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Technology Lecture "Armoured Fighting Vehicle".

Dr.P.Sivakumar presides over Technology day celebration at NIOT

National Institute of Ocean Technology (NIOT) celebrated Technology day on 11th May 2012 in the august presence of Dr. P. Sivakumar, Director, Combat Vehicles Research and Development Establishment, Chennai. Dr.P. Sivakumar inspired the NIOTians with his technology day lecture on " Armoured Fighting Vehicle ". He released the 2nd I issue of NIOT quarterly online News Letter SAMUDRIKA. Dr.P. Sivakumar also distributed prizes to the winners of various competitions held on the occasion of Technology day.

Greetings on the occasion of Technology Day 2012

Greetings on the occasion of Technology Day 2012. This day has special significance to us as NIOT is the only institute in the nation which has a specific mandate to develop and demonstrate technology for the oceans. Our path is uncharted and virtually untraveled.

All the Technology Groups of NIOT have been making rapid strides in their respective fields in the last six months as before. The LTTD desalination plant has become operational making it the third such plant quenching the thirst of Lakshadweep islands. Our efforts are becoming more and more noticed. NIOT scientists were awarded National Geo Science awards in the categories of Oil & Natural Gas and Disaster Management for the development of ROSUB 6000 and Tsunami early Warning Systems respectively. A research paper by Vessel Management Cell has won the Maritime award. These laurels should enthuse us to strive harder and excel in all our endeavors.

Our proposals for the next five year plan have been presented to the Ministry and approvals are expected to be received soon. Fresh and bright youngsters have been infused into NIOT with the recruitment of additional staff both in permanent and project categories.

I thank Dr. P. Sivakumar, Director, CVERDE, Chennai for gracing the occasion of Technology Day celebration at NIOT and for releasing the second issue of the NIOT newsletter.

We have miles to sail before we sleep....and depths to fathom before we reap...

Dr. M.A.ATMANAND, DIRECTOR - NIOT

Ocean Energy for a Better Tomorrow



Today all over the world, there is awareness that existing fossil fuels on earth are getting fast depleted and soon there will be none left. The modern world with all the technological advances needs power in large quantities today and the requirement is only ever increasing. The world over therefore, the effort to tap renewable sources of energy is being attempted on a war footing. While solar, wind, biomass and other forms are already being tapped across the globe; energies which can be harnessed from the vast ocean have yet to move from the research arena. Ocean energy can be harnessed in the form of waves, currents, tides and temperature gradient.

Waves

When one watches the waves breaking at a shore, we can see the power they contain, as also the fury during a cyclone.



Wave energy plant at Vizhinjam, Kerala

Waves are caused by winds blowing on the surface of the ocean. However, due to this, waves are an irregular phenomenon and intensities vary with seasons as also the location on the globe. The wind and thereby driven waves have lower intensities in places close to the equator as against those in northern latitudes. Wave power devices extract energy directly from the motion of waves at the surface or from pressure fluctuations below the surface. Some of the wave energy devices being tried around the world are point absorbers, tapered channel, oscillating water column, pelamis, etc.



Wave powered device - BBDB

While waves contain fair amount of energy, any structure or equipment to be mounted in the open sea needs to resist the forces, to which it is subjected constantly, while generating power. Sea water is also very corrosive hence materials used should be suitable for long term usage in the sea environment. In India, the average wave power annually is low though during the monsoon season, for a few months the waves can be very high.

As far as the Indian scenario goes, for nearly two decades research has been carried out on a oscillating water column device at a place called Vizhinjam in Kerala. A lot of insight was derived as a part of the process in the power module design. However from the structural and hydrodynamic point of view, work is now being focused on smaller floating wave powered devices for remote locations. Laboratory studies as well as actual field trials are being conducted to optimize such devices.

Ocean Currents

Ocean currents are driven by wind and solar heating of the waters near the equator, although some currents result from variation in water density and salinity. Current speeds are much slower compared to wind speeds. However, water is about 835 times denser than wind so a smaller water flow can be equivalent to wind with extremely high velocity. Energy can be extracted from such ocean currents using submerged turbines that capture energy from hydrodynamic lift and drag forces.

For harnessing energy from marine currents a number of issues need to be resolved such as marine fouling, cavitation, corrosion and low speed underwater alternators. In India, similar to waves, current speeds also are low. Hence the challenge is to develop low speed turbines since we have a long coastline and isolated powers also can be useful in various remote locations.

Tides

When we harness energy from ocean currents we are actually tapping the kinetic energy of the moving water. Additionally potential energy can also be tapped from the difference in height (or head) between low and high tides. Tides are caused due to the gravitational effects.

Tides move large quantities of water twice each day and thus can be utilized for harnessing power. Till date only one 240 MW plant at the mouth of the La Rance river estuary in France is generating power from tidal energy. In India, tidal range is very low in most places except a few like the Gulf of Khambhat, hence no work has been initiated yet towards this type of renewable energy source.

Ocean Thermal Energy Conversion

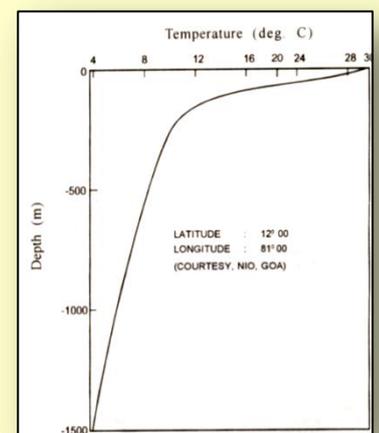
Countries like India have low wind and wave climates, however being close to the equator and temperatures being high, the sea surface is always fairly warm. The ocean's temperature varies with depth as shown in figure. The profile indicates that the temperature in around 1000m water depth could be as low as 6°C.



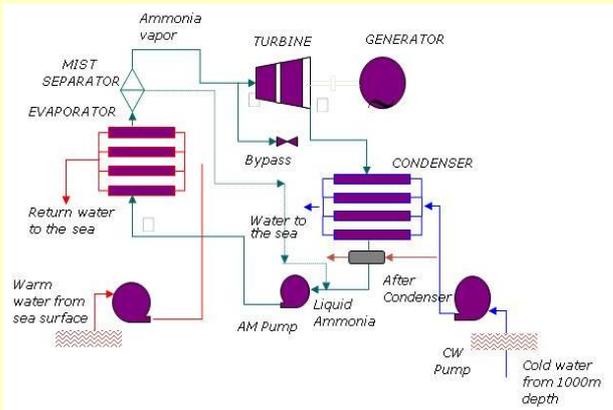
Helical current Turbine



Testing of Inclined current turbine



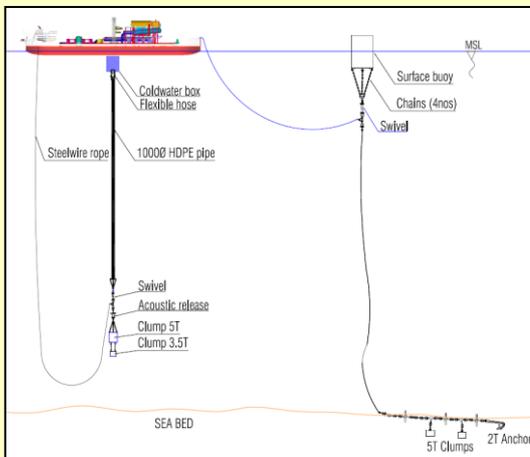
Temperature profile along ocean depth of 1500m



Schematic of the OTEC process

This difference in temperature between the sea surface and at a deeper depth can be utilized to harness energy. This is called Ocean Thermal Energy Conversion or OTEC. Essentially in OTEC, a fluid with low boiling point is vaporized using the warm surface sea water. This drives a turbine connected to a generator which generates power. The vapour is condensed using the deep sea cold water and in a closed cycle goes back and gets vaporized again. This cycle runs continuously to generate power. The main requirement of this process is large quantities of cold and warm sea water. While the warm water can be available all along the coastline, the deep sea cold water is available only at depths around 800 – 1000m. The sea bed near the coast drops very gently in India and hence the 1000m water depth is available only around 40 – 50 km offshore from the coast necessitating a floating OTEC plant. OTEC was attempted in the US and other countries a couple of decades ago, during the oil crisis. Thereafter work was stopped for some years. Today again many countries have realized that research on OTEC must be given importance.

Cold water from the depths also contains many nutrients and is good for mariculture. Possibility of extraction of some rare earth elements from the large volumes of water pumped is also being studied.



Configuration of the 1 MLD Plant

Similarly thermal desalination is a spin-off from the OTEC cycle. Hence an OTEC plant along with desalination would be an excellent source of clean and green energy and fresh water.

Though the technological challenges are many and demonstration of OTEC for larger ratings is yet to be successful anywhere in the world, India must strive to harness this form of energy due to the large coastline and tropical water temperatures in view of the fact that fossil fuels are fast depleting. It is therefore one of the endeavours being pursued by NIOT towards the alleviation of the power deficit.

Let us all work towards clean, green and sustainable energies.

Tidings- Happenings at NIOT

Continuous operation of Minicoy and Agatti Desalination Plant

Minicoy and Agatti desalination plants that started operations during 2011-12 have been continuously supplying fresh water to the 18000 strong local communities. The plant at Minicoy island is shortly scheduled to be handed over to the local PWD administration.



Met ocean observatory at gulf of Khambhat

Met ocean observatory (KALOBS) is established in gulf of Khambhat as a part of Kalpasar project. The KALOBS observatory consists of 24 tides using radar gauges and pressure gauges, met stations, current meters and water quality parameters like turbidity, chlorophyll A, conductivity and salinity measurements for one year monitoring.



Tsunami Event

Tsunami buoy TB10 deployed by NIOT identified Tsunami event on 10th January 2012 at the location 6°14"N, 85°53"E.



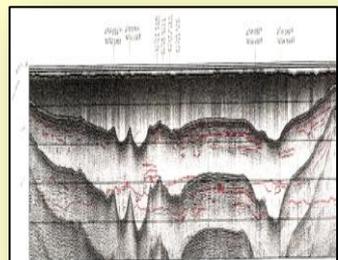
Ocean Acoustics

Ocean Acoustics group has successfully deployed autonomous ocean ambient noise measurement system in shallow waters off Visakhapatnam and time series measurements during north east monsoon have been taken including Thane cyclone. The Acoustic Test Facility (ATF) of Ocean Acoustics has been re-accredited by NABL and the facility has been upgraded for acoustic transducer calibration for the frequency upto 500 kHz.



Coastal and Environmental Engineering

The CEE group is in charge of all engineering investigation and modeling requirements of project Kalpasar and is in final stages of the engineering investigations. Geophysical and Hydrographic survey has been completed at the proposed Kalpasar dam corridor area. Southern Gulf of Khambhat bathymetry survey is completed and that of Northern Gulf of Khambhat is under progress. Vertical Control survey has been completed to interconnect the tidal network with SOI bench marks. The numerical modeling for sediment transport and estuarine dynamics are in progress under sustainable shoreline management. CEE group has completed the model setup for wave atlas as part of the Technical Criteria Atlas.



SOFT CORALS FOUND AT THE BOTTOM OF THE COASTAL BUOY HULL

A unique effort was undertaken by OOS-NIOT on the request of Department of Environment and Forests, Andaman to initiate a long term observation using met ocean buoy. The motivation for this work came from many reports and it was noted that Extensive coral bleaching occurs due to rising sea surface temperatures as a result global warming. Andaman and Nicobar Islands are bestowed with the richest coral diversity among all Indian reefs. Increased SST can have significant impacts on marine life especially in the tropics. These include primarily the corals, fishes, and species composition in the marine ecosystem.



National Geo-science Award 2010

NIOT scientist Team received National Geo-science Award (2010) from Ministry of Mines, Govt of India on 16th February 2012 at Vigyan Bhavan from Hon'ble Speaker of Loksabha Smt. Meira Kumar for outstanding contribution in the field of Basic & Applied Geosciences under the category Oil and Natural Gas Exploration and Disaster management.



National Competition on Student Autonomous underwater Vehicle (SAVe)

The team of Students from Panimalar Institute of Technology, Chennai from Mechanical, Electrical, Electronics and computer science departments won the national Student's Autonomous Underwater Vehicle (SAVe) competition in India in May 2012 after passing 3 stages of the competition. The winning team would be sponsored by NIOT to participate in the International Competition to be held at San Diego, USA during July 2012



Women's Day

Women's day was celebrated on March 2012 at NIOT. Various competitions were held for the staff of NIOT and prizes were distributed.



National Institute of Ocean Technology

(An autonomous organization under Ministry of Earth Sciences, Govt of India)

Velachery Tambaram Road, Pallikaranai

Chennai 600100 India

Email: postmaster@niot.res.in

www.niot.res.in