

e-STRUCT

e-Newsletter of CSIR-Structural Engineering Research Centre

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The e-STRUCT newsletter showcases a journey of continued resilience in the quarter gone by, coupled with optimism for a better future through the scientific activities and myriad events that are part of day-to-day life on the CSIR-SERC campus. I am very happy to present Vol. 10, No. 2, 2026 issue of e-STRUCT. This edition showcases the varied skills of the CSIR-SERC community, highlighting our R&D pursuits, achievements, skill development initiatives, and other significant events & endeavours during April - June 2026.

CSIR-SERC is developing a semisubmersible platform with hybrid offshore wind turbine and solar farm, which is a next-generation approach to offshore energy production. As the global demand for clean and sustainable energy continues to rise, innovative solutions are required to overcome the limitations of land-based renewable energy systems. This floating platform is for deployment in deep-sea and high-wind regions. By utilizing offshore areas with abundant natural resources, this hybrid offshore renewable energy system provides reliable and efficient means of generating power while minimizing environmental impact and maximizing energy yield. The work being done at CSIR-SERC on this promising technology is being highlighted in this newsletter.

It is my pleasure to share that a patent was granted for our technology Temporary support structural system for power lines in the USA. Four out of six batches consisting of around 155 Executive Trainees from NTPC have completed the customized short-term course designed specifically for them and the courses were very successful. Rear Admiral Ravi Kumar Dhingra, VSM, Indian Navy, visited our campus to witness the demonstration and testing of the Mast Hoisting Gear at the Advanced Seismic Testing and Research Laboratory of CSIR-SERC, and has commended our expertise in advanced structural testing and our significant contributions towards the development of technologies of the strategic and national importance.

This has indeed been a challenging but eventful quarter and as always, we look forward to more exciting opportunities in future.

With best wishes,

Dr. N. Anandavalli

18.08.2026



Research highlights

Semisubmersible platform with hybrid offshore wind turbine and solar farm

As the global demand for clean and sustainable energy continues to rise, innovative solutions are required to overcome the limitations of land-based renewable energy systems. The floating platform with hybrid offshore renewable energy system represents the next-generation approach to offshore energy production. The horizontal axis wind turbine integrated with photovoltaic solar panels onto a single floating platform, enabling dual-source energy harvesting from both wind and sunlight. This floating platform is for deployment in deep-sea and high-wind region. It addresses the challenges of space constraints, variable energy output, and infrastructure costs. By utilizing offshore areas with abundant natural resources, this hybrid offshore renewable energy system provides reliable and efficient means of generating power while minimizing environmental impact and maximizing energy yield. This hybrid energy system concept paves the way for more sustainable, high-capacity, and resilient offshore renewable energy projects. The semisubmersible platform featuring three outer columns and one main column to support 5 MW horizontal axis wind turbine (HAWT) was considered as shown in Fig. 1. The central column is interconnected with the three outer columns through pontoons and bracing system. At the base of the three outer columns, wider cylinders were included to enhance the stability by mitigating the platform motions. The top deck portion of the floating platform was utilized for integrating the solar panels

to generate the power from the sunlight.

Hydrodynamic analysis

The hydrodynamic analysis of the semisubmersible platform was conducted using panel method based ANSYS-AQWA tool to investigate its hydrodynamic behaviour. The analysis focused on the key hydrodynamic parameters, including added mass, wave excitation forces, radiation damping, and response amplitude operators (RAOs). The full-scale geometry of the semisubmersible platform was modelled. ANSYS-AQWA employs boundary element method (BEM) for analysis, which requires surface meshing of the wetted geometry. The generated geometry and mesh for the floating platform are shown in Fig. 2. The mooring lines were modeled as catenary lines connecting the fairlead locations on the platform to anchor positions on the seabed as shown in Fig. 3. The frequency and time domain analysis were carried out for different wave conditions by considering the corresponding wave height and wave period. The hydrodynamic pressure acting on the wetted surface of the floating platform was obtained from the frequency-domain hydrodynamic analysis. Fig. 4 shows the hydrodynamic pressure distribution for the selected wave height and wave period. It can be seen that the pressure varies over the platform surface depending on the wave conditions, indicating the different levels of wave-induced loads acting on the floating platform.



Fig. 1 Semisubmersible platform with hybrid offshore horizontal axis wind turbine (HAWT) and solar farm

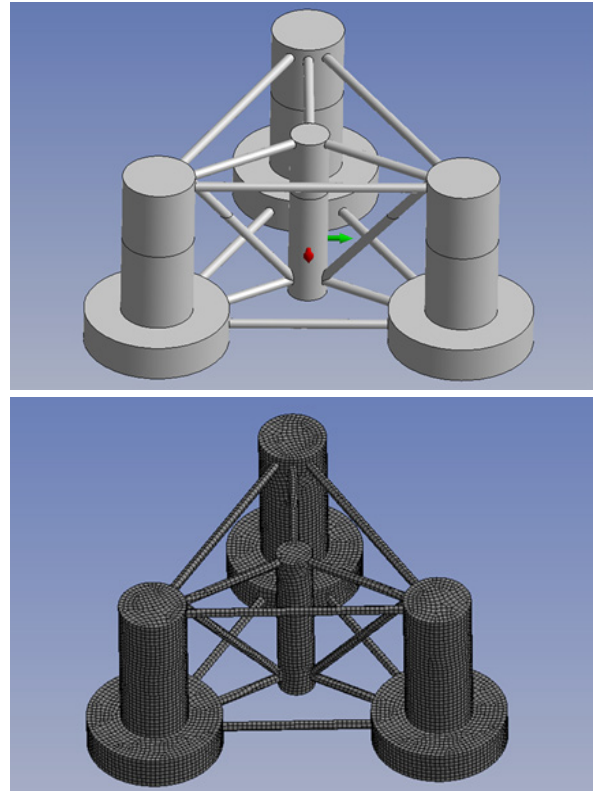


Fig. 2 Geometry and meshing of the semisubmersible platform

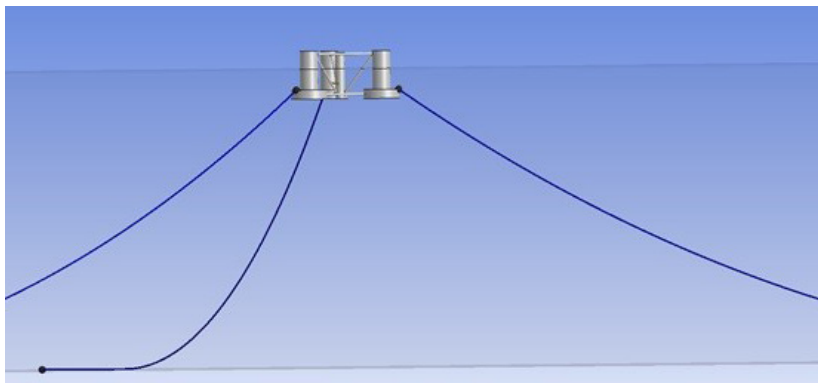


Fig. 3 Semisubmersible platform with mooring lines for hydrodynamic analysis

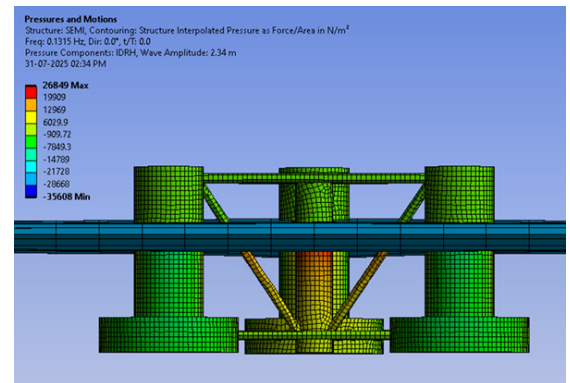


Fig. 4 Hydrodynamic pressure acting on the semisubmersible platform

Coupled aero-hydrodynamic analysis

A coupled aero-hydrodynamic analysis was performed for semisubmersible platform with HAWT using open-source code OpenFAST under irregular waves including turbulent wind conditions. This tool could not include the solar farm in its dynamic analysis. To address this issue, coupled dynamic analysis using FAST2AQWA (F2A) tool was used. The flow chart for coupled aero-hydrodynamic analysis is shown in Fig. 5. This tool integrates the hydrodynamic simulations in ANSYS-AQWA with the wind turbine dynamics simulated in FAST. This coupled dynamic analysis provides the comprehensive understanding of the complex interactions between the platform hydrodynamics and the wind turbine dynamics. The results obtained from the F2A tool for semisubmersible platform with HAWT was validated with OpenFAST results. After validation, this F2A tool was used for the coupled dynamic analysis of semisubmersible platform with hybrid offshore HAWT and solar farm under various wind and wave conditions.

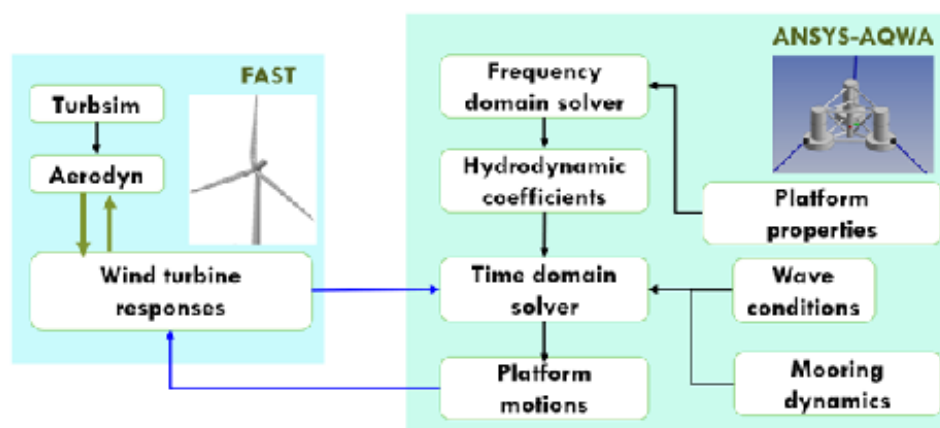


Fig. 5 Flow chart for coupled aero-hydrodynamic analysis using F2A

Free decay experiments

The 1:67 scaled model of the semisubmersible platform with hybrid offshore HAWT and solar farm was fabricated by following Froude scaling law. The Froude scaling law is a method widely used for hydrodynamic studies to ensure the similarity of fluid structure interaction between the scaled model and prototype. The scaled model served as a critical tool for evaluating the natural period, damping ratio and overall dynamic behavior of the semisubmersible platform in laboratory environment. The free decay experiments were conducted in heave and pitch degrees of freedom (DOF) on the scaled model to determine the natural period of platform and damping characteristics in corresponding DOFs as shown in Fig. 6. An initial amplitude of translation and rotation were given in the respective DOFs and the responses were measured. These tests were repeated to ensure the reliability of the results. The recorded heave and pitch free decay time histories are shown in Fig. 7.

Regular and irregular wave experiments

Regular and irregular wave experiments were conducted on the scaled model of the semisubmersible platform with hybrid offshore HAWT and solar farm including mooring system under wave environment including the rotation of the wind turbine blades as shown in Fig. 8. During testing, IMU 6-DOF motion sensors were installed on the fabricated scaled model to measure the six degree-of-freedom (6-DOF) platform responses. The experimental studies were carried out under both regular and irregular wave conditions to obtain the motion responses of the semisubmersible platform with hybrid offshore HAWT and solar farm. The experimental studies covered both operating and extreme wave conditions and also cut in and rated rotor speeds of the wind turbine.



Fig. 6 Free decay experiments on semisubmersible platform with hybrid offshore wind turbine and solar farm

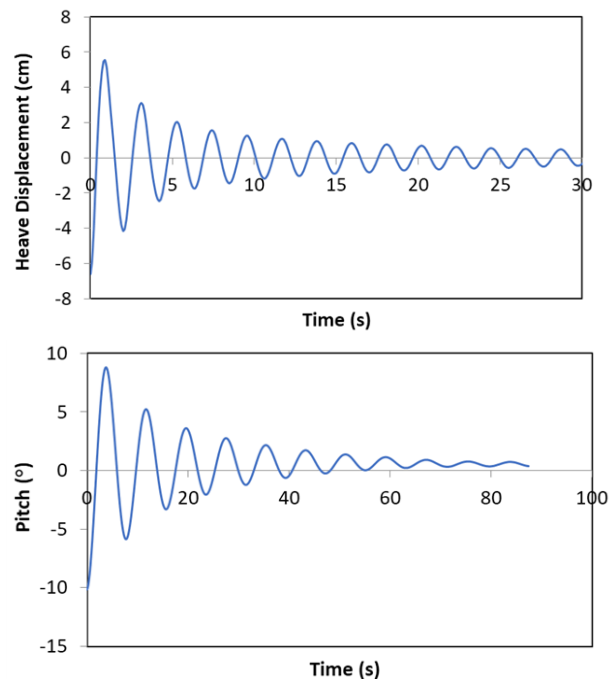


Fig. 7 Heave and pitch free decay time histories of 1:67 scaled model



Fig. 8 Regular and irregular wave experiments on 1:67 scaled model of the semisubmersible platform with hybrid offshore HAWT and solar farm

Concluding remarks

Overall, the hydrodynamic analysis, coupled aero-hydrodynamic simulations, and experimental studies helped to understand the dynamic behavior of the semisubmersible platform with hybrid offshore HAWT and solar farm. The AQWA analysis provided the important hydrodynamic characteristics of the platform, while FAST2AQWA approach was used to study the combined effects of wind, waves, turbine dynamics, and platform motions. In addition, free-decay tests on scaled model were carried out to obtain the natural periods and damping characteristics in heave and pitch, followed by regular and irregular wave tests to study the six-degree-of-freedom motions of the platform under operating and extreme wave conditions. The combination of numerical and experimental investigations gave the better understanding of the overall dynamic response of the hybrid energy floating platform and provided useful basis for evaluating its performance under realistic offshore environmental conditions.

Major Projects Undertaken

- Performance evaluation of snubber assembly (6 specimens)
- Continuous health monitoring of steel concrete composite girder for Chennai Metro Rail Limited
- Assessment of ROB near Dindigul through experimental investigations and suggestion of remedial measures
- Characterization of Ultra High-Performance Fiber Reinforced Concrete (UHPFRC)

Patent Granted

- Rajendra Pitambar Rokade, Santosh Kapuria, Kanchi Balaji Rao, Napa Prasad Rao, Rajagopal Balagopal - Patent was granted on **Temporary Support Structural System for Power Lines** in the United States of America.

Patent Filed

- Saravanan Murugesan, Marimuthu Veluchamy, Vinoth Krishnan Sampathkumar, Anoop Madambikkattil Bharathan - filed a Patent on **A Dissipative Steel Plate with Strategic Internal Cut Comprising Corrugated and/or Honeycomb Infill for Seismic Resilient Structures**, in India.

MoUs

1. A Memorandum of Understanding (MoU) was signed between CSIR-SERC and Visvesvaraya National Institute of Technology (VNIT), Nagpur, for **Academic and Research Collaboration**, on 6 May 2026.
2. A Memorandum of Understanding (MoU) was signed between CSIR-SERC and Gati Shakti Vishwavidyalaya (GSV), Vadodara, for **Research & Development and Skill Development in Railway Structural Engineering**, was signed on 9 June 2026.

Capacity development

Customised Short-Term Course for NTPC Civil Executive Trainees - 2026

Since 2023, CSIR-SERC is providing customized short-term courses to the civil engineering executives/trainees of NTPC. In 2026, CSIR-SERC conducted customized short-term course for 6 batches of NTPC civil executive trainees. In the first four batches, one hundred and fifty five trainees attended the training during April - June 2026, wherein around 44 topics were covered for each batch along with laboratory visits.



Participation in Exhibitions

CSIR-SERC participated in the **2nd Vision Karnataka** mega exhibition held during 23-25 June 2026 at KLE Centenary Convention Center, Belagavi, Karnataka. The three-day exhibition was organized with the objective of showcasing various Government initiatives, innovative technologies, and developmental programmes aligned with the national vision of **Viksit Bharat 2047**, promoting innovation, sustainable growth, and inclusive development.

As part of the CSIR Pavilion, CSIR-SERC showcased several of its indigenous technologies and innovations through informative posters and demonstration models. The technologies exhibited include Adaptive Vibration Control Devices using Magneto-Rheological Elastomers (MRE), Emergency Retrieval System (ERS) for Power Lines, FloaTech: A Floating Foundation Technology for Offshore Renewable Energy Structures, Low-Cost, Lightweight Sandwich SECROBuilt Panels for Housing, Bullet Resistant Movable Security Booth, Volumetric 3D Printed Concrete Pod, Smart Fibre-Optic System for Railway Asset Monitoring, Laced Steel-Concrete Composite Panels, Textile Reinforced Concrete Prototyping Technology (TRCPT). In addition to the posters, scaled-down working models of the Volumetric 3D Printed Concrete Pod and Floating Foundation Technology for Offshore Renewable Energy Structures were displayed, providing visitors with a better understanding of the innovative concepts and their practical applications.

The CSIR-SERC stall attracted a large number of visitors, including industry professionals, academicians, researchers, students, government officials, and members of the public. The exhibits generated considerable interest, particularly in the areas of sustainable infrastructure, disaster resilience, advanced construction technologies, smart monitoring systems, and renewable energy solutions. Shri Jagadish Shettar, Hon'ble Member of Parliament, Belagavi, Karnataka, & Former Chief Minister of Karnataka, and Shri Abhay Patil, Hon'ble Member of the Karnataka Legislative Assembly, Belagavi, visited the CSIR Pavilion. They were briefed on the technologies developed by CSIR-SERC, who appreciated the Centre's efforts in developing innovative, indigenous engineering solutions that address national priorities and contribute towards technological self-reliance.



Visits

- Professor Christian Boller, Professor and Chair at Saarland University, Saarbrücken (UKS), Germany, visited CSIR-SERC on 13 April 2026, and delivered a technical lecture titled **Reassessing Ageing Infrastructure through Damage Tolerance**. He also visited the major laboratories/research facilities at CSIR-SERC. He is one of the most renowned researchers in the field of Structural Health Monitoring (SHM).



- Rear Admiral Ravi Kumar Dhingra, VSM, Project Director, Indian Navy, visited CSIR-SERC, Chennai, on 9 June 2026 to witness the demonstration and testing of the Mast Hoisting Gear (MHG) at the state-of-the-art Advanced Seismic Testing and Research (ASTaR) Laboratory. During his visit, he toured key experimental facilities. He also interacted with the Director and scientists of CSIR-SERC, commending the institute's expertise in advanced structural testing and its significant contributions towards the development of technologies of strategic and national importance. Commander B. M. Bulle, along with officials from R&DE (Engineers), Pune, and Larsen & Toubro (L&T) Precision Engineering Systems, Pune, were also present during the visit.



Events

135th birthday of Babasaheb Dr. B. R. Ambedkar was celebrated with great enthusiasm on 21 April 2026, at CSIR-SERC and CMC. The function was inaugurated with the lighting of Kuthuvilakku and floral tribute to Babasaheb Ambedkar. Dr. S. Ravivarman, Director, National Commission for Scheduled Castes (NCSC), Chennai, was the Chief Guest of the function. Dr. N. Anandavalli, Director, CSIR-SERC and Coordinating Director, CMC, delivered the presidential address. Dr. Ravivarman, delivered the Dr. B. R. Ambedkar Birth Anniversary speech. In his speech, he said that Dr. Ambedkar is one of the most important leaders in Indian history who was committed to social justice and fought for all sections of the society. He said that Babasaheb was a great nationalist, whose nationality was rooted in justice, equality and dignity for all citizens.

Dr. Anandavalli, delivered the Presidential address, in which she said that the journey of CSIR-SERC is the journey of innovation and perseverance with a focus on service to nation, since its genesis on 10 June 1965. She also mentioned that the focus of the institute in the next five years would be asset management of critical/aging infrastructure, climate adaptive and disaster resilient structures, low carbon and clean infrastructure and cyber-physical systems for enhanced safety.

A Memorandum of Understanding (MoU) was exchanged between CSIR-SERC and Gati Shakti Vishwavidyalaya for Research & Development and Skill Development in Railway Structural Engineering. This MoU aims to collaborate in the field of railway bridge and transportation infrastructure engineering to support Indian Railways and the entire transportation sector through research, technology development, testing, innovation, consultancy, capacity building, and advanced skill development. Prof. Manoj Choudhary inaugurated the Sustainable Engineered Recycled Concrete Demonstration Building developed by CSIR-SERC virtually. The salient feature of the demo building was given by Dr. A. Kanchana Devi, Scientist-E, CSIR-SERC. Dr. Choudhary delivered the CSIR-SERC Foundation Day Lecture and Prof. G. S. Ramaswamy Memorial Lecture, in which, he remembered the significant contributions of CSIR-SERC since its inception and appreciated the vibrant culture inside the institute.



61st Foundation Day of CSIR-SERC was celebrated on 9 June 2026 at the CSIR Campus, Chennai. The function was presided over by Dr. N. Anandavalli, Director, CSIR-SERC and Coordinating Director, CMC. Prof. Manoj Choudhary, Vice Chancellor, Gati Shakti Vishwavidyalaya, Vadodara, was the Chief Guest of the function. Dr. S. Parivallal, Scientist-G and Advisor (M), CSIR-SERC extended a warm welcome to the chief guest and congratulated all the staff members on the occasion of the foundation day of CSIR-SERC.



Other Notable Events

- CSIR-SERC and CMC jointly celebrated **World Blood Donor Day** on 14 June 2026 to express gratitude of blood donors for their selfless act of saving lives through voluntary blood donation. This day serves a reminder of the critical need for regular non-remunerated voluntary blood donations and aims to raise awareness about the life-saving impact of these donations.
- In connection with the observance of **International Yoga Day**, activities celebrating the spirit of wellness were conducted with great enthusiasm on 21 June 2026. Under the theme *Yoga for Healthy Ageing*, Dr. N. Kalaiselvi, Secretary, DSIR & Ministry of Earth Sciences (MoES) and Director General, CSIR, led the celebrations at NIOT, Chennai. The event was jointly organized by the Ministry of Earth Sciences and CSIR, reaffirming a shared commitment to a healthier mind, body, and nation through the timeless practice of yoga.
- CSIR-SERC and CMC, observed **Swachhata Pakhwada 2026** through a series of cleanliness, housekeeping, waste management and workplace improvement activities conducted under the theme *Cleanliness, Hygiene and Environmental Sustainability*.

Invited talks/lectures

- Dr. P. S. Ambily, Scientist-F, delivered an invited lecture titled **Studies on Geopolymer Concrete with Re-Rolled Scrap Steel Slag as Coarse Aggregate** in 13th International Conference on Concrete Block Pavement (ICCBP 2026), held during 9-10 April 2026 at Hyderabad, organised by Pavers and Blocks Manufacturers Association (PBMA).
- Dr. S. Maheswaran, Scientist-G, delivered an invited lecture (online) titled **Microstructure Characterisation of Cementitious Materials** in Faculty Development Program, on 10 April 2026, organised by University College of Engineering, Osmania University, Hyderabad.
- Dr. N. Anandavalli, Director, CSIR-SERC, delivered an invited lecture titled **From Repair to Prevention: Strategic Corrosion Management for Sustainable Infrastructure** in 14th Webinar - AMPP Chapter India Chennai, on 25 April 2026, at IIT Madras, Chennai, organised by Association of Materials Protection and Performance (AMPP).
- Dr. P. S. Ambily, Scientist-F, delivered an online invited lecture titled **Geopolymer Concrete: From Sustainable Alternatives to High Performance Innovations** in Faculty Development Programme on Emerging Trends and Technologies for Smart and Sustainable Infrastructure, on 8 May 2026, organised by Department of Civil Engineering, Vardhaman College of Engineering.
- Dr. J. Prawin, Scientist-E, delivered a guest lecture titled **Generalised Machine Learning Model for Cross-Structure Damage Diagnosis** and interact with the M.Tech. students, during 15-16 May 2026, at Mahindra University, Hyderabad.
- Dr. S. Parivallal, Adisor (M) and Scientist-G, CSIR-SERC delivered an invited lecture titled **Fiber Optic Sensors for Health Monitoring of Critical Infrastructure** in the International Conference on Recent Advances in Construction Materials and Structures, held on 20 June 2026, organized at the PSG College of Technology, Coimbatore.
- Dr. Smitha Gopinath, Scientist-F, delivered an invited lecture titled **Textile Reinforced Concrete for Sustainable and Resilient Infrastructure** in the Pre-Conference Workshop of RCMS 2026 on Sustainable Construction: Innovations in Materials and Performance-Based Structural Design, held on 18 June 2026, organized at the PSG College of Technology, Coimbatore.

Honours/awards/recognitions/nominations/PhDs

- CSIR-SERC bagged two **Vishwakarma Awards** under the category, *Achievement Award for Research & Development in Construction Domain (Code L)*, for the projects **Condition assessment, Rehabilitation & Retrofitting and R & D on Sustainable Building Materials, Durability Performance and Condition Assessment in Civil Infrastructure/Construction Domain**. The Awards were received during 17th CIDC Vishwakarma Awards 2026 held at Delhi
- Dr. B. Arun Sundaram, Scientist-F, received the **Achievement Award for Scientists** during 17th CIDC Vishwakarma Awards organised by Construction Industry Development Council, held at Dr. Ambedkar International Centre, New Delhi, on 10 April 2026.
- CSIR-SERC Participated in 3rd National Corrosion Management Practices - Competition & Awards and won the award under the category **Best Case Study on Corrosion Management under Asset Integrity System/Concrete Structures**, during CII CORTEM 2026 International Conference on Corrosion Technology and Management, held at Delhi, on 7 May 2026.
- Dr. S. Parivallal, Scientist-G and Advisor (Management), CSIR-SERC, was nominated as **External Expert Member** of the Board of Studies for the Civil & Infrastructure Engineering Department, Adani University, Ahmedabad for a period of three years.
- Dr. P. Harikrishna, Scientist-G, was nominated as **Vice President** by the newly elected Executive Committee of Indian Society of Wind Engineering (ISWE), for a period of three years from 2026 to 2028.

Paper publications

- **Reputed Indian Journals - 1**