INDIAN NATIONAL ACADEMY OF ENGINEERING

E-Newsletter

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INAE VISION 2020-2025

INAE VISION

To be the premier Engineering Academy of the World providing timely inputs to the national and international policy makers, and to extend appropriate assistance in developing engineered solutions for the challenging problems facing contemporary societies and the humanity as a whole.

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INAE Mission

To serve professionals in building and institutionalizing engineering and technological excellence in education, research and industry in India and support advancement of engineering profession globally

Technology Roadmap

We are living in exciting times. We will have to contend with the profound transformation of our society and our industry, because of two revolutions in the making – namely, the digital revolution and the impending transition to fossil fuel free energy globally.

The digital revolution is rapidly transforming the very nature of industrial enterprise today. Many disruptive transformations are maturing rapidly because of the advent of cloud computing and internet of things (IoT) and due to major advances and breakthroughs being made on several fronts such as artificial intelligence (AI) including machine learning (ML) and big data analytics, robotics, autonomy, drones, 3D printing, advance sensors and 5G technologies.

Another revolution in the making is the exciting possibility of fossil fuel-free generation of electricity in the coming decade. The availability of electricity based on renewable sources such as sun, wind and biomass, will cause a major disruption as well as an opportunity for creating a cleaner world, since use of fossil fuels (coal, oil or natural gas) currently, creates deleterious environmental consequences which need urgent attention.

While both these revolutions will cause major disruptions in how we live and work, the transition to the new world in the making is contingent upon the availability of new sources of critical raw materials.

Both digital hardware and generation of electricity from renewables (including the technological challenges associated with energy storage) require a host of new metals and materials for which the new value chains (also the appropriate global supply chains) will have to be established. Innovative processes for extraction of minerals and metals as well as recycling, which are more energy efficient and environment-friendly will have to be developed to produce these critical elements.

To facilitate this global transition, we need to create human resources with high level of domain expertise in different facets of engineering as well as the much needed engineering skill sets needed to deal with the problems of scalability, uncertainty, reliability, complexity, system engineering, ability to deal with variability and yet manufacture products and create solutions of uniform and reproducible quality, capability to design, develop and optimize engineering systems for a given set of inputs and for a desirable set of assured outputs of consistent quality.

Our engineering education has to be appropriately re-engineered so as to equip our future leaders with not only the domain expertise but also the skillsets to innovate continuously and consistently in the face

of constant change and dynamic transformations. The human ingenuity and the preparing the well-trained minds, will be critical ingredients in responding to the challenges ahead.

It in this context, INAE has come up with the following areas for our focused attention in the next five years. We believe that these efforts will assist us in facilitating the smooth transition to the new world in the making.

1. **Accelerated Discovery, Development and Deployment of Novel Materials, particularly for strategic sectors like Defense, Atomic Energy and Space.**

We have an urgent need of materials (metals, alloys as well as composites) development for the following sectors – auto sector (both electric vehicles as well as IC engines based vehicles), aerospace, ultra-supercritical power plants, nuclear power plants, renewable energy sector (novel PV materials, rare earth magnets, battery materials for both large scale energy storage as well as for electric vehicles and other electronic appliances, thermoelectric materials for converting low temperature heat into electricity), novel sensors for healthcare industry, materials for the defense applications and space applications, to name a few.

These materials will have to be engineered for India-specific applications. That means one must consider during the process of design & development itself, the kind of natural resources we have and the kind of supply chains we will be able to establish to source the starting raw materials, considering the complex geo-political scenario and vulnerabilities associated with dependence on raw materials from abroad.

The other important consideration is the speed of development. In order to remain globally competitive in this domain, we must leverage the state of the art digital platforms (equipped with advance modeling, simulation, data analytics and knowledge engineering tools) for accelerating the development cycle from conception to deployment in actual applications as well as the entire life cycle (cradle to cradle or cradle to grave in some cases), that is, even for the structural health monitoring of the structures where these materials will be deployed.

Another important consideration is the environmental impact of these materials, that is, we must undertake a life cycle analysis, both with respect to the environmental footprint as well as the energy efficiency (actual consumption as compared to the thermodynamic energy needed to accomplish the particular task), for every developmental effort.

It is now well established that integrated computational materials engineering (ICME) approach can help accelerate the materials development cycle.

INAE will work towards coming up with a national strategy to establish and institutionalize the ICME based approach for all material development efforts. The digital platform, thus created, must be equipped with knowledge engineering capabilities so that it can not only act as a knowledge repository of all past efforts made thus far but also continues to update the knowledge going forward.

2. **Strategies for Energy Transition to Fossil Fuels free Renewable Energy Sources**

It is inevitable that India, like several other nations of the world, will move away from fossil fuels as a source of energy. While we have made some headway in developing renewable energy sources like solar and wind, the necessary infrastructure to support the energy transition does not exist at the present time. INAE plans to create an interdisciplinary expert group to study the whole energy transition comprehensively and holistically, keeping in mind the challenges inherent in such a massive transformation.

INAE will focus on the following important sectors which will be disrupted in the immediate future and/or the areas of concern which we require a strategy for, urgently to facilitate the transition

- Large scale energy storage solutions - Solutions other than Lithium Ion Batteries which do not seem to be appropriate for a country like India for a variety of reasons including the fact that we do not have the basic raw materials - Liquid Metal Flow batteries (for example, Vanadium Flow Batteries) is another attractive option which must be explored.
- Electricity Grid Infrastructure - current grid will not be able to cater to intermittent and distributed electricity inputs; the concept of smart grids which is adequately robust to cater to both supply side challenges (renewable energy sources) as well as demand management (dynamic pricing to take care of its peak loads).
- Transportation (electric mobility, both for people as well as for goods).
- Mining, Mineral Processing and Extractive Metallurgy Industry (which currently depends totally on fossil fuels not only as a source of heat but also as a reductant to convert metal oxides to metals).
- Recycling of waste by-products including municipal waste, tailings and smelter slags including steel slag, red mud and spent pot lining, electronic waste and hospital waste.
- Supply chains for raw materials needed for the transition - sourcing strategies from other geographies, urban mining, deep sea mining and space mining.
- Finding alternative technology options for the manufacture of steel and cement to reduce the environmental foot-print - currently these two materials which will continue to remain the backbone of the Indian economy for the foreseeable future and the consumption is likely to increase by an order of magnitude in the coming decade.
- Waste-water treatment and recycling.
- Water purification technologies including desalination

3. Excellence in Engineering Education

Several groups including other academies globally, are working on the new curricula for engineering education so that our young emerging leaders are adequately equipped with necessary engineering skill sets to face the challenges in the coming decades.

Various deliberations within India as well as abroad have emphasised the need of providing hands-on design experience, problem solving skills and exposure to the systems engineering concepts, tools and technologies to the engineering students. The curricula also need to be updated with the advancements in digital technologies.

All engineers must be familiar with the sustainability paradigm and must be able to do life cycle analysis for every engineering product. They must be equipped with knowledge and the experience with various digital platforms and modelling tools such as computational materials engineering (all the way from atomistic scale to macroscopic scale), computational fluid dynamics, structural analysis tools, life cycle analysis modelling tools, engineering scale up, robust design methodologies to take care of uncertainty and complexity, machine learning and data analytics tools and algorithms, multi-objective and multi-variate optimization tools and technologies.

It is important that the professional ethics is part of the engineering course curricula. A multi-disciplinary systems perspective to all engineers will certainly broaden their horizons – much needed to face the emerging world scenario. Good communication skills and ability to work in teams, are also prerequisites for engineers to succeed in the real life.

All engineers must possess basic IT skillsets and it is a given since digital technologies are transforming every aspect of our lives.

A multidisciplinary INAE Expert Group will critically examine the current status of engineering education, identify gap areas and strive to fill those gaps with appropriate action plans

4. World Class Infrastructure

INAE will come up with an action plan in consultation with all stake- holders to upgrade our national infrastructure within next few years. This will include

- Requirements, technology options and the investments needed to create a few smart cities in the country - including mobility, healthcare facilities, e-governance, access to affordable housing, utilities (electricity and water), waste collection, processing and recycle, education, communication, maintenance of infrastructural facilities, disaster management infrastructure including extreme events (for example, excessive rain and floods) etc.
- Requirements, technology options and the investments needed to create a rural infrastructure so that they can enjoy access to certain basic amenities where they are located - digital connectivity for example can provide them with access to healthcare, online education, information dissemination, financial inclusion, logistics warehousing and agriculture and farm productivity with engineering focus etc.

5. Cyber-physical Systems

Globally innovations are taking place at the interface of digital technologies and domain expertise. For example, manufacturing is being transformed as a consequence of the following - robotics and automation, Internet of Things (IoT), cloud computing, 3D printing, AI, machine learning and data analytics (Digital Twins), structural health monitoring of built structures and engineered products, drones, autonomy, data analytics based predictive asset maintenance systems, blockchain technology to facilitate complete traceability of the products, digital platforms for integrated design, development, deployment and monitoring of materials and products and knowledge engineering platforms for capturing, retaining and context sensitive retrieval of knowledge to solve challenging problems.

Similarly leveraging the advanced digital technologies, the infrastructure available in a given locality or a city can be upgraded for easy accessibility – for example, healthcare facilities, e-governance, utilities (electricity and water)

It is now possible to make most of healthcare facilities available to the citizens at their place ofresidence (particularly important for senior citizens living alone) through the intervention of digital connectivity, sensors and IoT solutions. Provision of healthcare and affordable Medicare facilities through technological interventions is a key focus area.

INAE will select certain areas for focussed attention during the next five years and develop strategies to create infrastructure to facilitate digital transformation for achieving a set of desirable objectives for example, higher productivity, higher efficiency, better quality of life and better quality of products, reduced cost of services, higher safety of workers, etc.

Back to Main Page

ACADEMY NEWS

Academy News

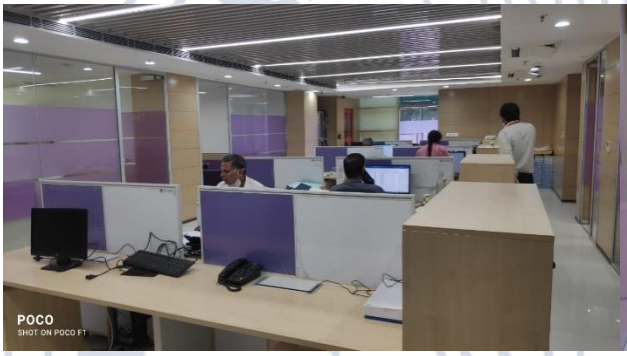
- **Shifting of INAE Office from Gurgaon to DST Complex New Delhi**

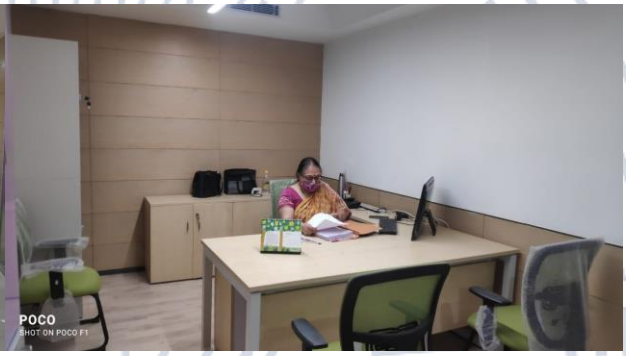
INAE has been allocated fully furnished Office space of about 3300 sq. ft area by DST for its functioning at Ground Floor of the newly constructed Building No.2 of DST Complex, Technology Bhavan, New Delhi, which would also house various other Autonomous Bodies under DST. INAE has since got possession of the new premises and shifting of INAE Office to the new premises at DST Complex, New Delhi has been completed on July 29, 2021 to July 30, 2021 (Friday). The INAE office commenced its functioning in the DST Complex w.e.f. August 2, 2021 (Monday).

Some photographs of the shifting process of INAE Office are featured below.

Packing of Material at old INAE Gurgaon Office During Shifting Process

A few photographs of the new premises of INAE are featured below.





Photographs of new INAE Office Premises at Technology Bhavan, New Delhi

The postal address, telephone numbers etc. of the new Office of INAE located in DST Complex, New Delhi are given below**.**

Indian National Academy of Engineering
Ground Floor, Block-II,
Technology Bhavan,
New Mehrauli Road,
New Delhi-110 016.
Phone: 011-26582475

In view of above, all material should be despatched to the new INAE Office, DST Complex, New Delhi and despatch of all postal/courier material to the old INAE Office at Gurgaon should be ceased.

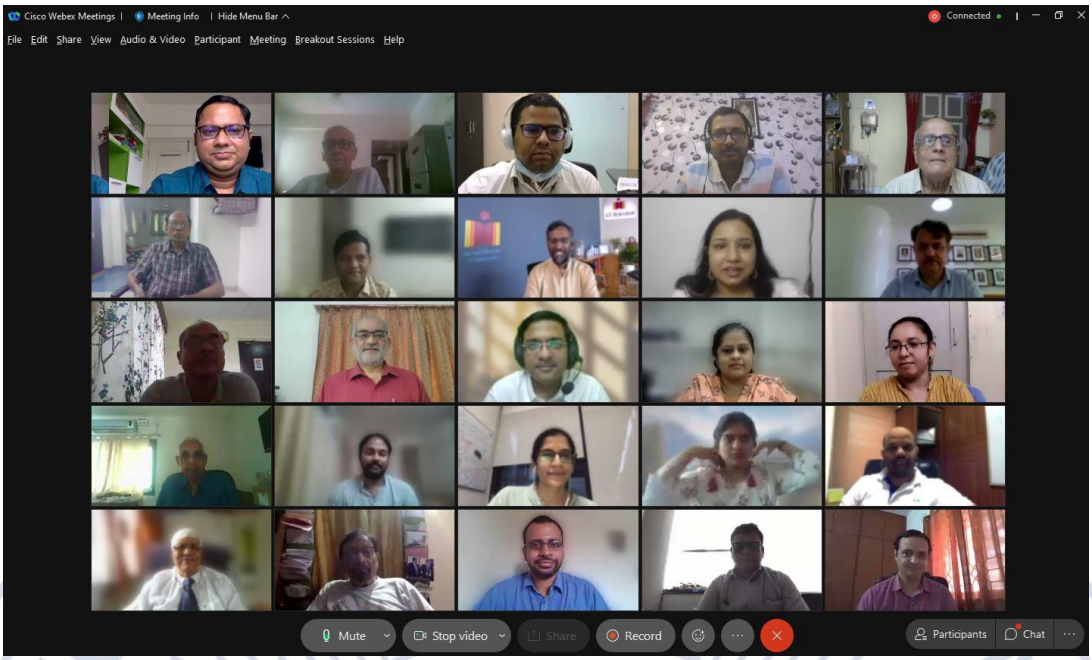
- **National Frontiers of Engineering (NatFOE 2021)**

Indian National Academy of Engineering organized 15th National Frontiers of Engineering (NatFoE) Symposium jointly with IIT Hyderabad on July 9-10, 2021 on virtual platform bringing together 50 bright young engineers to deliberate on emerging technologies in some key engineering sectors. Prof BS Murty, Director, IIT Hyderabad and Prof Sivaji Chakravorti, Vice-President, INAE were the coordinators of the event. Prof Chandrasekhar Sharma, IIT Hyderabad was the Convener of the event.

NatFoE Symposium is an annual flagship event of INAE aiming towards bringing together young engineers from academic institutes, R&D labs and industry on a single platform to deliberate upon emerging trends of research and cutting-edge technologies. About fifty young engineers discussed, deliberated and brainstormed the state-of-the-art knowledge and development, and highlighted the opportunities and challenges in the four major areas: Artificial intelligence & machine learning, advanced materials &manufacturing technologies, infrastructure & unconventional energy and rural technology & entrepreneurship. All the four themes were chosen carefully as key areas to focus towards making India self-reliant in engineering & technology. As a part of seventy five years of independence celebrations of India, a special session on 'Azadi Ka Amrit Mahotsava' was also organized in which speakers talked about various indigenous technologies in the area of female hygiene, mitigating greenhouse effects and developing green routes for hydrogen production as an alternative fuel. Another highlight of this session was the model technology to translate English text into 11 Indian languages that may play a key role in translating engineering text books into Indian languages in line with the new education policy to provide technical education in local languages.

Dr. Tessy Thomas, Director General (Aeronautical Systems), DRDO presented a detailed overview on the advances in aerospace materials and manufacturing technologies and highlighted their importance in the success of India's space program. Dr. Debashish Bhattacharjee, Vice President (New Materials Business), Tata Steel in another keynote lecture presented some of the breakthrough technologies and innovations in the area of high strength, lightweight materials for automotive sector.

The symposium started with the welcome address by Prof. B. S. Murty, Director IIT, Hyderabad. Conveying the welcome greetings to the dignitaries and the attendees, Prof. Murty said, "despite the organization of the meeting on a virtual platform due to Covid-19 pandemic, organization of NatFoE2021 will achieve its goal in fostering the new collaborations and exchanging new ideas among the brightest minds and the deliberations will help in unveiling new innovations and the strategies for their commercialization paving the way for the country to become a leader in technology innovations ".



Inaugural Session of the 15th National Frontiers of Engineering Symposium held on July 9, 2021

Congratulating IIT Hyderabad for its efforts in organizing NatFoE, as an online event for the first time, Prof. Indranil Manna, President, INAE said the INAE will take appropriate steps in implementation of the recommendations and action items in the four themed areas as a final outcome of this symposium. As a satellite event of NatFoE 2021, a national design competition event, Innovations in Manufacturing Practices (IMP) was also organized for UG and PG students as well as start-ups. Out of 160 entries, 6 award winners were chosen. Prof. Sivaji Chakravorti, Vice President, INAE declared the award winners in each category and congratulated them for their innovation and extended further support to take them to the next level. Dr. Chandra Shekhar Sharma, Coordinator, NatFoE 2021 extended a vote of thanks to all speakers & participants, INAE Fellows and Young Associates and other guests for their active participation to make the NatFoE 2021 a grand success. A copy of the Abstract Booklet of the 15thNatFoE Symposium can be viewed by clicking here…

The links for the Online News Coverage of Press Releases for the NaTFoE 2021 Symposium are given below:

Hyderabad: IITH-INAE Jointly Organizes 15th NATFoE-2021 Concludes Successfully https://www.globalgreenews.com/2021/07/12/15231/
IITH & INAE jointly organized the 15th National Frontiers of Engineering symposium, NATFoE, 2021 https://www.thehawk.in/education/iit-hyderabad-inae-jointly-organized-the-15th-national-frontiers-of-engineering-symposium-natfoe-2021-238137
IIT Hyderabad & INAE jointly organize NATFoE 2021 https://www.pallikkutam.com/edu-news/iit-hyderabad-inae-jointly-organizes-natfoe-2021
50 bright, young engineers on a common platform https://www.thehindu.com/news/cities/Hyderabad/50-bright-young-engineers-on-a-common-platform/article35285417.ece
IIT Hyderabad, INAE jointly organises 15th National Frontiers of Engineering symposium 2021 https://www.abpeducation.com/news/iit-hyderabad-inae-jointly-organises-15th-national-frontiers-of-engineering-symposium-2021/cid/1210035

➢ **Innovation in Manufacturing Processes (IMP-2021)**

Innovation in Manufacturing Processes (IMP), conducted by INAE and IIT Hyderabad jointly as a satellite event along with 15thNatFoE symposium, is a national level project competition open to all engineering students and practitioners. In addition to undergraduate and postgraduates (Master's students) categories, start-ups were also included as a new category this year. In the UG and PG category, the eligible branches were Aeronautical, Biomedical, Chemical, Civil, Computer/Information, Design, Electrical, Electronics, Industrial, Instrumentation, Material Science, Mechanical, Power, Production and other allied branches. Entrepreneurs-in-Residence (EiR) and Start-ups with less than two years and incubated at any of the Technology Business Incubators (TBI) in India were eligible in the Start-up category. In each of these categories, the award included a prize of Rs. 40,000 and Rs. 20,000 for first and second place winners, respectively. The event was coordinated by Prof. S. Surya Kumar (MAE) and INAE Young Associate Dr. Mudrika Khandelwal (MSME) of IIT Hyderabad.

Entries to this competition were taken in the form of a short video and a small write-up, floated through an online application portal which remained open from 1st April to 15th June. Based on the preliminary screening, out of 150 entries, 24 were selected for the "Virtual Showcasing" where the submitted project videos are hosted on a dedicated webpage (https://www.iith.ac.in/natfoe2021/imp/) as a run-up to the competition.

The winners were selected from these 24 applications by an eminent jury comprising of INAE Young Engineer awardees and chaired by Prof. Sivaji Chakravorti, Vice-President INAE. The jury included Dr. Amartya Mukhopadhyay (IIT Bombay), Dr. Aravind Kumar Rengan (IIT Hyderabad), Dr. Chirasree Roy Chaudhuri (IIEST, Shibpur), Dr. Pooja Devi (CSIR-CSIO) and Dr. Swati Ghosh Acharyya (University of Hyderabad).

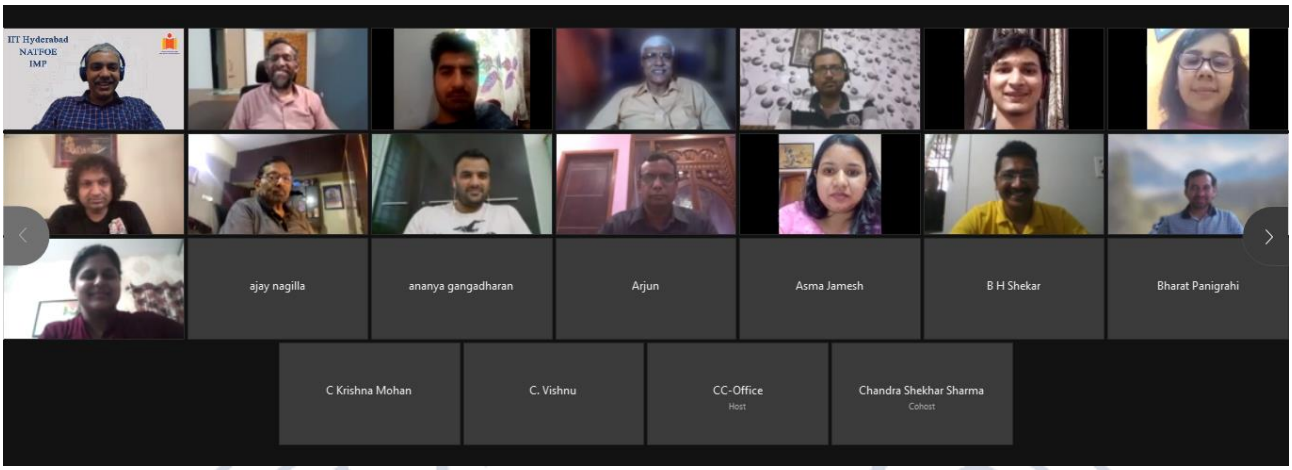
On the day-1 of the NaTFoE event (9th July in the 12:00 to 13:00 session), videos of the selected applicants were showcased as part of the event. The final winners were announced on the day-2 of the NaTFoE (10th July in the 17:00 to 17:45 session) by Jury-Chair, Prof. Sivaji Chakravorti. This was followed by a quick bite from the winners, who are listed below:

- **UG Category:**
  - First Prize: Nitheesh P, Surya Bharath for "Natural fiber extraction Machine for Sustainable Development (Pineapple Fiber)" (affiliation: KCG College of Engineering, Chennai)
  - Second Prize: Mohammed Safi A for "An Autonomous Drowning Rescue System (One's SEGAIN)" (affiliation: Sri Venkateshwara College of Engg, Sriperumbudur)

- **PG Category:**
  - First Prize: Mayank Kanubhai Patel for "Novel Approach for 3D printing of High Strength Al7075 alloys" (affiliation: IIT Kanpur)
  - Second Prize: Prashanth M, Nayana Kumari JR, Chaithra D for "Development of low-cost falling weight deflectometer" (affiliation:M S Ramaiah University of Applied Science, Bengaluru)

- **Startup Category:**
  - First Prize: Refaz Ahmad Wani, Shugufta Akhter, Ishfaq Ahmad Wani for "Spade and Hoe" (affiliation: Wani Agri Tools Plant, Anantnag, J&K)

Second Prize: R Sai Chandra Teja, C Krishna Mohan, C Vishnu for "State-of-the-art Multi-class Wafer Defect Detection & Segmentation in Semiconductor Manufacturing" (affiliation: CKM Vigil Pvt Ltd, Hyderabad)



Screenshot of the Final Award event for IMP-2021(July 10, 2021)

- **INAE Youth Conclave 2021**

INAE Youth Conclave 2021 has been planned to be organized online by National Institute of Industrial Engineering (NITIE); IIT Bombay and ICT Mumbai on Engineers' Day September 15, 2021. The presentations would be based on five topics of national importance **namely:** Waste to wealth; Digitization and revolution in logistics & Engineering intervention to fight against COVID-19 and healthcare management; Innovative technologies and product developed during COVID; Teaching and learning in pandemic and Azadi Ka Amrit Mahotsav. Preparations are ongoing for planning of the event.

INAE Webinar Series

INAE Webinar by Dr SethuramanPanchanathan, Director, National Science Foundation, USA on 31st July 2021 (Saturday) from 7 PM to 8 PM (IST) (9:30 AM to 10:30 AM EDT).

Dr SethuramanPanchanathan, Director, National Science Foundation, USA delivered a special lecture on "Creating Foundational Partnerships: Building on the strength of US-India collaboration towards a roadmap for the future" during the INAE Webinar held on 31st July 2021 (Saturday) from 7 PM to 8 PM (IST). Prof. Indranil Manna, President INAE, Vice-Chancellor, Birla Institute of Technology (BIT), Mesra delivered the Welcome Address during the Webinar. Prof Sivaji Chakravorti, FNAE, Vice-President, INAE, Electrical Engineering Department Jadavpur University, Kolkata was the Moderator of the Webinar.

Dr Sethuraman Panchanathan, Director, NSF, USA delivering the Special Lecture

Abstract of the Special Lecture:

For more than a decade, cooperation between the United States and Indian science and engineering communities has pushed forward the frontiers of discovery and innovation. From materials research and sustainable urban systems to space technology and beyond, various engineering research areas have benefited from this collaboration. Formal mechanisms for cooperation, which have existed for nearly 20 years, coupled with National Science Foundation (NSF) investments in a wide range of research with Indian scientists and institutions, have facilitated numerous accomplishments and discoveries.

Dr. Panchanathan will outline the state of scientific and engineering collaboration between the United States and India while also elaborating on his vision for the future of NSF. This includes the importance of ensuring accessibility and inclusivity in STEM fields across the United States and India and advancing technological progress through the continued translation of curiosity-driven, discovery-based research. Building on the firm foundation of past US-India science and engineering engagements, Dr. Panchanathan will discuss strengthening existing engagements and creating new opportunities for collaboration to accelerate discovery and innovation at speed and scale.

Brief Bio of the Speaker: Dr. Sethuraman Panchanathan, Director, National Science Foundation, USA

The Honourable Dr Sethuraman Panchanathan is a computer scientist and engineer and the 15th director of the U.S. National Science Foundation (NSF). Dr Panchanathan was nominated to this position by the President of the United States in 2019 and subsequently unanimously confirmed by the U.S. Senate on June 18, 2020. NSF is an independent federal agency with annual budget of 8.5 Billion Dollars and the only government agency charged with advancing all fields of scientific discovery, technological innovation and STEM education.

Dr Panchanathan is a leader in science, engineering and education with more than three decades of experience. He has a distinguished career in both higher education and government, where he has designed and built knowledge enterprises, which advance research innovation, strategic partnerships, entrepreneurship, global development and economic growth.

Dr Panchanathan previously served as the executive vice president of the Arizona State University (ASU) Knowledge Enterprise, where he was also chief research and innovation officer. He was also the founder and director of the Center for Cognitive Ubiquitous Computing at ASU. Under his leadership, ASU increased research performance fivefold, earning recognition as the fastest growing and most innovative research university in the U.S.

Prior to joining NSF, Dr Panchanathan served on the National Science Board as chair of the Committee on Strategy and as a member of the External Engagement and National Science and Engineering Policy committees. Additionally, he served on the National Advisory Council on Innovation and Entrepreneurship. He was chair of the Council on Research of the Association of Public and Land-grant Universities and co-chair of the Extreme Innovation Taskforce of the Global Federation of Competitiveness Councils. Arizona's Governor appointed Dr Panchanathan as senior advisor for science and technology in 2018. He was the editor-in-chief of the IEEE Multimedia Magazine and editor/associate editor of several international journals.

Dr Panchanathan's scientific contributions have advanced the areas of human-centered multimedia computing, haptic user interfaces, person-centered tools and ubiquitous computing technologies for enhancing the quality of life for individuals with different abilities; machine learning for multimedia applications; medical image processing; and media processor designs. He has published close to 500 articles in refereed journals and conference proceedings, and has mentored more than 150 graduate

students, postdocs, research engineers and research scientists, many now occupy leading positions in academia and industry.

For his scientific contributions, Dr Panchanathan has received numerous awards, such as Distinguished Alumnus Awards and the Governor's Innovator of the Year for Academia Award for his development of information technology centric assistive and rehabilitative environments to assist individuals with visual impairments.

Dr Panchanathan is a fellow of the National Academy of Inventors, where he also served as vice president for strategic initiatives. He is also a fellow of the American Association for the Advancement of Science, the Canadian Academy of Engineering, the Association for Computing Machinery, the Institute of Electrical and Electronics Engineers and the Society of Optical Engineering.

Local Chapter Activities

- **Bangalore Local Chapter**
  - **"SAMVAAD – an IIT Dharwad-INAE Bangalore Chapter Lecture Series"**

INAE Bangalore Chapter organized a **live session of "SAMVAAD – an IIT Dharwad-INAE Bangalore Chapter Lecture Series" on 28th July 2021 from 5:30 PM - 7:00 PM** wherein a **Lecture on "Electric Vehicles - Current Trends and Future Strategies**" was delivered by FIEE and Distinguished Professor University of Houston, **Dr Kaushik Rajashekara.**

- **First Roddam Narasimha Memorial Lecture**

The first Roddam Narasimha Memorial Lecture was held on July 20, 2021 at 6.0pm through on-line mode via Google Meet. This memorial lecture was instituted by the INAE Bangalore Chapter with the support of INAE Headquarters, New Delhi. The inaugural lecture was delivered by Prof. K R Sreenivasan, Distinguished University Professor, New York University USA. Over 100 fellows and participants from all over the world participated in this lecture. The event was inaugurated by Mrs Neelima Narasimha, wife of Late Prof. Narasimha.

The event began with a welcome address by Dr V K Aatre, Chairman, INAE Bangalore Chapter. Following his welcome address, Prof. G. Jagadeesh, Member, INAE Bangalore Chapter and Professor, Department of Aerospace Engineering, IISc Bangalore, presented Professor Narasimha's technical contribution in the area Fluid Dynamics and his pioneering work in the Laminar-to-Turbulent flow transition. Prof. Narasimha had contributed significantly to various National Aerospace Programs over last 5 decades for the country and his contributions were documented in the form of a video, which was prepared by National Aerospace Laboratories, Bangalore. This video was next played to provide the attendees a bird's eye view of Prof. Narasimha's contributions to the National Aerospace Programs. Following this, the President of INAE Prof. Indranil Manna addressed the gathering, wherein, he fondly recalled Prof. Narasimha's Seminal contributions and his own association with him. Following the address of INAE President, the Memorial Lecture was inaugurated by Mrs Neelima Narasimha, wife of late Prof. Narasimha. In her address, she recalled the personality of Prof. Narasimha and the passion he brings into his work culture.

The Roddam Narasimha Memorial Lecture was given by Prof. K R Sreenivasan, Distinguished University Professor, New York University, USA and one of the most Prolific Students of Late Prof. Narasimha. His talk was on the "Contributions of Prof. Roddam Narasimha in the area of re-laminarization Research". Prof. Sreenivasan elegantly brought out the contribution of Late Prof. Narasimha and his students in this area and showed how his research is still relevant in today's fluid dynamic research and still highly cited. He blended his talk very well by mixing Prof. Narasimha's Technical contribution with some personal flavour making the talk extremely enjoyable. The program

ended at 7.30 pm with a vote of thanks proposed by Prof. S. Gopalakrishnan, Secretary, INAE Bangalore Chapter.

- **SAMVAAD – an IIT Dharwad-INAE Bangalore Chapter Lecture Series held on June 30, 2021 featuring talk by – by Padma Bhushan Awardee, Chancellor of IIST and former President, INAE - Dr BN Suresh, on "Mastering Rocket Science: Experiences and Excitements".**

SAMVAAD is a monthly lecture series organized jointly by IIT Dharwad and Indian National Academy of Engineering - Bangalore Chapter (INAEBC) to leverage the wisdom and experience of INAE for the benefit of faculty and students. On 30th June 2021 at 4 pm, Dr B N Suresh, Chancellor of IIST and a Padma Bhushan awardee, delivered an enthralling talk on "Mastering Rocket Science: Experiences and Excitements" on Google Meet online video conferencing platform. The talk captured the glorious journey of India's tryst with rocket science spanning over five decades and in making us "AtmaNirbhar ". The talk gave an overview of "Rocket Science" to the uninitiated. The talk was simultaneously streamed on YouTube (https://www.youtube.com/watch?v=6zBKZ-YWXHA) for the benefit of a wider audience including fraternities from technical institutes in Karnataka and CFTIs.

After the presentation, Dr BN Suresh took queries from audience members including students, faculty and other esteemed members of INAE. The questions spanned technical domains including systems integration and reliability, effect of various natural phenomena like combustion and lightning, current research areas of ISRO and policy-decision domains like need for introducing reliability in UG programs and commercialization of ISRO expertise for civilian areas. The talk ended with closing remarks from Prof. Seshu who thanked Dr Suresh for the nice talk and for extending his support in making IIT Dharwad a center for excellence in Aerospace Engineering.

- **Frontiers of Engineering webinar on "Advent of AI in Medical devices".**

INAE Bangalore Chapter organized a Frontiers of Engineering webinar on "Advent of AI in Medical devices". The talk was delivered by Dr Gopal Avinash, Global leader of Data Science, GE Healthcare's Edison AI Services on July 31, 2021 (Saturday) from 11am-12 noon

- **Delhi Local Chapter**
  - **INAE Industry Lecture**

INAE Delhi Chapter organized an INAE Industry Lecture (webinar) on July 29, 2021from 2-4PM. The lecture was scheduled through MS-Teams app. The title of the Lecture was "Energy Efficient IoT Devices - the Quest for Longer Battery Life" and the Speaker was Mr N Venkatesh, Sr. Director, Silicon Labs, Hyderabad.

Abstract of the Lecture: Many or most connected devices - like smart watches, smart locks, location trackers, medical monitors - require long battery life. Since battery technology is not growing at the same pace as the volume of data transferred between devices, innovative methods and techniques to improve energy efficiency have become critical. The question of energy consumed is important in all activities of IoT devices including sense/control, compute, intelligence and communication. This talk covers the current practices in fundamental HW/SW architectural considerations, and algorithmic methods for achieving a very low power wireless end node ASIC design without sacrificing performance. Areas of focus such as HW/SW partition, algorithms, energy efficient wireless receiver algorithms, sleep states, and dynamic performance scaling will be drilled down to explain practical challenges faced in design of wireless SoCs. The talk includes how battery life enhancement is a joint endeavour involving semiconductor device construction and control, the simultaneous use of multiple architecture level techniques, and a seamless approach to wireless design involving algorithms, hardware realizations and software control.

Bio-Data of Speaker:

Mr N. Venkatesh is Senior Director, Engineering at Silicon Labs through its March 2020 acquisition of Red pine Signals of which he was one of the founders in 2002. Mr. Venkatesh has over 35 years of engineering and management experience in wireless system design, IoT solutions, semiconductor design, and avionics. His current areas of interest are on building semiconductor and system solutions in the field of the Internet of Things. Prior to Redpine Signals, he was General Manager at California based Paxonet Communications developing semiconductor devices for optical and telecom networks, and prior to that at HAL developing airborne communication systems. He is an active IEEE volunteer and was the Chair of IEEE Hyderabad Section in 2019. He is a Board Member of TiE Hyderabad and helps foster entrepreneurship.

Mr. Venkatesh holds a Masters Degree in Electrical Engineering from the Indian Institute of Technology, Madras, India. He holds 22 US patents, has contributed to IEEE standards development and has written numerous articles in technical journals. He is a Fellow of the Indian National Academy of Engineering and a recipient of the VASVIK Award for Industrial Research in 2011.

Documentary film on INAE

At the behest of DST, the Vigyan Prasar had coordinated a series of films made on various institutes of DST including INAE. In this connection, Vigyan Prasar, DST informed INAE regarding release of film on INAE on Wednesday, 26th May 2021 to be watched on India's 24x7 national science channel on the internet, called India Science (www.indiascience.in) . The English and Hindi versions of the film can be viewed by clicking on the links given below:

https://www.indiascience.in/videos/dst-inae-e

https://www.indiascience.in/videos/dst-inae-h

Proposed Document on "Landmark Achievements in Science and Technology in Independent India"

The Government of India has launched a 75-week celebration of India's 75th Year of Independence (*Aazadi ka Amrut Mahotsava*) with a grand celebration on 15th August 2022. In this connection, it has been decided that DST will publish a compendium of most significant scientific and technological achievement of India since independence. For this purpose, the Sectoral Group of Secretaries (SGoS) has been constituted. The Secretary DBT, Chairperson of the Sectoral Group of Secretaries (SGoS) has requested all Science and Engineering Academies of the country including INAE to join hands and produce an encyclopaedia containing all those feats in Science & Technology that make us proud and will inspire future generations since independence. In this regard, the Presidents of INSA, IASc, NASI and INAE had met on April 3, 2021 and committed to help create a volume and a website that would provide a comprehensive view of India's growth and contributions in S&T since independence. Further, it was decided to solicit suggestions (initially only name or item) to propose a list of 75 or 100 landmark innovations (individual or collective) in S&T in India achieved primarily after our independence that eminently merit a mention in the proposed volume so as to select deserving items. Suggestions were invited from Fellows/Conveners.

Subsequently, a meeting was held to consider suggestions received earlier and also to discuss and formalize the methodology to propose a list of 75 or 100 landmark innovations (individual or collective) in S&T in India achieved primarily after our independence that eminently merit a mention in the proposed volume so as to select deserving items. During the said meeting, it has been decided that each Convener of the Sectional Committee may request Fellows affiliated to his/her respective Engineering

Section to seek 10 to 20 topics of such landmark technical achievements since independence. The inputs received are since being collated.

A list of suggested topics received for the proposed Compendium on "Landmark Achievements in Science and Technology in Independent India" were discussed in the Steering Committee during its meeting held on 10th June 2021 to shortlist and finalize 3 to 4 topics from each Engineering Section (a total of about 30-40 such engineering accomplishments) proposed to be submitted to DST for inclusion in the said Compendium.

During discussions, the Steering Committee has recommended that INAE may publish or contribute in two volumes as Compendium (Collection of Eminent Contributions by Individuals or Group) as given below:

Volume A: Jointly with Science, Medical, Agricultural and other National Academies.
Volume B: 75 (Azadi@75) most outstanding engineering feats or marvels in Independent India (one page each) – only by INAE; Not individual contribution or novelty, but major engineering or technological achievement that has made a huge difference, say, an engineering system or product.

Actions are ongoing and committees being constituted to undertake these activities.

Meetings of the Gender Parity Advisory Committee

INAE has been discussing the Gender Parity issue for the past several years but with no tangible solution. For this purpose, a Gender Parity Advisory Committee has been constituted under the Chairmanship of Dr. BN Suresh, Past-President, INAE to deliberate and suggest proactive measures to achieve acceptable level of gender parity in INAE. The composition of the Committee of INAE Fellows is as follows: Dr. BN Suresh, Former President, INAE is the Chairman of the Committee with Dr. Saswasti B Roy, Prof Sushmita Mitra, Dr. VR Lalithambika, Prof. Ligy Philip, Ms Alpa Seth, Prof K Chattopadhyay, and Prof Prem Krishna as Members. Dr BN Suresh had prepared a Base Paper on the issue of Gender Parity in INAE which is summarized as follows. Gender parity subject is being discussed in many forums in India for a long time including the reservation for women in Indian Parliament. INAE has been discussing this issue for the past several years but with no tangible solution. As on date, INAE has only 28 women Fellows out of 871 Fellows in India, which is a meagre 3% of the entire Fellowship. Similarly, the representation of women in Young Associates is also poor. Although we have been pursuing very proactive policy to induct women into Fellowship for the last few years, the results are not all encouraging. It is therefore felt essential that we deliberate in detail and generate suitable recommendations to improve the situation in all these forums of INAE. There is a need for innovative and out-of-box thinking to drive gender parity. No doubt the implementation aspects also possibly demand certain structural changes to improve the nomination and selection processes and create an enabling environment. The recommendations so made should also be actionable and implementable.

The Base Paper on the subject prepared by Dr. BN Suresh was deliberated in the first meeting of said Committee held on 6th May 2021 wherein a number of valuable suggestions/comments emerged. These have been culminated in the form of Draft Recommendations on Gender Parity of INAE. The Draft Recommendation were circulated to the members to seek inputs before further deliberations in the next meeting of the said Committee held on May 22, 2021, so as to consolidate into actionable and implementable recommendations on Gender Parity in INAE. Productive meetings were held, and clear-cut recommendations were crystallized. The final Recommendations were put up for further discussion and approved by Governing Council during its meeting on June 25, 2021 for implementation from this year itself.

Important Meetings held during July 2021

- **Meeting of the Committee regarding proposal for instituting IEEE IC - INAE joint Award held on July 1, 2021 over Webex**
- **Meeting of ISRO-INAE Consultative Committee held July 1, 2021 over Webex**
- **Second Meeting of Sectional Committee – VIII (Mining, Metallurgical and Materials Engineering) held on July 2, 2021 over Webex.**
- **Second Meeting of Sectional Committee-II (Computer Engineering and Information Technology) held on July 2, 2021 over Webex.**
- **Second Meeting of Sectional Committee-I (Civil Engineering) held on July 2, 2021 over Webex.**
- **Second Meeting of Sectional Committee-IX (Energy Engineering) held on July 5, 2021 over Webex.**
- **Second Meeting of Sectional Committee-VI (Electronics and Communication Engineering) held on July 6, 2021 over Webex**
- **Review Meeting of the Search Cum Selection Expert Committee for Abdul Kalam Technology Innovation National Fellowship held on July 6, 2021 over Webex.**
- **Second Meeting of Sectional Committee-IV (Chemical Engineering) held on July 7, 2021 over Webex.**
- **Second Meeting of Sectional Committee-VIII (Aerospace Engineering) held on July 8, 2021 over Webex**
- **Meetings of the Expert Committee on Cyber Security Related Disasters held on July 12, 2021 over Webex**
- **Annual General Meeting (AGM) of Fellows held on July 16, 2021 over Webex**
- **Meeting of INAE Local Chapters held on July 12, 2021 over WebEx**
- **Meeting of CAETS Energy Committee held online on July 13, 2021**
- **Meeting of CAETS Committee on Sustainable Development Goals (SDGs) held online on July 15, 2021**
- **Meeting of the INAE Forum on Civil Infrastructure (HOUSING) held on July 20, 2021 over Webex.**
- **First meeting of INAE Young Innovator & Entrepreneur Award Committee held on July 22, 2021 over WebEx.**
- **Meeting of the "Peer Committee on Technological Preparedness for dealing with National Disruptions" held on July 26, 2021 over Webex.**
- **Meetings of Selection Committee for INAE Young Engineer Award 2021 held on July 30-31, 2021**

Back to Main Page

International/National Conferences/Seminars Being Organized by IITs/Other Institutions

2nd International Conference on Electronics and Sustainable Communication Systems ICESC 2021 online Conference on 4th to 6th August 2021 at Coimbatore, TamilNadu,
https://conferencealerts.com/show-event?id=234983

2nd International Conference on Innovations in Computational Intelligence and Computer Vision (ICICV-2021) online Conference on 5th to 6th August 2021 at Jaipur, Rajasthan
https://conferencealerts.com/show-event?id=232588

International conference on Inventive Computation and Information Technologies ICICIT 2021 online Conference on 12th August to 13th September 2021 at Coimbatore, Tamil Nadu,
https://conferencealerts.com/show-event?id=232283

International Conference on Innovative Data Communication Technologies and Application (ICIDCA 2021) Conference on 20th to 21st August 2021 at Coimbatore, Tamilnadu,
https://conferencealerts.com/show-event?id=231032

The International Conference on Creep, Fatigue and Creep-Fatigue Interaction (CF-8) is being organised by Indira Gandhi Centre for Atomic research, Kalpakkam, India in association with The Indian Institute of Metals Kalpakkam Chapter and Metal Sciences Division of IIM and in collaboration with Japan Society of Mechanical Engineers during August 24-27, 2021.
https://www.cf-8.in

International Conference on Intelligent Data Communication Technologies and Internet of Things (ICICI 2021) online Conference on 27th to 28th August 2021 at Coimbatore, Tamil Nadu,
https://conferencealerts.com/show-event?id=231899

Note: Due to Lockdowns imposed by Government in view of Covid-19, schedule of these conferences may be rechecked.

Back to Main Page

HONOURS AND AWARDS

1	Dr. Tessy Thomas, FNAE, Distinguished Scientist & Director-General, Aeronautical System, Defence Research and Development Organisation (DRDO), Bangalore has been listed as one of the top 35 Most Influential Women Engineers of the world. An article in this regard can be viewed by clicking here….
2	Prof Sanjit K. Mitra, FNAE, Professor Emeritus of Electrical & Computer Engineering, University of California, Santa Barbara, USA has been elected as a Corresponding Member of the Academia Nacional de Engenharia (Brazilian National Academy of Engineering).
3	Prof. K. Bhanu Sankara Rao, FNAE, Pratt & Whitney Chair Professor, at the University of Hyderabad (UoH) received Dr. N. Kondal Rao Memorial Award on July 15th, 2021 from Indian Society for Non-Destructive Testing (ISNT). He was felicitated by Dr. Dasharath Ram, Director Defence Research and Development Laboratory (DRDL), Defence Research and Development Organisation (DRDO); Dr. S.K. Jha, Chairman and Managing Director, MIDHANI and Dr. Jaitheerth Joshi, Project Director, DRDL and Chairman ISNT Hyderabad Chapter, at MIDHANI Auditorium in Hyderabad. On this occasion, Prof K. Bhanu Sankara Rao delivered an illuminating lecture on the "Indigenous Development of Ferritic-Martensitic Steels and Fabrication Technologies for Fusion Reactor (ITER)" which was live telecasted and 400 people listened on-line.

Back to Main Page

NEWS OF FELLOWS

1	Mr AK Anand, FNAE, Director Technical, Microtrol Sterilisation Services Pvt Ltd, Mumbai and Formerly Director (Reactor Projects Group), BARC, Mumbai has contributed a chapter on 'Marine propulsion' for the Encyclopedia of Nuclear Energy to be published by Elsevier publications co-authored by Dr. J. Stephen Herring Director Center for Space Nuclear Research, Idaho. The chapter can be accessed by clicking on the link given below. https://www.sciencedirect.com/science/article/pii/B9780128197257001586#a0010
2	Dr K Kasturirangan, FNAE, Past President, INAE and Chairman, National Education Policy (NEP) – 2020 and Chairman, Karnataka Knowledge Commission; Distinguished Professor Emeritus, National Institute of Advanced Studies (NIAS) and Formerly Chairman, Space Commission and Secretary, Department of Space, Bangalore; Formerly Director, National Institute of Advanced Studies, Bangalore; Formerly Member (Science), Planning Commission, New Delhi and Former Chancellor, JNU, delivered the University Distinguished Lecture on Saturday, 24th July 2021. The title of the talk was "Creating a Vibrant Knowledge Society - An Indian Strategy for 21st Century".

Back to Main Page

INAE ON FACEBOOK AND TWITTER

INAE has created a Facebook and Twitter Account to post the news of recent INAE activities in the Social Media. The same can be viewed at the link below.

(a) Facebook -link https://www.facebook.com/inaehq1

(b) Twitter handle link https://twitter.com/inaehq1

Back to Main Page

OBITUARY

Dr Vijai Mohan Sharma

(January 6, 1939 - July6, 2021)

Dr Vijai Mohan Sharma (VMS), born on 6 January 1939, passed away in Singapore on 6th July 2021, bravely battling for life against his steadily failing health and persistent kidney ailment. He was an outstanding professional, an astute administrator, a well-known author and above all, a decent human being. Rarely can one find a professional of his kind with qualities of excellence, ethics, empathy and care for details, far beyond the standards of routine practice. While pursuing projects in the fields of Geotechnical Engineering, Rock Mechanics, Water Resources, Tunnelling, Field Instrumentation, Slope Stabilization & Numerical Modelling which were his forte, he never lost sight of the fact that, real life problems in Civil Engineering invariably call for sound engineering judgment to deal with the vortex of uncertainties. As far as I could make out during my decades of association with him, asking right questions in a technical discourse was much more important to him than merely indulging in a discourse in the comfort zone of conventional thinking and available design data.

Dr Sharma had an outstanding track record throughout his academic career. He obtained his B. Tech (Hons) in 1961 from the Indian Institute of Technology, Kharagpur; P.G. Diploma (1966) and M.E. degree (1968) from the University of Roorkee and Ph.D. (Rock Mechanics) in 1985, from the Indian Institute of Technology, Delhi. Central Soil and Materials Research Station (CSMRS), New Delhi became his karma-bhumi in the formative period of his career where he rose to the position of its Director. During his six-year-long tenure as Director, he placed CSMRS on the national map by transforming it into a world class laboratory, inter alia, covering fields of Water Resources Engineering, Rock Mechanics and Tunnelling. He worked at the University of Alberta in Canada as a UNDP Fellow. The country benefitted a great deal by his visits to Imperial College of Science and Technology, London; Building Research Establishment Garston; the Institute of Geological Sciences, in the United Kingdom and several other Engineering and Water Resources Development Centres in the Europe and Northern America. He took voluntary retirement from CSMRS and joined the Associated Instrument Manufacturers (India) Limited, (AIMIL), as a Chief Consultant and established Advanced Technology Engineering Services (ATES) in AIMIL. He got closely associated with major hydro-electric projects, tunnels and underground power houses and extended the scope of work to include Numerical Modelling, Reinforced Earth Technology and Non-destructive Testing. The list of his achievements during his 26-year long tenure at ATES(AIMIL) is very long.

The Indian National Academy of Engineering elected Dr Sharma as a Fellow in 1995, in recognition of his meritorious work. The same year, he was elected as the President of the Indian Geotechnical Society. This recognition came to him closely on the heels of his contribution as organizing secretary of Technical Sessions related to the historic 13th International Conference on Soil Mechanics and Foundation Engineering hosted by India in 1994. Earlier, he had served the IGS as its Honorary Secretary for the two consecutive terms during 1977-1981. He was also the Editor of the Journal of IGS during 1978-82. His general report on the underground structures presented at the 17th International Society for Soil Mechanics and Geotechnical Engineering held in 2009 carried a scholarly synthesis of the ideas contained in as many as 24 papers covering fields of Geotechnical Investigations and Seismic Analysis, Numerical Modelling and 3D simulation and use of field measurements for predictions, received from 17 countries. He was invited by the IGS to deliver the prestigious IGS annual lecture in

2010.He also served as a Chairman of the Indian National Committee on Rock Mechanics and Tunnelling Technology; Chairman of the Indian National Committee on Construction Materials and Structures, and as a Delegate for RILEM for the period 1992-1997. Bureau of Indian Standards appointed him as the Chair of two of its Sectional Committees, CED-6 and RVD-8.

Dr VM Sharma published about 250 papers and edited 10 books covering fields of Rock Mechanics, In-situ Characterization of Soils, Modelling in Geomechanics, Dams-Accidents and Incidents, and Instrumentation in Geotechnical Engineering. He served on the Editorial board of several prestigious technical journals, including Materials and Structures of RILEM. Numerous awards won by him include the 'Gopal Ranjan' Award of the IIT, Roorkee for outstanding contribution in Rock Mechanics; and the Kueckelmann Award of the Indian Geotechnical Society for his outstanding Contribution to Geotechnical Engineering.

Of the various recollections of my intimate personal engagement with Dr Sharma over the period of last four decades, a few things stand out as exemplary and highly inspirational. On my request made in early 2019, despite his failing health, he agreed to join the Indian Roads Congress (IRC) Technical Committee on Disaster Mitigation. Both of us decided to co-author a Monograph on Criteria governing Selection of Technologies for Slope Stabilization and Landslide Hazard Mitigation. He proposed its first draft on the 26 January 2019 in two parts and formally presented the same at the IRC meeting held on 30 January 2019. The revision 1 was informally discussed between us in his office in the AIMIL campus on 20 July 2019. He further worked on it overtime to ensure that the updated version of the monograph gets ready by 22 July 2019 well in time for circulation to the members of the IRC committee. Later, he personally presented the revision 2 at the IRC meeting held on 29 July 2019. As the work developed, despite bi-weekly dialysis and enormous physical challenge, he never missed even a single meeting. Even after the monograph increased in its scope to be discussed again, without the slightest reaction, he wrote the following email to Shri Sanjay Nirmal, Secretary General of IRC on 3rd February 2020:

" Even though it is difficult for me to haul myself up to reach the first floor level which is the venue of the meeting, I will attend. In the absence of lift, I will need physical help, which I will bring with me. However, I understand it would be difficult to change the venue, and therefore I will try to reach the venue in time. I will, in any case, send the revised write-up before the meeting".

The above message received from him reflected his deep commitment to the job. Indeed, he not only attended the IRC meeting on 21st February 2020, but also participated intensively in the ensuing discussion. Unfortunately, Covid-19 impeded the progress and now when he is no more, the draft monograph remains as an item on the unfinished agenda for the IRC.

Dr Sharma never failed to express his gratitude to acknowledge those associated with him. I recall him approaching me in the year 2000 for an article for the H.C. Verma (HCV) Commemorative Volume on Instrumentation in Geotechnical Engineering of which he was a joint editor with K.R Saxena, the then Director, Research and Development at Central Board of Irrigation and Power. His spirit of gratitude for HCV was so intense and disarming that all whom he had approached contributed state of the art papers for the commemorative volume which carry a Foreword from Professor M.G.K. Menon, Dr Vikram Sarabhai Distinguished Professor of the Department of Space.

For those who are born, death is certain but people like Dr VM Sharma continue to live in our hearts. I thank God for the privilege to work with him. May his soul rest in peace.

R.K. Bhandari
A close friend of Dr V.M. Sharma

May God Bless his Soul to Rest in Peace

Back to Main Page

ENGINEERING AND TECHNOLOGY UPDATES

Civil Engineering

1. Kaleshwaram Lift Irrigation Project

The Kaleshwaram Lift Irrigation Project or KLIP is a multi-purpose irrigation project on the Godavari River in Kaleshwaram, Bhupalpally, Telangana. Currently the world's largest multi-stage lift irrigation project, its farthest upstream influence is at the confluence of the Pranhita and Godavari rivers. The Pranahita River is itself a confluence of various smaller tributaries including the Wardha, Painganga, and Wainganga rivers which combine to form the seventh-largest drainage basin on the subcontinent, with an estimated annual discharge of more than 6,427,900 acre feet (7,930 cubic hectometres) or 280 TMC. It remains untapped as its course is principally through dense forests and other ecologically sensitive zones such as wildlife sanctuaries. The Kaleshwaram Lift Irrigation Project is divided into 7 links and 28 packages spanning a distance of approximately 500 km (310 mi) through 13 districts and utilizing a canal network of more than 1,800 km (1,100 mi). The project aims to produce a total of 240 TMC (195 from Medigadda Barrage, 20 from Sripada Yellampalli project and 25 from groundwater), of which 169 has been allocated for irrigation, 30 for Hyderabad municipal water, 16 for miscellaneous industrial uses and 10 for drinking water in nearby villages, with the remainder being estimated evaporation loss. The project aims at increasing total culturable command area (the sustainable area which can be irrigated after accounting for both upstream and downstream factors) by 1,825,000 acre·ft (2,251 hm3) across all 13 districts in addition to stabilizing the existing CCA. On 21 June 2019, the project was opened by Telangana governor Narasimhan and chief ministers K. Chandrashekar Rao (Telangana), Fadnavis (Maharashtra) and Y.S. Jaganmohan Reddy (Andhra Pradesh). Four major pumping facilities manage the project's outflow, the largest at Ramadugu (Medaram, Annaram and Sundilla being the others) is also likely to be the largest in Asia once consistent measurements are available, requiring seven 140 MWh (500 GJ) pumps designed and manufactured specifically for the project by the BHEL.

To view a video on the project, click on the link given below:

https://www.dropbox.com/s/0adjb0yj7ex3zv5/WhatsApp%20Video%202021-08-03%20at%203.48.46%20PM.mp4?dl=0

Source https://bhoopalapally.telangana.gov.in/tourist-place/kaleshwaram-lift-irrigation-project

Computer Engineering and Information Technology

1. MaxDIA: Taking proteomics to the next level

Proteomics produces enormous amounts of data, which can be very complex to analyze and interpret. The free software platform MaxQuant has proven to be invaluable for data analysis of shotgun proteomics over the past decade. Now, Jürgen Cox, group leader at the Max Planck Institute of Biochemistry, and his team present the new version 2.0. It provides an improved computational workflow for data-independent acquisition (DIA) proteomics, called MaxDIA. MaxDIA includes library-based and library-free DIA proteomics and permits highly sensitive and accurate data analysis. Uniting data-dependent and data-independent acquisition into one world, MaxQuant 2.0 is a big step towards improving applications for personalized medicine. Proteins are essential for our cells to function, yet many questions about their synthesis, abundance, functions, and defects still remain unanswered. High-throughput techniques can help improve our understanding of these molecules. For analysis by liquid chromatography followed by mass spectrometry (MS), proteins are broken down into smaller peptides, in a process referred to as "shotgun proteomics." The mass-to-charge ratio of these peptides is subsequently determined with a mass spectrometer, resulting in MS spectra. From these spectra, information about the identity of the analyzed proteins can be reconstructed. However, the enormous amount and complexity of data make data analysis and interpretation challenging. Two main methods are used in shotgun proteomics: Data-dependent acquisition (DDA) and data-independent acquisition (DIA). In DDA, the most abundant peptides of a sample are preselected for fragmentation and measurement. This allows to reconstruct the sequences of these few preselected peptides, making analysis simpler and faster. However, this method induces a bias towards highly abundant peptides. DIA, in contrast, is more robust and sensitive. All peptides from a certain mass range are fragmented and measured at once, without preselection by abundance. As a result, this method generates large amounts of data, and the complexity of the obtained information increases considerably. Up to now, identification of the original proteins was only possible by matching the newly measured spectra against spectra in libraries that comprise previously measured spectra. Jürgen Cox and his team have now developed a software that provides a complete computational workflow for DIA data. It allows, for the first time, to apply algorithms to DDA and DIA data in the same way. Consequently, studies based on either DDA or DIA will now become more easily comparable. MaxDIA analyzes proteomics data with and without spectral libraries. Using machine learning, the software predicts peptide fragmentation and spectral intensities. Hence, it creates precise MS spectral libraries in silico. In this way, MaxDIA includes a library-free discovery mode with reliable control of false positive protein identifications. Furthermore, the software supports new technologies such as bootstrap DIA, BoxCar DIA and trapped ion mobility spectrometry DIA. What are the next steps? The team is already working on further improving the software. Several extensions are being developed, for instance for improving the analysis of posttranslational modifications and identification of cross-linked peptides. MaxDIA is a free software available to scientists all over the world. It is embedded in the established software environment MaxQuant. "We would like to make proteomics data analysis accessible to all researchers," says Pavel Sinitcyn, first author of the paper that introduces MaxDIA. Thus, at the MaxQuant summer school, Cox and his team offer hands-on training in this software for all interested researchers. They thereby help bridging the gap between wet lab work and complex data analysis. Sinitcyn states that the aim is to "bring mass spectrometry from the Max Planck Institute of Biochemistry to the clinics." Instead of measuring only a few proteins, thousands of proteins can now be measured and analyzed. This opens up new possibilities for medical applications, especially in the field of personalized medicine.

Source https://www.sciencedaily.com/releases/2021/07/210712122222.htm

Mechanical Engineering

2. Lean and mean: Building a multifunctional pressure sensor with 3D printing technology”

The treatment of many medical issues like abnormal gait and muscular disorders require an accurate sensing of applied pressure. In this regard, flexible pressure sensors that are simple, lightweight, and low-cost, have garnered considerable attention. These sensors are designed and manufactured through "additive manufacturing," or what is more commonly called "3D printing," using conductive polymer composites as their building blocks. However, all 3D-printed pressure sensors developed so far are limited to sensing applied forces along a single direction only. This is hardly enough for real world applications, which involve situations where forces can be applied along various angles and directions. Moreover, the electrical resistance of most conductive polymers varies with temperature and must be compensated for accurate pressure sensing. In a study a group of scientists led by Prof. Hoe Joon Kim from Daegu Gyeongbuk Institute of Science and Technology, South Korea, have addressed this issue with a newly designed multi-axis pressure sensor coupled with a temperature-sensing component that overcomes the limitations of conventional sensors. "Our multi-axis pressure sensor successfully captures the readings even when tilted forces are applied. Moreover, the temperature-sensing component can calibrate the resistance shift with temperature changes. In addition, the scalable and low-cost fabrication process is fully compatible with commercial 3D printers," explains Prof. Kim. Scientists first prepared the printable conductive polymer using multi-walled carbon nanotubes (MWCNTs) and polylactic acid (PLA). Next, they built the sensor body with a commercial elastomer and sensing material with MWCNTs/PLA composite filament using 3D printing. The sensor is based on a bumper structure with a hollow trough beneath and employs three pressure-sensing elements for multi-axis pressure detection and a temperature-sensing element for calibration of resistance. The sensor could successfully calibrate both the magnitude and direction of the applied force by evaluating the response of each pressure-sensing element. This bumper structure, when installed in a 3D-printed flip-flop and a hand gripper, enabled clear distinction between distinct human motions and gripping actions. The scientists are thrilled about the future prospects of their 3D-printed sensor. "The proposed 3D printing technology has a wide range of applications in energy, biomedicine, and manufacturing. With the incorporation of the proposed sensing elements in robotic grippers and tactile sensors, the detection of multi-directional forces along with temperature could be achieved, heralding the onset of a new age in robotics," comments an excited Prof. Kim.

Indeed, those are some interesting consequences to look forward to!.

Source https://www.sciencedaily.com/releases/2021/07/210714110606.htm

Chemical Engineering

4. New electronic paper displays brilliant colors

Imagine sitting out in the sun, reading a digital screen as thin as paper, but seeing the same image quality as if you were indoors. Thanks to research from Chalmers University of Technology, Sweden, it could soon be a reality. A new type of reflective screen -- sometimes described as 'electronic paper' -- offers optimal colour display, while using ambient light to keep energy consumption to a minimum.

Traditional digital screens use a backlight to illuminate the text or images displayed upon them. This is fine indoors, but we've all experienced the difficulties of viewing such screens in bright sunshine. Reflective screens, however, attempt to use the ambient light, mimicking the way our eyes respond to natural paper. "For reflective screens to compete with the energy-intensive digital screens that we use today, images and colours must be reproduced with the same high quality. That will be the real breakthrough. Our research now shows how the technology can be optimised, making it attractive for commercial use," says Marika Gugole, Doctoral Student at the Department of Chemistry and Chemical Engineering at Chalmers University of Technology. The researchers had already previously succeeded in developing an ultra-thin, flexible material that reproduces all the colours an LED screen can display, while requiring only a tenth of the energy that a standard tablet consumes. But in the earlier design the colours on the reflective screen did not display with optimal quality. Now the new study takes the material one step further. Using a previously researched, porous and nanostructured material, containing tungsten trioxide, gold and platinum, they tried a new tactic -- inverting the design in such a way as to allow the colours to appear much more accurately on the screen. The inversion of the design represents a great step forward. They placed the component which makes the material electrically conductive underneath the pixelated nanostructure that reproduces the colours -- instead of above it, as was previously the case. This new design means you look directly at the pixelated surface, therefore seeing the colours much more clearly. In addition to the minimal energy consumption, reflective screens have other advantages. For example, they are much less tiring for the eyes compared to looking at a regular screen. To make these reflective screens, certain rare metals are required -- such as the gold and platinum -- but because the final product is so thin, the amounts needed are very small. The researchers have high hopes that eventually, it will be possible to significantly reduce the quantities needed for production. "Our main goal when developing these reflective screens, or 'electronic paper' as it is sometimes termed, is to find sustainable, energy-saving solutions. And in this case, energy consumption is almost zero because we simply use the ambient light of the surroundings," explains research leader Andreas Dahlin, Professor at the Department of Chemistry and Chemical Engineering at Chalmers. Reflective screens are already available in some tablets today, but they only display the colours black and white well, which limits their use. "A large industrial player with the right technical competence could, in principle, start developing a product with the new technology within a couple of months," says Andreas Dahlin, who envisions a number of further applications. In addition to smart phones and tablets, it could also be useful for outdoor advertising, offering energy and resource savings compared with both printed posters or moving digital screen.

Source https://www.sciencedaily.com/releases/2021/07/210712092227.htm

Electrical Engineering

5. Ultrathin semiconductors electrically connected to superconductors

For the first time, University of Basel researchers have equipped an ultrathin semiconductor with superconducting contacts. These extremely thin materials with novel electronic and optical properties could pave the way for previously unimagined applications. Combined with superconductors, they are expected to give rise to new quantum phenomena and find use in quantum technology. Whether in smartphones, televisions or building technology, semiconductors play a central role in electronics and therefore in our everyday lives. In contrast to metals, it is possible to adjust their electrical conductivity by applying a voltage and hence to switch the current flow on and off. With a view to future applications in electronics and quantum technology, researchers are focusing on the development of new components that consist of a single layer (monolayer) of a semiconducting material. Some naturally occurring materials with semiconducting properties feature monolayers of this kind, stacked to form a three-dimensional crystal. In the laboratory, researchers can separate these layers -- which are no thicker than a single molecule -- and use them to build electronic components. These ultrathin semiconductors promise to deliver unique characteristics that are otherwise very difficult to control, such as the use of electric fields to influence the magnetic moments of the electrons. In addition, complex quantum mechanical phenomena take place in these semiconducting monolayers that may have applications in quantum technology. Scientists worldwide are investigating how these thin semiconductors can be stacked to form new synthetic materials, known as van der Waals heterostructures. However, until now, they have not succeeded in combining such a monolayer with superconducting contacts in order to dig deeper into the properties and peculiarities of the new materials. A team of physicists, led by Dr. Andreas Baumgartner in the research group of Professor Christian Schönenberger at the Swiss Nanoscience Institute and the Department of Physics of the University of Basel, has now fitted a monolayer of the semiconductor molybdenum disulfide with superconducting contacts for the first time. The reason why this combination of semiconductor and superconductor is so interesting is that the experts expect components of this kind to exhibit new properties and physical phenomena. "In a superconductor, the electrons arrange themselves into pairs, like partners in a dance -- with weird and wonderful consequences, such as the flow of the electrical current without a resistance," explains Baumgartner, the project manager of the study. "In the semiconductor molybdenum disulfide, on the other hand, the electrons perform a completely different dance, a strange solo routine that also incorporates their magnetic moments. Now we would like to find out which new and exotic dances the electrons agree upon if we combine these materials."The electrical measurements at the low temperatures required for superconductivity -- just above absolute zero (-273.15°C) -- show clearly the effects caused by the superconductor; for example, at certain energies, single electrons are no longer allowed. Moreover, the researchers found indications of a strong coupling between the semiconductor layer and the superconductor. "Strong coupling is a key element in the new and exciting physical phenomena that we expect to see in such van der Waals heterostructures, but were never able to demonstrate," says Mehdi Ramezani, lead author of the study. The fabrication of the new component in a type of sandwich made of different materials requires a large number of different steps. In each step, it is important to avoid contaminations, as they seriously impair the transport of electrical charges. To protect the semiconductor, the researchers pack a monolayer of molybdenum disulfide between two thin layers of boron nitride, through which they have previously etched the contacts vertically using electron-beam lithography and ion etching. They then deposit a thin layer of molybdenum rhenium as a contact material -- a material that retains its superconducting properties even in the presence of strong magnetic fields. Working under a protective nitrogen atmosphere in a glove box, the researchers stack the boron nitride layer onto the molybdenum disulfide layer and combine the underside with a further layer of boron nitride as well as a layer of graphene for electrical control. The researchers then place this elaborate van der Waals heterostructure on top of a silicon/silicon-dioxide wafer.

Source https://www.sciencedaily.com/releases/2021/07/210706153031.htm

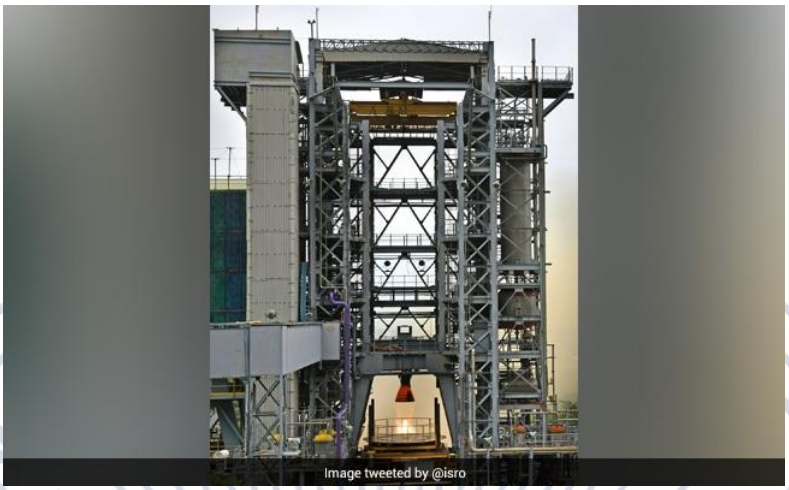
6. Novel heat-management material keeps computers running cool

UCLA engineers have demonstrated successful integration of a novel semiconductor material into high-power computer chips to reduce heat on processors and improve their performance. The advance greatly increases energy efficiency in computers and enables heat removal beyond the best thermal-management devices currently available. The research was led by Yongjie Hu, an associate professor of mechanical and aerospace engineering at the UCLA Samueli School of Engineering. Computer processors have shrunk down to nanometer scales over the years, with billions of transistors sitting on a single computer chip. While the increased number of transistors helps make computers faster and more powerful, it also generates more hot spots in a highly condensed space. Without an efficient way to dissipate heat during operation, computer processors slow down and result in unreliable and inefficient computing. In addition, the highly concentrated heat and soaring temperatures on computer chips require extra energy to prevent processers from overheating. In order to solve the problem, Hu and his team had pioneered the development of a new ultrahigh thermal-management material in 2018. The researchers developed defect-free boron arsenide in their lab and found it to be much more effective in drawing and dissipating heat than other known metal or semiconductor materials such as diamond and silicon carbide. Now, for the first time, the team has successfully demonstrated the material's effectiveness by integrating it into high-power devices. In their experiments, the researchers used computer chips with state-of-the-art, wide bandgap transistors made of gallium nitride called high-electron-mobility transistors (HEMTs). When running the processors at near maximum capacity, chips that used boron arsenide as a heat spreader showed a maximum heat increase from room temperatures to nearly 188 degrees Fahrenheit. This is significantly lower than chips using diamond to spread heat, with temperatures rising to approximately 278 degrees Fahrenheit, or the ones with silicon carbide showing a heat increase to about 332 degrees Fahrenheit."These results clearly show that boron-arsenide devices can sustain much higher operation power than processors using traditional thermal-management materials," Hu said. "And our experiments were done under conditions where most current technologies would fail. This development represents a new benchmark performance and shows great potential for applications in high-power electronics and future electronics packaging." According to Hu, boron arsenide is ideal for heat management because it not only exhibits excellent thermal conductivity but also displays low heat-transport resistance. "When heat crosses a boundary from one material to another, there's typically some slowdown to get into the next material," Hu said. "The key feature in our boron arsenide material is its very low thermal- boundary resistance. This is sort of like if the heat just needs to step over a curb, versus jumping a hurdle." The team has also developed boron phosphide as another excellent heat-spreader candidate. During their experiments, the researchers first illustrated the way to build a semiconductor structure using boron arsenide and then integrated the material into a HEMT-chip design. The successful demonstration opens up a path for industry adoption of the technology.

Source https://www.sciencedaily.com/releases/2021/06/210629191730.htm

Aerospace Engineering

7. ISRO Holds Hot Test of Liquid Propellant Vikas Engine For "Gaganyaan"



The Indian Space Research Organisation (ISRO) recently successfully conducted the third long-duration hot test of the liquid propellant Vikas engine for the Gaganyaan programme, the country's first manned mission to space. The test was done for the core L110 liquid stage of the human rated GSLV MkIII vehicle, as part of the engine qualification requirements for the Gaganyaan programme, the space agency said in a statement. The engine was fired for 240 seconds at the test facility of ISRO Propulsion Complex (IPRC), Mahendragiri, Tamil Nadu, said the statement. The performance of the engine met the test objectives and the engine parameters were closely matching with the predictions during the entire duration of the test, it said. The objective of the Gaganyaan programme is to demonstrate the capability to send humans to low earth orbit onboard an Indian launch vehicle and bring them back to earth. Four Indian astronaut-candidates have already undergone generic space flight training. ISRO's heavy-lift launcher GSLV Mk III has been identified for the mission. The initial target was to launch the human spaceflight before the 75th anniversary of India's independence on August 15, 2022. ISRO is also taking the help of French, Russian and US space agencies in some of the crucial activities and supply of components, sources said.

Source https://www.ndtv.com/india-news/isro-successfully-conducts-3rd-vikas-engine-long-duration-hot-test-for-gaganyaan-program-2486711

Mining, Metallurgical and Materials Engineering

8. Made in Hyderabad alloy for Gaganyaan crew space

A special titanium alloy has been developed by Hyderabad-based Midhani, a defence PSU, which will play a crucial role in ensuring safety of Gaganyaan crew. Gaganyaan, India's human space flight mission, could propel India to the centre of human space exploration. 'Crew escape systems' is one of the new technologies required for ISRO's Gaganyaan manned space mission and the crew will operate from a honeycomb-like structure which will be their home in the spacecraft. In simple words, the material to build this 'home' is ready and has been supplied to ISRO by Midhani. Titanium-31 was developed at Midhani particularly to meet this need. The alloy will make it possible for the astronauts to escape to safety in any eventuality. "The material would otherwise have to be imported, but we developed it here. We have tested it to perfection and made a supply to ISRO," Sanjay Kumar Jha, chairman and managing director of Midhani, told TOI.

Source https://timesofindia.indiatimes.com/city/hyderabad/made-in-hyderabad-alloy-for-gaganyaan-crew-space/articleshowprint/84911822.cms

9. Recycling next-generation solar panels fosters green planet

Tossing worn-out solar panels into landfills may soon become electronics waste history. By designing a recycling strategy for a new, forthcoming generation of photovoltaic solar cells -- made from metal halide perovskites, a family of crystalline materials with structures like the natural mineral calcium titanate -- will add a stronger dose of environmental friendliness to a green industry, according to Cornell-led research. The paper shows substantial benefits to recycling perovskite solar panels, though they are still in the commercial development stage, said Fengqi You, the Roxanne E. and Michael J. Zak Professor in Energy Systems Engineering in the College of Engineering. "When perovskite solar panels reach the end of their useful life, how do we deal with this kind of electronic waste?" said You, also a faculty fellow at the Cornell Atkinson Center for Sustainability. "It is a new class of materials. By properly recycling it, we could potentially reduce its already low carbon footprint. "As scientists design solar cells, they look at performance," You said. "They seek to know energy conversion efficiency and stability, and often neglect designing for recycling." Last year, You and his laboratory found that photovoltaic wafers in solar panels containing all-perovskite structures outperform photovoltaic cells made from state-of-the-art crystalline silicon, and the perovskite-silicon tandem -- with cells stacked like pancakes to better absorb light -- perform exceptionally well. Perovskite photovoltaic wafers offer a faster return on the initial energy investment than silicon-based solar panels because all-perovskite solar cells consume less energy in the manufacturing process. Recycling them enhances their sustainability, as the recycled perovskite solar cells could bring 72.6% lower primary energy consumption and a 71.2% reduction in carbon footprint, according to the paper, "Life Cycle Assessment of Recycling Strategies for Perovskite Photovoltaic Modules," co-authored by Xueyu Tian, a doctoral student at Cornell Systems Engineering, and Samuel D. Stranks of the University of Cambridge. "Lowering the energy needed to produce the cells indicates a significant reduction of energy payback and greenhouse gas emissions," said Tian. The best recycled perovskite cell architecture could see an energy payback time of about one month, with a carbon footprint as low as 13.4 grams of carbon dioxide equivalent output per kilowatt hour of electricity produced. Without recycling, the energy payback time and carbon footprint of new perovskite solar cells show a range of 70 days to 13 months, and 27.5 to 158.0 grams of carbon dioxide equivalent throughout their life cycles. Today's market-leading silicon photovoltaic cells can expect an energy payback period of 1.3 to 2.4 years, with an initial carbon footprint between 22.1 and 38.1 grams of carbon dioxide equivalent emissions per kilowatt hour output. "Recycling makes perovskites outcompete all other rivals," Tian said.

Source https://www.sciencedaily.com/releases/2021/06/210624170843.htm

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Interdisciplinary and Special Engineering Fields and Leadership in Academia, R&D and Industry

10. Advanced care: Smart wound dressings with built-in healing sensors

Researchers have developed smart wound dressings with built-in nanosensors that glow to alert patients when a wound is not healing properly. The multifunctional, antimicrobial dressings feature fluorescent sensors that glow brightly under UV light if infection starts to set in and can be used to monitor healing progress. The smart dressings, developed by a team of scientists and engineers at RMIT University in Melbourne, Australia, harness the powerful antibacterial and antifungal properties of magnesium hydroxide. They are cheaper to produce than silver-based dressings but equally as effective in fighting bacteria and fungi, with their antimicrobial power lasting up to a week. Project leader Dr Vi Khanh Truong said the development of cost-effective antimicrobial dressings with built-in healing sensors would be a significant advance in wound care. "Currently the only way to check the progress of wounds is by removing bandage dressings, which is both painful and risky, giving pathogens the chance to attack," said Truong, a Vice-Chancellor's Postdoctoral Fellow at RMIT. "The smart dressings we've developed not only fight bacteria and reduce inflammation to help promote healing, they also have glowing sensors to track and monitor for infection. "Being able to easily see if something is going wrong would reduce the need for frequent dressing changes and help to keep wounds better protected. "With further research, we hope our multifunctional dressings could become part of a new generation of low-cost, magnesium-based technologies for advanced wound care." The global advanced wound dressing market is expected to grow with demand fueled by technological innovations, increasing numbers of surgical procedures, and the rising prevalence of chronic wounds and chronic diseases such as diabetes and cancer. Though magnesium is known to be antimicrobial, anti-inflammatory and highly biocompatible, there has been little practical research on how it could be used on medically-relevant surfaces like dressings and bandages. The new study is the first to develop fluorescent magnesium hydroxide nanosheets that could contour to the curves of bandage fibres. The research team synthesised the nanosheets -- which are 10,000 to 100,000 times thinner than a human hair -- and embedded them onto nanofibres. The magnesium hydroxide nanosheets respond to changes in pH, which makes them ideal for use as sensors to track healing. Healthy skin is naturally slightly acidic while infected wounds are moderately alkaline. Under UV light, the nanosheets glow brightly in alkaline environments and fade in acidic conditions, indicating the different pH levels that mark the stages of wound healing. The nanosheets are easily integrated onto any biocompatible nanofibre, which means they can then be deposited onto standard cotton bandages. Laboratory tests showed the magnesium hydroxide nanosheets were non-toxic to human cells, while destroying emerging pathogens like drug-resistant golden staph and Candida auris. Truong said the process to make the fluorescent nanosheets was simple to scale for potential mass production." Normally, antimicrobial wound dressings start to lose their performance after a few days, but our studies show these new dressings could last up to seven days," he said. "And because magnesium is so abundant compared to silver, our advanced dressings could be up to 20 times cheaper." The research team is keen to collaborate with clinicians to further progress the technology, through pre-clinical and clinical trials.

Source https://www.sciencedaily.com/releases/2021/06/210628123012.htm

Back to Main Page

ENGINEERING INNOVATION IN INDIA

1. MIDHANI's new plants to make bulletproof vests, armoured vehicles

Mishra Dhatu Nigam Limited (MIDHANI), the specialised metals and metal alloys manufacturing public sector undertaking under Ministry of Defence, is getting ready to fully commission two new production facilities, including the ₹550-crore special steel, titanium and nickel alloy sheet and plate-making plant at Kanchanbagh, Hyderabad. In the second ₹60-crore plant at Rohtak (Haryana), it will be making a maiden foray into making bullet-proof vests and armoured personal vehicles for the armed forces, disclosed chairman and managing director Dr S.K. Jha on Friday."Both facilities will be commissioned in the next few months. In fact, even as the Rohtak plant is under construction, we have delivered about 20 armoured vehicles for BSF on an urgent request in view of the face-off at the China border," he said, in an exclusive interaction.

The PSU is assuring armour bullet-proof plating or even mine-proof without affecting the overall vehicle performance for any chassis sourced by the end user with capacity to make up to 25-30 vehicles a year. After scouting for a technology partner in vain, it has taken the support of Bhabha Atomic Research Centre (BARC) for bullet-proof vests to make 30,000 units annually, to be scaled to 50,000 units.

"Demand is for one lakh bullet-proof vests in the country. Though in defence area, this is a complete diversification. We are going to harp on good quality and reliability to the end user," said Dr. Jha, who took charge last May. It was able to meet COVID pandemic challenges ensuring there was no slack in production, in commissioning 'unique' projects to meet the needs of strategic sectors like defence, aerospace and nuclear power even while strengthening indigenous efforts as part of 'Atmanirbhar' policy.Last year's lockdown did cause some loss and decline in sales in the first quarter but the period also enabled the personnel to come up with innovative solutions towards production of high-grade alloys and composite material. Vaccination for entire staff and safety protocols are in place, he said.

MIDHANI has supplied steel and cobalt alloy material to ISRO human flight 'Gaganyan' mission, titanium alloy metal for HAL-AMCA (Advanced Multi-Combat Aircraft) and light weight nickel-titanium engine for the unmanned aerial vehicles engine in collaboration with DRDO.Other 'novel' works were in production of indigenous RHA steel used for missiles development replacing expensive imported substitute, special impeller blades for uranium mining replacing German-made with the first assembly set to be tried out at Kadapa mines and steam generators, earlier imported from Europe, for new nuclear plants in association with NFC for BHEL.New defence procurement policy with mandatory clause of sourcing for special metals from within the country augers well for the firm. MIDHANI is aiming to double turnover of current ₹800 crore within the next five years with 15-20% growth, even as the third greenfield project of developing composite material with HAL (Tumkur near Bengaluru), could take off with detailed project report under preparation, added the CMD.

Source https://www.thehindu.com/news/cities/Hyderabad/midhanis-new-plants-to-make-bulletproof-vests-armoured-vehicles/article35635186.ece

2. DRDO develops high strength titanium alloy for aerospace forgings

Landing gear drop link was first component forged successfully by ADA at HAL, Bengaluru

The Defence Research and Development Organisation (DRDO) has recently developed a high strength titanium alloy on industrial scale for applications in aerospace structural forgings. "The high strength beta titanium alloys are unique due to their higher strength, ductility, fatigue, and fracture toughness – making them increasingly attractive for aircraft structural applications," a DRDO statement said. Further, their relatively lower lifetime cost, owing to superior corrosion resistance in comparison to steels, was an effective trade-off to justify the use of this expensive material in India too, it stated. The Aeronautical Development Agency (ADA) had identified over 15 steel components that may be replaced by the alloy forgings in the near future with a potential of 40% weight savings. "Some of the components which may be forged from this alloy include slat and flap tracks, landing gear and drop link in landing gear – among several others," the DRDO said. The high strength metastable beta titanium alloy, Ti-10V-2Fe-3Al, containing Vanadium, Iron and Aluminium, was developed by the Defence Metallurgical Research Laboratory (DMRL). These alloys were being used by many developed nations in recent times as a beneficial substitute for the relatively heavier traditional structural steels to achieve weight savings, the statement said. The landing gear drop link was the first component forged successfully by the ADA at HAL, Bengaluru, with the DMRL's involvement and duly certified for airworthiness. The excellent forgeability of high strength-to-weight ratio Ti-10V-2Fe-3Al alloy facilitated the manufacture of intricately configured components for aerospace applications with potential for significant weight savings, the statement added.

Source https://www.thehindu.com/news/national/drdo-develops-high-strength-titanium-alloy-for-aerospace-forgings/article35421043.ece

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3. Hyperloop pod developed at IIT-Madras to compete at European competition

Imagine being encapsulated in a bus-sized pod, traveling at speeds in excess of 1000kmph, in a vacuum tube that connects two cities. Popularly known as Hyperloop, this concept is touted as the probable fifth-mode of transport in the modern world. This concept was proposed by American billionaire and techpreneur Elon Musk, back in 2013. Since then, teams of engineers and governments from across the globe have been exploring ideas and working on prototypes that attempt to bring this futuristic concept closer to reality. Among them is a 40-member team, Avishkar, from the Indian Institute of Technology Madras (IIT-M). Building upon the lessons they learnt from competing and earning a spot in the top 21 at the SpaceX Hyperloop Pod Competition 2019, the team had been making modifications to their prototype. Enter 2020 and COVID-19 disrupted both their academics and work on the Pod Prototype. As classes gradually resumed via the virtual mode, their work on the pod also took the same route. According to the team, design, 3D modeling, simulation and software programming were all done while the students were in their respective cities, owing to the lockdown. After returning to campus, they barely had three and a half months to work on the manufacturing and fabrication process. When queried on the major modifications that find place in the latest prototype, "Our 2019 vehicle was a simple-model and was similar to a basic Electric vehicle. We tweaked and modified all the eight subsystems on it. The most significant changes have been made in the propulsion and braking systems of the pod. We installed more battery packs on this one, plus also developed our own DC-AC inverter" Neel Balar of team Avishkar told Zee Media. Regarding the percentage of components that were purchased and indigenous, the students said that it was 30 and 70 percent respectively. "Battery pack had to be purchased and we used them with an improved packaging and configuration. Dampers, semi-active suspension, microcontrollers had to be purchased off the shelf, but nearly 70percent of the pod was indigenously developed" added Bharat Bhavsar, a student of the Aerospace department, who is part of the team. The team competed at the European Hyperloop Week, that was held between 19th and 25th July. Owing to travel restrictions, the Indian team participated virtually. The week-long event was said to comprise of many technical rounds. A large part of it had teams presenting the capabilities and components used in their vehicles and the engineering reasons behind it. Following that, the test videos of the teams were evaluated for performance and various other facets. Unlike the real-world hyperloop, this competition is different. It's not all about breakneck speed, but the pods will be judged on their superior technology, scalability, and innovation. It is for this reason that the team has readied a 60meter long test track at the institute. Besides the pod, team Avishkar is also working on the design of the hyperloop infrastructure. According to Kishan Thakkar, Team Avishkar Lead, they are conducting research on reducing the cost of construction of the tubes and pylons that take up nearly 70 per cent of the Hyperloop corridor budget. Their efforts also include adapting this technology for Indian use.

Source https://zeenews.india.com/india/hyperloop-pod-developed-at-iit-madras-to-compete-at-european-competition-2376985.html

Back to Main Page