

Department: ME
Date: 04th to 08th October, 2021

One Week FDP On "NEW AGE MATERIALS AND TECHNOLOGIES"

4th – 8th October, 2021

Organizing Department : MECHANICAL ENGINEERING,
SREE VIDYANIKETHAN ENGINEERING COLLEGE,
(AUTONOMOUS)
Sree Sainath Nagar, Tirupati 517102, Chittoor Dist., AP

Objectives of the Programme:

In today's new age materials have been evolved from their respective conventional base material properties to an astonishing extent, enabling the steady march toward faster, smaller, lighter products with more and more functionality can continue within existing framework. Worldwide use of new age materials is expanding so rapidly. To maintain and improve our global standard of material processing, we need to step beyond the conventional methodologies, and to do this we need new age technologies. The objectives are as listed below.

- To introduce advanced structural & functional materials and technology for energy, environment & health sectors and so on.
- To unfold the recent advancements, leading-edge developments and trends in engineering materials and respective technologies.
- To provide insight about the breakthrough research works accomplished worldwide and core and advanced research works from the manufacturing area.

Outcomes of the Programme:

- ❖ To help faculty members gain knowledge on recent innovations and applications in the areas of advanced materials.
- ❖ To understand novel issues and breakthroughs in the field of Advanced Materials and Technology for engineering applications.
- ❖ To get awareness on materials research innovations covering all areas of research with a special emphasize on synthesis, processing, and properties from the nano-scale to the macro-scale.

Day 1 (4th Oct 2021)

Topic : New age technologies for processing high strength alloys

Resource Person : **Dr. VINOTHKUMAR. S**

Associate Professor

School of Mechanical Engineering

Research centre for Aeronautical Component Manufacturing

Technology & Equipment. Shandong University, China-250061

The Day 1 session was started with formal inaugural address delivered by the professor and in charge Head of the department Dr. HARIPRASAD garu and presidential address delivered by Principal Dr. B. M. SATISH garu. Later the resource person of the day Dr. VINOTHKUMAR was introduced to the gathering and the session was handed over to the resource person for the following day. The resource person presented the recent advances in the development of high-strength titanium & nickel alloys.



He summarized the conventional strengthening approaches and their mechanisms, the corresponding microstructures, and the optimized mechanical properties. Subsequently, various strengthening strategies for high-strength titanium & nickel alloys were presented and discussed.

Finally, resource person discussed some of his case studies of the successful development of high-strength titanium & nickel alloys based on mechanical and metallurgical crystallization, sintering and various methods are discussed in detail. The state of the interrelation between the microstructure, the strengthening mechanism, and the properties of high-strength titanium & nickel alloys were discussed. Later participants were started their interactions with resource person and got clarified their doubts with respect to the day's session. The first day session was ended with formal thanks delivered by the program coordinator.

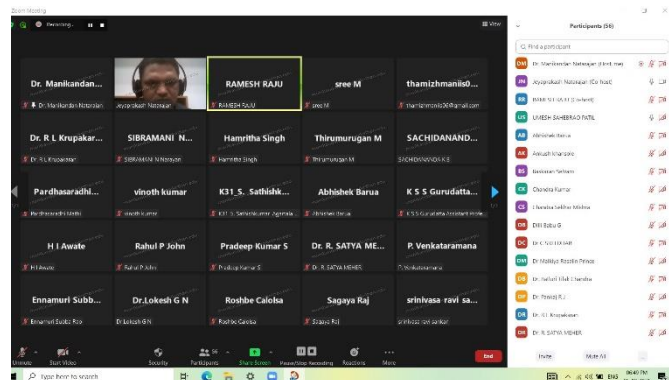
Day 2 (5th Oct 2021)

Topic : Research trends in laser material processing

Resource Person : **Dr. N. JEYAPRAKASH**

Research Assistant Professor,
Additive Manufacturing Center for Mass Customization
Production,
National Taipei University of Technology, Taipei City 106,
Taiwan, R.O.C

The Day 2 session resource person Dr. N. JEYAPRAKASH was introduced to the gathering by the program coordinators and the session was handed over to the resource person for the following day. The resource person explained the Laser materials processing process and its important role in the modern manufacturing industry and the economy



The resource person explained that the laser cutting, welding, marking, and drilling processes have reached maturity with wide industrial acceptance, new developments in recent years in additive manufacturing. He further stated that the micro/nano fabrication have enabled new capabilities that lasers can bring to the manufacturing industry. With the availability of high-brightness lasers such as fiber and disk lasers as well as ultra-fast lasers such as femto- and pico-second lasers, new beam-material interaction phenomena may appear.

Later the resource person detailed about the research in new technology development, optimization, modeling/simulation, and understanding the basic science involved in laser processing which are all playing critical roles in advancing laser materials processing science and technology. With this end of the session, participants were allowed to have an interactions with resource person and got clarify with their doubts on the day's session. The second day session was also ended with formal thanks delivered by the program coordinator.

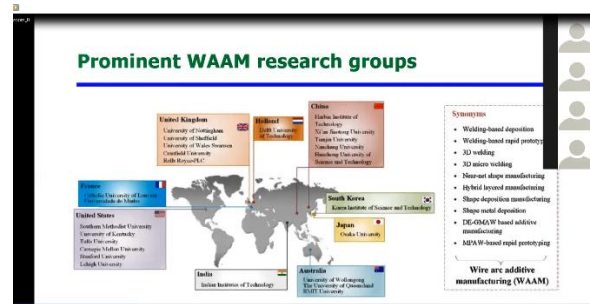
Day 3 (6th Oct 2021)

Topic : Applications of Wire Arc Additive Manufacturing

Resource Person : **Dr. VIMAL K E K**

Assistant Professor,
Mechanical Engineering Department, National Institute of
Technology, Patna, Bihar (800005), India

The Day 3 session resource person Dr. VIMAL K E K was introduced to the gathering by the program coordinators and the session was handed over to the resource person for the following day. The resource person explained the evolution of Wire Arc Additive Manufacturing (WAAM) process and also explained the wide range of materials associated with the process for various applications.



The resource person presented the detailed research on WAAM techniques and the commonly used metallic feedstock materials. He also provided a comprehensive overview of the metallurgical and material properties of the WAAM deposited parts. Common defects produced in WAAM components using different alloys were discussed along with the possible deformation, porosity, and cracking defects. Further the resource person explained various methods to improve the fabrication quality of the additively manufactured components, taking into account the requirements of the various alloys.

The resource person elaborated the wide application of WAAM and their challenges, and he spoken about all these challenges which may need to be addressed in specific ways for different materials in order to achieve an operational system in an acceptable time frame. With this the presentation came to an end and participants were allowed to have an interactions with resource person and got clarify with their doubts especially on the integration of materials and manufacturing process to produce defect-free parts. The third day session was ended with formal thanks delivered by the program coordinator.

Day 4 (7th Oct 2021)

Topic

: Advanced CFD Simulation and its applications

Resource Person

: **Dr. SALAISARGUNAN S PARAMANANTHAM**

School of Energy and Chemical Engineering

Ulsan National Institute of Science and Technology, Ulsan, Korea
44919

The Day 4 session resource person Dr. SALAISARGUNAN S PARAMANANTHAM was introduced to the gathering by the program coordinators and the session was handed over to the resource person for the following day. The resource person explained the current state of the art in accidental explosion modeling using methods based on computational fluid dynamics (CFD) in the marine ships and related industries.



Analyzing Method

Approach	Advantages	Disadvantages
Experimental	1. Capable of being most realistic	1. Equipment required 2. Scaling problems 3. Tunnel corrections 4. Measurement difficulties 5. Experimental uncertainties 6. Operating costs
Theoretical	1. Clean, general information which is usually in formula form	1. Restricted to simple geometry and physics 2. Usually restricted to linear problems
Numerical	1. No restriction to linearity 2. Complicated physics can be treated 3. Time evolution of flow can be obtained 4. Term-by-term effects on the governing equations can be analyzed 5. Lead time in design and development is significantly reduced 6. Can simulate flow conditions not reproducible in experimental model tests 7. Provides more detailed and comprehensive information 8. More cost-effective than wind-tunnel testing 9. Lower energy consumption	1. Truncation errors 2. Boundary condition problems 3. Hard to simulate accurately turbulence flows 4. Numerical uncertainties 5. Computer costs

The resource person discussed the problems in terms of its industrial importance and its technical difficulty, which stems mainly from the large range of length and timescales. He also discussed the geometry modeling by various method and review relevant combustion modeling. He presented an advanced CFD approach using unstructured adaptive gridding and discussed its usefulness.

The resource person described the formulation and current status of the model, following break-up of the primary discharge bubble into smaller bubbles. He insisted that it is more important to know how the resulting bubble plume interacts with the surrounding water to mix the pool. He explained the use of an advanced turbulence model to model two-phase plumes with recent case studies and participants were allowed to have an interactions with resource person and got clarify with their doubts on the day's session. Later the fourth day session was ended with formal thanks delivered by the program coordinator.

Day 5 (8th Oct 2021)

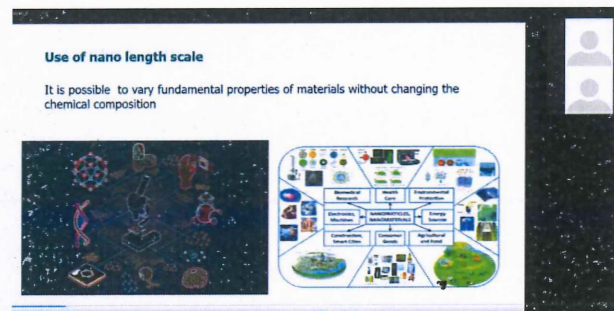
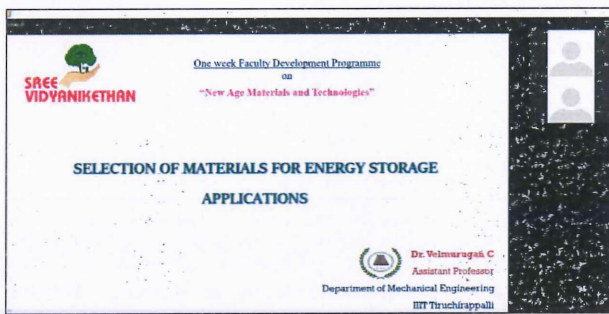
Topic : Selection of Materials for Energy Storage Applications

Resource Person : **Dr. VELMURUGAN C**

Assistant Professor & Head

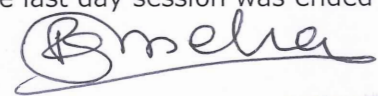
Department of Mechanical Engineering, Indian Institute of Information Technology, Trichy, Tamil Nadu – 620012, India

The Day 5 session resource person Dr. VELMURUGAN C was introduced to the gathering by the program coordinators and the session was handed over to the resource person for the following day. The resource person explained the need for the development of technologies with renewable energy sources in order to overcome the increasing demand–supply energy gap



The resource person explained about phase changing materials further he added that they are one of the most appropriate materials for effective utilization of thermal energy from the renewable energy resources. He insisted that the development of phase change materials is one of the most active research fields for thermal energy storage with higher efficiency. His presentation focused on the application of various phase change materials based on their thermophysical properties. In particular, the melting point, thermal energy storage density and thermal conductivity of the organic, inorganic and eutectic phase change materials for various thermal energy storage applications.

The resource person made a detailed discussion about the strategy adopted in improving the thermal energy storage characteristics of the phase change materials through encapsulation as well as nanomaterials additives. With this end of the session, participants were allowed to have an interactions with resource person and got clarify with their doubts on the day's session. Later participants are invited to share their feedback on entire one week FDP followed with vote of thanks delivered by the Professor and Head Dr. R. SATYA MEHER with this the last day session was ended successfully.



Dr. R. SATYA MEHER
Professor & Head