INTERNATIONAL TRAINING COURSE – CUM – BUSINESS OPPORTUNITIES WORKSHOP ON SURFACE ENGINEERING, HYDERABAD (INDIA), JULY 19-26, 2005

PARTICIPATING COUNTRIES: 06

NUMBER OF PARTICIPANTS: 42 (INCLUDING 8 FROM THE MEMBER COUNTRIES OF THE NAM S&T CENTRE

Surface Engineering is a generic term applied to a large field of diverse technologies that can be gainfully harnessed to achieve increased reliability and enhanced performance of degradation-prone industrial components. Typically, surface engineering encompasses coating and surface treatment processes that are capable of modifying surface properties of critical components to provide enhanced resistance against deterioration due to mechanisms such as corrosion, oxidation, wear or failure under an excessive heat load. The popular surface technologies include electro-deposited coatings, diffusion coatings, thermal sprayed coatings, sol-gel coatings, plasma and laser assisted surface modification etc., and several new variants of the above technologies are also becoming increasingly available. Considerable advances in the field of coatings technology in recent years have made it possible to realize the immense potential of surface engineering in diverse industry segments. Although Surface Engineering is of growing relevance in the modern industrial world, the industry in the developing countries is yet to exploit the state-of-the-art surface modification technologies to their full potential and ongoing R&D efforts in this area are also far short of what this important field demands.

Motivated by the above, the Centre for Science and Technology of the Non-Aligned and other Developing Countries (NAM S&T Centre) with the approval of its Governing Council organised a 8-day International Training Course–cum–Business Opportunities Workshop on Surface Engineering at Hyderabad, India during July 19-26, 2005 jointly with the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad. During this event, participants from different countries, who were technical professionals, and researchers were provided an overview of the basic concept of Surface Engineering and the all-expansive domain of the applicability of the same and were acquainted with a broad spectrum of current state-of-the-art surface modification technologies that are available for use by the industry. Visits to a Technology Park and industries to acquaint the participants with industrial scale applications of surface modification technologies were also organized.

Prof. P. Rama Rao, ISRO Dr. Brahm Prakash Distinguished Professor and former Secretary to the Government of India inaugurated the training course at ARCI on July 19, 2005. During the inaugural session the delegates were welcomed by Dr. Dr. G. Sundararajan, Director, ARCI, who subsequently also gave a talk on 'Introduction to Surface Engineering: Recent Trends', and Prof. A. P. Kulshreshtha, Director, NAM S&T Centre briefed the audience on the genesis of the training course and the role of the NAM S&T Centre in the promotion of science and technology in the developing world.

There were 42 course participants from six countries including Dr. Randa Abdel Kareem, Associate Professor, Department of Metallurgy, Faculty of Engineering, Cairo University, Egypt; Mr. Tursiloadi Silvester, Senior Researcher, Research Centre for Chemistry, Indonesian Institute of Sciences, Serpong, Mr. Husaini, Lecturer, University

of Achmad Yani, TLP and Mr. Nendar Herdianto, Researcher, Secretary of the State, Ministry of Science and Technology, BPPT, Jakarta of Indonesia; Mr. Adeyemi Olumuyiwa Adekola, Researcher and Development Officer, Engineering Materials Development Institute (EMDI), Akure, Nigeria; Mr. J.M.S. Jayatileke, Technical Manager, Materials Laboratory, Industrial Technology Institute (ITI) and Mrs. S. S. K. Muthurathne, Scientist, Building Materials Division, National Building Research Organisation (NBRO) in Colombo, Sri Lanka; and Prof.. Khalil Azimeh from the Faculty of Mechanical & Electrical Engineering, University of Damascus, Syria.

The training course comprised 19 lectures by the resource persons drawn from premier institutions of excellence, which enabled the participants to have a general understanding on the principles and usefulness of different types of surface processing technologies. In late afternoons, visits were arranged to the surface engineering shops with demonstration of surface processing equipment, testing and characterisation labs, Centre for Laser Processing of Materials (CLPM) and ARCI Technology Park. A 1-day visit was also arranged to GE-BHEL, a joint venture company between General Electric and Bharat Heavy Electricals Limited (BHEL) and BHEL R&D Centre, where their range of activities were explained and the working of various surface coating systems were demonstrated.

Technical lectures were delivered by eminent scientists, engineers and experts in respective fields e.g. 'Electrodeposited and Electroless Coatings' by Dr. K.S. Rajam of the National Aerospace Laboratories (NAL), Bangalore; 'Multi-layer Nanostructured Coatings' by Dr. Harish Barshilia of NAL; 'Plasma-Based Surface Engineering Techniques' by Dr. S. Mukherjee of the Institute of Plasma Research (IPR), Gandhinagar; 'Diamond and Diamond Like Carbon Thin Films and Coatings for Engineering Surfaces' by Dr. V.D. Vankar of the Indian Institute of Technology (IIT), Delhi; 'High Temperature Coatings' by Prof. A. S. Khanna of the IIT, Mumbai; 'Thin Film Coatings: Processing and Characterization' by Dr. A. Subrahmanyam of IIT, Chennai; 'Laser Assisted Surface Modification' by Prof. I. Manna of IIT, Kharagpur; on 'Qualification and Quality Assurance of Coating Process: BGGTS Experience at GE-BHEL' by Mr. G. A. Bharathi of GE-BHEL, Hyderabad; 'HP HVAF and HVOF Coatings to Combat Erosive and Corrosive Wear in Indian Industry with a Specific Example of Hydro Industry' by Mr. B.S. Mann of BHEL R&D Centre; 'Diffusion Coatings' by Dr. D. K. Das of the Defence Metallurgical Research Laboratory (DMRL), Hyderabad; and 'Tribological Coatings and Their Evaluation' by Dr. B. Venkataraman of DMRL. Speakers from the host organisation- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad delivered lectures on Thermally Sprayed Coatings (Dr. S. V. Joshi); Detonation Spray Coatings (Mr. D. Srinivasa Rao); Electro-Spark Coatings (Mr. K. R. C. Soma Raju); Cold Gas Dynamic Spraying (Mr. G. Sivakumar and Mr. P. S. Phani); Sol-Gel Coatings: Basic Science, Processing and Applications (Dr. U. Harish)); Surface Modification: An Introduction to the Characterization of Coatings (Dr.Ravi Chandra); Residual Stress Analysis using X-ray Diffraction Techniques (Dr. GVN Rao), and Micro-Arc Oxidation: An Innovative Surface Engineering Tool (Mr. L. Rama Krishna).

On the concluding day, an interaction session with senior representatives of various industrial units dealing with manufacture of equipment and machines related to Surface Engineering was organized. The training course participants in their feedback spoke highly about the quality of the programme and expressed confidence that the knowledge gained by them through the training course would be immensely beneficial to them in improving their professional work in the respective areas of their interest.

On the cultural front, the participants got an opportunity to visit the famed monument Char Minar, Salar Jung Museum, Golconda Fort and the Ramoji Film City.