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Mobile Teleclock: Adding New Dimensions to Time Dissemination

The National Physical Laboratory (NPL), New Delhi, has developed Mobile Teleclock Receiver – An improved version of Teleclock receiver utilizing mobile network technology and licensed it to M/s Bihar Communication Pvt Ltd, Noida, on 23 July 2009. Mobile Teleclock receiver has been formally launched by Prof. Samir K. Brahmachari, Director General, CSIR and Secretary DSIR on 28 July 2009.

NPL has developed an innovative system for transmission of digital time data via telephone line. This unique time service may not only be accessed by a computer but also by a very inexpensive system called TELECLOCK Receiver, developed by NPL. Teleclock service has the immense potentiality. This service is very simple to use and serves the users who need time with accuracy of few seconds (e.g. for time-stamping and public display of time). Another attracting feature is that this service can be implemented in any country with very low investment. This service is in operation in Saudi Arabia and Nepal. Soon it will be commissioned in many other SAARC countries.

Till now this service can be accessed by a Teleclock receiver which is applicable for landline network. In order to avail Teleclock service a user therefore must have a landline telephone which may not be accessible for some applications, for example, police patrolling vans, personal vehicles, outstation places where STD facility is not available, remote locations where telephone lines may not be available etc. To take care of such applications, NPL has designed an improved Teleclock receiver (Mobile Teleclock)



Prototype Mobile Teleclock receiver developed at NPL ▶



The new receiver makes use of the mobile network. So the time can be accessed anywhere through this unit without any landline telephone connection. The improved Teleclock receiver receives time data through a GPRS modem to access the wireless mobile telephone network. Improved Teleclock receiver has an in-built clock run by a crystal oscillator. The receiver has the provision of dialing the telephone number of the line dedicated for this service manually by pressing a switch or automatically at a pre programmed time. The frequency of automatic dialing is normally once in a day but may be increased or decreased on the user's demand. Through dialing, the receiver receives the data corresponding to the standard time of the day [in India Indian Standard Time (IST)], sets its own time accordingly, displays it and disconnects itself. The improved Teleclock receiver is an inexpensive and advanced solution to access standard time without any dedicated landline telephone connection. Mobile Teleclock receiver uses the SIM card in a similar way it is being used in any ordinary GSM mobile phone, but only 'Data Communication Enabled SIM' card should be used for this purpose. Such an inexpensive, simple and mobile accessibility of Standard Time is unique and is not yet available elsewhere.

R&D at NIO

The scientists working at the National Institute of Oceanography (NIO), Goa, have reported following R&D pursued at the institute:

Reduced near-surface thermal inversions in 2005-06 in the southeastern Arabian Sea (Lakshadweep Sea)

Repeat XBT transects made at near-fortnightly intervals in the Lakshadweep Sea (southeastern Arabian Sea) and ocean data assimilation products are examined to describe the year-to-year variability in the observed near-surface thermal inversions during the winter seasons of 2002-06. Despite the existence of a large low-salinity water intrusion into the Lakshadweep Sea, there was an unusually lower number of near-surface thermal inversions during the winter 2005/06 compared to the other winters. The possible causative mechanisms were examined. During the summer monsoon of 2005 and the following winter season, unusually heavy rainfall occurred over the southwestern Bay of Bengal and the Lakshadweep Sea compared to other years in the study. Furthermore, during the winter of 2005, both the East India Coastal Current and the Winter Monsoon Current were stronger compared to the other years, transporting larger quantities of low salinity waters from the Bay of Bengal into the Lakshadweep Sea where a relatively cooler near-surface thermal regime persisted owing to prolonged upwelling until November 2005. In addition, the observed local surface wind field was relatively stronger, and the net surface heat gain to the ocean was weaker over the Lakshadweep Sea during the postmonsoon season of 2005. Thus, in winter 2005/06, the combination of prolonged upwelling and stronger surface wind field resulting in anomalous net surface heat loss caused weaker secondary warming of the near-surface waters in the Lakshadweep Sea. This led to a weaker horizontal sea surface temperature (SST) gradient between the Lakshadweep Sea and the intruding Bay of Bengal waters and, hence, a reduced number of thermal inversions compared to other winters despite the presence of stronger vertical haline stratification.

For more information read

Nisha, K.; Rao, S.A.; Gopalakrishna, V.V.; Rao, R.R.; Girishkumar, M.S.; Pankajakshan, T.; Ravichandran, M.; Rajesh, S.; Girish, K.; Johnson, Z.; Anuradha, M.; Gavaskar, S.S.M.; Suneel, V.; Krishna, S.M. Reduced near-surface thermal inversions in 2005-06 in the southeastern Arabian Sea (Lakshadweep Sea). *J. Phys. Oceanogr.* **39**(5); 2009; 1184-1199.

Evidence of paleo-cold seep activity from the Bay of Bengal, offshore India

Evidence of paleo-cold seep associated activities, preserved in methane-derived carbonates in association with chemosynthetic clams (*Calypptogena* sp.) from a sediment core in the Krishna-Godavari basin, Bay of Bengal is reported. The observations and calculations based on high-resolution wet bulk density profile of a core collected on board R/V Marion Dufresne (May 2007) depict zones of sharp increase in carbonate content (10-55 vol %) within 16-20 meters below seafloor (mbsf). The presence of *Calypptogena* clam shells, chimneys, shell breccias with high Mg calcite cement, and pyrite within this zone suggest seepage of

methane and sulfide-bearing fluid to the seafloor in the past. Highly depleted carbon isotopic values ($\delta^{13}\text{C}$ ranges from -41 to -52 ppt VPDB) from these carbonates indicate carbon derived via anaerobic oxidation of methane. Extrapolated mean calendar age (approx. 58.7 ka B.P) of the clastic sediments at a depth of 16 mbsf is close to the upper limit of the U-Th based depositional age (46.2 plus or minus 3.7 and 53.0 plus or minus 1.6 ka) of authigenic carbonates sampled from this level, thereby constraining the younger age limit of the carbonate deposition/methane expulsion events. It has been inferred that the observed carbonate

deposition might have resulted from the flow of methane-enriched fluids through the fracture network formed because of shale diapirism.

For more information read

Mazumdar, A.; Dewangan, P.; Joao, H.M.; Peketi, A.; Khosla, V.R.; Kocherla, M.; Badesab, F.K.; Joshi, R.K.; Roxanne, P.; Ramamurty, P.B.; Karisiddaiah, S.M.; Patil, D.J.; Dayal, A.M.; Ramprasad, T.; Hawkesworth, C.J.; Avanzinelli, R. Evidence of paleo-cold seep activity from the Bay of Bengal, offshore India. *Geochem. Geophys. Geosyst.*: **10**(6); 2009; 15 pp, doi:10.1029/2008GC002337

Evolution of the Late Cretaceous crust in the equatorial region of the Northern Indian Ocean and its implication in understanding the plate kinematics

Analysis of 3100 km of newly acquired marine magnetic data, constrained by satellite and shipborne free air gravity anomalies, in the corridor between the 86E fracture zone (FZ) and Ninetyeast Ridge, north of the equator reveals the evolutionary history of the Late Cretaceous crust characterized by anomaly 34 through 31 (83.5-68.7Ma) under complex tectonic settings. Seafloor spreading model studies suggest that the crust, particularly between the chrons 33R and 33 (79.0-73.6 Ma), was formed with variable and slightly higher half-spreading rates (4.8-7.1 cm yr sup(1)) than the crust of similar age either

in the regions west of 86 degrees E FZ or east of the Ninetyeast Ridge or the Southern Crozet Basin. Further, the interpretation of magnetic anomalies suggests the presence of fossil spreading ridge segments and extra oceanic crust on the Indian plate that has been transferred from the Antarctica plate by discrete southward ridge jumps. These ridge jumps are caused by thermal instability of the spreading centre as the Indian plate moved northward over the Kerguelen mantle plume. The present study indicates that the spreading ridge-plume interaction is the prime mechanism for these ridge

jumps, which have occurred since 75.8 Ma. The newly identified magnetic anomalies 34 through 31 and the inferred approx. N3 degrees E trending FZs refined the plate reconstruction models for that period.

For more information read

Desa, M.; Ramana, M.V.; Ramprasad, T. Evolution of the Late Cretaceous crust in the equatorial region of the Northern Indian Ocean and its implication in understanding the plate kinematics. *Geophys. J. Int.*: **177**(3); 2009; 1265-1278.



Grant- in-aid/Sponsored projects, Technical services undertaken and Patents filed at CECRI

The Grant- in-aid/Sponsored projects, Technical services undertaken and Patents filed by the Central Electrochemical Research Institute (CECRI), Karaikudi, during January-June 2009 include:

Grant-in-aid/Sponsored Projects taken up

- Feasibility study on gold plating on Cu-Be alloy fixtures for Satellite applications, for ISRO Inertial systems Unit, Thiruvananthapuram
- Development of Micro sensor for Biomedical food and environmental applications, for Aeronautical Development Agency, Bangalore
- Development of Nano scale multilayered and Nano composite Super Hard Coatings by reactive magnetron sputtering for biomedical applications, for DST, New Delhi
- To study suitable coating system for corrosion protection of steel structures, for Neyveli Lignite Corporation Ltd, Neyveli
- Signal amplification by Gold Nanoparticles in Bioelectrocatalysis and Biosensing, for Department of Biotechnology, New Delhi
- Installation and measurement of strain by SMER gauge for ILRT of Unit-6, for Rajasthan Atomic Power Project NPCIL, Kota
- Identification of metallic coating and alloys for under water application for ECIL, Hyderabad
- Identification of organic coatings for Aluminium alloy for under water application, for ECIL, Hyderabad

- Exploration of Sonochemical methodologies for control of metal nanoparticles for electrochemical reactions, for DST, New Delhi
- Development of nanoparticles dispersed Nickel composite materials by electro-co deposition technique using DC and pulse current, for DST, New Delhi

Technical Services undertaken

- Design, fabrication and supply of Filter Press, for Department of Chemical Engineering, Annamalai University
- To test the sample batteries 12V/40Ah and 12V/75Ah as per IS 13369-1992 and sulphation test as per IRS 88/2204, for M/s Vishkarma Associates Pvt. Ltd, New Delhi
- Testing of CPCC coated reinforcement rods used in construction of new major bridge No 1274 at KM 881/10-882/9 as per CECRI code of practice, for M/s Cherian Verkey Construction Co., Cochin.
- Testing of non-organo phosphonate samples, for Neyveli Lignite Corporation Ltd., Neyveli
- To supply a 250 A Electrolyser of active area 60 cm x 40 cm with anode, cathode and membrane, for M/s Tatva Chintan Pharma Chemicals, Ankleshwar.

- Supply of two 40 W self supporting DBFC Unit, for M/s Genex Science & Tech Pvt Ltd, Mumbai
- Testing of CPCC coated reinforcement rods and chemicals covered by the Patent Nos. 481/Del/93& 259/Del/92, for M/s RDS – CVC (JV), Cochin.
- Utilization of electrode coating machine for lithium ion cell activity for 120 hours, for VSSC, Thiruvananthapuram
- Evaluation of 2V, 1530 Ah VRLA Cells as per IEC 0896-21: 2004 specification, for M/s Amara Raja Batteries Ltd, Tirupathi
- Testing of CPCC coated reinforcement rods and chemicals covered by Patent No 481/Del/93 and 259/Del/92 as per CECRI code of practice, for M/s KRV Infrastructures, Dindigul
- Supplying suitable corrosion resistant thermal coating for Hydroclave in VSSC, for VSSC, Thiruvananthapuram

Patents filed

- An electrochemical coagulation process for the removal of nitrate from drinking water and electrolytic cell therefor — Vasudevan S; Florence Epron; Ravichandran S; Sozhan G; Mohan S; Lakshmi J

System Controller and Software Algorithm for Mid FACE knowledge base, developed at NPL, licensed to M/s Sheel Bio-Tech Ltd

Globally changing environment is affecting the life on the Earth in several ways. One of the important constituents of the Earth's atmosphere is the Carbon dioxide (CO₂) gas, which controls the carbon cycle of the Earth's rhizosphere. Present level of CO₂ in earth's atmosphere is around 360-380 ppm as compared to the pre industrial era level of 280ppm with an exponential rise of 1.5 to



During Transfer of Technology Know-How documents seen (from left) are: Dr Vikram Kumar, the then Director NPL; Shri N.K. Babbar, Head, Industrial Liaison, NPL; Shri Sadeep Maheswari and Shri M.K. Dwivedi M/s Sheel Biotech Ltd, New Delhi

1.8 ppm per year. By middle of 21st century the CO₂ level is likely to double (560 ppm) its pre industrial value of 280 ppm in late 18th century. This exponential increase has attracted the attention of scientists and government agencies, as the enhanced level of CO₂ in the atmosphere may affect the agricultural productivity.

The effects of the enriched CO₂ air are being studied worldwide on crops, forests and animals etc. These studies have more significance in India as India has an agricultural based economy and enhanced level of CO₂ in the atmosphere may affect the agricultural productivity. Our food security may be significantly affected by rise in CO₂. To adapt and benefit from the enhanced level of the CO₂, fundamental knowledge of

the responses of crops systems to such changes is required. Such studies are being made by using various techniques such as Open Top Chambers (OTC), Free Air CO₂ Enrichment (FACE) etc. The OTCs are though a cost effective means of meeting the requirement of field research on CO₂ enrichment, but they do not simulate the natural environment for experiments under elevated CO₂ owing to chamber effects like change in microclimate of plants, increase in ambient temperature, poor sunlight etc.

The limitations of OTC technology have been overcome by developing the Free Air CO₂ Enrichment (FACE) technology for enriching CO₂ in open fields in place of closed/semi-closed chambers. They offer more near natural

simulated environment for the experiments. The first FACE system known as Arizona FACE with advanced technology was developed in USA during mid eighties and set up at University of Arizona, Phoenix. Due to their exceptionally high cost of development, as well as high cost of operation, such FACE facilities were setup only at a few places in USA and Europe, but none in

India or South Asia. FACE facilities also have been set up in Italy, Japan, and Switzerland etc.

The first medium size FACE facility (Mid-FACE) based on good features of Italian and Japanese designs, has been developed at the National Physical Laboratory (NPL), New Delhi; and is installed in the fields of IARI, New Delhi, for studying the response of crops under elevated level of CO₂ in open fields. With this development, India has been included in the international network of FACE facilities and becomes the second to have such a facility, after Japan, in whole of Asia for carrying out CO₂ enrichment research.

The design of Indian Mid FACE systems is based on the principle of injecting additional CO₂ gas in open



fields suitably so as to attain a predetermined elevated level of gas concentration (550 ppm at The Center) and with a fairly uniform distribution in the fields under the varying meteorological conditions of winds and temperature. The main components of the FACE facility are — apart from CO₂ gas storage and distribution system (i) the FACE ring, generally known as plenum, through which CO₂ enriched air is injected into the open field, (ii) different sensors and actuators used for monitoring the environment and controlling the operations and (iii) an electronic system for controlling various operations.

The Mid-FACE ring is Octagonal in shape having a diameter of 8 m. Each arm is fitted with a centrifugal air blower at one end and is closed at the other end. All the eight arms of the octagon have independent supply of CO₂ controlled by 8 On/Off valves. Depending on the upward wind direction, CO₂ is released from 3 adjacent arms at a time at crop canopy height. A common computer controlled PID valve controls the quantity of the CO₂ to be released into the arms. The concentration of CO₂ in open fields not only depends on the quantity of CO₂ gas released but also on the gas dispersion characteristics controlled by the meteorological factors such as wind speed and wind direction. The sensors for wind speed (anemometer), wind direction (wind vane) and CO₂ analyser are located near the center of the FACE ring. Their output signals are continuously measured in real time. Based on these inputs the control system, through a specially developed algorithm, controls the flow rate of CO₂ gas with the help of a PID controller valve. The direction of wind decides that which On/Off valve is to be opened to release CO₂. The CO₂ concentration at the center of the ring is maintained at within the permissible limit of $\pm 10\%$ of the target value of 550 ppm. The CO₂ concentration achievable in the entire field, using NPL design are within limits acceptable to the international CO₂ research agricultural community for meaningful research.

System controller is the heart of the FACE system. Technology for this system controller with Algorithm has been transferred to M/s Sheel Bio-Tech Ltd (Green House Division), New Delhi.

IMMT signs MoU with Murdoch University, Australia

An MoU was signed between Institute of Minerals and Materials Technology (IMMT), Bhubaneswar, and Murdoch University, Australia, to assist each other — in developing, strengthening and implementing initiatives for promotion of R&D in material science, have bilateral exchange of research and teaching staff, training and guidance of students, collaboration in offering academic programmes, and organization of joint seminars and workshops.,

Murdoch University is a leading research university in Australia having strong academic and R&D programmes in mineral, metallurgical, chemical, environment and renewable energy technology. Both IMMT and Murdoch University have been collaborating with each other on specific projects such as mitigation of Arsenic in drinking water, nano iron oxide for effluent treatment, utilization of sulphur dioxide etc. with financial support from various Australian agencies. These projects have laid a strong foundation of cooperation between the two institutes, leading to significant scientific and technological contribution. The above MoU was signed with an aim to expand and deepen this collaboration between the two organizations. It was signed on 22 April 2009 at IMMT.

The MoU was signed by Prof. Jim Reynoldson, Deputy Vice Chancellor (Research) of Murdoch University and Prof. B. K. Mishra, Director, IMMT. This agreement will help both IMMT and Murdoch University complement each other in furthering scientific and human resources development goals. To start with, it has been agreed to develop a collaborative R&D programme in the area of Solution Processing of Materials involving a range of disciplines from hydrometallurgy to computational material science. Other R&D areas in nanotechnology and biotechnology with mutual synergy and potential are being explored.

NGRI signs MoU with NRSC, ISRO

The National Geophysical Research Institute (NGRI), Hyderabad, signed an MoU with National Remote Sensing Center (NRSC), ISRO, Hyderabad, on 5 August 2009.

The MoU is basically aimed at sharing the knowledge between the two institutions to strengthen and add R&D component in the field of groundwater and geo-environmental studies. The study includes assessment of the groundwater resource and pollution. NGRI will be collecting primary data through field investigations based on the NRSC satellite image interpreted maps on GIS platform besides helping NRSC in carrying out studies on groundwater flow and mass transport modeling studies and water quality data base thematic layer preparation.

The creation of database for selected areas for Environmental Impact Assessment (EIA) and Net Work Project (NWP), would facilitate the availability of systematic information to the user groups, and policy makers which would lead to better economic returns and utilization strategy of the groundwater resources of the country.

The digital base would open an avenue for a better planning in terms of systematic exploitation to maintain environmental/ecological balance besides its immense use for comparison with other databases to corroborate the quality and quantity of the resource potential for future market strategies.

NIO signs MoU with Chilika Development Authority (CDA), Bhubaneswar

The National Institute of Oceanography (NIO), Goa, has signed a memorandum of understanding MoU with the Chilika Development Authority (CDA), Bhubaneswar, for the sustainable management of



Signing of MoU document

Chilika lagoon through regular environmental monitoring programmes. The MoU was signed on 28 August 2009 by Dr S. R. Shetye, Director, NIO, and Dr A.K. Pattnaik, Chief Executive, CDA, at NIO Goa.

The five year collaboration, under the MoU signed, on Chilika lagoon envisages monitoring of the water and sediment quality; coastal processes; biological characteristics; and an advisory on remedial measures. It will compare the output of present monitoring with the output of previous study done by NIO in 2000-01.

The MoU undertakes to conduct this environmental monitoring through the study of physico-chemical, eco-biological and water quality parameters; coastal processes; fish and fishery resources; and the extent of sea grass growth for three seasons (pre-monsoon, monsoon and post-monsoon). The CDA personnel will be trained in all these aspects of environmental monitoring programme.

An Advisory Committee with Dr S.G. Prabhu Matondkar, Scientist, NIO as Chairperson and Dr A. K. Pattnaik, Chief Executive, CDA, as Co-Chairperson has been constituted to guide and help in implementation of this scientific and environment friendly pact between NIO and CDA. Shri R. A. Sreepada, Scientist, NIO, the coordinator of this programme, has been nominated as co-Convenor with Shri R.N. Samal of CDA as Convenor.

The Chilika lagoon ecosystem was in a severe degraded condition. It was placed in the Motreux Record (threatened list) by Ramsar Convention. The restoration of the lagoon was carried out by CDA, a Government of Orissa undertaking, in consultation with NIO and other premier institutions of the country. The lagoon ecosystem has improved significantly after the hydrological restoration by CDA and it was removed from the Montreux Record. The restoration intervention is acclaimed globally. The Chilika lake is among the largest brackish water ecosystems of the world.



Groundwater Information System for Farmers & Policymakers of Punjab

On the Independence Day, 15 August 2009, Director, National Geophysical Research Institute (NGRI), Hyderabad, released the Groundwater Information System for Farmers and Policymakers developed by Ecology and Environment Group of NGRI. The information system has detailed groundwater level data, groundwater quality with regard to major ions and pesticide residues information. The Project has been supported as a pilot project in the country by NRDMS, Department of Science and Technology, to provide the web site at all village Knowledge Centers in the districts. Agriculturally developed and over exploited groundwater irrigated central parts of Punjab viz., old Amritsar and Jalandhar districts have been chosen for the study. The web page has been temporarily linked to NGRI website www.ngri.org.in. The main aim of the project is to bring information to the door step of farmers about the status of groundwater condition in a particular village regarding to at what depth the groundwater is available, whether it is of potable drinking water quality with respect to major ion concentrations and persistence of pesticide residues. The tool is a general information system which can be accessed anywhere in the world. The NGRI started collecting primary groundwater level and groundwater quality data at selected 120 observation wells in Amritsar and Jalandhar Districts since June 2007. The groundwater data has been collected during pre monsoon and post monsoon of 2007 and 2008. The website can be updated with

forthcoming latest groundwater data sets as and when is readily available with line departments in the Punjab state. The web site can be accessed through Internet Explorer with District boundary maps of old Amritsar and Jalandhar districts. The Web Server requires about 50 MB of space on the Machine for hosting groundwater data base in the two districts.

The larger purpose of the Groundwater Information System on the web site stands, makes available freely immense body of groundwater information that is of great relevance to day to day affairs of agriculture activities at Farm level as well as for planning developmental activities in various departments either at State or Centre. One can prepare their own print page. The website is dynamic in the sense it can be used as an interpretation tool for making comparison of various parameters through the two pop windows projected information in both the districts. If there are more than one well in a particular village all the wells information will pop up.

The GWIS offers information on declining groundwater level year after year for past two years (which will soon be updated to 10 years) from across the districts. Metadata offered include historical groundwater levels, groundwater quality during 1990s. The information is ranging from mapping the canal network, location of hand pumps and agricultural wells in each village. As of now, the web site is specific to Amritsar and Jalandhar Districts, Punjab, and is more useful to

the society with regard to groundwater information, which is becoming stand alone reliable resource for agriculture production in the State. The web site will be horizontally expanded to Muktsar and Ludhiana districts, Punjab, immediately and later to all districts in Punjab state. The site can be further updated with groundwater prospect maps of the districts available with National Remote Sensing Centre, ISRO, Hyderabad.

The web site showcasing, a visual graphic format, the immense information that is available with state line departments dealing in groundwater resource management. In its present form, the GWIS is most user friendly accessible through Internet explorer. The web site is being improvised by the day. In fact, the whole World today is involved in it's development, because we are constantly monitoring and updating the information with regard to groundwater status periodically and refining the information database with reliable details for further groundwater development and providing sustainable agriculture in the overexploited areas in the central parts of Punjab State. The website is adopting ISO/ OGC standards for providing geo-web services (WMS/ WFS). This could be adopted by CGWB/ SGWBs as a Standard methodology for managing groundwater data. For further details one may contact, Director, NGRI, Hyderabad (director@ngri.org.in) or Director (psa@nic.in), NRDMS, NSDI, New Delhi.

Primary Ozone Standard Facility (NIST-Standard Reference Photometer) commissioned at NPL

In India and adjoining countries of South Asian region, various institutes and organizations have undertaken measurements of surface ozone to understand various Global change related problems and also to study air quality of the region. It is also very important that these measurements are made traceable to International standards. Keeping in view of the above importance, a NIST's Standard Reference Photometer (SRP-43) – Primary Ozone Standard Facility has been setup at National Physical Laboratory (NPL), New Delhi, under Metrology in Chemistry Programme under the nutshell of CSIR's Advancement in Metrology network project (NWP-45). This facility was commissioned by Prof. Vikram Kumar, the then Director, NPL on 20 May 2009 on the occasion of World Metrology Day.

The ground-level ozone concentration is an important air quality parameter which is monitored and reported worldwide. The reference method for ozone measurements is based on UV photometry, with the National Institute Standards & Technology (NIST, USA) Standard Reference Photometer (SRP) ozone reference standard acting as the primary standard for numerous national and international ozone monitoring networks. The NIST SRP was developed in 1980s as a joint collaboration between the US Environmental Protection Agency (EPA) and NIST to ensure the traceability in the US ground-level

ozone network. Two of these instruments are maintained by NIST (SRP0 and SRP2) and are regularly used to ensure proper comparability of ten other SRPs maintained by the EPA

regional centres. Similar requirements for other networks exist globally; for example, the European Directive 2002/3/CE related to ozone in ambient air sets information and alert thresholds, target values and long-term objectives, as well as rules and guidelines on the implementation of ozone monitoring networks. The UV photometry method is described as the reference method for ozone analysers as well as calibration instruments, following the ISO standard 13964. The Directive also gives a data quality goal by specifying a maximum uncertainty of 15% attached to individual measurements. In total 44 SRPs are currently maintained in 21 countries over the globe.

The Standard Reference Photometer operates by measuring the absorption of UV radiation at 253.65 nm by an ozone/air mixture flowing through its gas cells. The concentration of ozone is calculated



Dr Vikram Kumar, the then Director NPL, observing Primary Ozone Standard Facility setup

from the attenuation of the light intensity in air containing ozone compared with the same air without ozone. Estimations using the Guide to the Expression of Uncertainty in measurement yield a combined standard uncertainty of 2.0 ppbv from 0 ppbv – 100 ppbv (absolute) and 2% from 100 ppbv – 1000 ppbv (relative). These uncertainties have recently been increased to a more conservative value based on discrepancies in the ozone cross-section uncertainty.

The facility commissioned at NPL will be a unique in the South Asian region. NPL is expecting lot of potential users of this facility from this region to calibrate their ozone measurement systems. It is also planned to provide secondary ozone standards after calibration against primary standard at NPL to various institutes for their use to calibrate their ozone analyzer systems.



Short Term Training Course on Cheminformatics and Computer Aided Drug Designing

Bioinformatics Infrastructure Facility, Biotechnology Division, of the North-East Institute of Science & Technology (NEIST), Jorhat, organized 2nd Short Term Training Course on 'Cheminformatics & Computer Aided Drug Designing' for three days i.e during 18-20 August 2009. The programme was inaugurated by Dr P. G. Rao, Director, NEIST. Prof. Pinak Chakrabarti from Bose Institute, Kolkata, was the Chief Guest. Sixteen students from different parts of India attended the training course. During these three days experts from different institutes gave lectures and hands-on-training to the participants.



Short Term Training Course in progress

Dr Nagesh R. Iyer delivers the Foundation Day Lecture at CECRI

The Central Electrochemical Research Institute (CECRI), Karaikudi, celebrated its 62nd Foundation Day on 27 July 2009. Dr Nagesh R. Iyer, Director, SERC, Chennai, who was the Chief Guest, delivered a lecture on 'Grand Structural Engineering Challenges & their Solutions – A Few Illustrative cases'.

In his lecture, Dr Iyer highlighted the quality policy of SERC (ISO 9001 certified by RINA) followed by the vision, organizational structure, major facilities and R&D thrust areas. He mentioned that SERC's Tower Testing Research Station is one among the top five similar facilities in the world. He spoke about the great invention of FINite element engineering analysis using Adaptive Refinement Technique (FINEART) – A multiphysics computational analysis package. This software package was developed with international

collaboration for R&D purposes for static, natural frequency and dynamic types of analysis. This is meant for testing and analysis of new materials of construction using powerful mathematical modeling.

Dr Iyer explained a few case histories of successful utility of FINEART to Cooling towers design proof check; Damage tolerant evaluation of wing bottom skin panel of SARAS aircraft; Dynamic crash simulation showing impact of car into a post in order to educate people how air bags and seat belts reduce injury; Analysis and design of superstructure of navigational span of Pamban railway bridge where the existing bridge is successfully



Dr Nagesh R. Iyer, Director SERC, delivering the CECRI Foundation Day Lecture

converted for broad gauge based on the recommendations of SERC. Talking of FINEART application, he mentioned that the package was given to all engineering colleges/research centers in Tamil Nadu and a few others in Karnataka, Kerala and Andhra Pradesh for its evaluation and validity. The feedback from these colleges and research centers are continuously being received and taken into

consideration for further upgradation of the package.

Dr Iyer, in his lecture, while discussing the bridge evaluation for railways said that in order to estimate the residual life of bridges under various test conditions, SERC has taken up an extensive study of two old bridges one at Nagari in Andhra Pradesh and another the bridge across Kusasthalai near Arokkonam in Tamilnadu. Both were constructed many years ago. The study would cover all aspects viz., drastic increase of traffic, load and weightage of the trains at present and in future too, including whether the overloading would affect the design. SERC would also undertake a similar study on three more old bridges with the main objective to devise a methodology which will take into consideration mainly the safety aspects. He informed that the condition of the Pamban Bridge, which was converted into broad gauge without altering the basic structure with the active participation of SERC, was good. It would be monitored continuously.

Further he apprised of the successful continuous remote monitoring of a bridge located at Vishakhapatnam, by SERC, for five years. He also posed some of the corrosion problems encountered during their structural evaluation and requested CECRI to come up with suitable remedial measures.

Finally, he mentioned about the blast resistant test evaluation of IGLOO structures meant for ammunition storage for defense applications. He concluded his talk by describing the goals of SERC for the forthcoming five years.

Earlier, Dr V. Yegnaraman, Acting Director, CECRI, in his welcome address, paid rich tributes to Dr R. M. Algappa Chettiar, who donated 300 acres of land and cash of Rs 15 lakh in 1948 to establish CECRI at Karaikudi. He said that CECRI activities were directed towards the development of new and improved products and processes as well as novel innovations in electrochemical science and technology. CECRI is also offering Anna University B. Tech. course in Chemical and Electrochemical Engineering. It has been undertaking several projects in collaboration with laboratories in and outside India.

Dr S. Syed Azim, Scientist and Head, IPC Section, proposed the vote of thanks.

Prof. Roddam Narasimha delivers Lecture on 'New Wings for New Turboprops'

Prof. Roddam Narasimha delivered a Lecture on 'New wings for new Turboprops' at the National Aerospace Laboratories (NAL), Bangalore, on 20 July 2009. The occasion was Prof. Roddam Narasimha's birthday.

Prof. Narasimha started his lecture stating that the turboprops have some great advantages which we could afford to ignore so far owing to low fuel costs. But no longer we can do so since the fuel prices have started to rise.

Since 1990, there has been a drop in the use of Turboprop aircraft owing to cheap oil, high cabin noise and more flying into turbulent weather. There is also a general perception that jet aircraft are "safer" which, in reality, is not so. Jet aircraft also enjoy some sort of status symbol. But they are pricy and consume lot more fuel. For instance, an ATR-72 on a 370 km (200 Nm) sector consumes less than 40% fuel and emits 50 % less CO₂ than an equivalent jet.

Prof. Narasimha has been involved in the NAL's RTA project in many ways. On many occasions he has spoken about it with a lot of passion. He has thought very deeply about it and now has taken up a project on developing new optimized wings for the proposed new turboprop aircraft that NAL intends to build, viz., RTA-70. During this talk, he presented the details of this work. His idea is to exploit the propeller slipstream energy for better wing design. The approach is to use a simple theory to understand the basic physics. He said that there is generally no need to jump to complicated tools or theories. The present work makes use of a simple lifting line theory to model the wing. This wing is assumed to be immersed in the wake of the propeller which is estimated using CFD. He presented the details of the classical lifting line theory modified to take into account the slip stream effect. The problem is then solved numerically using standard collocation method. The wing itself is parameterized using Bezier curves. Prof. Narasimha gave a brief introduction to the Bezier



curves and said that they were first employed to design fonts.

He then presented some sample results. In some cases, the reduction in induced drag could be as high as 37%. Some shapes looked very unusual. Some even looked almost like Batman's cape! But they all made physical sense. Prof. Narasimha said that the shapes need to be examined further using tunnel experiments or high fidelity CFD simulations. More practical constraints need to be brought in, such as structural constraints, engine integration, fuel tank volume etc. However, the present methodology is fully established.

There were many questions from the audience. Some were unable to believe that such wings could exist. Some appreciated the idea. Prof. Narasimha answered the questions with great clarity.

ISAMPE Lecture 2009

A lecture was organized by ISAMPE Bangalore Chapter on 14 August 2009 at the National Aerospace Laboratories (NAL), Bangalore. Dr C Divakar, Chairman, ISAMPE Bangalore Chapter, welcomed the speaker Dr C.M. Manjunatha and the audience. He briefly introduced the speaker to the audience. Dr C.M. Manjunatha, Scientist, Structural Technologies Division, NAL, delivered his lecture on 'The fatigue behaviour of a GFRP nano-composite'. He presented lucidly the results of a systematic study made by him at Imperial College, London, UK, on fatigue behaviour of silica based nano-composites. The summary of the lecture is presented. A thermosetting epoxy polymer was modified by incorporating (i) 9 wt.% CTBN rubber micro particles, (ii) 10 wt.% silica nano particles, and (iii) both 9 wt.% rubber micro-particles and 10 wt.% silica nano particles. The neat and all the modified resins were then used to produce bulk epoxy sheets and GFRP composites.

Under constant amplitude tensile fatigue at stress ratio $R = 0.1$, the addition of either the rubber micro particles or silica nano particles in the resin enhanced the bulk epoxy fatigue life by ~ 4 times. The addition of both micron-rubber and nano-silica particles resulted in further significant enhancement of the epoxy fatigue life, by about 6-10 times. The energy dissipating mechanisms such as rubber cavitation-plastic deformation,

silica particle debonding-plastic void growth were observed which contribute towards improved fatigue life of bulk epoxy polymers.

The GFRP composites with modified epoxy matrices, under constant amplitude tensile fatigue, also exhibit improved fatigue behaviour. The rubber micro particles or silica nano particles independently increased the fatigue life by about 3-4 times, whereas presence of both these particles enhanced the fatigue life by about 6-10 times. The suppressed matrix cracking in the modified epoxy matrix and reduced crack propagation contribute to significant improvement in fatigue life of GFRP composites.

The fatigue life of GFRP composite with neat and hybrid epoxy matrices were observed to increase with stress ratio from $R = 0.1$ to 0.7. However, the GFRP nano-composite exhibit higher fatigue life over that of GFRP with neat matrix, at all stress ratios investigated. Under a typical three-step tensile block load sequence, the GFRP with hybrid matrix exhibits about 30% higher fatigue life over that of GFRP with neat matrix. The predicted fatigue life using various models compared reasonably well with experimental results. This study is expected to initiate interest amongst aerospace research community for application of nano-composites in air frame structures.

Dr Anjana Jain, Secretary, ISAMPE Bangalore Chapter, proposed the vote of thanks.



Smt Uma Parameswaran delivers a Lecture on Intellectual Property Rights

Smt Uma Parameswaran, CEO of SciTech Patent Art, Hyderabad, delivered a lecture on 'Patent information as a tool for research and business' at the National Aerospace Laboratories (NAL), Bangalore, on 23 June 2009.

In her lecture, Smt Parameswaran pointed out the importance of patent documents and patent information for orienting the research and development projects to keep the pace with the developments happening in the technology. Speaker urged the audience to refer to the patent documents as it contains more than 80 % of latest information in the form of patent publications. Lecture was very informative as speaker had addressed the following topics during the presentation:

- White Space Analysis
- Research Collaborations
- Licensing Opportunities
- New Business Development
- Technology Trends
- Competitive Landscaping
- Competitor Patent Portfolio
- Patent Watch
- Patent Database Subject-action-object Analysis
- Prior Art Problem vs. Solution
- Inventor Tracking
- Citation Analysis
- Novelty/Patentability assessment
- Invalidation Searches
- Freedom to Operate

Earlier Shri Vasant Pilare welcomed the audience by highlighting the essence of IPR protection and purpose of patent landscape. Dr M. N. Sathyanarayana introduced the speaker to audience

Shri Vasant Pilare proposed the vote of thanks.

World Environment Day Celebrations at NEIST

The North-East Institute of Science & Technology (NEIST), Jorhat, celebrated the World Environment Day on 5 June 2009. The theme for this year was 'Your Planet Needs You! Unite To Combat Climate Change'.

Ms L. S. Changsan, IAS, Deputy Commissioner of Jorhat, graced the occasion and released a book titled '*NEIST activities for environment protection and restoration*'. Specially brought out for the occasion, the book is essentially a compilation of NEIST services rendered so far in Assam and the NE region for environment protection and restoration for all those who are engaged in environmental affairs. Ms Changsan, also planted a 'Neem' sapling as a gesture for harmonious living with nature. Delivering her speech on the occasion, Ms Changsan expressed her happiness to be amongst the distinguished scientists and mentioned that every human being should contribute a little in their own personal way to protect the environment and in this connection she appreciated the initiatives taken by NEIST for taking environmental issues seriously.

Earlier, Dr P. G. Rao, Director, NEIST, in his speech mentioned that unlike the previous years, the sapling chosen for plantation, this year, in NEIST campus was 'Neem' because of the special significance it bears. The campus has a forest cover of 300 acres of land with 3500 varieties of various plant species and the new saplings will be planted to replace some of those species which were either felled or uprooted owing to natural calamities, he apprised.

In the afternoon a film show on 'An unconventional truth' the award winning report on Global Warming by Mr A.I. Gore of USA was screened. The afternoon session held at NEIST auditorium was presided over by Dr P.G. Rao, which was also attended by Shri J. M. Kouli, Conservator of Forests, Eastern Assam Circle and Shri R. K. Das, Divisional Forest Officer of Jorhat.

In his welcome address, Dr B.P. Baruah, Scientist, NEIST, pointed out the effects of the 2.5 micron particulate matters present in the environment as pollutants and the environment friendly activities of NEIST. Dr Saurabh Baruah, Scientist, NEIST highlighted the effect of 'Global Warming' in his popular lecture. Shri Kouli, emphasized



World Metrology Day Celebrations

the need to protect the rich biodiversity and the high endemism of flora and fauna in North East India and specifically in Assam. He also mentioned the various projects undertaken by the Forest Department to conserve and protect the biodiversity, and the other activities of the Forest Department to save the environment. Shri Das mentioned the role of NEIST in protecting the environment of Jorhat and praised the greenery at NEIST campus.

As a part of the programme, a sit and draw art competition for the children of NEIST campus and a photography competition for the staff members was organized on the occasion. The winners of these competitions were suitably awarded.

Dr Rao, in his Presidential remarks mentioned that NEIST will continue its activity to develop environment friendly technologies and pursue research to protect the environment and work for conservation of biodiversity of the region. He also proposed that both NEIST and Forest Department of Jorhat, can have joint projects.

The programme ended with vote of thanks proposed by Shri Dipankar Neog, Scientist, NEIST.

World Metrology Day Celebrated at NPL



Dr K.T. Chacko, Director, IIFT delivering the theme lecture

The World Metrology Day was celebrated at the National Physical Laboratory (NPL), New Delhi on 20 May 2009. This year, the theme being commerce, the emphasis was given to the importance of measurement in trade. Dr K.T. Chacko, IAS and Director, Indian Institute of Foreign Trade (IIFT), New Delhi, was the chief guest and Shri Girdhar J Gyani, Secretary, General Quality Council of India, was the Presiding Officer.

In his welcome address Dr Vikram Kumar, the then Director, NPL, emphasized on the significance of metrology to the economy. He said the confidence in measurements is an essential prerequisite for international trade and facilitates almost every task in the industrialized world. The accuracy in measurement is vital not only in the world of science, but also in the world of business. Since the metrology, or the science of measurement, touches our lives in many ways, a need for a common

standard of measurement was felt.

In his address, Dr Kumar talked about his visit to Lothal sometime back and witnessing of signs of exact measurements and standardization of bricks during the Indus Valley civilization around 2000 BCE.

The World Metrology marks the anniversary of the signing of the Metre Convention by 17 countries in 1875. Dr Kumar remarked, “we are proud to have built up a national metrology programme, with state-of-the-art facilities and a core of highly professional staff. Our industries now have direct access to a reliable, competent and internationally-recognized facility for their measurement needs.”

Dr Kumar further informed that since past few years BIPM, is also trying to give emphasis on the importance and significance of metrology through different subjects. This year “Metrology in Commerce” was selected as theme message. NPL is propagating the theme message as much as possible



to the masses by distributing posters specially to schools. He also informed that NPL India is signatory to CIPM-MRA which completes its 10 years now. The MRA has had far reaching impact on trade particularly in removing technical barriers to trade.

Introducing Shri K.T. Chacko, Dr Kumar said he has long experience in Commerce and Industry in India and abroad. He also welcomed Dr Girdhan J. Gyani, who presided over the function.

On the occasion, Shri Chacko, shared his thoughts on “Technical Standards and Trade: Some Issues and specially said that:

- Ever since people began trading, measurements have become necessary. In the earlier days, measurements were not as accurate as it is today. For example, our ‘foot-rule’ began as a length of the man’s foot; however since human foot comes in various sizes, standardization has enabled us to measure the foot length accurately in different parts of the world.
- Standardization is necessary to ensure the reliable and safe operation of products. Standardization has opened up market access to producers in far-flung corners of the country and India has benefitted immensely from the standardization of parts and components in the Automobile Industry.
- The benefits derived from standardization are not limited to increased trade in itself but these also contribute to the development of products and

services in areas like Health and Environment.

- At times it has been felt that standards and norms have been set in such a manner as to preclude market access to products and services from the developing countries. Questions about transparency and objectivity of setting standards have been raised.
- Standards and norms, if unfairly, set could certainly lead to Barriers in Trade and keeping this in view, the Triennial Review of the TBT, Agreement has emphasized the importance of WTO Members’ participation in the International Standardization activities.
- Lack of National Standards and Norms are known to impact adversely the potential to regulate imports of non-conforming goods and services into a country. The recent attempt to regulate import of Chinese Dolls and other items is a case in point.
- Increasingly Indian Institutions and Agencies are getting accepted for their technical

strength and knowledge base and sound management and procedures and the mutual recognition agreements are providing an efficient enabling system for facilitating imports and exports.

Shri Gyani, in his presidential address, further elaborated on the need and importance of metrology in the society.

To mark the occasion, a theme poster “Measurement in Commerce” was released by the Chief Guest. Certificates and Cash prizes were given to the thirteen teams of scientists who were granted patents during 2008-2009.

Certificates and cash prizes were also given to those who had developed new technology and successfully licensed know-how to industry. This year NPL transferred two technologies namely “Piezoelectric Accelerometer – Shear Mode” and “System Controller and Software Algorithm for Mid-FACE (Free-Air CO₂ Enrichment)”.

Dr Vikram Kumar gave a token of appreciation and memento to the chief guest Shri Chacko and Shri Gyani.



Release of World Metrology theme poster “Measurements in Commerce”



Lifetime Achievement award to Dr S.S.S. Agarwala

Dr Chandra Shekhar, Director, CEERI presented VEDA-2008 (Vacuum Electronic Devices and Applications Society) Lifetime Achievement Award and a citation to Dr S.S.S. Agarwala in recognition of his contributions to the field of microwave tubes.

On this occasion, Dr Chandra Shekhar informed that CEERI has been playing a leading role in microwave tubes research and currently it is pursuing R&D activities on many sponsored projects. He recalled the valuable contributions of Dr S.S.S. Agarwala to the microwave tubes area in CEERI. He mentioned that CEERI has been receiving constant cooperation and guidance from Dr Agarwala and expects similar cooperation in future too.

Earlier, Dr S.N. Joshi, Emeritus Scientist and President, VEDA Society, welcomed Dr Agarwala, Mrs Agarwala and other guests. He shared his experiences with Dr Agarwala and the guidance he received from him for about 22 years as their team leader. He read out the messages received from Dr Amarjit Singh, former Director, CEERI and Dr G.S. Sidhu, Former Scientist, CEERI, congratulating Dr Agarwala.

Dr Vishnu Srivastava, Senior Scientist and Vice President, VEDA Society, also welcomed Dr Agarwala



Dr S.S.S. Agarwala receiving Lifetime Achievement Award from Dr Chandra Shekhar

and Mrs Agarwala and all other guests. He deeply appreciated Dr Agarwala's sincerity, discipline and farsightedness.

Dr B.N. Basu, Director, CET, Muradabad, gave a talk on 'Motivation Microwaves – Maestro in Sidhi Sadan Swaroop'. Dr Lalit Kumar, Director, MTRDC, thanked Dr Chandra Shekhar, Director, CEERI, for facilitating to organize this event in CEERI. He felt that he is fortunate for having served CEERI under Dr Agarwala's leadership for a long time. He made a special emphasis on Dr Agarwala's discipline and administration at work place.

Dr S.S.S. Agarwala expressed

his gratitude to VEDA Society for having considered him for the Award. He also thanked Dr Chandra Shekhar for hosting this award presentation ceremony at CEERI, where he served for 30 years. He said that he and his wife were overwhelmed with joy on meeting their old colleagues. He expressed deep appreciation over the progress made by the institute. He congratulated the Director and staff for their achievements.

Smt Ranjana Chandra Shekhar honoured Smt Sushma Agarwala with a shawl. Shri R.K. Gupta, Senior Scientist and Secretary, VEDA Society, proposed the vote of thanks.