation and Drying Kinetics of Concentrated Direct Forced Convection Solar Dryer
By Mumtaz A. Qaisrani, Khwaja Fareed, University of Engineering & Information Technology, Rahim Yar Khan

Thermal Enhancement of Double Pipe Heat Exchanger Using Diamond Shaped Fins Configuration and Geometric Optimization
By Ghulam Mustafa, University of Engineering & Technology, Peshawar

Utilization of Waste Heat of Engine's Exhaust Gases for Domestic Heating Applications
By Muhammad Adeel Qadeer, University of Lahore

IoT Based Indoor Air Quality and Lighting Control System using Blynk Cloud By Hizbullah Jahangir, College of Electrical & Mechanical Engineering NUST, Islamabad

Address by Industrial Guest , Anis Ahmed Khan, Chief Industries and Energies ,Planning and Development Board

Nanoindentation and Simulation Analysis of Deformation Behavior in Bulk Metallic Glass Alloy By Syed Salman Shah, Ghulam Ishaq Khan Institute, Swabi

IoT-Based Heart Monitoring System for early Diagnosis of Cardiovascular Diseases
By, Muhammad Saad Rafique, College of Electrical & Mechanical Engineering NUST, Islamabad

CFD-Based Self-Propulsion Analysis of a 1/75 Scale Aframax Model in Medium-Deep Water Using the Body Force Propeller Method
By Asif Raza, Pakistan Navy Engineering College NUST, Karachi

Integrated Experimental and Computational Optimization of Twin Turbocharged Cross-Dual Tubular Turbojet Engines: AI - Enhanced Combustion & Propulsion Dynamics
By Abdullah Hasni, NED University of Engineering & Technology, Karachi

Address by Industrial Guest, Waqas Moein Siddiqui, Section Head, Technical Training, Total Support,Hino Pak Motor Limited

Iterative Learning Control for Lower Limb Exoskeleton Robot for Rehabilitation
By Saud Ahmed Khan, Ghulam Ishaq Khan Institute, Swabi

Design and Development of Dent Remover without Removal of Paint
By Muhammad Zaid Khan, NED University of Engineering & Technology, Karachi

Design, Fabrication and Testing of a Smart Shoes: Advancing Rehabilitation Using Wearable Footwear Technology
By Eylia Abbas, Pakistan Navy Engineering College NUST, Karachi

Weight Optimization of Tractor PTO Shaft using Composite Materials
By Hateem Arif, NED University of Engineering & Technology, Karachi

Address by Industrial Guest Muhammad Fahad, Advisor Industrial Processing, Engineering Development Board

Mechanical Characterization of Used Steel for Green Construction Practices
By Hadeer Siddiqui, NED University of Engineering & Technology, Karachi

Future of Sustainable and Green Energy Based Technologies in Global Shipping Sector – an Overview
By Asif Raza, Pakistan Navy Engineering College NUST, Karachi

Power Import Challenges and Distributed Generation Impact on Makran, CPEC, and Pakistan's Economy
By Muhammad Muneeb Khan, University of Southern Punjab, Multan

Enhancing the Performance of Latent Heat Thermal Energy Storage System
by Optimizing the Design Geometry By Mohamad Syafiq Abdul Khadir, Universiti Malaysia Perlis

Address by Industrial Guest, Zeeshan Kidwai, GM Mechanical ,Pakistan Beverages Limited

Impact of Artificial Aging Temperature Cycles on Microstructure and Tensile Behavior of TIG Welded Dissimilar Aluminum Alloys
By Syed Muhammad Jawwad Ali NED University of Engineering & Technology, Karachi

Straight Minichannel Heat Sink: A Potential Evaluation towards Hybrid Nanofluids of TiO2-SiO2/H2O By Asif Khan, Pakistan Navy Engineering College NUST, Karachi

Enhancing Electrical Conductivity of Cellulose Acetate Microfibers through Copper Electroplating
By Syed Waqar Hasan, Pakistan Navy Engineering College NUST, Karachi

Influence of Dual Soaking Durations and Variable Tool Feed Rates on Tensile Behavior of Friction Stir Welded Aluminum 2219
By Shehzaib Yousuf, NED University of Engineering & Technology, Karachi

Address by Industrial Guest Noman Sajjad, Deputy CEO, Amreli Steels Limited
Fabrication and Testing of Low-Cost PVDF Thin Film Sensor By Muhammad Huzaifa Iqbal NED University of Engineering & Technology, Karachi

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IEP Karachi Centre Calendar of Events 2026

S.#	TITLE OF ACTIVITIES	DATE
01	IEP International Mechanical Engineering Conference (15th IMEC-2026) at NEDUET & IEP Karachi Centre	30th & 31st January, 2026
02	IEP 5th International Bio-Medical & Digital Health Conference (5th IBDC-2026) at NEDUET & IEP Karachi Centre	13th & 14th February, 2026
03	IEP 11th International Electrical Engineering Conference (11th IEEC-2026) at NEDUET & IEP Karachi Centre	10th & 11th April, 2026
04	Earthquake Engineering Workshop at IEP Karachi Centre	TBD
05	IEP 14th International Conference on Occupational Health Safety & Environment (14th ICOHSE-2026) at IEP Karachi Centre	18th July, 2026
06	16th International Conference on Civil Engineering Conference (16th ICEC-2026) at NEDUET & IEP Karachi Centre	6th & 7th November, 2026
07	6th HVACR Trends Exhibition & Conference at Hotel Marriot Karachi organized by ASHRAE in collaboration with IEP Karachi Centre	11th & 12th December, 2026
08	5th International Conference on Advanced Materials and Process Engineering (5th ICAMPE-2026) at NEDUET & IEP, Karachi Centre	18th & 19th December, 2026
09	Fortnightly Webinars on various engineering topics. The date and topics of these Webinars will be communicated later.	January / December 2026

IEP Conferences Held During 2026

S.#	TITLE OF ACTIVITIES	DATE
01	IEP 3rd International Conference on Computer Sciences / Engineering & Application (3rd ICCSA-2026) at TIEST, Mithi, Tharparkar, Sindh	14th & 15th January, 2026
02	IEP 2nd International Civil Engineering Symposium (2nd ICES-2026) at TIEST, Mithi, Tharparkar, Sindh	15th January, 2026
03	IEP 1st International Conference on Sustainable Green Energy, Environment & Digital Innovations (1st ICSGEEDI-2026) at Deptt.of Chemical Engineering, UoK & IEP Karachi Centre	23rd & 24th January, 2026

IEP Conferences Held During 2025

S.#	TITLE OF ACTIVITIES	DATE
01	IEP 2nd International Conference on Computer Sciences & Application 2nd ICCSA-2025) at TIEST, Mithi Tharparkar, Sindh	31st January-1st February, 2025
02	IEP 1st International Civil Engineering Symposium at TIEST, Mithi, Tharparkar, Sindh	1st February, 2025
03	IEP 14th International Mechanical Engineering Conference (14th IMEC-2025) at NEDUET & IEP Karachi	25th & 26th April, 2025
04	Centre IEP 4th International Bio-Medical & Digital Health Conference (4th IBDC-2025) at ELJ Campus, NEDUET & IEP Karachi Centre	2nd & 3rd May, 2025
05	IEP 13th International Conference on Occupational Health Safety & Environment (13th ICOHSE-2025) at IEP Karachi Centre	26th July, 2025
06	IEP 10th International Electrical Engineering Conference (10th IEEC-2025) at NEDUET & IEP Karachi Centre	29th & 30th August, 2025
07	IEP 15th International Conference on Civil Engineering Conference (15th IECEC-2025) at NEDUET & IEP Karachi Centre	7th & 8th November, 2025
08	**IEP Supported Conference** Global Conference on Green Construction Materials & Practices (GCGC-2025) at NEDUET, Karachi	5th & 6th February, 2025

IEP Programme Held During 2025

S.#	TITLE OF ACTIVITIES	DATE
01	IEP Karachi International Women's Day Celebration at IEP, Karachi Centre	12th April, 2025
02	Glimpses of Pakistan Victory Celebrations, IEP Foundation Day & Distribution of Fellowship Diplomas	17th May 2025
03	Reception Dinner in Honour of Engr. Dr. Sarosh Hashmat Lodi on his appointment as Chairman, Charter Inspection & Evaluation Committee, Sindh HEC & Engr. Prof. Dr. Muhammad Tufail, Vice-Chancellor, NEDUET, Karachi	21st June, 2025
04	IEP Flag Hoisting Ceremony-2025 at IEP Karachi Centre	14th August, 2025

IEP Webinars / Seminars held During 2025

S.#	TITLE OF ACTIVITIES	DATE
01	Webinar on "Have the Courage to Rise Lessons from Lifetime Case Studies" by Dr. Mansoor A. Bhatty, USA at IEP Karachi Centre	18th January 2025
02	Seminar on Breaking Barriers – Unlocking Engineering Potential at IEP Karachi Centre Talk by Engr. Shalendra Ram, Senior Member, ACECC Mr. Muhammad Mujtaba, Engr. Ayesha Ahmed and Engr. Uzair Siddiqui, A Digital Project Professional at IEP, Karachi Centre	15th February-2025
03	Webinar on "Engineering the Future inside Mode's Product Journey" by Engr. Syed Najiullah Hussaini, Co-Founder & CPO and Engr. Shah Talha, Sohail, Chief Executive Officer at Trodmor at IEP Karachi Centre	8th July 2025
04	Webinar on Sustainable Wastewater Treatment Challenges and Engineering Solutions for Karachi by Engr. Dr. Ahsan Abdul Ghani, UoK at IEP Karachi Centre	12th September, 2025
05	Webinar on Practical Wisdom for a Life that Pays Dividends by Salman Ahmed Ansari, SAM Consulting, Karachi at IEP Karachi Centre	20th September, 2025
06	Webinar on Significance and Impact of Asset Management on Power Sector by Engr. Dr. Raja Masood Larik, NEDUET, Karachi at IEP Karachi Centre	27th September, 2025

For further information please contact **Engr. Aijaz ul Haque**
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