INSTITUTION OF ENGINEERS PNG

NEWSLETTER

FEBRUARY 2016

FROM THE CEO'S DESK

My Dear Members of the Institution, stakeholders and friends, welcome to the February issue of the IEPNG Newsletter.

Despite the gloom situation of the country's economy, exciting times are on the horizon for the Institution and its membership.

For the immediate term, the Institution and its members are looking forward to the Annual General Meeting scheduled for April in Port Moresby *(see separate story in this issue of the Newsletter)*.

The AGM will be highlighted by the swearing in of new members of the IEPNG Board at the AGM dinner.

The election process is already underway, and details of that election process are also in a separate story in this edition of the Newsletter.

All members please read these details carefully as you all will in one way or another be involved in this process, the results of which will determine how we move forward as an Institution and as a profession.

For those engineers and other technical people who are not financial members of the Institution, it is imperative that you start the process of registering with the Institution right away.

We all know the repercussions of not being a registered member of the Institution, but I wish to take this opportunity to remind all of us again about its importance.

It could have an impact on your profession, your employer and of course your family

The Institution has started, in Port Moresby at least, surprise inspections and site visits to ensure major projects and contracts are implemented within the parameters of the contracts and the Professional Engineers Registration Act (Amended) 2007 (PERA).

This initiative will definitely affect a lot of people and its impact could amount to a lot of money being lost in fines and even termination of contracts. I, on behalf of the IEPNG Board and Management, hope you do what is right and register.

Pleasant Reading.

IEPNG STARTS CONSTRUCTION SITE INSPECTIONS

The Institution of Engineers PNG (IEPNG) has started carrying out surprise inspections on construction sites in Port Moresby to ensure compliance with relevant laws and regulations guiding the engineering profession and contracts.

IEPNG officials early this week paid a surprise visit on a major hotel construction site, catching the contractors by surprise and – as the IEPNG officials said – unearthing some alleged irregularities in contractual requirements.

The Professional Engineers Registration Act (Amended) 2007, PERA, which regulates the conduct of engineers in the country, requires that all engineers involved in any construction or other work which involves some engineering decision-making, must be registered with the Institution of Engineers PNG.

Failure to adhere to this and other requirements can attract penalties like fines or even termination of contracts.

The new hotel project construction site, which was the subject of a surprise inspection visit this month by offiicials from the Insitution of Engineers PNG. Work is underway to rectify the alleged irregularities with the contractors.

The IEPNG officials were surprised to find out during the surprise inspection that more than one of the contractors involved in the city hotel construction project appeared not to have registered engineers overseeing the project. A quick check with the IEPNG's database confirmed that irregularity.

This prompted the IEPNG board and management to issue a stern warning that they will not hesitate to penalise the contractors, which in turn could affect the important project.

"We have started, and more inspections will follow in the coming weeks and months," says IEPNG chief executive officer Benedict Mick. "Ignorance of the law is not an excuse for those who are not complying with the law," he said in reference to the alleged irregularity uncovered in the site visit. "We will seek legal advice from out lawyers to explain clearly our jurisdiction in regards to the law and how we can penalise them and other contractors who are not adhering to the law."

Mr Mick said contractors involved in any engineering work or decision-making in any contract anywhere in the country must be registered with the IEPNG. Failure to do so will attract various fines and penalties as specified in the Act.

"Those that do not comply will be charged and fined and even can have their contracts terminated," Mr Mick warned.

The Professional Engineers Registration Act (Amended) 2007 governs and regulates the engineering profession in the country.

One of its requirements is that every person holding any engineering position in any company or government agency that operates in the country, must be registered with the IEPNG, which manages the Act.

WORK ON TRACK FOR ANNUAL GENERAL MEETING

Work is on track for the Institution of Engineers PNG Annual General Meeting, scheduled April 22 in Port Moresby, which will coincide with the election of new members of the IEPNG Board.
IEPNG staff have been hard at work since the start of the year, calling for nominations, which opened on January 25 and closed on February 12.
The actual voting for new Board members, which started on February 29, will end on April 8 before the Annual General Meeting dinner on April 22, where the new Board members will be announced.
IEPNG Chief Executive Officer Mr Benedict Mick has appealled to all financial members to take part in the election process diligently as the results of that process will determine how they move forward as an institution and as a profession.

KEY DATES AND EVENTS:

January 25	*- Nominations Opened*
February 12	*- Nominations Closed*
February 29	*- Voting Started*
April 8	*- Voting Ends*
April 22	*- Board Members Announcement/AGM*

WHY NOT RECYCLED CONCRETE?

From paper towels to cups to plastic bottles, products made from recycled materials permeate our lives. One notable exception is building materials. Why can't we recycle concrete from our deteriorating infrastructure for use as material in new buildings and bridges? It's a question that a team of researchers at the University of Notre Dame is examining.

"While concrete is the most commonly used construction material on earth, it is also the biggest in terms of environmental impact," said Yahya "Gino" Kurama, a professor of civil and environmental engineering and earth sciences, who is leading the research effort. "Coarse aggregates, such as crushed rock and gravel, make up most of a given concrete volume. The mining, processing and transportation operations for these aggregates consume large amounts of energy and adversely affect the ecology of forested areas and riverbeds."
A recent paper by a team of researchers in the journal Science questioned whether human's combined environmental impact has caused the planet to enter a new geological epoch, the "Anthropocene." The scientists note the problem of concrete in particular, pointing out that more than half of the concrete ever used was produced in the past 20 years.
"Through my research, I want to contribute to efforts towards reducing these demands on our natural environment by reducing the need for natural coarse aggregates," Kurama said.
"Especially in the years to come, the renovation and replacement of our nation's aging infrastructure will result in both an increase in the supply of old concrete rubble and the demand for new concrete. We need to be better prepared to utilize this growing resource at a higher level, which is what my research is focused on."
The biggest barrier to using recycled concrete has been the variability and uncertainty in the quality and properties of the recycled material and how this variability affects the strength, stiffness and durability of reinforced concrete structures. Kurama's team is trying to develop an understanding of how using recycled concrete affects the behavior of reinforced concrete structures so that buildings using large amounts of recycled material can be designed for safety and to serve their intended purpose without undesirable consequences in performance.
"Much of the research to date and the state-of-practice pertaining to sustainable use of structural concrete has focused on the partial replacement of cement with industrial byproducts, such as fly ash, slag and silica fume," Kurama said. "In comparison, conservation of coarse aggregates has been largely ignored in the U.S., resulting in a big knowledge gap related to this material."
Kurama's research group was the first to investigate recycled materials from a large number of sources, thereby studying the inherent variability in material quality and properties. Their research also addressed the deflection behavior, or how much a structure would continue to deform, over a long period of use under normal day-to-day loading and environmental conditions for the first time, as well as potential for using recycled aggregates in the precast concrete industry.
"Our initial research studied the variability from 16 recycled aggregate sources in the Midwest and quantified ways to pre-qualify the material for structural applications," Kurama said.
"Through a partnership with the University of Texas at Tyler and New Mexico State University, we are now expanding this study to many more sources from the eastern, southern, and southwestern U.S. We are also looking at durability and life-cycle cost, in comparison with natural aggregates, and effects of recycled concrete aggregates in pre-stressed concrete.
Because of the knowledge gap to date, the use of recycled aggregates in the U.S. has been limited mostly to non-structural applications such as sidewalks and roadways, even though the quality of the material is generally significantly higher than is required in these applications. Our ultimate goal is to develop the necessary engineering background and methods for the wider utilization of recycled concrete aggregates in structural concrete, such as in buildings."
Their results could be used by engineers to design concrete structures that incorporate varying amounts of recycled concrete aggregates that have less environmental impact than concrete structures made with natural aggregates.

Story Source: SCIENCE DAILY

This story is reprinted from materials provided by University of Notre Dame. Note: Materials may be edited for content and length.

THE BIG DIG: GLOBAL SOFTWARE SOLUTION FOR ROAD, WATER AND SEWER REPAIRS

Researchers develop streamlined program to integrate key infrastructure information

Ever have your street repaved one year, only to have it torn up for sewage work shortly afterwards? Municipal blunders like this may soon be a thing of the past, thanks to new software developed by researchers at Concordia University in Montreal.

In a paper recently published in the Journal of Construction Engineering Management, former graduate student Khaled Shahata and Tarek Zayed, a professor in the Department of Building, Civil and Environmental Engineering, describe an innovative method of tracking the many issues involved with the repair and renewal of road, water and sewer networks.

"The main problem is that city infrastructure planners often work in silos," says Zayed, the study's senior author. "When the infrastructure shares the same space, the integration of roads, water and waste water is a major planning challenge."

By combining a wide variety of variables for water, sewage and road networks, the software developed by Zayed and Shahata breaks down those silos. It identifies risk factors and consequences of a project's failure to map out which areas are most in need of attention, as well as where resources would most effectively allocated.

This software solution comes not a moment too soon.

"Water supply and sewer systems across North America have reached a point where maintenance and renewal is essential," says Shahata, who conducted the research during his graduate studies at Concordia. He is now an asset management specialist for the City of London, Ontario.

"Most of the drinking water infrastructure is nearing the end of its useful life," Shahata says.

"Forty-two per cent of America's major urban highways are congested, and three-quarters of waste-water systems need pipe repair. It's not much better in Canada, where about 30 per cent of municipal infrastructure has been assessed as between fair and very poor."

While infrastructure repair and rehabilitation is constantly underway in cities across the continent, carrying out that work is not always so easy. Issues like shrinking budgets, health risks, environmental concerns and maintenance are major obstacles.

Zayed believes the software, which was initially implemented in a pilot project for the City of Guelph, could soon be used by municipalities around the world.

"These problems are common in cities around the world," he says.

"By using this software, we remove the planning issues that often exist between these separate entities and consider a city's infrastructure issues more holistically.

"The end result is a more streamlined repair and rehabilitation process that uses the available budget in the most efficient way possible."

Story Source: SCIENCE DAILY

This story is reprinted from materials provided by Concordia University. Note: Materials may be edited for content and length.

Contractors digging up a section of the newly-completed Two-Mile section of the Hubert Murray Highway in Port Moresby to fix service lines. The new software, when fully developed, could avoid such wastage and inconvenience

EDITOR'S NOTE: IEPNG Members or Stakeholders who wish to contribute to this newsletter are welcome to do so and can get in touch with the IEPNG Editorial team on telepone number 325 8765 or 325 8763, through fax number 325 8718 or email JethroWamm@iepng.org.pg

SCIENTISTS 'BRIDGE' MATERIALS GAP IN NEW STUDY

Scientists at the University of Liverpool have shown that it is possible to design and construct interfaces between materials with different structures by making a bridge between them.

The advance is reported in Nature Chemistry.

It is usually possible to make well-controlled interfaces when two materials have similar crystal structures, yet the ability to combine materials with different crystal structures has lacked the accurate design rules that increasingly exists in other areas of materials chemistry.

The design and formation of an atomic-scale bridge between different materials will lead to new and improved physical properties, opening the path to new information technology and energy science applications amongst a myriad of science and engineering possibilities -- for example, atoms could move faster at the interface between the materials, enabling better batteries and fuel cells.

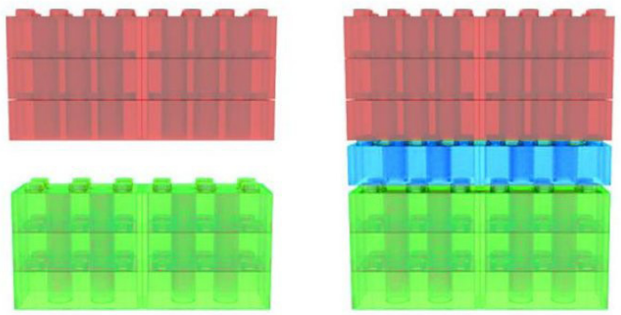
Many devices, for example a transistor or blue LED, rely on the creation of very clean, well-ordered interfaces between different materials to work.

Liverpool Materials Chemist, Professor Matthew Rosseinsky, said:

"When we try to fit materials together at the atomic scale, we are used to using the sizes of the atoms to decide which combinations of materials will "work" i.e. will produce a continuous well-ordered interface.

"The project team added in consideration of the chemical bonding around the atoms involved, as well as their sizes, as a key design step. This allowed the selection of two materials with different crystal structures yet with sufficient chemical flexibility to grow in a completely ordered manner throughout the interface between them.

"This was achieved by the formation of a unique ordered structure at the interface which did not correspond to either material but contained features of both of them, an atomic-scale bridge."



The arrangement of chemical bonds in different materials can make it hard to put them together to form a clean interface, like the green and red blocks in the figure. It is possible to construct a flexible block, which will fit with both materials, and bridge the gap between them, like the blue blocks bridge the gap between the red and green ones.
Credit: University of Liverpool

Story Source: SCIENCE DAILY
The story is reprinted from materials provided by University of Liverpool. Note: Materials may be edited for content and length.

ENGINEER MODELS HEART VALVES, TURBINES FOR BETTER DESIGNS AND PERFORMANCE

Three thin leaflets blew open and blood blasted through an artificial heart valve, the center stream firing reds and yellows, the colors indicating a flow speed up to 125 centimeters per second. When the leaflets slammed shut, the flow turned to light blue eddies, indicating blood flow had nearly stopped.

And then Ming-Chen Hsu, an Iowa State University assistant professor of mechanical engineering (pictured), searched his computer for another video and clicked play.

This time the tip of a wind turbine blade appeared on his monitor, constantly moving, flexing and vibrating as the blade rotated around the rotor hub. Red indicated air moving at a relative speed of 52 meters per second over the top of the blade; blue and green marked the slower air around the blade.

These are computer models featuring technologies called computational mechanics, fluid-structure interaction and isogeometric analysis. They show the flow fields and stresses that mechanical systems have to withstand. And they're part of a toolkit Hsu and his research group are developing to improve the design, engineering and operation of all kinds of machines.

"If we are able to use computers to model and simulate these engineering designs, we can save a lot of time and money," Hsu said. "We don't have to build and test every prototype anymore."

Hsu said it would be impractical, for example, for the wind energy industry to build and test full-scale prototypes of each and every idea for improving the performance of wind turbines.

Instead, the wind energy industry can opt for computational models. Hsu said they're based on complex mathematical equations. They're full of data. And studies show they're accurate. Using the models, "We can predict the real physics of the problems we are looking at," he said.

And so those videos showing blood flowing through an artificial heart valve or the vibrations of a wind turbine blade are a lot more than colorful graphics. To engineers, they can be as good as full-scale prototypes for studying durability and performance.

Hsu has a background in computational mechanics and started modeling wind turbines during his doctoral studies at the University of California, San Diego. He started modeling heart valves as a postdoctoral research associate at the University of Texas at Austin.

He's been at Iowa State since the fall of 2013 and has built a research group that currently includes doctoral students Austin Herrema, Chenglong Wang, Michael Wu and Fei Xu plus undergraduate student Carolyn Darling. The group is now working on two wind turbine studies and an engine project:

■ They're modeling the performance of the "Hexcrete" concrete wind turbine towers being developed by Sri Sritharan, Iowa State's Wilson Engineering Professor in Civil, Construction and Environmental Engineering. The goal is to use prefabricated concrete to build taller wind turbine towers that can access the steadier winds at 120 meters and higher. The project is primarily supported by the U.S. Department of Energy.

■They're also developing software to help engineers design wind turbine blades. The software will bridge a wide gap between blade design tools and performance simulations. The project is supported by a National Science Foundation grant that established Iowa State's graduate program in wind energy science, engineering and policy.

■And Hsu's research group is modeling the performance of the rotors inside gas turbines. The models will help engineers design the next generation of turbine engines. The project is supported by a grant from the U.S. Army Research Office.

Story Source:SCIENCE DAILY
The above post is reprinted from materials provided by Iowa State University. Note: Materials may be edited for content and length.