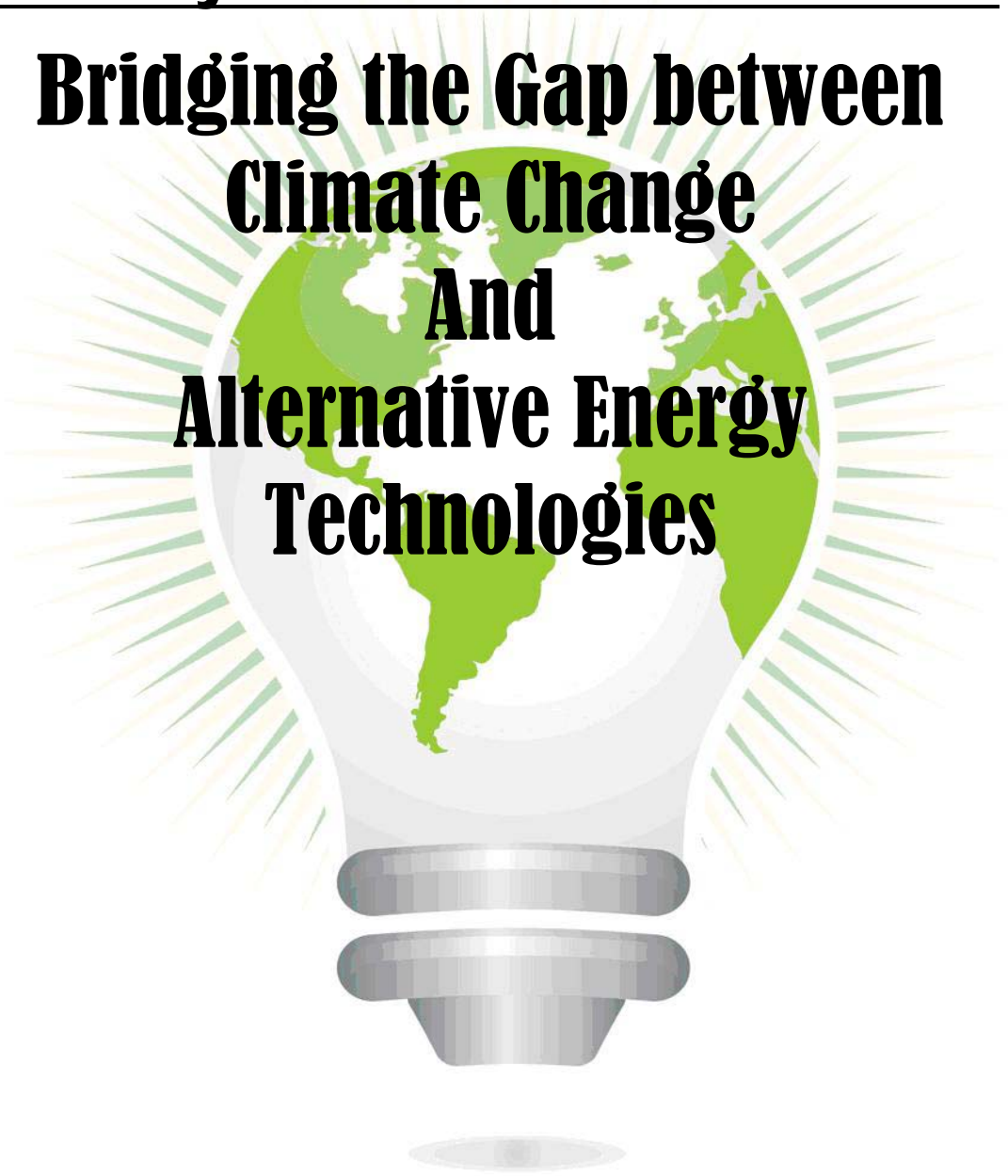
Industry – Academe - Government

Bridging the Gap between Climate Change And Alternative Energy Technologies



Association of Tokyo Tech Alumni and Research Scholars
Kuramae Kai Philippines

1st National Seminar – Workshop

19 September 2008, 8 AM – 5 PM
Ambassador Sala, Traders Hotel
Manila, Philippines

☼ Rationale and Objectives

The current issues on climate change and the initiatives that have been done in search for alternative energy technologies prompted the implementation of the Biofuels Act of 2006 and the consideration of the ENERCON Bill.

The Association of Tokyo Institute of Technology Alumni and Research Scholars (ATTARS) recognizes the need to address these issues for the development of the country. In line with the objectives of ATTARS, the 1st National Seminar-Workshop brings together experts from the industry, academe and the government to address issues related to alternative energy and climate change. The seminar-workshop provides a venue for the exchange of expedient ideas and subsequent establishment of possible collaborative researches geared towards the association's contribution to our country's development.

☼ Program of Activities

Bridging the Gap between Climate Change and Alternative Energy Technologies - 19 Sept 2008

08:00 – 08:30	Registration/Snacks	
08:30 – 08:45	Opening Ceremonies	
08:45 – 09:00	Keynote Address	**Hon. Sec. Angelo Reyes** Department of Energy
09:00 – 09:30	*"NASA on Climate Change Observation & Implications"*	**Dr. Josefino Comiso**, NASA Senior Scientist
09:30 – 10:00	*"National Priority Program on Climate Change"*	**Dr. Graciano Yumul** DOST Undersecretary
10:00 – 10:30	*"Responding to the Challenges of Climate Change*	**Dr. Alma Madrazo** Country Manager, Tetra Tech
10:30 – 11:00	*"Advances on Concentrated Solar Power Cell Technologies"*	**Dr. Yutaka Tamaura** Tokyo Tech
11:00 – 12:00	Open Forum	
12:00 – 13:00	LUNCH	
13:00 – 14:00	Poster/Exhibit Presentations	
14:00 – 15:20	*Technical Parallel Sessions*	
15:20 – 15:40	Afternoon Snacks	
15:40 – 16:40	Workshop	
16:40 – 17:00	Synthesis/Awarding of Certificates/Closing Remark	

Dr. Jonathan Dungca & Dr. Maria Natalia Dimaano
Masters of Ceremonies

☼ Technical Parallel Sessions

	BIOFUELS **Moderator: Dr. N. Diola**	**SOLAR ENERGY** **Moderator: Dr. A. Madrazo**
14:00 – 14:20	**Dr. Edwin Quiros** (VTRL/UPD) *"UP VRTL: Geared Up For Biofuel Testing"*	**Dr. Rene Fernandez** (DLSU/SINAG car) *"Pushing the Solar Envelope through Creative Research by Young Inquisitive Minds"*
14:20 – 14:40	**Dr. Alvin Culaba** **(**DLSU-CESDR) *"S&T Challenges in the Energy and Environment Sector"*	**Dr. Ma. Antonia Tanchuling** (UPD) "*Desalination using Solar Distillation"*
14:40 – 15:00	**Engr. Peter Abaya** (PNOC) *"PNOC-AFC Jatropha Project Project"*	**Dir. Mario Marasigan** (DOE) *"Government Initiatives, Activities, and Policies on Solar Energy"*
15:00 – 15:20	**Engr. Ed Chua** (Shell Phil.) *"Sustainable Mobility: Addressing the Energy Challenge"*	**Mr. Greg Reichow** (Sunpower)

☼ Poster Presentations

P1: ***"Testing and Evaluation of the Temperature Control System of a Solar Powered Egg Incubator"***
By Ralph Christopher Gallegos, Fernando Paras, Delfin Suministrado, Rossana Marie Amongo – University of the Philippines, Los Baños

P2: ***"A Locally Fabricated Solar Flat Plate Collector for Water Heating"***
By Rossana Marie Amongo, Agerico Bautista, Fernando Paras, Delfin Suministrado – University of the Philippines, Los Baños

P3: "*Development of Small-Scale Fuel Ethanol Production for Small Farm Operations"* By Omar Zubia, Arsenio Resurreccion, Pepito Bato – University of the Philippines, Los Baños

P4: ***"Biomass-Fueled Stirling Engine for Domestic Energy Generation"***
By A.A. Blastique, C.A. Cuaresma, M.C. Petingco, J.D. Toquero, D.C. Suministrado – University of the Philippines, Los Baños

P5: ***"Alternative Natural Gas Utilization in the Philippines using Ni/CeO_2/ ZrO_2 Catalyst for Steam Reforming of Methane"***
By Anton Purnomo, Susan Gallardo, Leonila Abella, Chris Salim, Hirofumi Hinode – De La Salle University, Manila; Tokyo Tech

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Abstract

NASA on CLIMATE CHANGE: OBSERVATION AND IMPLICATIONS

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One of the most contentious issues of our time is the effect of human activities on the Earth's climate and therefore on it's habitability. The observed increase in atmospheric CO_2 (and other greenhouse gases) from about 280 parts per million (ppm) during pre industrial times to more than 380 ppm in recent years has been postulated to cause a significant increase in the average temperature of the Earth's surface. Such increase has been confirmed by several numerical climate models which also predict that a doubling of the greenhouse gases would cause a global warming of about 1 to 3 ^{o}C. Considerable warming has indeed been observed during the last century with the global surface temperature increasing by about 0.7 ^{o}C. Such warming, is expected to be amplified in the polar regions because of ice albedo feedback associated with the much higher reflectivity of ice covered surfaces compared to ice free surfaces. The Arctic temperatures have indeed been showing this amplification with temperatures inside 60 ^{o}N having increased by about 1.6 ^{o}C in the last 26 years alone. What is more remarkable is the rapid decline in the Arctic perennial ice cover which became precipitously low in 2007 and then again in 2008. The perennial ice is likely to be gone during this century. Meantime, the glaciers are retreating, the permafrost is thawing, the snow cover is declining and the Greenland ice sheet is melting. The sea surface temperature is also increasing likely impacting corral reefs and biota in the tropics and mid latitudes. We have also been observing unusual changes in our weather and environment. Such changes are captured on a large scale and with great fidelity by NASA's Earth Observing System, consisting of a series of satellites equipped with advanced and highly performing sensors. Results of quantitative analysis of these changes will be presented and implications will be discussed in the context of potential impacts on the Earth's ecology and environment as well as the quality of human life. Some mitigation strategies will also be discussed.

Abstract

UP VRTL: GEARED UP TOWARDS BIOFUEL TESTING

Edwin N. Quiros
Professor, Dept. of Mechanical Engineering, University of the Phils.
UP VTRL Director

Jeffrey Laguitao
Research Associate, UP VTRL

The UP Vehicle Research and Testing Laboratory (UP VRTL) which was inaugurated last Aug. 14, 2008, is the first ever vehicle research and testing laboratory here in the country. The facility was set up in line with the passage of the Biofuels Act, making one of center's primary functions is to conduct performance tests on alternative fuels. The laboratory can also assess available fuel-saving and emission-reducing products and devices. In addition to testing, the VRTL is also being used for undergraduate instruction and graduate research of the UP Department of Mechanical Engineering (DME). The facility is currently equipped with a chassis dynamometer, fuel flow meter with fuel conditioning, air mass flow meter, and an exhaust gas analyzer

UP VTRL is being implemented by four government agencies, namely UP, Department of Science and Technology (DOST), the Department of Energy (DOE), and the Philippine National Oil Company (PNOC). It is located at the DME Laboratory in Melchor Hall, UP Diliman Campus.

Abstract

SUSTAINABLE MOBILITY: ADDRESSING THE ENERGY CHALLENGE

Edgar O. Chua
Country Chairman,
Shell Group of Companies, Philippines.

Companies like Shell play a critical role in the challenge to meet the world's energy needs. The presentation will draw on the theme of sustainable mobility to explore the potentials of conventional and alternative fuels.

Outlining Shell's Three Hard Truths of the energy challenge, the presentation maps out how Shell is working to meet increasing energy demand and supply challenges, while addressing the impact on the environment. It will explain in detail the investment Shell is making in advanced environmental technology such as Carbon Capture and Storage (CCS), and innovative fuels such as GTL, hydrogen, others that help ensure that we move closer to meeting this difficult challenge. In particular, the presentation will discuss biofuels.

Shell believes that not all biofuels are created equal.

Being leaders in the development of more sustainable, second-generation biofuels is part of Shell's strategy and reflects our determination to build a material commercial business in at least one alternative energy technology. The presentation will discuss Shell's projects and partnerships towards addressing biofuels issues and ensuring a more sustainable sourcing. In particular, it will describe the current work that is being done to improve the sustainability of current first-generation production and the collaborative work with producers, governments and non-governmental organisations to raise awareness and develop industry-wide sustainability standards for biofuel production.

Shell sees leadership in second-generation biofuels as strategically important, and is investing in the next generation of biofuels. Before implementing any biofuels regulation, however, Shell believes that it is important that policymakers consider the overall role of biofuels in meeting policy objectives as well as consideration of CO_2, local emissions, consideration of sustainability issues, cost implications and implications for fuel specifications.

Abstract

PUSHING THE SOLAR ENVELOPE THROUGH CREATIVE RESEARCH BY YOUNG INQUISITIVE MINDS

Rene D. Fernandez
Assistant Professor, De La Salle University-Manila
Technical Team Leader of Team Sinag

With prices of crude oil becoming even more unpredictable in the world market, many in the academe and in industrial research institutions are rushing to find alternative ways to sustain the world's exponentially growing appetite for energy. Among the many renewable energy sources that show promise, it is solar cell (photovoltaic, or PV) technology that is making a fast transition from being a laboratory curiosity to one with obvious pragmatic applications. However, PV technology, despite making inroads in the Philippines, remains a highly specialized field. Part of the problem is its novelty; the other is its extremely rapid pace of development. It has become the goal of the country's more advanced technical universities to take on the challenge of educating young minds and prepare them for a future in which solar technology plays a major role in transforming society.

Starting with the design and construction of Sinag - the Philippine's first solar-powered car - DLSU-Manila has taken the lead in PV research. A series of projects will soon investigate the performance of non-imaging solar concentrators with built-in multi-degree of freedom (DOF) mechanism automatically tracking the sun's azimuth position. A group of students has started designing and building an aerial vehicle equipped with navigational and propulsion systems that rely on power generated by fuselage-mounted solar array. Solar research for such aerodynamic vehicles is supported by a computational laboratory running on ANSYS software. And to address the country's pressing remote settlement's electrification problems, DLSU-Manila is conducting research aimed at making affordable and compact PV systems.

Whereas many of these projects receive funding from the school and from the students themselves, there are projects that would be too expensive to carry out without external support. Hence, the need for financial support both from the government and industry sectors through grants and non-traditional means.

Abstract

DESALINATION USING SOLAR DISTILLATION

Maria Antonia N. Tanchuling
Assistant Professor, Dept. of Civil Engineering,
University of the Philppines Diliman

Arlene Buenaventura, Kareen Palaganas and Mark Saniel Villa
BS Civil Engineering Student, Dept. of Civil Engineering,
University of the Philppines Diliman

As water demand continues to increase, water supply becomes more critical. The lack of fresh water sources has driven the need to explore alternative sources as saltwater. There are several ways to remove salts in water but require the use of fuel to provide the energy to carry out the process. This study examines the viability of using the solar radiation to provide the heat which will cause the water to evaporate, to eventually form condensate, and when collected can be used a source of fresh water supply. Using a pilot scale system set-up in UP Diliman, which was tested over three months from April to June in 2008, results show that yield is dependent on the salt concentration of the feed water and on the height of water that is to be distilled. The concentration of total dissolved solids (TDS) was shown to have decreased by more than 99% in all test cases. This paper describes the set-up and how the yield is affected by some of the design parameters such as the slope of the cover and inclination of the trough. Although the yield is poor, the solar still can still be viable for coastal communities in small islands where there is no other source of potable water.

Abstract - Poster

BIOMASS-FUELED STIRLING ENGINE FOR DOMESTIC ENERGY GENERATION

Blastique, A. A., Cuaresma, C. A., Petingco, M. C., Tuquero, J. D., and Suministrado, D. C.

Agricultural Machinery Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños, College, Laguna (Corresponding author, dcsuministrado@yahoo.com)

Stirling engines are external combustion engines which can be run by biomass, solar energy and many other kinds of fuels. The development of commercial prototypes if this kind of engine has been hampered particularly because of the availability of internal combustion engines and electric motors along with the adequate supply of petroleum fuels and electricity. With the spiralling cost of fossil fuels and the general public concern about the dire consequences of global warming, the use of stirling engines can be an environment-friendly approach to the establishment of small or micro scale power generation systems in rural areas which have abundant biomass resource or solar energy.

This paper discusses the practical feasibility of running a small or micro scale power generation system with engine as the power unit in either the household or community level with biomass as fuel within the concept of cogeneration. Also, preliminary experiential and experimental data in the design, fabrication and operation of a small stirling engine are also presented.

Abstract - Poster

DEVELOPMENT OF SMALL-SCALE FUEL ETHANOL PRODUCTION FOR SMALL FARM OPERATIONS

Omar F. Zubia, Arsenio N. Resurreccion, and Pepito M. Bato
Agricultural Machinery Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños

Increasing the level of mechanization of the country's agricultural systems is one of the many solutions to outrace the population with increase food production. However, most agricultural productions and post-harvest operations are heavily dependent on imported petroleum. With the increasing prices of petroleum fuels, alternative sources to power our agricultural machinery and equipment are inevitably necessary. One of them is the production of substitute fuel like ethanol.

Ethanol is one of the first fuels used in internal combustion engines. It was extensively used as fuel for tractors and farm engines either in its pure or blended form. Studies showed that ethanol when mixed with gasoline enhances octane rating of the fuel mixture, improves exhaust emissions, and the engine does not require any modifications. With the above benefits, it is high time to revive the ethanol program to provide cheaper alternative for our farmers.

The technology of rural-based ethanol production already exists in the country but merely for making alcoholic drinks like *lambanog* in the provinces of Quezon and Batangas and *basi* in the Ilocos region. However, there is no small-scale technology for producing fuel-grade ethanol in the country.

A small-scale fuel-grade ethanol production plant was developed. The distilling apparatus is designed to be portable and easy to assemble, which makes it remarkable and suitable for small-scale production. The module is simple, practical and efficient. On the average, the module is producing close to a liter of 180 proof (90%) hydrous ethanol of per hour. The ethanol produced can directly be used in spark ignition engines even without modification but power is derated. Test showed about 67% decrease in power is exhibited by the test engine. Modification of the carburetion system proved to increase the power. Tests showed only about 14% decrease in power when carburetion system is modified. Results are encouraging and need to be pursued. Blending with gasoline and its performance are still to be investigated.

The country is rich with natural resources which can be utilized for the production of ethanol. Besides being renewable and domestic resource, production and utilization of fuel ethanol reduce our dependence on imported petroleum. In order to make a national impact, some institutional help is needed.

Abstract - Poster

A LOCALLY FABRICATED SOLAR FLAT PLATE COLLECTOR FOR WATER HEATING

Rossana Marie C. Amongo, Agerico P. Bautista, Fernando O. Paras, Jr. and Delfin C. Suministrado

Agricultural Machinery Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños

Flat plate solar heat collectors have potentials in generating energy from solar resources and applications in many heating processes. Flat plate collectors are the most economical and the most common among heating applications because they can be easily fabricated, fixed in place and requires little maintenance.

The study aims to design, fabricate and test a flat plate solar heat collector using low-cost and locally-available materials. Tests were conducted to compare the thermal performance of the fabricated collector and a commercially available collector. Results showed that both collectors performed at par with one another. The commercially available collector has higher fin efficiency (0.988), collector efficiency factor (0.978) and thermal efficiency (18.89) than the fabricated collector with fin efficiency of 0.957, collector efficiency factor of 0.953 and thermal efficiency of 17.38. The overall heat loss of 6.25W/m^2 was larger for the fabricated collector. However, statistical analysis showed that thermal efficiency of both collectors was insignificantly different. The energy utilization of both collectors was affected by the available solar radiation incident. Maximum thermal efficiency was increased during 2:00PM – 3:00PM. Thermal efficiencies during the first eight hours of operation were significantly different from the last two hours of observation.

The price of commercially available collector and cost of electricity for water heating was compared with the fabricated collector. It was found out that the fabricated collector had higher collection area at a lower cost. Cost comparisons were done for domestic water heating using the fabricated collector and water heaters utilizing electricity. It was found out that the fabricated collector was more economical with a payback period of 1.23 years.

Abstract - Poster

TESTING AND EVALUATION OF THE TEMPERATURE CONTROL SYSTEM OF A SOLAR POWERED EGG INCUBATOR

Ralph Kristoffer B. Gallego Fernando O. Paras, Jr. Delfin C. Suministrado, Rossana Marie C. Amongo

Agricultural Machinery Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños

The study aims to design, test and evaluate selected components of the temperature control system of a solar duck egg incubator. The design aspect was concentrated on the valve operations required to regulate temperature inside the incubator. The temperature control system was evaluated in terms of its capability to provide the needed amount of heat for egg incubation with a constant and uniform level of temperature. The power consumption of the solar egg incubator was also compared to that of the conventional incubators.

Graphical and statistical analyses revealed that the temperature control system is capable of producing the required amount of heat during incubation. However, it was found out that relying on the radiator alone as the source of heat is not feasible unless appropriate modifications are made to improve its heat transfer capability.

Temporal and spatial analyses on temperature distribution revealed that the solar aided arrangement has higher variability of temperature levels compared to the conventional arrangement. The intermittent operation of the blowers favored thermal stratification inside the incubator.

Using the solar aided arrangement for incubation significantly reduced the power consumption of the conventional arrangement to about 66.7%. This is attributed primarily to the intermittent operation of the components of the solar aided arrangement and the additional heat provided by the radiator. It was also observed that raising the temperature of the incubator from the ambient to the optimum level using the solar aided arrangement will need less time and energy compared to the conventional arrangement.

Abstract - Poster

ALTERNATIVE NATURAL GAS UTILIZATION IN THE PHILIPPINES USING NI/CEO_2/ZRO_2 CATALYST FOR STEAM REFORMING OF METHANE

Anton Purnomo [a,b], Susan Gallardo [a], Leonila Abella [a], Hirofumi Hinode [b], Chris Salim [b]

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[b] *Department of International Development Engineering, Tokyo Institute of Technology, Japan*
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Power generation is the only the utilization of Natural gas that was found in Malampaya. Emissions discharge from this activity significantly contribute to Green House Effect since CO_2 and methane, main component of natural gas, are powerful greenhouse gases. Natural gas may be a feasible alternative to oil by developing hydrogen power technologies. Natural gas also widely used as a chemical feedstock proceeds by initial conversion to carbon monoxide and hydrogen (synthesis gas). Hence, our project is mainly on developing catalyst for natural gas utilization.

Catalytic performance and characterization of $Ni/CeO_2/ZrO_2$ catalyst was investigated in steam reforming of methane. $Ni/CeO_2/ZrO_2$ catalyst was prepared using sequential incipient wetness impregnation of cerium nitrate and nickel nitrate onto zirconia support material. BET, SEM, EDS, XRD, TG, and ICP analyses were employed for the characterization of the catalysts. Remarkable catalytic performance of $Ni/CeO_2/ZrO_2$ catalyst at 600°C operating temperature and atmospheric pressure compared to commercial catalyst was observed.

In addition, the presence of cerium in $Ni/CeO_2/ZrO_2$ was effective in improving the stability and resistance to coke formation. These results showed that the prepared catalyst is promising in the real practice for the utilization of Natural gas.

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