

CSIR NEWS

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Team CSIR

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CGCRI signs MoU for Research on Refractories

The Central Glass & Ceramic Research Institute (CGCRI), Kolkata, signed an MoU on 31 May 2008 with Dalmia Institute of Scientific and Industrial Research (DISIR) and OCL India Limited, both located at Rajgangpur of Sundergarh district in Orissa. Under the agreement, CGCRI has envisaged joint collaborative research work with DISIR on specific areas followed by up scaling of the same wherever necessary at OCL India Limited on advanced refractories. The agreement detailed the modalities of collaboration, terms and conditions, financial arrangements, intellectual property rights and obligations between the three signatories. OCL India Limited is one of the largest refractory plants in the country, producing widest spectrum of high quality refractories consisting of alumina silicates, carbon-based refractory, silica and others for continuous casting.

The major features of the agreement are that the DISIR shall carry out research work for effective and expeditious implementation of agreement and coordinate the project between the parties, CGCRI will work on the project as per agreed priority for effective and expeditious implementation of the agreement, and DISIR and CGCRI will participate in industrial trials at OCL as and when required. Both DISIR and CGCRI have agreed to train authorized employees of either parties.



Clockwise: Dr B.K. Panda, Director DISIR; Dr J.N. Tiwari, Executive Director, OCL and Dr H.S. Maiti, Director, CGCRI, shake hands after exchange of documents



The agreement also spells out clearly that neither CGCRI nor DISIR shall disclose the R&D work under the project to parties not covered under the resolution. Nor shall CGCRI and DISIR carry out similar projects without prior written consent of the signatories of the agreement. The responsibility of OCL envisages supply of main raw materials e.g. aggregates/sintered/ natural magnesia, limestone, dolomite alumina etc free of cost except nano materials, non oxides and additives.

OCL would arrange for industrial trial for the project at its plant at their cost and if necessary shall provide financial assistance. The MoU emphasizes that the parties shall pool finance from internal resources for their respective activities. Appropriate funding agencies will be approached for financial support of various aspects depending on the priority if self financing is not possible. The agreement has been planned to come into force on an effective date and remain in force for five years from the date which can be extended if needed.

It has been agreed that the assignment of Intellectual Property Rights (IPR) will be in the name of CGCRI and DISIR. OCL will have the first right to commercially exploit the intellectual property generated in the know-how/process, provided such option is exercised by OCL within 12 months of offering the same. In case OCL is not interested in commercially exploiting the intellectual property within the mentioned period, the same would be transferred to other party by the three signatories on equal sharing basis which of course will not disentitle OCL from commercially exploiting the IPR at a later date as and when considered appropriate by it. All the parties agreed to protect any IPR that may result from the project to license to other parties as per mutual agreement.

IMMT signs MoU with Amity University, Uttar Pradesh (AUUP)

The Institute of Minerals and Materials Technology (IMMT), Bhubaneswar, has signed an MoU with Amity University, Uttar Pradesh (AUUP) through Ritnand Balved Education Foundation, Noida. Effective from 24 June 2008 for a period of five years, which is extendable, the MoU would involve mutual cooperation towards the advancement of knowledge of the employees, faculty, scholars and students of both the organizations. The MoU will be governed by the following conditions:

AUUP will provide all facilities to the employees (scientific and technical) and scholars (Research Fellows and Project Assistants) of IMMT to enroll for M.Tech. and PhD programme at AUUP under joint supervision as per the rules and regulations of AUUP. The course work/experiments required for the award of these degrees by AUUP shall be taken up/ conducted at IMMT and necessary tests to qualify for registration/award of degree shall be conducted by AUUP. The topics for M.Tech. and PhD work shall form part of the research programmes at IMMT. Vice Chancellor, AUUP shall be the ultimate authority to decide the numbers.

IMMT shall provide, without any financial obligation, necessary facility to the students and faculty of AUUP to conduct research required for partial fulfillment of requirements leading to the award of M.Tech. and PhD degree by AUUP. The number of candidates to be taken up under each of the degrees at a time shall depend upon the availability of supervising scientists and laboratory space. Director-IMMT shall be the ultimate authority to decide such number.

IMMT shall, subject to availability and without any financial implication on its part, extend facilities to a limited number of MSc/B.Tech. students of AUUP for short duration summer/winter training courses at IMMT under the relevant CSIR guidelines. Director-IMMT shall be the ultimate authority to decide the topics and number of participants.

AUUP shall provide scope to interested scientists of IMMT to teach certain portions of UG and PG courses at the campuses of AUUP. Necessary TA/DA and honorarium to the scientists of IMMT shall be paid by AUUP as per their policy guidelines.

On mutual agreement, specialized and short duration refresher courses/training programmes on topics of interest to

the industry/academia can be jointly offered at IMMT or AUUP. The resources for such activities shall be shared.

IMMT and AUUP will encourage and provide facilities to the faculty members of AUUP and scientists of IMMT to explore and prepare joint research proposals on some thrust areas for funding by government agencies. The technical activities and grant sharing between the two parties shall be defined and mutually agreed while submitting such proposals.

IMMT and AUUP shall extend their library facilities to the scientists, faculty members, research scholars and students in accordance with the rules and regulations that govern the functioning of their respective libraries.

IMMT signs MoU with Essar

The Institute of Minerals and Materials Technology (IMMT), Bhubaneswar, and Essar Steel Ltd, Visakhapatnam signed an MoU to work jointly on process and plant optimization programmes of mutual interest related to mineral processing activities.

The MoU was signed by Prof. B. K. Mishra, Director, IMMT, Bhubaneswar and Shri M.K. Sampath, CEO, Pellet Project (India), Essar Steel Holdings Ltd, at a function organized in the IMMT Conference Hall on 23 July 2008. Senior Essar officials and Scientists of the Mineral Processing Department (MPD) of IMMT were also present at the function that was organized by Shri P.S.R. Reddy, Scientist-G and Head of MPD.

As per the framework of the MoU, Dr S.K. Biswal, Scientist, IMMT and Shri A.S. Prasad, Head, Technology, Pellet Projects, India, Essar Steel Holdings, Ltd, have been nominated as coordinators to frame and execute the projects to be funded by Essar. Essar Steel Ltd. has deposited Rs 25 lakh as advance money to IMMT.

The initiative is the first of its kind for IMMT to kick start Public Private Partnership (PPP) in R&D.

Achievements in Tower Testing and Research

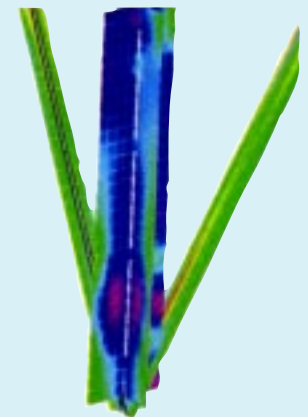
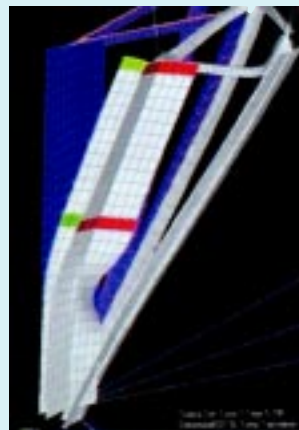
Power transmission line towers and Communication towers constitute an important segment of life line structures on which a nation's economy and industrial productivity depend to a large extent. The structural stability and integrity of such tall structures, under normal as well as extreme wind conditions, are therefore essential requirements for structural engineers to contend with. In this context, the Tower Testing and Research Station (TTRS) of the Structural Engineering Research Centre (SERC), Chennai, established with UNDP assistance, has been playing a significant role since its inception in 1985.

R&D and Thrust Areas

- Development of new Transmission Line power configurations, analytical study and Prototype Testing, feasibility,
- R&D efforts for minimization of land use in urban areas by replacing towers with monopoles.
- Development of economical and aestheti-

cal towers.

- Development of light weight Emergency Restoration Structures for quick restoration of power in the event of tower failure.



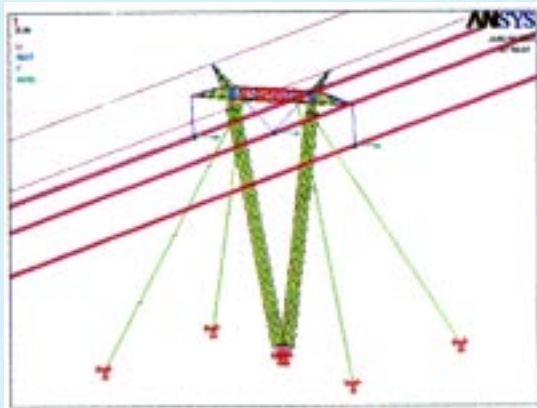
Simulation of Leg Member Buckling for tower failed during Prototype Testing



Testing of Cold-formed Steel Lipped Angle Panel and FE Model



Analytical and Experimental Investigations on 400 kV Portal Type Guyed Towers



System level Studies on 800 kV V-Type Guyed Towers

- Analytical and experimental investigations on refurbishment of tower stub and foundation concrete in live line condition.
- Investigations on the use of structural shapes other than hot rolled angles and their cost economics.
- Structural response evaluation of Power Line Structures for wind induced vibration.
- Failure modeling of towers that failed during prototype testing and improvement in code provisions based on these investigations.
- Study on tower dynamic characteristics and their use in correlating structural responses during testing.
- System level studies on guyed tower transmission lines and comparison with individual tower response (parametric studies).
- Studies on joint behaviour using FE models and test data.
- Forensic engineering investigations on the failed transmission line structures and their simulation.
- Health monitoring of Transmission Line structures for environmental loading conditions and structural responses while retrofitting.
- Reliability and risk assessment of power transmission line structures for climatic loads and aging for the lifetime/and return period.

Monopole Structures

The conventional self supporting lattice type towers are generally with square or rectangular base. The conventional test beds can accommodate only square, rectangular and triangular base towers. To accommodate circular base of pole structures, a special circular foundation was constructed in the existing test bed area.



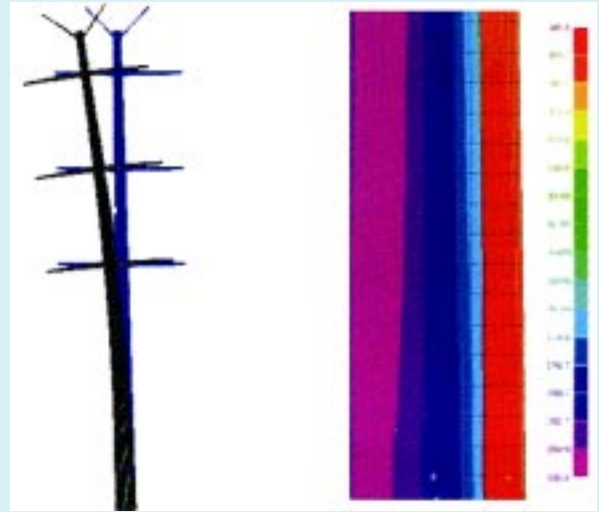
Circular foundation with three concentric rings of anchors



400 kV D/C pole at test bed



During testing



The stress distribution in reliability load case at bottom portion of the shaft

- 400 kV double circuit monopole has been tested for the first time in India.
- The pole is of 40m height and 2m base width.
- Poles are flexible structures with large deformations requiring nonlinear finite element analysis
- The entire pole was modeled in NE Nastran using plate-shell elements.



Instrumented foundation bolts

- Frequency analysis shows that the fundamental frequency of the pole is less than 1Hz, indicating that the poles are dynamically sensitive.
- Experimental frequency determined using sensitive acceleration sensors also indicated the same frequency.
- For the first time, Dead End pole of 220kV S/C was tested.



- Tension insulators are connected by circular ring attachment in the pole shaft.

Tallest Tower

Recently TTRS (SERC), has tested one of the tallest transmission line towers for General Company of Libya manufactured by KEC International Limited, an Indian multinational.

The tower had some special features:

- Tower Type – 400kV Single Circuit Dead End Tower with 30° to 60° Deviation
- Tower Height – 72.95 m tallest tower ever tested at TTRS/SERC



400 kV S/C Tower Type “TL-30” - M/s Gam Arak Company, Iran

- Tower base Width – 21.0m one of the widest base width tower ever tested at TTRS/SERC

Heaviest Tower

The Tower Testing and Research Station has tested one of the heaviest 400 kV D/C “SE-90” tower for M/s Dubai Electricity & Water Authority, Dubai. Some of the salient features of this tower are:

- Tower Weight – 1000 kN, heaviest tower ever tested at TTRS/SERC
- Transverse Load requirement – 4800 kN
- Generated Uplift force for foundation-4000 kN
- Generated Shear force for



400 kV D/C Tower Type “SE-90” tested for M/s Dubai Electricity & Water Authority, Dubai

- foundation – 1200 kN
- Longest cross arm ever tested with 25 m long, 7.4m wide box cross arm on one side and 21m tip cross arm on other side.

International Industries Benefited

- Ceylon Electricity Board, Sri Lanka
- Dhofar Power Company S.A.O.C. Sultanate of Oman
- Electrowatt Engineering, Sultanate of Oman
- Enerzet Sdn. Bhd., Malaysia
- Locweld Inc., Quebec, Canada
- LTL Projects (Private) Limited, Sri Lanka
- Maintenance Engineering Sdn, Bhd., Malaysia
- Ontario Hydro, Toronto, Canada
- Projass Engineering Sdn. Bhd Malaysia
- Sabah Electricity Sdn. Bhd., Malaysia
- Tala Hydro Electric Project Authority, Bhutan
- Teharan Regional Electric Company, Iran
- Tenaga National Berhad, Malaysia
- Water and Electricity Department, Abu Dhabi

Testing of Glass Insulators

Tower components like glass insulators were tested for clients from various countries like Brazil, China, France and Japan.

Testing of Special Structures

Testing of Glass Fibre Reinforced Plastic (GFRP) Mast for Indian Space Research Organisation (ISRO), Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram. The mast is located on the top of 120m High Self Supporting lattice Tower to act as a lightning arrester. Lateral loads were applied to simulate the wind loads acting on the mast. To simulate the support reaction of 35 tonnes at the bottom of the mast, special rigging arrangements were made.



Testing of 800 kV Single "V" Glass Insulator for M/s SEDIVER, France



Testing of Glass Fibre Reinforced Plastic (GFRP) Mast for Indian Space Research Organisation (ISRO)

Loading Capacities and Measurement Accuracies

• Transverse	12,000 kN
• Longitudinal	5,500 kN
• Vertical	5,000 kN
• Accuracy of loading	± 1%
• Accuracy of angle of application of load	± 20 min

- Test bed with prestressed rock anchors of each 500 kN uplift capacity
- Sophisticated servo-controlled hydraulic loading system
- Simultaneous application of loads at all points, Continuous monitoring of resultant loads and angles of their application
- Strain gauge instrumentation and on-line data acquisition and processing
- Tower crane and other handling equipment for erection and dismantling of test towers
- Calibration arrangement for load cell and angle transducers



MERADO Releases Technology to MEDORS Bio-tech

Mechanical Engineering Research And Development Organization (MERADO), an extension centre of CMERI, Durgapur, released the technology of 'Biogas through bio-methanation of deoiled *jatropha* cake of 6 m³/day capacity' to M/s MEDORS Bio Tech. Pvt. Ltd., New Delhi on 7 April 2008 at MERADO, Ludhiana.

The technology has a great advantage over the conventional system. Since organic waste is utilized, size of the gas plant is drastically reduced to 8:1, and also the construction cost, while achieving much more quantity and quality of bio-gas with higher calorific value.

The agreement was signed by Mr R.C. Sharma, CEO of M/s MEDORS Bio Tech Pvt. Ltd., New Delhi, a leading company of the country in the field of bio-fuels, and by Cdr.(Retd.) V.R. Dahake,



Seen on the occasion of release of MERADO's technology to M/s MEDORS Bio-tech Pvt. Ltd. (from left) are: Mr S. Salman Mojiz, Dr K. Kundu, Cdr. V.R. Dahake, Mr R.C. Sharma and Mr S. Ahuja

Scientist-Incharge, MERADO, Ludhiana.

Speaking on the occasion Cdr. Dahake emphasized the need of bio-fuels and their future in the country. He assured all support to MEDORS to imbibe the technology.

Mr S. Salman Mojiz, Scientist and Head, BDG, said that India being an agriculture oriented and net energy deficient country, there is an imperative need to explore alternative fuel options such as bio-fuels. So the present and future thrust area of MERADO would be bio-fuels. MERADO has taken

initiative in this direction and has designed and developed 'Semi-continuous type of bio-diesel plant of 600 litres per day capacity'. Technology is ready and is to be released soon, he informed.

Mr R.C. Sharma, CEO, MEDORS expressed his happiness and

confidence in MERADO developed technology and wished for a long term association with MERADO. He acknowledged and appreciated the important role of Dr K. Kundu for facilitating him with this technology.

Dr K. Kundu, Scientist and Project Leader thanked M/s MEDORS Bio-Tech Pvt. Ltd. for showing keen interest in the technology. He expressed his quest for continually improving the developed technologies and synergizing his efforts in future endeavors with industries.

Project Evaluated by NEIST

The following project has been evaluated at the North East Institute of Science & Technology (NEIST), Jorhat, in the recent past:

- Dr H. B. Singh, Scientist-In-Charge, NEIST Sub-station, Imphal, Manipur evaluated the CAPART project 'Promotion of roof-top rain water harvesting technology' (pre funding) as submitted by Social Enhancement & Rural Development Society, Chandel, Manipur

Central Scientific Instruments Organization, Chandigarh

R&D Highlights

Networked Projects of CSIR

The R&D achievements and current activities of Central Scientific Instruments Organization (CSIO), Chandigarh, in the field of Intelligent Instrumentation for Agro-based, Seismic and Energy Management and Condition Monitoring; Medical Instrumentation, Linear Accelerator, Medical Imaging and Prosthetic Devices for Disabled; Optic-based Strategic Instrumentation; Photonics; Analytical Instrumentation; and Material Science, Bio-Molecular Electronics and Nanotechnology were published in *CSIR News*, 58 (18), 2008 p. 272. Presented here are the Network Projects of CSIR with the institute as Nodal Agency and Participating Laboratory.

Networked Projects with CSIO as Nodal Laboratory

Electronics for Societal Purposes

The networked programme has the following three components:

- Electro-Optical System for Sorting, Grading, Packaging and Storage of Agricultural Products
- Prosthetic Devices & Medical Instruments Calibration
- Instrumentation for Natural Hazards Monitoring and Early Warning Systems

Keeping in view the relevance and societal impact of the overall programme in different sectors viz. agriculture, health and natural hazard mitigation as well as the core strengths of each of the participating laboratories of CSIR, following projects were identified for execution in the networked mode.

ELECTRO-OPTICAL SYSTEM FOR SORTING, GRADING, PACKAGING AND STORAGE OF AGRICULTURAL PRODUCTS

Electro-Optical System for Sorting, Grading and Packaging of different fruits, vegetables and grains like rice

(a) *Electro-optical System for Sorting, Grading and Packaging of Different Fruits and Vegetables*: System has been designed for sorting, grading and packaging of fruits and vegetables using electro-optical techniques with an initial throughput target of 6 apples per second. The opto-

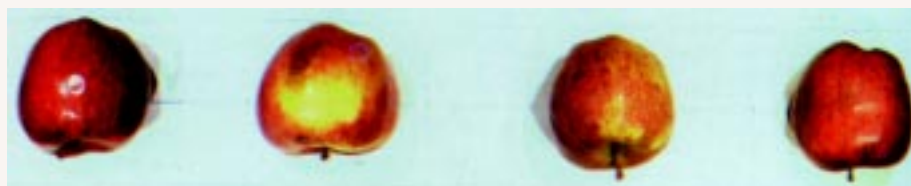


Image taken with 3-CCD RGB camera during field trial

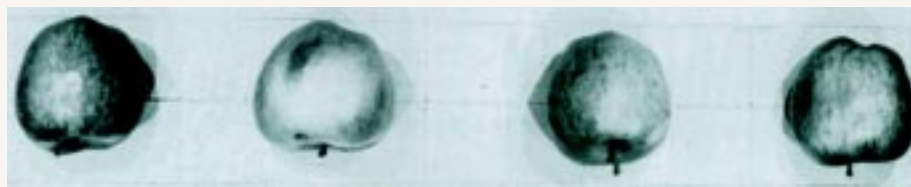


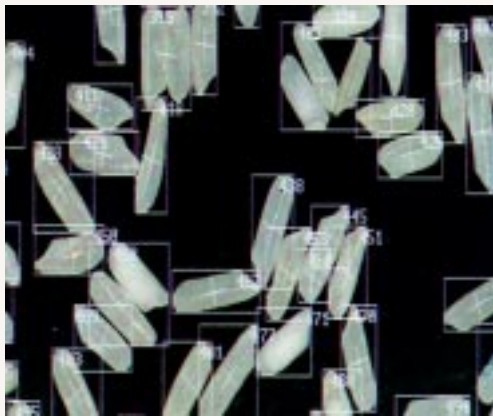
Image taken with 3-CCD NTR camera during field trial



mechanical assembly consists of the illumination system with multiple cold light sources (15 Volts, 150 Watts halogen bulbs) operated with dc power supply. The complete machine has been assembled at CMERI, Durgapur.

(b) Off-line System for Classification/Grading of Rice:

An automatic rice grain classification system for assessing refractions and grades as per an Indian Standard has been completed. The standard offers uniform specification for



A part of typical image after blob analysis showing each kernel labelled uniquely

marketing of grains all over the country. A flat-bed scanner is used for imaging the samples so as to allow remote operation. The system initially trained for raw rice uses both colour and geometrical attributes of each grain.

Monitoring and Control System for Food Storage Houses and Optimization of Process Parameters

A controlled atmosphere system

has been developed which has been integrated with sensors, solenoid valves, nitrogen generator and scrubbers to maintain the level of set parameters of atmospheric conditions.

The system is computer controlled operated with LabVIEW Software. The five control parameters, namely, temperature, humidity, oxygen, carbon dioxide and ethylene are displayed on a computer monitor and controlled through computer. The system is under performance trials with different fruits and vegetables.

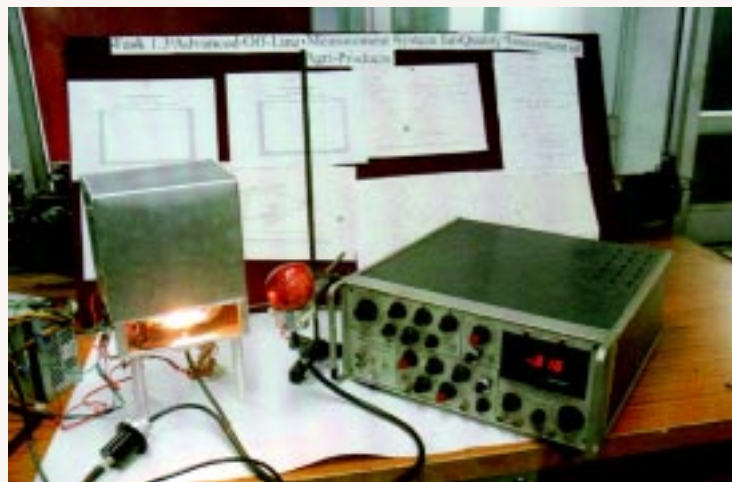


Controlled atmosphere storage system

Advanced Off-line & On-line Measurement Systems for Quality Assessment of Agri-Produce

An Off-line Non-destructive Quality Assessment System based on absorption of IR at selective wavelengths for fingerprinting of different attributes of apples using Fiber optic Probe has been developed. The system uses 10 NIR

filters in the wavelength range of 0.8-1.7 microns for measurement of NIR reflectance from the apple.



Set up for Off-line measurement of quality assessment of agri-produce

PROSTHETIC INSTRUMENTATION AND MEDICAL INSTRUMENTS CALIBRATION

Intelligent Prosthetic Devices for Rehabilitation of Physically Challenged

(1) **Artificial Knee:** An artificial knee joint has been developed. It consists of two cylinders — one is a master cylinder filled with thin oil and the other is for compensation. The compensation cylinder receives the hydraulic oil from master cylinder during the extension and releases it during flexion of the joint.



Artificial knee joint

(2) **Functional Electrical Stimulation System:** Engineered units of the FES System were developed and successful clinical trials were conducted on patients. Based on 8051 microcontroller, the unit provides programmable six-channel stimulation for application to identified muscles externally. The instrument also has an application for physiotherapy.

(3) **Myoelectric Arm:** An SMD Surface Mounted Device based compact & light weight myoelectric arm has been developed. The mechanical



Myoelectric arm with electrodes



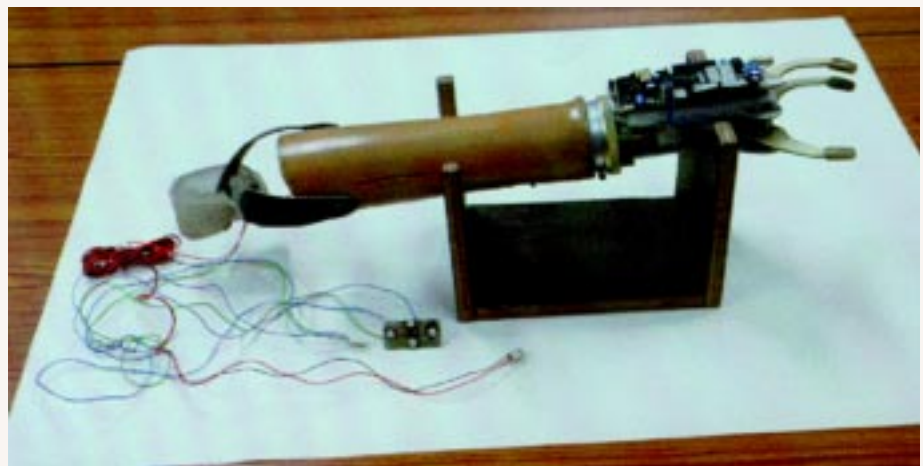
Myoelectric arm with electrodes

assembly of the arm consists of gripping fingers, palm, wrist and lower portion of upper limb. The developed arm has been tested

successfully at National Institute for the Orthopaedically Handicapped (NIOH), Kolkata on actual patients.

(4) **Electronic Hand (Voice Operated):** Two units of the Electronic Hand with two-finger movement based on Voice Recognition Technique have been developed. The developed Electronic Hand consists of a mechanical hand and voice-operated electronic control system. A satisfactory performance evaluation of switch operated mechanical hand has been undertaken at Saket Institute for Orthopaedically Handicapped, Chandimandir.

(5) **Spoon Feeding Robot System:** A prototype model of switch



Voice-operated electronic hand



controlled SFRS has been developed and in-house trials have been conducted successfully. The SFRS has four degrees of freedom and six voice commands i.e. Start, Reset, Feed 1, Feed 2, Feed 3 and Stop. Electronic control system based on



Spoon Feeding Robot System

microcontroller has been developed.

National Facility for Medical Instruments Calibration

An ISO 9001-2000 certified National Facility for Medical Instruments Calibration has been established at CSIO's Delhi Centre. On-site and in-house test/calibration services are provided. All calibrations are optimized thereby helping the beneficiaries in saving their money. The beneficiaries of this facility include hospitals, health centers, medical institutions and industry.

INSTRUMENTATION FOR NATURAL HAZARD MONITORING AND EARLY WARNING SYSTEMS

Seismic Alert System to Avert Colossal Losses due to the Occurrence of Major Earthquakes

The performance of the developed field station instruments i.e. weak motion recorder (WMR) has been checked by installing the instrument at CSIO Seismological Observatory and the recorded data have been compared with already installed imported digital seismic recorder. The waveform of earthquakes which were recorded by CSIO developed instruments are exactly similar to that recorded by Reftek make instrument.

Design, Development & Installation of Instrumentation for Detection and Early Warning of Landslides

(a) *Instrumentation Comprising Standard Sensors and Advanced Associated Electronics for Monitoring, Detection and Early Warning of Landslides:* A PC architecture based Data Acquisition System has been designed, developed and tested. Various sensors such as load cell, piezo meter, stress meter, rain gauge, inclinometer, tilt meter, crack meter and borehole extensometer have been interfaced along with required signal conditioning.

(b) *Optical Fiber Sensing System for Early Warning and Detection of Landslides:* This system that has been designed and developed provides early warning of landslides and prevents damage to hillside

structures as well as loss of human life. A unique configuration for enhancement of microbends in optical fibers due to landslide has been developed and a prototype using wood has been fabricated so as to verify the mathematically predicted results.

Setting up Test & Calibration Centres for Seismic Instruments & Networks

A full-fledged calibration facility for calibration of seismic recorders & sensors has been set up and made operational. The facility is available to the users along with the required test & measuring equipments, reference sensors and Shake Table. Traceability of the test & measuring equipments available at the Centre is with NPL, New Delhi.

Networked Projects (With CSIO as Participating Laboratory)

Key Technologies for Photonics & Opto-Electronics

These networked projects were undertaken in view of the expertise and infrastructure available at CSIO in fiber optic sensors. A Fiber Grating Lab has been created and the FBG/LPG Writing System has been inspected at source in Canada and hands-on training undergone there by two scientists.

LPG Sensor for Detection of Fuel Adulteration and Humidity: Adulteration of petrol and diesel with kerosene is a common malpractice in India. Adulteration of petrol and diesel results in increased pollution, decrease in engine performance or failure of machine components. Long Period Grating (LPG) sensor has been investigated for detection of kerosene contamination of petrol and diesel. To detect petrol adulteration using LPG sensor, a glass cell was designed and got fabricated for holding the grating.

Long Period Grating Sensors for Humidity Sensing: Due to the high sensitivity of LPG sensors to refractive index of the medium surrounding the cladding, they have also been studied for sensing humidity. This study has been carried out by coating LPG sensors with polyvinyl alcohol (PVA) and HEC (gelatin).

Holo Based Phase Mask for FBG Writing: In order to make

indigenously coated photoresist plates required for making phase masks, experimental investigations were carried out for the optimization of various process parameters such as substrate preparation, photo resist concentration, spinning speed and time, photoresist coating thickness, baking of coated plates etc.

Custom-Tailored Special Materials

Non-Linear Photorefractive Semiconductor Materials: Several experiments were carried out at different substrate temperatures to optimize the growth temperature of photorefractive semiconductor nanostructures using GaAs and GaAs/AlGaAs semiconducting materials.

DNA Nanowire based Devices: DNA is the best molecular electronic device produced by nature which can store, process and provide information for growth and maintenance of any living system. Single cell production carries with it all requisite information and processing capability to produce living species by taking materials from the environment. DNA can be synthesized in any desired sequence of four bases, A, T, G, and C to act as information storage.

Synthesis and Characterisation of Nano-materials: Nano particles of Platinum, Palladium, Nickel, Gold, Cd and Ni-Co Alloy have been

synthesized by reverse micellation and direct reduction techniques. These nano particles have been capped with different molecules like polymers and surfactant molecules to alter the properties and make them soluble in aqueous and non-aqueous solvents. The nano particles have been characterized for shape, size and structure using Transmission Electron Microscopy (TEM), X-Ray Diffractometry (XRD), Optical Absorption and Electro-luminescence techniques. The Nickel nano particles have been characterized for magnetic properties. Efforts have been made



TEM image of platinum nanoparticles (~2nm)

to prepare nano fluids. Platinum nano particles have been used for conversion of CO vapours into CO₂ whereas Ni nano particles have been used for the reduction studies.

High Science & Technology for National Aerospace Programmes

The preparation of pre-design report (PDR) for design & development of multi-function display and head-up display



systems for civilian aircrafts like SARAS is in progress in consultation with NAL, Bangalore. A brief study of CAMFD as avionic cockpit display system and its various electronic hardware block is also in progress. Study has been carried out for different types of HUDs developed and available in the international market.

Industrial Waste Minimization and Clean-up

CSIO's Chennai Centre has successfully developed and implemented web-enabled energy management system. The technology demonstration of the project entitled 'On-Line Energy Monitoring System in a Textile Dyeing Unit' was carried out at M/s Classic Knit Processors (CKP), Tirupur with support from Petroleum Conservation Research Association (PCRA), New Delhi.

Developing Capabilities in Advanced Manufacturing Technology

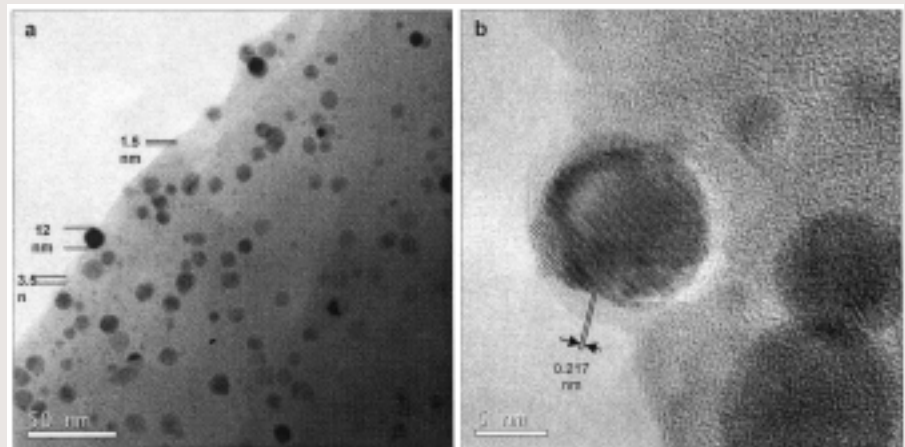
Autonomous Mobile Robot

The Ultrasonic Range Finder (URF) module has been tested in the lab. A set of sensors has been inspected and delivered to CMERI for further integration. The development of laser range finder is in progress. Design of a stereo vision sensor has been completed. It consists of two identical cameras with adjustable disparity distance. A pair of lenses has been chosen as per the field of requirements. Both the imaging modules have single IEEE 1394/USB 2.0 Interface.

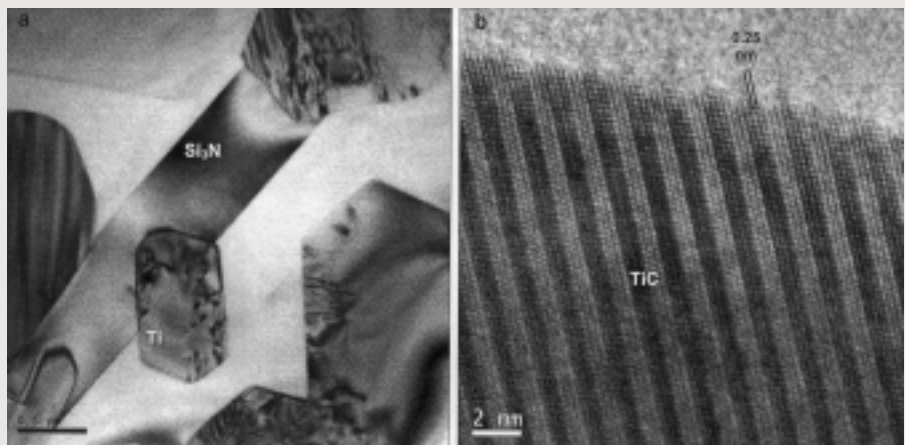
Activities on Nano Science & Technology: Installation of TEM at CGCRI

Present-day materials research, especially in the field of nano-science and nano-technology, involves elucidation on materials microstructure at nanometer length-scales with space resolved information on chemical composition and crystallography. The transmission electron microscope (TEM) is an

indispensable tool in obtaining such information. The Central Glass and Ceramic Research Institute (CGCRI), Kolkata, has recently installed a highly advanced state-of-the-art Transmission Electron Microscope Tecnai G² 30ST. The microscope is fitted with LaB₆ thermionic electron emitter and is capable of operating at a maximum



Au-Pd nanoparticles dispersed in amorphous Al₂O₃ matrix prepared by sol-gel synthesis. (a) Bright field TEM image (b) High-resolution TEM image



Sintered Si₃N₄-Ti Composite (a) Bright field TEM image showing the representative microstructure. (b) HREM image of a TiC grain



accelerating voltage of 300 kV.

As an integral part of the TEM Laboratory, a laboratory complete with all the requisite specimen preparation equipments has been set-up in CGCRI so that the prepared samples are suitable for imaging in the nano-scale. Utilizing all these equipments, TEM-specimens can be prepared out of all kinds of materials including ceramics, semiconductors and metals.

The complete TEM laboratory facility at CGCRI is thus capable of providing information down to the atomic level to help carry out cutting-edge research work at par with the standards of research laboratories in the rest of the world.

Conference on Micro Aerial Vehicle and Unmanned Ground Vehicle Technologies

The National Aerospace Laboratories, Bangalore and the Aerial Delivery Research and Development Establishment, Agra, a constituent of the Defense Research and Development Organization (DRDO), partnered with the US Army Research, Development and Engineering Command (RDECOM)'s International Technology Center-Pacific to host the first U.S.-Asian Demonstration and Assessment of Micro Aerial and Unmanned Ground Vehicle Technologies during 10-15 March 2008 at the Jaypee Palace Hotel, Agra.

The event was mainly sponsored by the US Department of Defense, in particular the R&D wings of US Army (RDECOM), US Navy (ONR-G), US Air Force (AOARD) and the Defense Advanced Research Projects Agency (DARPA), and had been extended full support by DRDO, CSIR and the Indo-US Science and Technology Forum (IUSSTF).

The purpose of the conference was (i) to showcase next-generation, COTS enabled prototype systems of Micro Air Vehicles (MAV) and Unmanned Ground Vehicles (UGV) that are almost ready for end-use, thus hastening their induction into the Forces; (ii) identify areas for further development of critical technologies and (iii) evolve ideas and



Chief Guest Lt. Gen. M.L. Naidu, PVSM, AVSM, YSM, VCoAS, Indian Army, delivering the Inaugural Address at MAV-08

strategies for countermeasures. The conference was expected to give a major fillip to the current developmental efforts in India in the area of MAVs and UGVs by presenting the state-of-the-art in technologies and indicating the future trends in research and development in the area.

The subject is highly relevant as the Defence Services need systems appropriate to Military operations in Urban Terrain (MOUT), Light-Combat Survivability and Force Protection (FP). Presently such support is being given by a larger class of UAVs, but MAVs definitely enjoy greater advantage. The systems are also important for civilian applications such as disaster management, urban traffic monitoring, search and rescue operations etc.

Two previous editions of the event, held in Germany in the years 2003 and 2005, mainly concentrated on proving



platform technology, but mission capability and adaptability was the major goal at this conference.

The event consisted of demonstration-cum-assessment (both static and flying) of MAV/UGV entries from participating teams as per mission requirements specified for the event. The mission scenario was a mixture of operational and developmental flight test maneuvers, and mission tasks were combined to create a unique and challenging demonstration environment for the prototype MAV systems. The objective of the competition was to demonstrate how combinations of MAV and UGV systems controlled by a team of human operators can effectively conduct a simulated hostage rescue mission.

The rules governing the demonstrations were tuned to elicit the following capabilities: Cooperatively and autonomously flying groups of MAV; Cooperation between groups of MAV and UGV; Collision and obstacle avoidance and de-confliction; Extrication from confined spaces using vision-based navigation; On-board storage and processing of information; Mapping and photographing interiors of buildings; Acoustic sensing; Ability to perch and stare, Chemical sensing etc.

Prototype systems were required to perform

a prescribed mission wherein the systems (MAVs and UGVs) were designed to assist a group of commandos to rescue hostages being held by an insurgent group in a bank building. There were booby traps (mines and explosives) laid out around the building and armed insurgents were circling the building in a vehicle. The MAVs and UGVs, working together, assisted in decommissioning the mines, identifying the location of explosives and the hostages and also identifying a path for ingress by commandos.

While the main venue of the conference was the Jaypee Palace Hotel, Agra, the mission compliance demonstrations by the teams took place at the Drop Zone in Agra, which is an Indian Air Force facility.

Twelve teams from international academia, government and industry (two from USA, one each from Germany, France, Spain, Netherlands, Japan, Australia and four from India) conducted briefings, displayed their entries and

associated technologies, and demonstrated capability for mission compliance through aerial demonstrations during the five day technology event. An International Judging Panel evaluated the entries on their performance. A three day specialist's conference was also held concurrently by 15 subject matter experts of distinction from abroad and India to address research and development critical to the next generation of micro air vehicle systems.

An International Organising Committee (IOC) planned and coordinated the overall organizational efforts in association with NAL, Bangalore, ADRDE, Agra and RDECOM's International Technology Centre-Pacific. A National Advisory Committee chaired by SA and RM and consisting of eminent personalities from the concerned scientific departments and user communities in India provided advice and guidance to the organizers. The

local organizational effort at Agra was led and coordinated by ADRDE, Agra with full assistance from and active participation of Air Force Station and Para Brigade at Agra.

The Inaugural programme was chaired by Dr A.R. Upadhyya, Director, NAL. During his opening remarks Dr Upadhyya welcomed all the invitees and



A Competing Team at the aerial demonstrations in MAV-08

participants. Dr D. Banerjee CC R&D (AMS), DRDO and Col. J Bass, Commander, US Army, ITC PAC delivered the welcome address on behalf of the Indian and US sides. The key note addresses were delivered by Lt. Gen. M.L. Naidu, PVSM, AVSM, YSM, VCoAS, Indian Army and BG (S) Peter Fuller, Deputy Commander, U.S. Army, Research, Development & Engineering Command. Lt. Gen (Retd). Dr V.J. Sundram, Advisor, National Design and Research Form (IE) in his invited talk 'R&D Programmes pertaining to MAVs and UGVs in India' gave an overview of the on-going activities related to MAV technology in various institutions in India. From the US side, Col. John Wright, Deputy Director, Aviation and Missile Research, Development and Engineering Center, USA spoke on 'US Army Science & Technology (S&T) Challenges for Unmanned Aircraft Systems'. LTC Eric Stierna, ITC-PAC gave an overview of the MAV08 mission definitions. Mr Balraj Gupta, Director, ADRDE, Agra proposed the vote of thanks on behalf of the organizers.

The conference had a total of about 300 participants of which about 120 participants were from abroad, nearly 50 of them from the US Army, Air force and the US Office of Naval Research Global (ONRG). Indian participants were about 180, mostly invitees from CSIR, Defence Research and Development Organisation; Defence Services; INDO-US

Science & Technology Forum and other concerned Government Departments; Research Organisations; Academic Institutions, and industries.

On the final day of the conference, each of the demonstrators explained their approach to their

respective design and were asked to provide a retrospective view. This was followed by a panel discussion by representatives of the potential user community (both from India and abroad) who provided their impressions and feedback to the organizers and contestants. The conference concluded with recognition of the meritorious teams (Best Mission Performance, Best Hover Performance/Rotorcraft, Best Autonomous MAV, Best Exotic Design MAV, Best UGV Performance) by Dr Barbara Machak, Director, ARDEC, NJ, USA.

The conference demonstrated that significant progress had been made in technologies of constituent systems of MAVs. It was now possible to achieve a physical size of less than 300mm. However, issues



Seen (from left) are: BG(S) Peter Fuller, Deputy Commander, U.S. Army, Research, Development & Engineering Command, Vice Adm. (Retd) Raman Puri (Former Head, Integrated Defense Services), India, Lt. Gen M.L. Naidu PVSM, AVSM, YSM, VCoAS, Indian Army, Dr A.R. Upadhya, Director, NAL and Mr Balraj Gupta, Director, ADRDE, Agra

of system integration and reliability, sensing, and efficient communication between MAVs, and MAVs and ground systems (including UGVs) were brought to focus and these need to be addressed before the systems could gain user acceptance.

Following the conference some technology areas have been identified for possible cooperation between concerned agencies in India and the US. These include power sources for endurance and covert operations, collision avoidance, communications, onboard processing and autonomous decision making capabilities and increasing the sensitivity of bio-sensors to detect explosive substances with low vapor pressures.



IIP participates in Exhibition at 19th World Petroleum Congress, Madrid, Spain



Dr M. O. Garg, Director IIP and Dr S. K. Singal Scientist IIP along with a poster displayed in the exhibition



Petroleum Minister Mr Murli Deora interacting with the media during the inauguration of the Indian Pavilion

In the exhibition organized at the 19th World Petroleum Congress, Madrid, Spain, the Indian Pavilion was set up by the Ministry of Petroleum and Natural Gas which consisted of stalls put up by CSIR and Indian oil companies such as Oil and Natural Gas Corporation (ONGC), Indian Oil Corporation (IOC), Bharat Petroleum Corporation (BPC), Hindustan Petroleum Corporation (HPC), Engineers India Ltd. (EIL) etc.

CSIR was represented by the Indian Institute of Petroleum (IIP), Dehra Dun. In the CSIR stall, posters on IIP along with other CSIR laboratories were displayed. The Indian Pavilion was inaugurated by Mr Murli Deora, Minister of Petroleum and Natural Gas. Petroleum Secretary Mr M.S. Srinivasan, Mr R.S. Sharma,

Chairman, ONGC, Dr M.O. Garg, Director IIP, Dr S.K. Singal and Directors of IOC, BPCL, HPCL etc. were present.

This exhibition was one of the largest oil and gas exhibitions ever held, covering an area of about 15,000 m² and was a key attraction of the Congress. Around 300 exhibitors from different countries showcased their national or corporate identity, their activities, products and services to the oil and gas community. While oil giants such as CHEVRON, EXXON MOBIL, REPSOL, CEPSA, BP, Petroleum, Total, Shell, FLUOR, Qatar Petroleum, Saudi Aramco, SatoilHydro, CNPC, IBP, Ras Gas, Schlumberger, Sonatrach, CONOCOPhilips, Kuwait Petroleum Corporation etc. participated in the exhibition the

large groups from China, Russia, Italy and Brazil participated for the first time.

The brochures of IIP and its documentary film were made available to the visitors at the Indian Pavilion. Visitors showed keen interest in the activities of CSIR in the field of Petroleum, Energy and Chemicals and made enquiries. Important contacts were established by IIP.

The 19th World Petroleum Congress is considered as the 'Olympics of the Oil & Gas Industry'. Its theme was 'A World in Transition: Delivering Energy for Sustainable Growth'. The Congress was organized at Madrid, the capital of Spain, during 29 June–3 July 2008. In the Congress, 5000 participants, 600 high level speakers, 18 Ministers and 100 CEOs of oil and related

companies and decision makers from all over the world shared their views over wide-ranging issues such as reserves and resources, finance, environment and geopolitics pertaining to petroleum. The Congress received the highest level of support from the King of Spain, H.M. Juan Carlos I.

India was represented by a high-level delegation under the leadership of the Petroleum Minister, Mr Murli Deora. Mr M.S. Srinivasan, Petroleum Secretary and Chairmen and Directors of Oil Companies both in Public and Private Sector, Engineering companies and related organizations. Dr M.O. Garg, Director, IIP and Dr S.K. Singal, Head, AFLAD, IIP represented CSIR.

Discussions were held and lectures were delivered in the Congress by leading personalities of the Industry in Plenary, Special and Ministerial Sessions. Some of the wide-ranging issues discussed in the Technical Sessions were Upstream, Downstream and Petrochemicals, Natural Gas and Renewables and Managing the Industry. An additional Special Session on 'BP Statistical Review of World Energy 2008' was also held.

India International Leather Fair – IILF 2008

A theme pavilion encapsulating the spirit of "Nature, Beauty & Technology" showcasing an exclusive collection of footwear, footwear components, finished leather, leather goods & garments & fashion accessories was set up at the India International Leather Fair (IILF 2008) held during 31 January – 3 February 2008). The Central Leather Research Institute (CLRI), Chennai, coordinated the conceptualization and presentation of the theme pavilion in synergy with ITPO and CLE and supported by ISF and IFLMEA. Delegates from 21 countries participated and presented their production capabilities. CLRI set the stage for the presentation "India — Flavour of the World" at the fair highlighting Indian Leather Industry and its potential for growth and future investment.

Inaugurating the fair, Dr V. Krishnamurthy, Chairman, NMCC, complemented CLRI for being a fore runner in the technology development for the leather sector and making India feel proud. He also appreciated the synergy between ITPO, CLE, IFLMEA, ISF, AISHTMA & CLRI.

OCEANTEX 2008 awarded to Research Team of IIP

Outstanding Achievement Award for R&D and innovation, OCEANTEX 2008, has been presented to Research Team of the Indian Institute of Petroleum (IIP), Dehra Dun. The research team of IIP has developed new catalysts for sweetening of petroleum products, by removing mercaptans (sulphur containing compounds).

The new catalysts developed are Cobalt Phthalocyanine derivatives which have not been reported earlier. These catalysts can be used both for extractive sweetening of LPG and lighter fractions and for fixed bed sweetening of heavier fractions. The petroleum products from which mercaptans can be removed for sweetening include LPG, Pentanes, LSRN, light thermally cracked naphtha, FCC gasoline, Aviation Turbine Fuel and Kerosene. Both catalysts are unique and have higher catalyst activity.

The catalysts have been tried at Bharat Petroleum Corporation Ltd's Mumbai refinery in its FCC LPG Merox unit for four months and were found to be superior to the commercial catalyst. Reliance Industries also tried the catalyst in one of the LPG Merox units of Jamnagar refinery for eight months and its technical services group has recommended its commercial use in its refinery.



Dr Amitava Roy takes over as Acting Director, CMERI

Dr Amitava Roy, Scientist-G, took over as Acting Director of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, from 1 August 2008. He was the Head of the Materials & Structural Analysis Group, CMERI, before taking up the present assignment. Before joining CMERI as Scientist-F, he served various organisations such as Development Consultant, Kolkata (1978-1980), Thapar Corporate R&D Centre, Patiala (1986-1988) and NML, Jamshedpur (1991-1998) in various capacities.

Born on 10 December 1948,

Dr Roy did his B.Tech. in Mechanical Engineering in 1970 from IIT, Kharagpur, M.Tech. in Material Science in 1973 from IIT, Kanpur and M.S. in Metallurgy & Material Science in 1975 from Carnegie-Mellon University, USA. He obtained his Ph.D. with "Summa cum Laude" grade from University of Saarland, Germany, in 1982 on the topic of Nanomaterials (Interface Structure and Property Correlation).

During his professional career, Dr Roy received the Post-Doctoral Fellowship from University of Saarland, Germany (1983-84); Ames

Laboratory, Iowa State University, USA (1984-85) and Cornell University, USA (1985-86).

He is the fellow member of Institute of Engineers and Indian Society of Engineers. He is Life Member of the Indian Ceramic Society, Indian Association for the Cultivation of Science and has the Membership of American Materials Society, German Metals Society and American Institute of Physics. He has several publications in National and International Journals, and Proceedings of Conferences and Seminars to his credit.

ADDENDUM

News item: NEIST Efforts for Yield Improvement of Ginsenoside Covered in *CSIR News* 58 (12) 2008, p192

Under a CSIR network programme, technology development work on production of Ginsenoside – a group of terpenoid saponin with strong immunomodulatory activity, has been scaled-up in a 3L bioreactor using an improved cell line of American Ginseng, *Panax quinquefolium* developed by CIMAP Lucknow. This outcome is expected to lead to development of technology with design of bioreactors and down stream processing techniques for achieving improved techno economic benefit for production of Ginsenoside through plant cell culture technique in bioreactors for commercial exploitation. This is one of the finest examples of Networking among the CSIR laboratories where the CIMAP provided an improved, high yielding and stable cell line of *Panax quinquefolium* to NEIST where it was maintained and sub cultured. Based on this sub cultured material different bioreactors experiments were conducted for optimizing culture and reactor conditions. Down stream processing techniques have also been developed for separation and purification of the product. The Ginsenoside isolated and purified from the bioreactor harvests have been analytically examined with TLC/HPLC and found to be comparable to American Ginseng powder from Sigma Aldrich.

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