

SEMINAR-WORKSHOP ON THE UTILIZATION OF WASTE MATERIALS (2013)

Organized by:



**Association of Tokyo Tech Alumni
and Research Scholars (ATTARS)**
(Kuramae Kai Philippines)



東京工業大学
Tokyo Institute of Technology



**Department of International Development Engineering
Alumni Association (IDEAL) - Tokyo Institute of Technology**



De La Salle University - Manila

September 5-6, 2013 ♦ Manila Philippines

Henry Sy Sr. Hall, De La Salle University

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Association of Tokyo Tech Alumni
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(*Kuramae Kai Philippines*)

ATTARS – Kuramae Kai Philippines

The members of the Association of Tokyo Tech and Research Scholars (ATTARS) – Kuramae Kai Philippines bind together into one organization and one community in order to promote closer camaraderie and cooperation among all the members and to strengthen research and cooperation with the academe, industry and government so as to stimulate scientific and technological consciousness.

Rationale of the Seminar-Workshop

In view of the current issues on waste management and the initiatives that have been done, the organizers were motivated in organizing this activity to promote discussions and development of sustainable engineering solutions on the management and utilization of waste.

Objectives of the Seminar-Workshop

The Association of Tokyo Tech and Research Scholars (ATTARS) – Kuramae Kai Philippines in cooperation with Tokyo Institute of Technology, De la Salle University and International Development Engineering Alumni Association recognize the need to participate in addressing environmental issues geared towards sustainable development.

The seminar-workshop hopes to bring together technologists, engineers, scientists, field project managers, representatives from NGOs, governments, academia and industry to promote discussions on the development of sustainable engineering solutions on the management and utilization of waste. The seminar-workshop provides a venue for the all the stakeholders to share their work, exchange ideas and meet others who are involved in waste management and an opportunity to formulate projects with new partners.

SEMINAR-WORKSHOP ON THE UTILIZATION OF WASTE MATERIALS (2013)

OPENING CEREMONIES
Day 1, September 5, 2013 (Thursday)
Venue: Henry Sy Sr. Hall, DLSU

I. Registration (12:00-1:30 PM)	
II. Prayer (1:30 PM)	Dr. Mary Ann Q. Adajar
III. National Anthem	
IV. Welcome Remarks	Bro. Ricky Laguda, FSC – President, De la Salle University
Opening Remarks	Dr. Melito A. Baccay, - ATTARS President Professor, Civil Engineering Department College of Engineering Technological University of the Philippines
Welcome Message	Dr. Hirofumi Hinode Director, Tokyo Institute of Technology – Philippines Department Chairman and Professor, International Development Engineering
V. Introduction of the Keynote Speaker	Dr. Ma. Antonia Tanchuling Professor Institute of Civil Engineering University of the Philippines Diliman, Quezon City
VI. Keynote Address (2:30-3:00 PM)	Dr. Fortunato T. Dela Peña Department of Science and Technology Undersecretary for Science & Technology Services
Break (3:00-3:30 PM)	
VII. Plenary Session	
Plenary Speaker (3:30-4:00 PM) (Philippines) Title of Paper: Characterization of Solid Wastes for Green Utilization	Dr. Susan M. Gallardo Professor Chemical Engineering Department College of Engineering De la Salle University, Manila Philippines
Plenary Speaker (4:00-4:30 PM) (Japan) Title of Paper: Utilization of Organic Waste and Biomass Resource for Environment	Dr. Kiyohiko Nakasaki Professor & Chair, Graduate School Program Environmental Engineering Biochemical Engineering International Development Engineering Tokyo Institute of Technology Tokyo, Japan
Open Forum (4:30-5:00 PM)	

VIII. Welcome Party (5:30-7:30 PM)
Masters of Ceremonies: Dr. Sheilah G. Napalang & Dr. George William C. Hong

2013 SEMINAR-WORKSHOP ON THE UTILIZATION OF WASTE MATERIALS (2013)

CLOSING CEREMONY
Day 2, September 6, 2013 (Friday)
Venue: Henry Sy Sr. Hall, DLSU

TECHNICAL SESSIONS

Session Time	Track A	Track B
Session 1 8:00-8:20 AM	<p style="text-align: center;">PROPERTIES OF FRESH AND HARDENED CONCRETE REINFORCED WITH HAIR FIBERS FROM SUS SCRUF A DOMESTICA</p> <p style="text-align: center;">Bernardo A. LEJANO¹, Julinel TEMPLONUEVO², Channel James YOUNG², and Rafael Louis ZOTOMAYOR²</p> <p>¹Associate Professor, De La Salle University, Manila Philippines ²Student, De La Salle University, Manila, Philippine</p>	<p style="text-align: center;">PERMEABILITY CHARACTERISTICS OF ROAD BASE MATERIALS BLENDED WITH FLY ASH AND BOTTOM ASH</p> <p style="text-align: center;">DUNGCA J., Alday J., BARRETTOM. A., BAUZON M. K., TOLENTINO A.</p> <p style="text-align: center;">Department of Civil Engineering – Construction Technology and Management, De La Salle University-Manila</p>
Session 2 8:20-8:40 AM	<p style="text-align: center;">OCEAN FERTILIZATION TO UTILIZE THE HARDENED COAL ASH BLOCK</p> <p style="text-align: center;">Atsushi SAITO¹, Mamoru SAKAMOTO¹, and Yasutaka NOMA¹</p> <p>¹ HAZAMA ANDO Corporation, Tokyo, Japan</p>	<p style="text-align: center;">TREATMENT OF SOLID WASTE CONTAMINATED WITH HEAVY METALS</p> <p style="text-align: center;">Keisuke MATSUKAWA¹</p> <p>¹ Chiyoda Corporation, Yokohama, Japan</p>
Session 3 8:40-9:00 AM	<p style="text-align: center;">SHEAR STRENGTH AND CONSOLIDATION PROPERTIES OF WASTE LIMESTONE BLENDED EMBANKMENT MATERIALS</p> <p style="text-align: center;">Marabelle R. DEL PRADO¹,</p>	<p style="text-align: center;">INVESTIGATION ON THE COMPRESSIVE STRENGTH AND BULK DENSITY OF CONCRETE HOLLOW BLOCKS (CHB) WITH POLYPROPYLENE (PP) PELLETS AS PARTIAL REPLACEMENT FOR SAND</p>

	<p>Xenoula Krizzia R. MANZANO², Louise Francesca B. TUAZON³, Margaux Brigitta B. WONG⁴, and Jonathan R. DUNGCA⁵</p> <p>Civil Engineering Department, De La Salle University Manila, 2401 Taft Avenue, 1004 Manila, Philippines</p>	<p>Jonathan David D. LASCO and Marish S. MADLANGBAYAN</p> <p>College of Engineering University of the Philippines, Los Baños Laguna</p>
<p>Session 4 9:00-9:20 AM</p>	<p>EFFECTIVE USE OF LAKE SLUDGE TO PRODUCE ZEOLITE FOR HEAVY METAL ADSORPTION</p> <p>Yan SHAO¹, Chris SALIM¹, and Hirofumi HINODE¹</p> <p>¹ Tokyo Institute of Technology, Tokyo, Japan</p>	<p>COLORIMETRIC DETECTION OF ESCHERICHIA COLI BY USING A RECOMBINANT BACTERIOPHAGE</p> <p>Hoang A. HOANG, Michiharu ABE and Kiyohiko NAKASAKI*</p> <p>Department of International Development Engineering, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro- ku 152-8550, Tokyo, Japan</p>
<p>Session 5 9:20-9:40 AM</p>	<p>INFLUENCE OF CURING TIME ON THE ELECTRICAL RESISTIVITY OF CONCRETE CONTAINING CRYSTALLINE RICE HUSK ASH</p> <p>Jean Marie M. MACATANONG, Marish S. MADLANGBAYAN, Joseph M. CABURNAY, Richelle G. ZAFRA and Eliseo V. ANA Jr.</p> <p>College of Engineering University of the Philippines, Los Baños Laguna</p>	<p>INFLUENCE OF VARIOUS REPLACEMENT RATIOS OF FLY ASH TO CONCRETE MIXED WITH SEAWATER</p> <p>¹Irene Olivia UBAY – ANONGPHOUTH, ²Arjan David ALQUINTO, ²Anthony Bryan ANG, ²Gino Angelo ANORE, and ²Joe Arsen MANGILIMA</p> <p>¹Faculty, Civil Engineering Department, De La Salle University, Manila, Philippines ²Student, Civil Engineering Department, De La Salle University, Manila, Philippines</p>

<p>Session 6 9:40-10:00 AM</p>	<p>CORROSION PROPERTIES OF STEEL BAR EMBEDDED IN CEMENT MORTAR MIXED WITH SEA WATER DURING STRENGTH DEVELOPING PERIOD</p> <p>Hidenori HAMADA¹, Masanori ANNOURA², Daisuke Yamamoto¹, Yasutaka SAGAWA¹ and Amry DASAR¹</p> <p>¹ Kyushu University, Fukuoka, Japan ² Fukuoka Prefecture (Fukuoka Local Government), Fukuoka, Japan</p>	<p>LIFETIME PREDICTION OF CONCRETE MIXED WITH SEAWATER AGAINST CHLORIDE ATTACK AND CARBONATION</p> <p>Tomohiro NAGATA¹, Nobuaki OTSUKI¹, Takahiro NISHIDA¹, Hiroki OHARA², MOUSSA GARBA-SAY Zoukanel¹</p> <p>¹ Tokyo Institute of Technology, Tokyo, Japan ² JGC Corporations, Kanagawa, Japan</p>
<p>Break 10:00 -10:20 AM</p>		
<p>Session 7 10:20-10:40 AM</p>	<p>SHEAR STRENGTH PROPERTIES OF GOLD MINE TAILINGS AND WASTES FROM AGGREGATE QUARRY IN THE PHILIPPINES</p> <p>Mary Ann Q. ADAJAR¹ and Mark Albert H. ZARCO²</p> <p>¹ Civil Engineering Dept., Gokongwei College of Engineering, De La Salle University, Manila, Philippines ² Geotechnical Eng'g Group, Institute of Civil Engineering, University of the Philippines, Diliman, Quezon City, Philippines</p>	<p>EFFECT OF UTILIZING CRUMB RUBBER TIRE AND COAL COMBUSTION BY-PRODUCTS ON THE PROPERTIES OF DENSE GRADED ASPHALT MIX</p> <p>Manuel M. MUHI¹, Melito A. BACCAY²</p> <p>¹Polytechnic University of the Philippines, Manila, Philippines ²Technological University of the Philippines, Manila</p>
<p>Session 8 10:40-11:00 AM</p>	<p>ACCELERATION OF COMPOSTING BY INOCULATION OF YEAST THAT DEGRADES ORGANIC ACIDS PRESENT IN THE RAW COMPOST MATERIAL</p> <p>Shogo ARAYA*, Hiroshi MIMOTO, and Kiyohiko</p>	<p>APPLICATION OF STEEL SLAG HYDRATED MATRIX WITH ANTI-WASHOUT PERFORMANCE</p> <p>Takumi SAWADA¹, Hiroki KANNO², Yoshihiro TAKANO², Yosuke</p>

	<p>NAKASAKI</p> <p>Tokyo Institute of Technology, Tokyo, Japan</p>	<p>YAMAGOSHI², Seiji KOMATSU¹, Tetsuya OGASAWARA¹ and Hideharu NAITO¹</p> <p>¹Penta-Ocean Construction Co., LTD, Tokyo, Japan ²Nippon Steel & Sumitomo Metal Corporation, Tokyo, Japan</p>
<p>Session 9 11:00-11:20 AM</p>	<p>NON-LINEAR ULTRASONIC TESTING OF CONCRETE USING SHORT STEEL FIBERS AS REINFORCEMENT</p> <p>Jason Maximino C. ONGPENG¹ and Sohichi HIROSE²</p> <p>¹ De La Salle University, Manila, Philippines ² Tokyo Institute of Technology, Tokyo, Japan</p>	<p>INFLUENCE OF SLAG AND FLYASH ON THE HARDENED PROPERTIES OF CEMENT-LAHAR SAND CONCRETE PAVING BLOCK</p> <p>Jedel G. AGRON</p> <p>Integrated Research and Training Center Technological University of the Philippines</p>
<p>Session 10 11:20-11:40 AM</p>	<p>FUNDAMENTAL STUDY ON UTILIZATION OF WASTE COMBUSTION ASH AS CONCRETE MATERIAL MIXED WITH OPC, BFS AND ANHYDRITE ON UTILIZATION OF WASTE COMBUSTION ASH AS CONCRETE MATERIAL MIXED WITH OPC, BFS AND ANHYDRITE</p> <p>Takuya KURAMOCHI¹, Nobuaki OTSUKI¹, Takahiro NISHIDA¹ and Takayuki FUKUNAGA²</p> <p>¹ Tokyo Institute of Technology, Tokyo, Japan ² Kagoshima National College of Technology, Japan</p>	<p>DEVELOPMENT OF CONCRETE USING SEA WATER AND CONCRETE DEBRIS FROM EARTHQUAKE DISASTER</p> <p>Keisaburo KATANO¹, Nobufumi TAKEDA¹, Makoto HISADA², and Nobuaki OTSUKI³</p> <p>1 Obayashi Corporation, Tokyo, Japan 2 Tohoku University, Miyagi, Japan 3 Tokyo Institute of Technology, Tokyo, Japan</p>

<p>Session 11 11:40-12:00 Noon</p>	<p>A STUDY ON THE USE OF BAMBOO AS REINFORCEMENT FOR CONCRETE MIXED WITH SEAWATER</p> <p>Cheryl Lyne C. ROXAS¹, Ronaldo S. GALLARDO¹, Nobuaki OTSUKI², Takahiro NISHIDA², Gabriel Ariston S. LATORRE¹, Manuel DM M. ORTIGAS¹, Dexie Rae R. PEREZ¹, Jalaloden B. TAGO¹</p> <p>¹ De La Salle University, Manila, Philippines ² Tokyo Institute of Technology, Tokyo, Japan</p>	<p>INFLUENCE OF BINDER ON THE PHYSICAL AND MECHANICAL PROPERTIES OF COCO PEAT PARTICLE BOARD</p> <p>Teodinis C. Petalcorin-GARCIA</p> <p>College of Engineering Technological University of the Philippines, Manila, 1000, Philippines</p>
<p>Lunch 12:00-1:00 PM</p>		
<p>Session 12 1:00-1:20 PM</p>	<p>COMPREHENSIVE UTILIZATION OF BAGASSE FLY ASH (BFA) FOR ADVANCED MATERIALS PREPARATION</p> <p>Chandra W. PURNOMO¹, Chris SALIM² and Hirofumi HINODE³</p> <p>¹ Gadjah Mada University, Yogyakarta, Indonesia ² Surya University, Banten, Indonesia ³ Tokyo Institute of Technology, Tokyo, Japan</p>	<p>UTILIZATION OF UNTREATED AND TREATED RICE HUSK AS ADSORBENTS FOR LEAD REMOVAL FROM WASTEWATER</p> <p>Sovattei CHEA¹, Florinda T. BACANI¹, Michael Angelo B. PROMENTILLA¹ Hirofumi HINODE², and Seingheng HUL³</p> <p>¹ De la Salle University, Manila, Philippines ² Tokyo Institute of Technology, Tokyo, Japan ³ Institute of Technology of Cambodia, Phnom Penh, Cambodia</p>
<p>Session 13 1:20-1:40 PM</p>	<p>INFLUENCE OF VARYING MIX DESIGN AND FIBER LENGTH ON THE PROPERTIES OF WATER HYACINTH PARTICLE BOARD</p>	<p>INFLUENCE OF CURING PERIOD AND CURING MEDIUM ON CONCRETE MIXED WITH SEAWATER</p> <p>Cheryl Lyne C. ROXAS¹,</p>

	<p>Melito A. BACCAY</p> <p>College of Engineering Technological University of the Philippines, Manila</p>	<p>Jason Maximino C. ONGPENG¹, Nobuaki OTSUKI², Takahiro NISHIDA², Nicko Jeanina M. DEMA FELIX¹, Jose Luis A. GALAN¹, Ganna Athena L. GANTUANGCO¹, Dondon M. VERGARA¹</p> <p>¹ De La Salle University, Manila, Philippines ² Tokyo Institute of Technology, Tokyo, Japan</p>
<p>Session 14 1:40-2:00 PM</p>	<p>ASSESSMENT OF SOLID WASTE GENERATION AND RECYCLABLE MATERIALS POTENTIAL OF COMMERCIAL ESTABLISHMENTS IN UP DILIMAN</p> <p>Paolo G. FONOLLERA, Dominique Charmaine D. ARANAS, Ma. Brida Lea D. DIOLA and Maria Antonia N. TANCHULING</p> <p>Institute of Civil Engineering College of Engineering University of the Philippines, Diliman Quezon City</p>	<p>A STUDY ON THE USE OF EXPANDED POLYSTYRENE AS A SUBSTITUTE FOR FINE AGGREGATES IN CONCRETE HOLLOW BLOCKS</p> <p>Nico Lauren Andrew D. AGUILAR, Jose Enrique S. OCTAVIANO, Timotei Martin C. SANTIAGO, Ronaldo S. GALLARDO, and George William C. HONG</p> <p>Civil Engineering Department, De La Salle University 2401 Taft Avenue, Manila Philippines 1004</p>
2:00-4:00 P.M	Focus-group Discussion	
2:00-2:20 PM		
2:20-2:40 PM		
2:40-3:00 PM		
3:00-3:20 PM		
3:20-3:40 PM		
3:40-4:00 PM		
4:00-4:20 PM		
4:20-4:40 PM	Closing Remarks – Dr. Nobuaki Otsuki	
4:40-5:00 PM	Distribution of Certificates	
<p>Masters of Ceremonies Dr. Sheilah G. Napalang & Dr. George William Hong</p>		

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Dr. Susan M. GALLARDO

P2: Utilization of Organic Waste and Biomass Resource for Environment

Dr. Kiyohiko Nakasaki

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A3: SHEAR STRENGTH AND CONSOLIDATION PROPERTIES OF WASTE LIMESTONE BLENDED EMBANKMENT MATERIALS - Marabelle R. DEL PRADO¹, Xenoula Krizzia R. MANZANO², Louise Francesca B. TUAZON³, Margaux Brigitta B. WONG⁴, and Jonathan R. DUNGCA⁵

A4: EFFECTIVE USE OF LAKE SLUDGE TO PRODUCE ZEOLITE FOR HEAVY METAL ADSORPTION - Yan SHAO¹, Chris SALIM¹, and Hirofumi HINODE¹

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A6: CORROSION PROPERTIES OF STEEL BAR EMBEDDED IN CEMENT MORTAR MIXED WITH SEA WATER DURING STRENGTH DEVELOPING PERIOD - Hidenori HAMADA¹, Masanori ANNOURA², Daisuke Yamamoto¹, Yasutaka SAGAWA¹ and Amry DASAR¹

A7: SHEAR STRENGTH PROPERTIES OF GOLD MINE TAILINGS AND WASTES FROM AGGREGATE QUARRY IN THE PHILIPPINES - Mary Ann Q. ADAJAR¹ and Mark Albert H. ZARCO²

A8: ACCELERATION OF COMPOSTING BY INOCULATION OF YEAST THAT DEGRADES ORGANIC ACIDS PRESENT IN THE RAW COMPOST MATERIAL - Shogo ARAYA*, Hiroshi MIMOTO, and Kiyohiko NAKASAKI

A9: NON-LINEAR ULTRASONIC TESTING OF CONCRETE USING SHORT STEEL FIBERS AS REINFORCEMENT - Jason Maximino C. ONGPENG¹ and Sohichi HIROSE²

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A11: A STUDY ON THE USE OF BAMBOO AS REINFORCEMENT FOR CONCRETE MIXED WITH SEAWATER - Cheryl Lyne C. ROXAS¹, Ronaldo S. GALLARDO¹, Nobuaki OTSUKI², Takahiro NISHIDA², Gabriel Ariston S. LATORRE¹, Manuel DM M. ORTIGAS¹, Dexie Rae R. PEREZ¹, Jalaloden B. TAGO¹

A12: COMPREHENSIVE UTILIZATION OF BAGASSE FLY ASH (BFA) FOR ADVANCED MATERIALS PREPARATION - Chandra W. PURNOMO¹, Chris SALIM² and Hirofumi HINODE³

A13: INFLUENCE OF VARYING MIX DESIGN AND FIBER LENGTH ON THE PROPERTIES OF WATER HYACINTH PARTICLE BOARD - Melito A. BACCAY

A14: ASSESSMENT OF SOLID WASTE GENERATION AND RECYCLABLE MATERIALS POTENTIAL OF COMMERCIAL ESTABLISHMENTS IN UP DILIMAN - Paolo G. FONOLLERA, Dominique Charmaine D. ARANAS, Ma. Brida Lea D. DIOLA and Maria Antonia N. TANCHULING

B1: PERMEABILITY CHARACTERISTICS OF ROAD BASE MATERIALS BLENDED WITH FLY ASH AND BOTTOM ASH - DUNGCA J., Alday J., BARRETTO M. A., BAUZON M. K., TOLENTINO A.

B2: TREATMENT OF SOLID WASTE CONTAMINATED WITH HEAVY METALS - Keisuke MATSUKAWA¹

B3: INVESTIGATION ON THE COMPRESSIVE STRENGTH AND BULK DENSITY OF CONCRETE HOLLOW BLOCKS (CHB) WITH POLYPROPYLENE (PP) PELLETS AS PARTIAL REPLACEMENT FOR SAND - Jonathan David D. LASCO and Marish S. MADLANGBAYAN

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B7: EFFECT OF UTILIZING CRUMB RUBBER TIRE AND COAL COMBUSTION BY-

PRODUCTS ON THE PROPERTIES OF DENSE GRADED ASPHALT MIX - Manuel M. MUHI¹, Melito A. BACCAY²

B8: APPLICATION OF STEEL SLAG HYDRATED MATRIX WITH ANTI-WASHOUT PERFORMANCE - Takumi SAWADA¹, Hiroki KANNO², Yoshihiro TAKANO², Yosuke YAMAGOSHI², Seiji KOMATSU¹, Tetsuya OGASAWARA¹ and Hideharu NAITO¹

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B14: A STUDY ON THE USE OF EXPANDED POLYSTYRENE AS A SUBSTITUTE FOR FINE AGGREGATES IN CONCRETE HOLLOW BLOCKS - Nico Lauren Andrew D. AGUILAR, Jose Enrique S. OCTAVIANO, Timotei Martin C. SANTIAGO, Ronaldo S. GALLARDO, and George William C. HONG

S1: CHARACTERIZATION OF INDUSTRIAL WASTES FOR GREEN UTILIZATION

Dr. Susan M. GALLARDO

Chemical Engineering Department
De la Salle University

ABSTRACT

Waste materials produced by industries as well as from other sources are valuable resources that maybe utilized to generate income. Wastes produced can be raw materials for another process. Recycling of wastes is encouraged by the RA 9003 or the Ecological Solid Wastes Management Act.

In order to utilize waste in a healthy and in an environmentally sound manner, there is a need to assess its suitability as a resource. This means that the waste material has to be characterized. This presentation will highlight two cases of industrial waste management.

Case 1 involves the characterization of sludge produced by a recycling paper mill in the country. This project aims to utilize the sludge by producing compost by windrow composting. The partner industry is the biggest paper recycling mill. The main concern in utilizing paper sludge is the heavy metals content. These heavy metals come from the dyes and pigments in paper. Thus, the Asian Regional Research Program on Environmental Technology (ARRPET)-De la Salle University did a detailed assessment of the sludge produced by the industry's waste water treatment plant. The result of the assessment led to the use of the sludge for composting using different nitrogen amendment sources.

Case 2 involves the characterization of coal ash from a partner coal fired power plant in the Philippines. The SDCC/AIT-France Network is an off shoot program of ARRPET-DLSU. The main objective is to come up with sustainable solutions to coal ash management. The main issue in using coal ash is the heavy metals present in the coal ash. Thus, the DLSU Research Coordination Office Interdisciplinary research project was implemented to characterize the physical, chemical and geo-technical properties of bottom ash and fly ash generated from the power plant that uses a green coal technology called circulating fluidized bed boiler. The results of the assessment led to the utilization of coal ash in the making of construction materials and embankment materials. Lastly, the use of coal ash as a secondary source of metals is currently a subject of research under the Filipino—French Cooperation Program.

Keywords: Green utilization, heavy metals, industrial waste, sludge, recycling

S2: Utilization of Organic Waste and Biomass Resource for Environment

Dr. Kiyohiko Nakasaki

Professor & Chair, Graduate School Program, Environmental Engineering,
Biochemical Engineering, International Development Engineering,
Tokyo Institute of Technology Tokyo, Japan

ABSTRACT

**A1: PROPERTIES OF FRESH AND HARDENED CONCRETE REINFORCED WITH
HAIR FIBERS FROM SUS SCRUF A DOMESTICA**

**Bernardo A. LEJANO¹, Julinel TEMPLONUEVO², Channel James YOUNG², and
Rafael Louis ZOTOMAYOR²**

¹Associate Professor, De La Salle University, Manila Philippines

²Student, De La Salle University, Manila, Philippine

ABSTRACT

Although concrete is durable and has high compressive strength, it remains weak against tensile stress. A solution to this is to provide tensile reinforcements such as steel reinforcing bars and synthetic/natural fibers. This study specifically aims to look into the possibility of using hair fibers from *sus scrufa domestica* (pig) as a cheaper fiber reinforcement alternative. The study intends to find the effects of pig's hair-fibers to the properties of fresh and hardened concrete; specifically its effect on the slump, workability, air content, and finishability of fresh concrete and its effect on the compressive and tensile strengths of hardened concrete. The experimental research was divided into two phases. For the first phase, the most efficient range of fiber content, fiber length, and method of mixing that would increase the tensile and compressive strength of fiber-reinforced concrete were determined. Afterwards, in the second phase, using the governing parameters in the first phase, a more precise fiber content that generated the highest increase in compressive and tensile strengths of fiber-reinforced concrete was determined. Moreover, statistical analysis through T-test: Two-Sample Assuming Unequal Variances was used to check the significance of the results with respect to the control specimens. Test results showed that as the fiber-content was increased, the slump decreased while the air content increased. Also, results indicated that dry mixing, unsorted length of fiber, and 0.80% fiber content by volume of concrete were the most favorable parameters that made the better improvement on the hardened properties of concrete. Experimental results showed that 0.80% fiber-content generated the highest compressive and tensile strengths with a percentage increase of 35.49% and 10.46%, respectively, with reference to the control specimens.

Keywords: Concrete, Fiber Reinforcement, Pig's Hair

A2: OCEAN FERTILIZATION TO UTILIZE THE HARDENED COAL ASH BLOCK

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ABSTRACT

The possibility of food shortage by the rapid increase in the population of the world is pointed out. Japan's food self-sufficiency rate of 40% is very low. Since the food production in land is approaching to the limit, development of the technology to produce food in the sea has been required. In the meantime, the amount of coal ash generated from all coal-fired power plants in Japan is about 11 million ton per year. Though the greatest user of coal ash has been in cement production, its delivery amount has been on a declining trend due to the sluggish economy in recent years. Thus the development of a wider use of coal ash has long been a crucial issue.

To simultaneously solve two above-mentioned problems, the demonstration project which can utilize the coal ash and produce foods in the sea was carried out. A large scale artificial seamount was built on the seabed by the hardened coal ash block called "Ashcrete". As a result, the nutritive salt in the sea floor were transported to the sea surface by upwelling flow. And it exerted the effect of increasing the fish catch. The possibility of the food production increase in the sea to utilize the coal ash was proved for the first time in the world.

Keywords: Coal ash, ashcrete, artificial seamount, ocean fertilization, upwelling flow

**A3: SHEAR STRENGTH AND CONSOLIDATION PROPERTIES OF WASTE LIMESTONE
BLENDED EMBANKMENT MATERIALS**

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ABSTRACT

The vast distribution of limestone in the Philippines makes limestone quarrying prevalent resulting to the accumulation of waste limestone. This opened the idea of utilizing the wastes as embankment materials which would result to a more economical construction. In order to test the ability of limestone to be an embankment material, its strength and consolidation parameters are evaluated in different mixed proportions, at 0%, 20%, 40%, 60% and 100%, with the conventional embankment material using two evaluation programs such as the one dimensional consolidation test and the direct shear test. Index properties (i.e. specific gravity, Atterberg limits, and maximum and minimum index densities) were obtained for all the blends in order to produce empirical relationships with the different percentage of limestone. It was found out that soil samples having greater limestone content are more compressible than those with lower which can be associated from their high liquid limit. For the direct shear test, the cohesion increased with the addition of limestone, although there was a decrease in the internal angle of friction.

Keywords: Waste Limestone, Embankment, Direct Shear, Consolidation

**A4: EFFECTIVE USE OF LAKE SLUDGE TO PRODUCE ZEOLITE
FOR HEAVY METAL ADSORPTION**

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ABSTRACT

Nowadays, water pollution is becoming a serious environmental problem. Some of the water sources are river, lake, and groundwater. Here, we focused on lake because it is a closed water system where pollutants could be accumulated easily. This accumulation of sludge could lead to several problems such as eutrophication or malodor. Instead of the common disposal method of dredged sludge by landfilling, here we proposed the utilization of the lake sludge as precursor for zeolite material that is useful as adsorbent towards heavy metals in water. The lake sludge that is rich in silica and alumina was treated in alkali solution prior to zeolite synthesis by hydrothermal treatment at increased temperature for a certain time. The effects of various conditions (alkali solution concentration, alkali solution volume to dry sludge weight (L/S) ratio, Si/Al molar ratio, and reaction temperature) towards the type of zeolite formed were investigated. The cation exchange capacities (CEC) and the adsorption abilities of the zeolites towards heavy metal ions were also evaluated.

Keywords: Hydrothermal synthesis, lake sludge, zeolite synthesis, alkali, adsorption ability.

**A5: INFLUENCE OF CURING TIME ON THE ELECTRICAL RESISTIVITY OF CONCRETE
CONTAINING CRYSTALLINE RICE HUSK ASH**

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ABSTRACT

The study investigated the influence of the curing time on the electrical resistivity behavior of concrete produced with constant percent crystalline RHA replacement of 15%, w/c of 0.55 and s/a of 0.53, with specimens submerged in either simulated or actual set-up of 3% NaCl solution after curing. Curing periods were set to 7, 28, and 56 days. Electrical resistivity is a measure of the passage of current through a material. A highly electrical resistive material is less corrosive, thereby more durable. The values obtained from the measurement of electrical resistivity were done using the DC electrical resistivity test. This was done after submerging all the specimens in NaCl solution after 60 days. The results proved that there was a reduction in Coulomb charges when longer curing periods were applied to all the mixes. There was a positive correlation between the amount of time specimens were cured and their resistance to electricity. Specimens cured for 7 days showed the weakest resistance to electricity while those exposed for 56 days exhibited the strongest. Therefore, the effect of crystalline RHA as a pozzolan is evident at a longer period of curing (e.g. 56 days). Thus, incorporation of RHA with longer curing period will produce more durable concrete as opposed to using concrete with Type I cement. Furthermore, the difference between the two submersion environment (actual and simulated NaCl solution set-up) caused an insignificant change in the trend of the results for electrical resistivity test.

Keywords: Electrical resistivity; crystalline rice husk ash; curing; concrete; submerged marine environment

A6: CORROSION PROPERTIES OF STEEL BAR EMBEDDED IN CEMENT MORTAR MIXED WITH SEA WATER DURING STRENGTH DEVELOPING PERIOD

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ABSTRACT

Generally, sea water is prohibited to use as mixing water in reinforced concrete due to high concentration of chloride ion. However, in some area where the availability of fresh water for concrete is limited, the use of sea water as mixing water is necessary. There are a few researches on properties of steel bar in sea water mixed concrete. Objective of the study is to understand the properties of steel bar in concrete mixed with sea water. Firstly, half-cell-potential of steel bar embedded in mortar is measured to evaluate the potential of corrosion. Tap water and sea water are used both for mixing and curing. Secondly, anodic polarization curve is measured for evaluating the condition of passivity film of steel bar, using the passivity grade proposed by Otsuki (1985). From experimental results, following conclusions are derived.

(1) Half-cell-potential of steel bar in sea water cured mortar showed lower value about 300mV than tap water cured mortar both for tap water and sea water mixing. (2) Half-cell-potential of steel bar in mortar mixed with sea water and cured in sea water shows increasing trend under the strength developing stage. (3) Anodic polarization curve of steel bar in mortar mixed with sea water is classified into the Grade 5 for tap water curing and the Grade 4 for sea water curing, at the age of 140 days. It seems that passivity film of steel bar in mortar is not broken at the age of 140 days even sea water is used as mixing water.

Keywords: Sea Water Mixing, Sea Water Curing, Steel Corrosion, Half Cell Potential, Polarization Curve

A7: SHEAR STRENGTH PROPERTIES OF GOLD MINE TAILINGS AND WASTES FROM AGGREGATE QUARRY IN THE PHILIPPINES

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ABSTRACT

Geotechnical characterization is an essential step towards determining the suitability of mine tailings as fill or embankment materials. Considering the large volume of tailings generated and currently in storage facilities, the use of mine tailings that do not contain deleterious components as fill or embankment materials is one possible option that can alleviate disposal problems of these mine wastes. This study was conducted to determine the geotechnical characteristics of wastes from concrete aggregate quarry and tailings from gold mine sites in the Philippines. Standard ASTM procedures are performed to obtain the physical characteristics. Results of these tests indicate that the tailing samples are non-plastic and considered as fine-grained consisting of fine sands and silts. Microfabric analyses performed using electron microscopy show a microstructure that is granular with some flaky particles. Tailings' shear strength behavior was investigated through direct shear tests. Tailings in dry condition manifested a strong particle interlock as indicated by high critical state friction angle ranging from 36.6° to 38.4°. Friction angles at failure of saturated tailings were lower at an average of 4° as compared to those obtained in dry condition. Modified hyperbolic model was formulated to predict the shear stress vs. shear strain and volumetric strain vs. shear strain responses of tailings measured from the direct shear test. In the modified hyperbolic model, the hyperbolic relation between the changes in stress and strains is defined in terms of an initial shear modulus, G_i and the shear strength at failure, τ_f . The model introduced new hyperbolic parameters, the volumetric strain parameters α and β , to describe the volumetric strain against shear strain behavior of tailings. The modified hyperbolic model provides a good approximation to the stress-strain and volumetric strain-shear strain responses measured during the tests of tailings that exhibited a ductile failure and compressive volumetric strain. However, the model does not give a good prediction of stress-strain response for specimens that exhibited brittle failure with dilative volumetric strain. The model cannot capture the strain softening phenomena, but it can be used to model the behavior leading to the strain softening as well as during the ductile stage.

Keywords: tailings, stress-strain behavior, shear strength, modified hyperbolic model

**A8: ACCELERATION OF COMPOSTING BY INOCULATION OF YEAST THAT
DEGRADES ORGANIC ACIDS PRESENT IN THE RAW COMPOST MATERIAL**

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ABSTRACT

Managing the ever-increasing waste materials produced in our society has become an essential area of study in recent years. Among waste materials, organic fractions such as food waste originating from households, restaurants, and food processing factories can be reclaimed as compost for agricultural use. One of the significant characteristics of food waste composting is that the pH decreases in the early stages of composting, and it is well known that the low pH inhibits vigorous organic matter degradation in the composting. In the present study, microbial inoculation into the raw compost material was carried out in order to prevent the decrease in pH and thereby accelerate organic matter degradation. A yeast strain RB1 that has a high degradation activity against organic acids, was used as an inoculum to accelerate organic matter degradation during composting. The RB1 strain rapidly degraded the organic acids present in raw compost material, leading to a rise in pH. As a result, both mesophilic and thermophilic bacteria proliferated faster in the compost with RB1 inoculation than in that without inoculation; thus, the lag time for vigorous organic matter degradation was shortened by 2 days in the RB1-inoculated compost. Additionally, microorganisms that were dominant in the thermophilic stages of composting without RB1 inoculation were also dominant in the composting with RB1 inoculation. Thus, we conclude that RB1 inoculation adjusts the environmental conditions to promote proliferation of microorganisms and contributes to the high composting rate.

Keywords: Composting, acceleration of organic matter degradation, microorganisms, inoculation

**A9: NON-LINEAR ULTRASONIC TESTING OF CONCRETE USING SHORT
STEEL FIBERS AS REINFORCEMENT**

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ABSTRACT

Use of waste from manufacturing industry is needed to protect the environment and utilize it to improve mechanical properties. In this paper, short-steel fibers were added to concrete to improve ductility and compressive strength. Non-destructive test was done in Tokyo Institute of Technology in testing the three concrete cube specimens of mature age with size of 150mm x 150mm x 150mm. Specifically, non-linear ultrasonic test was used to examine the internal effects in concrete until it reached the ultimate compressive strength. The use of 200kHz transmitter with 100kHz receiver and 100kHz transmitter and 200kHz receiver was obtained. It was observed that the ratio of the normalized amplitude of fundamental and sub-harmonics from baseline values was sensitive to internal damage. These ratios of 50kHz:100kHz, 100kHz:200kHz and 50kHz:200kHz sub-harmonic generations gave consistent behavior on concrete characteristics like stress-strain diagram and formation of cracks inside the specimen. Further study is recommended to correlate the stress-strain diagram and internal physical defects in concrete.

Keywords: Fiber-reinforced concrete, Non-destructive test, Non-linear ultrasonic test

**A10: FUNDAMENTAL STUDY ON UTILIZATION OF WASTE COMBUSTION ASH AS
CONCRETE MATERIAL MIXED WITH OPC, BFS AND ANHYDRITE
ON UTILIZATION OF WASTE COMBUSTION ASH
AS CONCRETE MATERIAL MIXED WITH OPC, BFS AND ANHYDRITE**

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ABSTRACT

In this study the utilization of “waste combustion ash” as concrete material was investigated from the viewpoint of leaching phenomena of chromium hexavalent and the practical usage. Especially, in order to clarify the influence of binder type on leaching phenomena of chromium hexavalent, ordinary portland cement with several replacement ratios of blast furnace slag and anhydrite were used as binder. As the result of this study, the immobilization ability of cement matrix of chromium hexavalent was improved in the case of binder with both of blast furnace slag and anhydrite. It was concluded that this effect was derived from the formation of ettringite containing chromium hexavalent as well as monosulphate in OPC-blast furnace slag-anhydrite system. Also there was a possibility that this material could be used as the factory concrete products such as interlocking block, although it is not enough to use as important structural material from the viewpoint of compressive strength.

Keywords: Waste Combustion Ash, binder type, chromium hexavalent leaching, practical usage

**A11: A STUDY ON THE USE OF BAMBOO AS REINFORCEMENT FOR CONCRETE
MIXED WITH SEAWATER**

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ABSTRACT

Alarming issues such as depletion of renewable freshwater and shortage in cement, especially in the Philippines, are evident nowadays. Traditionally, steel is used as reinforcement to concrete to compensate its low tensile strength. However, there is a limited supply of steel in some countries because of limited natural resource and lack of skilled labor. Consequently, the use of suitable materials as alternative reinforcements to concrete, such as bamboo, are highly recommended due to its availability, low cost, lightweight characteristics, flexibility and toughness. The significance of this study is directed towards sustainable development wherein alternative construction materials are being tested for their effectiveness in construction.

This study investigates the effectiveness of bamboo as reinforcement in concrete, replacing concrete's mixing water component with seawater and substituting 20% of its cement constituent with fly ash. The parameters studied in this research are the compressive strength, tensile strength of bamboo, pull out bond characteristics and flexural strength.

Results show that the compressive strength of the concrete mixed with seawater samples attained a higher compressive strength than concrete mixed with freshwater samples after 28 days of curing. Pull out results suggest a significant difference between the steel embedded pull out specimens and bamboo pull out specimens. The corrugations of the steel proved to add bond with the concrete. Tensile test results show that the strength of steel in tension is significantly greater than the bamboo samples. Results also show that as the number of nodes increased, the tensile strength of the bamboo decreased. The flexure strength of steel reinforced beams is significantly greater than bamboo reinforced beams. In addition, as the number of nodes increased, the resistance to flexure also increased.

Keywords: bamboo, fly ash, seawater, reinforcement

**A12: COMPREHENSIVE UTILIZATION OF BAGASSE FLY ASH (BFA) FOR
ADVANCED MATERIALS PREPARATION**

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ABSTRACT

The common objective of preparing material from waste is for lowering the synthesis cost and at the same time reducing the quantity of the waste. Here, the potential of Bagasse Fly Ash (BFA) for various material precursors is comprehensively discussed. BFA should be separated into small and large particle before preparation due to different properties between the fractions. The large fraction is rich in carbon that can be used for preparing carbon-based material (activated carbon) and the small fraction is rich in silica that suitable for preparing silica-based materials (zeolite and mesoporous silica).

Keywords: Bagasse fly ash, advanced material, activated carbon, zeolite

**A13: INFLUENCE OF VARYING MIX DESIGN AND FIBER LENGTH ON THE PROPERTIES
OF WATER HYACINTH PARTICLE BOARD**

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ABSTRACT

This study is focused on the investigation of the influence of varying mix design and fiber length on the properties of water hyacinth particle board. A total of nine mixtures were considered in this study using three resin-fiber ratio (70:30, 75:25 and 80:20) and three varying fiber lengths (13 mm, 26 mm and 52 mm) to produce a 30 cm by 30 cm by 1.2 cm sample boards. The samples were prepared and tested for Water Absorption and Thickness Swelling Test, Modulus of Rupture Test, Face Screw Holding Strength Test, Internal Bond Strength Test and Edge Screw Holding Strength Test based on the Philippine Agricultural Engineering Standards – 320 (PAES – 320) for Type 100 particle boards. Based on the test results, the amount of resin and the size of fibers used in the mix have an influence on the physical and mechanical properties of the particle board. The more resin used in the mix the lesser the particle board absorbs water. In addition, using large amount of resin makes the particle board brittle. On the other hand, the use of small and long fibers in the mix showed a significant effect on the properties of the board. Incorporating smaller sizes of fibers causes higher thickness swelling due to the larger exposed contact area that absorbs water. Consequently, the use of short fibers resulted to a low holding strength in the board as a consequence of the less continuous bond in the fibers, while the use of longer fibers caused difficulty and consistency in the mix that affects the even distribution of the binder. Hence, voids are formed causing lower strength in the particle board. Generally, the particle boards having a resin-fiber ratio of 70:30 with 26 mm fiber length reinforcement exhibited the best performance among the nine mixtures satisfying the PAES - 320 for Type 100 high-density particle board.

Keywords: Fiber, water hyacinth, resin and particle board

**A14: ASSESSMENT OF SOLID WASTE GENERATION AND RECYCLABLE MATERIALS
POTENTIAL OF COMMERCIAL ESTABLISHMENTS IN UP DILIMAN**

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ABSTRACT

The University of the Philippines Diliman Campus produces a large amount and different types of solid wastes because of the different academic buildings, offices, dormitories, residential houses and laboratories located in it. Data on the solid waste management (SWM) and generation of the whole campus are not available at the present. In this study, the commercial establishments in the campus were given focus considering the large amount and varied types of solid waste they produced. This paper presents an analysis of the solid waste generation and waste composition of different commercial establishments of the campus. The potential of their recyclable components were also analyzed. The Shopping Center (SC), College of Arts and Sciences Alumni Association (CASAA) Food Service, and Kiosks were taken as representative of all commercial units in the campus. The generation rates and composition of solid wastes were analyzed using a waste analysis and characterization survey (WACS). Results of WACS show that waste generation rates of commercial establishments are very high. For instance, the amount of daily solid waste of SC is found to be about 219.27 kg; and CASAA is producing an average of 68.39 kg/day of waste. It is also revealed that almost half of the solid wastes being disposed are still potentially recyclable and divertible. Food waste is the major recyclable/divertible component followed by mixed papers and plastics. It has been observed that the commercial units in the campus are still lacking in terms of efficient waste management, especially in segregation, public awareness etc. Hence, it is recommended that concerned authorities should view this issue seriously and improve the current SWM practices of the commercial establishments in UP Diliman.

Keywords: Waste generation, solid waste, recyclable material, segregation

B1: PERMEABILITY CHARACTERISTICS OF ROAD BASE MATERIALS BLENDED WITH FLY ASH AND BOTTOM ASH

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ABSTRACT

Permeability, being the ability of water to flow through a soil, should be considered when designing roads. Roads are commonly designed as having low permeability to increase their strength capacity. However, without suitable level of permeability, drainage will be insufficient and thus, causing ponding, pavement deterioration, and road failure.

A specific permeability apparatus was designed and fabricated to test the horizontal permeability. In contemplation of permeability of roads, the horizontal directional flow of the water is to be given more attention since the flow runs horizontally or in line and parallel to the planes of compaction. Roads stretch out horizontally, rather than vertically, thus the tendency of water flowing in the horizontal direction is to be given more thought.

Unfortunately the process on testing the permeability only involves the testing through the vertical direction at present; there is still no apparatus available to test the horizontal flow of water of different soil samples for laboratory use. With that in mind a horizontal permeameter was designed and constructed in order to obtain and allow permeability in the horizontal direction to be measured, analyzed, and compared.

Series of experiments were conducted to test both the horizontal and vertical permeability of pure fly ash (F), pure bottom ash (B), pure conventional road base materials (CRBM), and blends comprising of the said soil components. The results showed varying parameters for every blend considering the void ratio, relative compaction, and bottom ash content. Furthermore, an ideal blend was determined to have a 40% to 60% bottom ash content. Correspondingly, SEM tests projected that voids for each type of soil greatly influenced the index properties of the soil samples and the permeability characteristics of the blended soil samples. It was also established that horizontal and vertical permeability had a significant difference wherein the flow of water at the horizontal-direction is greater compared to the vertical-direction.

Keywords: Fly ash, bottom ash, permeability, relative compaction, road base materials

B2: TREATMENT OF SOLID WASTE CONTAMINATED WITH HEAVY METALS

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ABSTRACT

Bulk solid wastes containing hazardous heavy metals have been serious environmental issues to highly populated cities. Technology and engineering practice to treat those bulk solid wastes have been changing in these 50 years; as knowledge on toxicity of hazardous material increase, as analytical technology develop, as treatment technology become more sophisticated, complicated, complete, and as the public attitude to environmental issues change. This paper introduces three cases of engineering solutions applied to solid waste that the author experienced. First, solidification of river bed sludge having odor problem with solidifying agent produced from by-product of flue gas desulfurization, worked effectively for problem requiring urgent solution. Second, thermal treatment of heavy metal contaminated soil had both advantages and drawbacks. Third, the groundwater model has become an essential tool for monitoring and remediation of groundwater, which is necessary for risk communication with stakeholders associated with the solid waste holding site. Through those cases, it is learned that the engineer should carry out correct assessment of the site and waste, and should be able to present options of technical solution focusing on solidification / adsorption of hazardous heavy metals by natural soil or solidified material. It is also learned that various risks associated with each option should be properly evaluated because decision making among those options are influenced by economical and social conditions at the time of its implementation.

Keywords: solid waste, solidification, ettringite, gypsum, heavy metal, thermal treatment, groundwater model

**B3: INVESTIGATION ON THE COMPRESSIVE STRENGTH AND BULK DENSITY OF
CONCRETE HOLLOW BLOCKS (CHB) WITH POLYPROPYLENE (PP) PELLETS AS PARTIAL
REPLACEMENT FOR SAND**

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ABSTRACT

Urbanization has made plastics a necessity today. However, plastics are non-biodegradable and the increasing generation of plastics creates a problem of disposal. In the Philippines, this problem is exacerbated because of lack of sanitary landfills. In this study, PP, which is a subset of these plastics, were pelletized and incorporated in concrete hollow blocks as partial replacement for sand. Tests such as determination of the specific gravity of the materials, and sieve analysis and fineness modulus of the aggregates were performed before molding. Five batches of specimens, each with 0%, 10%, 20%, 30%, 40% PP replacement (by volume) were molded and cured for 28 days. The compressive strength and bulk density of the specimens from these batches were determined and compared. Results showed that compressive strength decreases as percent replacement increases, except when 10% sand was replaced by PP pellets, and the bulk density decreases when percent replacement increases. The results were analyzed and explained, and statistical and economic analyses were employed to further discuss the results. It was concluded that PP pellets, up to 10% replacement, has potential as partial replacement for sand, provided that economic constraints are satisfied. Recommendations focused on improving and reinforcing this study, and suggesting other researches similar to this study that can be undertaken.

Keywords: Plastic waste disposal management, green concrete, lightweight construction, polypropylene

**B4: COLORIMETRIC DETECTION OF ESCHERICHIA COLI
BY USING A RECOMBINANT BACTERIOPHAGE**

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ABSTRACT

Composting of feedstock feces attracts public concerns. Thermophilic temperature maintained during composting process is expected to be effective to eliminate pathogens in the raw materials. In a large scale composting, however, there are large temperature distribution such as core region with highest temperature and surface region with lowest temperature. Therefore, some pathogens may survive at the low temperature region. It is important to ascertain compost product free from pathogens to ensure the safety of usage of the compost. Traditionally, possible pathogens can be detected by plating method. The plating method, however, cannot distinguish pathogens from non-pathogens. Therefore, more specific method for detection of pathogens is required. In this research, a new colorimetric phage-based method for the detection of pathogenic *E. coli* O157:H7 was investigated. A recombinant phage that expresses a eukaryotic chromogenic enzyme (ce) was constructed through the homologous recombination between the wild type phage genome and a synthesized plasmid vector that contain the ce gene. The recombinant phage was screened by plaque hybridization technique. The detection of the *E. coli* was based on a colorimetric reaction of the enzyme with substrates. The method was tested its possibility to detect the *E. coli* in broth. By the enzyme assay, the detection was conducted after few minutes. Moreover, color change of the enzyme assay could be visualized and quantified by a common spectrophotometer.

Keywords: Bacteriophage; pathogens; pathogenic *E. coli*; detection.

**B5: INFLUENCE OF VARIOUS REPLACEMENT RATIOS OF FLY ASH TO
CONCRETE MIXED WITH SEAWATER**

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ABSTRACT

To minimize the problem in the unequal distribution of the country's water supply, the use of seawater as an alternative for fresh water in concrete was utilized. However, the problem is that the high concentration of chloride present in the seawater penetrates the reinforced concrete making the steel reinforcements corrode. Therefore, the use of fly ash would help delay the effects of chlorides on the reinforcement steel, and help minimize its problem in disposal. The main objective of the study was to determine the influence of various replacement ratios of fly ash to concrete mixed with seawater in the compressive strength and corrosion properties. Concrete specimens with 0%, 10%, 15%, 20%, 30%, 40%, and 50% fly ash replacement ratios and Ordinary Portland Cement mixed with fresh water and seawater were prepared. These specimens were cured in freshwater and seawater. The compressive strength of the specimens were tested on the every week until the 84th day. For the corrosion test, the corrosion potential, corrosion current densities, corrosion rates, and the chloride contents were also determined. The optimum fly ash content for the compressive strength ranges from 20% to 25%. Meanwhile, 10% to 20% fly ash replacement range in general showed a significant improvement in the corrosion of specimens compared to those with no fly ash content. However, for the specimens mixed with seawater but cured in fresh water, a 50% fly ash replacement ratio is the best amount to add in the mix to show a significant decrease in its corrosion rate.

Keywords: Seawater, fly ash, concrete, compressive strength, corrosion

**B6: LIFETIME PREDICTION OF CONCRETE MIXED WITH SEAWATER
AGAINST CHLORIDE ATTACK AND CARBONATION**

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ABSTRACT

World Meteorological Organization (WMO) reported that two-third of world population was going to suffer from fresh water shortage by 2025. Therefore, it is necessary to investigate the usage of seawater as mixing or curing water in concrete industry these days. From the above background, the resistance of material penetration and corrosion behavior of steel embedded in concrete mixed with seawater are investigated in this study. Also the life time of structure, including the initiation and propagation periods are predicted based on experimental data. As a result of this study, the propagation period of steel reinforced concrete mixed with seawater is longer than that with fresh water, although the opposite result is obtained in the case of incubation period. Also the difference of life time, defined as the sum of incubation and propagation periods, between reinforced concrete mixed with seawater and fresh water is smaller than the differences of incubation periods only. Especially the life time of reinforced concrete mixed with seawater and blast furnace slag cement (replacement ratio: 55%) became 40 years and this period is almost the same with reinforced concrete mixed with tap water.

Keywords: Concrete mixed with seawater, material penetration, steel corrosion, blast furnace slag

**B7: EFFECT OF UTILIZING CRUMB RUBBER TIRE AND COAL COMBUSTION BY-PRODUCTS
ON THE PROPERTIES OF DENSE GRADED ASPHALT MIX**

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ABSTRACT

Recycling waste products and by-products for construction is an effective strategy for waste management. The utilization of rubber tire is increasing due to urban mobility and rapid urbanization in major cities and suburban areas.

The crumb rubber tire and coal combustion by-products (bottom ash) as partial replacement to fine aggregate was used to develop a design mix for asphalt pavement that is resistant to heavy transport vehicles such as trucks and trailers.

The development of the project is divided into two major parts: the first part covers the determination of the physical properties of materials used for asphalt mixing and mechanical properties of asphalt mix, and second part is the field exposure test of the optimum asphalt mix design that satisfied the ASTM Standard of Bituminous Asphalt Mixture.

The optimum design that satisfied the strength and durability requirement according to Marshall Design Criteria for heavy traffic was subjected to field exposure test. Ramon Magsaysay Boulevard, which caters to heavy vehicles, served as the site for field testing of the optimum asphalt mix design. The transversal and longitudinal cracking, deformation and rutting were evaluated by means of visual inspection on a monthly basis. The study showed that the increasing amount of crumb rubber tire and bottom ash affects the marshall property of asphalt mix. In the 7-month field exposure test of the asphalt mix design, it showed no occurrence of structural deformation, cracks, and rutting.

Keywords: Crumb rubber, bottom ash, asphalt binder, recycling, asphalt mix

**B8: APPLICATION OF STEEL SLAG HYDRATED MATRIX WITH
ANTI-WASHOUT PERFORMANCE**

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ABSTRACT

The authors developed a steel slag hydrated matrix with anti-washout performance, to extend the applicability of the existing steel slag hydrated matrix. This paper reports the results of laboratory experiments and various construction measurement data. These results show that a steel slag hydrated matrix with anti-washout performance has sufficient construction performance, like that of anti-washout concrete.

Keywords: Slag, hydrated matrix, anti-washout concrete

**B9: INFLUENCE OF SLAG AND FLYASH ON THE HARDENED PROPERTIES OF
CEMENT-LAHAR SAND CONCRETE PAVING BLOCK**

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ABSTRACT

This paper presents the experimental investigation of concrete paving block made of lahar sand < 9.52 mm in size and crushed furnace slag aggregates < 9.52 mm in size with fly ash as cement replacement. The properties investigated were compressive strength and abrasion resistance under natural and accelerated weathering. The effects of fly ash were also investigated. Two mixture proportions were investigated Series A consisted of mixes having varying content of crushed slag as replacement of lahar aggregates, ranging from 30, 40, 50 and 60 percent (%) by weight. Series B contained mixes with a varying water cement ratio ranging from .45, .50, and .55, respectively. The experiments were conducted using the appropriate ASTM standards.

The results indicate that for concrete paving block with constant water cement ratio incorporating crushed slag aggregates there is a significant increase of the compressive strength of block. Data indicate a definite beneficial effect of crushed slag on the hardened properties of concrete block. Further, the surface of concrete block becomes rougher as the crushed slag content increases. Incorporating fly ash on the block as cement replacement is not really beneficial on the strength of the block. The results indicate that for concrete block with constant water cement ratio incorporating fly ash as cement replacement there is a significant decrease of the compressive strength of block. The abrasion resistance of block was affected similarly.

Keywords: Furnace slag, lahar sand, abrasion resistance, accelerated weathering

**B10: DEVELOPMENT OF CONCRETE USING SEA WATER AND
CONCRETE DEBRIS FROM EARTHQUAKE DISASTER**

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ABSTRACT

A lot of concrete debris was generated in the Great East Japan Earthquake Disaster, and methods need to be developed to effectively reuse it. Port and harbor structures suffered serious damage from the tsunami, and a lot of concrete will be required for their reconstruction. We have developed methods for producing concrete structures using uncrushed concrete debris and sea water. The “pre-packed concrete method” and the “post-packed concrete method” make it possible to use large uncrushed concrete debris as coarse aggregate. In addition, using sea water as the mixing water can improve early strength. This paper describes concrete production methods using large concrete debris and sea water, and the properties of the concrete.

Keywords: The Great East Japan Earthquake Disaster, concrete debris, sea water, pre-packed concrete method, post-packed concrete method

**B11: INFLUENCE OF BINDER ON THE PHYSICAL AND MECHANICAL PROPERTIES
OF COCO PEAT PARTICLE BOARD**

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ABSTRACT

Coco peat is the spongy and dusty material remaining from extraction of fibers from coconut husk. It is currently utilized for horticultural purposes such as plant growing media and soil conditioner. Potential use of coco peat can be as sorbent material, filter bed material and as construction material. In this study, the viability of using coco peat as material for particle board is being explored. It is focused on the property characterization of coco peat particle board using Cement, Urea-formaldehyde powder resin, and Polyester resin as binders. A total of nine (9) mix designs using three (3) binder-coco peat material ratio of 4:1, 5:1, and 6:1 were used in this study. The produced coco peat particle boards were subjected to the physical and mechanical tests based on the Philippine National Standards (PNS) procedures. The physical properties investigated were Density, Thickness Swelling (TS), and Water Absorption (WA). On the other hand, the mechanical properties analysed were Modulus of Rupture (MOR), Edge Screw-Holding Strength, Face Screw-Holding Strength, Nail-Head Pull-through and Internal Bond Strength (IB). Result of the physical tests showed that the produced coco peat particle board using urea-formaldehyde as binder is categorized as low-density board. While the produced coco peat particle board using cement and polyester as binders are categorized as high-density boards. The outcome of the thickness swelling test revealed that all the specimen satisfied the minimum requirement set by PNS while only the 4:1 Urea-formaldehyde board did not passed the water absorption test. From the test results of the mechanical properties, the 6:1 mixture of Polyester-coco peat has the highest value of MOR with 137.72 kg/cm² and the only specimen that exceeded the 80kg/cm² MOR requirement for Type 100 particle board. While for the Edge Screw-Holding Strength Test, the Face Screw-Holding Strength Test, and the Internal Bond Strength Test, all samples passed the minimum requirements. In conclusion, the specimen with polyester-coco peat ratio of 6:1 exhibited the best performance amongst the nine mix designs satisfying the PNS 230 Type 100 particle board.

Keywords: Coco peat, particle board, cement, Urea-formaldehyde powder resin, Polyester resin

**B12: UTILIZATION OF UNTREATED AND TREATED RICE HUSK AS ADSORBENTS
FOR LEAD REMOVAL FROM WASTEWATER**

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ABSTRACT

The removal of lead from wastewater in a fixed-bed column by untreated rice husk (URH), tartaric acid treated rice husk (TAT-RH) and sodium carbonate treated rice husk (SCT-RH) was investigated in this study. Three operating parameters such as adsorbent bed height (3, 6 and 9cm), flow rate (5, 10 and 15mL/min) and initial lead concentration (10, 100 and 190mg/L) were carried out. It was found that increased in adsorbent bed height and decreased in flow rate, increased the breakthrough time and bed adsorption capacity. The increase of initial lead concentration decreased the breakthrough time but increased the bed adsorption capacity. The increase of adsorbent height from 3 to 9cm, bed adsorption capacity increased from 0.818 to 1.946mg/g, 0.273 to 1.727mg/g and 2.946 to 4.091mg/g for URH, TAT-RH and SCT-RH, respectively. The higher adsorption capacity and breakthrough time were observed for SCT-RH in comparison with URH and TAT-RH. BDST Model was fitted well to the experimental data at different adsorbent bed height. The Thomas Model fitted well also to some experimental data. Predicted breakthrough curves of Thomas Model were observed to be well predicted at low flow rate and low initial lead concentration.

Keywords: Rice husk, lead, adsorption, fixed-bed column

B13: INFLUENCE OF CURING PERIOD AND CURING MEDIUM ON CONCRETE MIXED WITH SEAWATER

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ABSTRACT

With the increasing demand for resources and cost of construction materials, many alternatives are being studied for sustainable use. In the Philippines, coal used for power generation results to continuous production of residues like bottom ash and fly ash. Rather than being disposed, these materials can be utilized as partial substitute to ordinary Portland cement in producing concrete. The construction industry is also one of the major consumers of freshwater in the world. With the abundance of seawater in the Philippines, a study on the feasibility of using seawater will help reduce the freshwater consumption of the construction industry, thereby allocating it to other uses.

This study investigates the effects of curing period and curing medium on concrete mixed with fly ash and seawater in terms of compressive strength and corrosion behavior. Specimens were cured in freshwater and seawater and then exposed to indoor, outdoor and coastal area conditions. Cylindrical specimens were prepared and tested for compressive strength while rectangular prism specimens with 10mm-diameter round steel bars were monitored every week for corrosion potential and corrosion current density

Curing the specimens in either freshwater or seawater resulted to no significant difference in terms of its compressive strength and corrosion current density until its 84th day. In terms of corrosion potential, seawater cured specimens tend to have higher value only on the 2nd week of testing. However, it can be said that the corrosion potential at the early weeks of testing is still stabilizing. Seawater as a curing medium for concrete mixed with seawater can produce the same effect as freshwater curing at the 84th day, in terms of corrosion and compressive strength, given that the specimens will only be cured for 7 days.

Keywords: curing, flyash, seawater, corrosion, compressive strength

**B14: A STUDY ON THE USE OF EXPANDED POLYSTYRENE AS A SUBSTITUTE
FOR FINE AGGREGATES IN CONCRETE HOLLOW BLOCKS**

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ABSTRACT

Polystyrene is one of those materials that people come across in their everyday lives; it comes in the form of a white bulky mass which is called Styrofoam. However, disposing polystyrene is a big problem since it is made of petroleum, a non-sustainable and heavily polluting resource, which makes polystyrene a product that cannot be incinerated. The recent means of disposing polystyrene is by recycling or dumping. In any case, recycling polystyrene has a very little market all over the globe and is not currently available in the Philippines. According to a polystyrene fact sheet, 25-30% of landfills are composed of polystyrene products which in time may continue to increase to a much bigger number.

This study was dedicated to introduce a new innovation in disposing polystyrene wastes by making it as a substitute material to fine aggregates in concrete hollow blocks. In achieving the purpose of the study, test specimens with polystyrene was tested by means of direct load application or compression test.

This study proved a new way of disposing polystyrene and knew its effect when substituted to concrete hollow blocks regarding its compressive strength and weight, which decreases as the percentage of polystyrene increases. The specifics obtained from the study were analyzed and shown through graphs and tables; the results from the laboratory tests were compared to that of the control specimens, and which among these specimens are nearest to the acceptable compressive strength for commercial hollow blocks. The study produced the best possible polystyrene added mix with 20% polystyrene substitution which had a strength capacity of 2.052 MPa and density of 1653 kg/m³ attaining the nominal acceptable strength capacity of non-load bearing concrete hollow blocks stated in PNS 16:1984, as well as producing a lightweight hollow block having a density which was less than 1680 kg/m³, a standard which was set by ASTM C-129.

Keywords: Expanded Polystyrene, petroleum, fine aggregates, Concrete Hollow Blocks, substitute material