TECHNOLOGY ROUNDUP

A NEWS BULLETIN FROM

Technology Information Services Section (TIS)
Pakistan Scientific & Technological Information Centre

PASTIC

July-August, 2017

Vol.9 No.4

Editorial Board

Tech & Trade Offers

KOLDKRAFT TONGDA

Tech News Headlines

- Short Term Economic Emission Power Scheduling of Hydrothermal Energy Systems Using Improved Water Cycle Algorithm
- Cost Estimation and Comparison of Carbon Capture and Storage Technology with Wind Energy
- Potato waste Processing may be the Road to enhanced Food waste Conversion
- Ultrathin Device Harvests Electricity from Human Motion
- Living Computers: RNA Circuits Transform Cells into Nanodevices
- Brain Cells found to Control Aging
- Electric Aquaculture Vessel saves costs and Emissions
- Artificial Womb Raises hope for Premature Babies

Forthcoming Tech Events

- International Conference on Science, Technology, Engineering & Management
- International Multi-Disciplinary Research Conference
- International Conference on Agricultural and Food Science
- National Exhibition on IT Computer Tools for Science and Education
- International Conference on Management, Engineering, Science & Technology
- IP EXPO
- International Energy Conference
- International Conference on New Energy and Applications

PASTIC National Centre
Quaid-i-Azam University Campus
P.O. Box 1217, Islamabad

Phone: 051-9248103-4, 9248128
Fax: 051-9248113
Email: shah_aftab@yahoo.com
Web: www.pastic.gov.pk

Indigenous Technology

Short Term Economic Emission Power Scheduling of Hydrothermal Energy Systems Using Improved Water Cycle Algorithm

As environmental concerns are increasing, day by day the demand of clean and green energy and concern of atmospheric pollution is also increasing. Hence, the power utilities are forced to limit their emissions within the prescribed limits. Therefore, the minimization of fuel cost as well as exhausts gas emissions is becoming an important and challenging task in the short-term scheduling of hydro-thermal energy systems. This paper proposes a novel algorithm known as WCA-ER (Water Cycle Algorithm with Evaporation Rate) to inspect the short term EEPSHES (Economic Emission Power Scheduling of Hydrothermal Energy Systems). WCA has its ancestries from the natural hydrologic cycle i.e. the raining process forms streams and these streams start flowing towards the rivers which finally flow towards the sea.

The worth of WCA-ER has been tested on the standard economic emission power scheduling of hydrothermal energy test system consisting of four hydropower and three thermal plants. The problem has been investigated for the three case studies (i) ECS (Economic Cost Scheduling), (ii) ES (Economic Emission Scheduling) and (iii) ECES (Economic Cost & Emission Scheduling). The results obtained show that WCA-ER is superior to many other methods in the literature in bringing lower fuel cost and emissions.

Source:

Shaikh Saaqib Haroon & Tahir Nadeem Malik. Short Term Economic Emission Power Scheduling of Hydrothermal Energy Systems using Improved Water Cycle Algorithm. Mehran University Research Journal of Engineering & Technology 2017 36 (2): 255-272.

Indigenous Technology

Cost Estimation and Comparison of Carbon Capture and Storage Technology with Wind Energy

The CCS (Carbon Capture and Storage) is one of the significant solutions to reduce CO_2 emissions from fossil fuelled electricity generation plants and minimize the effect of global warming. Economic analysis of CCS technology is, therefore, essential for the feasibility appraisal towards CO_2 reduction. In this paper LCOE (Levelized Cost of Electricity Generation) has been estimated with and without CCS technology for fossil fuel based power plants of Pakistan and also further compared with computed LCOE of WE (Wind Energy) based power plants of the Pakistan. The results of this study suggest that the electricity generation costs of the fossil fuel power plants increase more than 44% with CCS technology as compared to without CCS technology.

The generation costs are also found to be 10% further on higher side when considering efficiency penalty owing to installation of CCS technology. In addition, the CO_2 avoided costs from natural gas plant are found to be 40 and 10% higher than the local coal and imported coal plants respectively. As such, the electricity generation cost of 5.09 Rs/kWh from WE plants is found to be competitive even when fossil fuel based plants are without CCS technology, with lowest cost of 5.9 Rs./kWh of CCNG (Combined Cycle Natural Gas) plant. Based on analysis of results of this study and anticipated future development of efficient and cheap WE technologies, it is concluded that WE based electricity generation would be most appropriate option for CO_2 reduction for Pakistan.

Source:

Abdullah Mengal, Khanji Harijan, Mohammad Aslam Uqaili, Nayyar Hussain Mirjat, Syed Mushtaq Ahmed Shah. Cost Estimation and Comparison of Carbon Capture and Storage Technology with Wind Energy. Mehran University Research Journal of Engineering & Technology, 2017 36 (2): 373-384.

Potato waste Processing may be the Road to enhanced Food waste Conversion

With more than two dozen companies in Pennsylvania manufacturing potato chips, it is no wonder that researchers have developed a novel approach to more efficiently convert potato waste into ethanol. This process may lead to reduced production costs for biofuel in the future and add extra value for chip makers.

Using potato mash made from the peelings and potato residuals from a Pennsylvania food-processor, researchers triggered simultaneous saccharification -- the process of breaking down the complex carbohydrate starch into simple sugars -- and fermentation -- the process in which sugars are converted to ethanol by yeasts or other microorganisms in bioreactors.

The simultaneous nature of the process was innovative, according to researcher Ali Demirci, professor of agricultural and biological engineering. The addition to the bioreactor of mold and yeast -- Aspergillus niger and Saccharomyces cerevisiae, respectively -- catalyzed the conversion of potato waste to bioethanol.

The bioreactor had plastic composite supports to encourage and enhance biofilm formation and to increase the microbial population.Biofilms are a natural way of immobilizing microbial cells on a solid support material. In a biofilm environment, microbial cells are abundant and more resistant to environmental stress causing higher productivities. In this application, these benefits were especially important because mold enzyme activity required higher temperature and the yeast had to tolerate this.

Researchers evaluated the effects of temperature, pH and aeration rates in biofilm reactors, and the optimal conditions were found to be 95 degrees Fahrenheit and a pH of 5.8 with no aeration. After 72 hours, the researchers achieved the maximum ethanol concentration of 37.93 grams per liter. The yield was 0.41 grams or ethanol per gram of starch.

"These results are promising, because the co-culture biofilm reactor provided similar ethanol production -- 37.93 grams per leader -- compared to the conventional ethanol production -- 37.05 grams per liter -- which required pre-treatment with added commercial enzymes at a higher temperature," Demirci explained. "Therefore, eliminating the externally added enzyme and energy costs will certainly reduce the cost of bioethanol production."

Source: **https://www.sciencedaily.com/releases/2017/08/170817135956.htm**

Ultrathin Device Harvests Electricity from Human Motion

A new electrochemical energy harvesting device can generate electrical current from the full range of human motions and is thin enough to embed in clothing. Based on battery technology and made from layers of black phosphorus that are only a few atoms thick, the new device generates small amounts of electricity when it is bent or pressed even at the extremely low frequencies characteristic of human motion.

"In the future, I expect that we will all become charging depots for our personal devices by pulling energy directly from our motions and the environment," said Assistant Professor of Mechanical Engineering Cary Pint, who directed the research. The new energy harvesting system is described in a paper titled "Ultralow Frequency Electrochemical Mechanical Strain Energy Harvester using 2D Black Phosphorus Nanosheets" published Jun.21 online by the journal ACS Energy Letters. "This is timely and exciting research given the growth of wearable devices such as exoskeletons and smart clothing, which could potentially benefit from Dr. Pint's advances in materials and energy harvesting," observed Karl Zelik, Assistant Professor of mechanical and biomedical engineering at Vanderbilt, an expert on the biomechanics of locomotion who did not participate in the device's development. Doctoral students Nitin Muralidharan and Mengya Li co-led the effort to make and test the devices. "When you look at Usain Bolt, you see the fastest man on Earth. When I look at him, I see a machine working at 5 Hertz," said Muralidharan. "Our harvester is calculated to operate at over 25 percent efficiency in an ideal device configuration, and most importantly harvest energy through the whole duration of even slow human motions, such as sitting or standing," Pint said.

"One of the peer reviewers for our paper raised the question of safety," Pint said. "That isn't a problem here. Batteries usually catch on fire when the positive and negative electrodes are shorted, which ignites the electrolyte. Because our harvester has two identical electrodes, shorting it will do nothing more than inhibit the device from harvesting energy. It is true that our prototype will catch on fire if you put it under a blowtorch but we can eliminate even this concern by using a solid-state electrolyte." One of the more futuristic applications of this technology might be electrified clothing. It could power clothes impregnated with liquid crystal displays that allow wearers to change colors and patterns with a swipe on their smartphone. "We are already measuring performance within the ballpark for the power requirement for a medium-sized low-power LCD display when scaling the performance to thickness and areas of the clothes we wear." Pint said.

Pint also believes there are potential applications for their device beyond power systems. "When incorporated into clothing, our device can translate human motion into an electrical signal with high sensitivity that could provide a historical record of our movements. Or clothes that track our motions in three dimensions could be integrated with virtual reality technology. There are many directions that this could go.

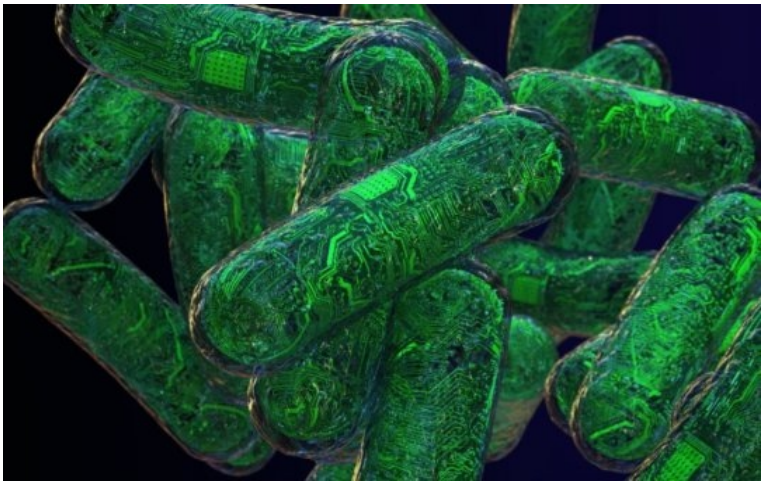
Source: **https://news.vanderbilt.edu/2017/07/21/device-harvests-electricity-human-motion**

Living Computers: RNA Circuits Transform Cells into Nanodevices

Scientists have demonstrated how living cells can be induced to carry out computations in the manner of tiny robots or computers. The interdisciplinary nexus of biology and engineering, known as synthetic biology, is growing at a rapid pace, opening new vistas that could scarcely be imagined a short time ago.

In new research, Alex Green, a Professor at ASU's Biodesign Institute, demonstrates how living cells can be induced to carry out computations in the manner of tiny robots or computers. The results of the new study have significant implications for intelligent drug design and smart drug delivery, green energy production, low-cost diagnostic technologies and even the development of futuristic nanomachines capable of hunting down cancer cells or switching off aberrant genes. "We're using very predictable and programmable RNA-RNA interactions to define what these circuits can do," says Green. "That means we can use computer software to design RNA sequences that behave the way we want them to in a cell. It makes the design process a lot faster." The study appears in the advance online edition of the journal *Nature*.

The approach described uses circuits composed of ribonucleic acid or RNA. These circuit designs, which resemble conventional electronic circuits, self-assemble in bacterial cells, allowing them to sense incoming messages and respond to them by producing a particular computational output, (in this case, a protein). In the new study, specialized circuits known as logic gates were designed in the lab, and then incorporated into living cells. The tiny circuit switches are tripped when messages (in the form of RNA fragments) attach themselves to their complementary RNA sequences in the cellular circuit, activating the logic gate and producing a desired output. The RNA switches can be combined in various ways to produce more complex logic gates capable of evaluating and responding to multiple inputs, just as a simple computer may take several variables and perform sequential operations like addition and subtraction in order to reach a final result. The new study dramatically improves the ease with which cellular computing may be carried out.



Source: **https://www.sciencedaily.com/releases/2017/07/170726131758.htm**

Brain Cells found to Control Aging

Scientists at Albert Einstein College of Medicine have found that stem cells in the brain's hypothalamus govern how fast aging occurs in the body. The finding, made in mice, could lead to new strategies for warding off age-related diseases and extending lifespan. The paper was published online in Nature.

The hypothalamus was known to regulate important processes including growth, development, reproduction and metabolism. In a 2013 Nature paper, Einstein researchers made the surprising finding that the hypothalamus also regulates aging throughout the body. Now, the scientists have pinpointed the cells in the hypothalamus that control aging: a tiny population of adult neural stem cells, which were known to be responsible for forming new brain neurons.

"Our research shows that the number of hypothalamic neural stem cells naturally declines over the life of the animal, and this decline accelerates aging," says senior author Dongsheng Cai, M.D., Ph.D., (Professor of molecular pharmacology at Einstein. "But we also found that the effects of this loss are not irreversible. By replenishing these stem cells or the molecules they produce, it's possible to slow and even reverse various aspects of aging throughout the body."

Source: **https://www.sciencedaily.com/rees/2017/07/170726132107.htm**

Electric Aquaculture Vessel saves costs and Emissions

A forward-thinking Norwegian aquaculture company has opted for battery technology for its vessels to save costs and preserve the environment**.**Salmar has contracted the energy equipment company Plan B Energy Storage (PBES) to equip its electric fish farm vessel Elfrida with battery technology. “We see this as crucial preparation for a low-carbon future,” said Roger Bekken, managing director of Salmar. “In keeping with our forward-thinking management and focus on operational efficiency, adding battery technology to our vessels brings cost savings and environmental stewardship together in one package.”

“The battery system onboard Elfrida was one of the first PBES installed in a working vessel and proves the technology and has proved to be well suited to fish farming,” said Grant Brown, vice president of marketing, PBES. “We envision the entire fleet of Norwegian aquaculture and fishing vessels to either run as hybrid or on full battery propulsion,” he added.

The vessel has been in operation since February 2017 and provides up to 12 knots speed and a full eight-hour shift per charge. Not only does the system eliminate emissions, the fact there is no noise, vibration or diesel fumes provides

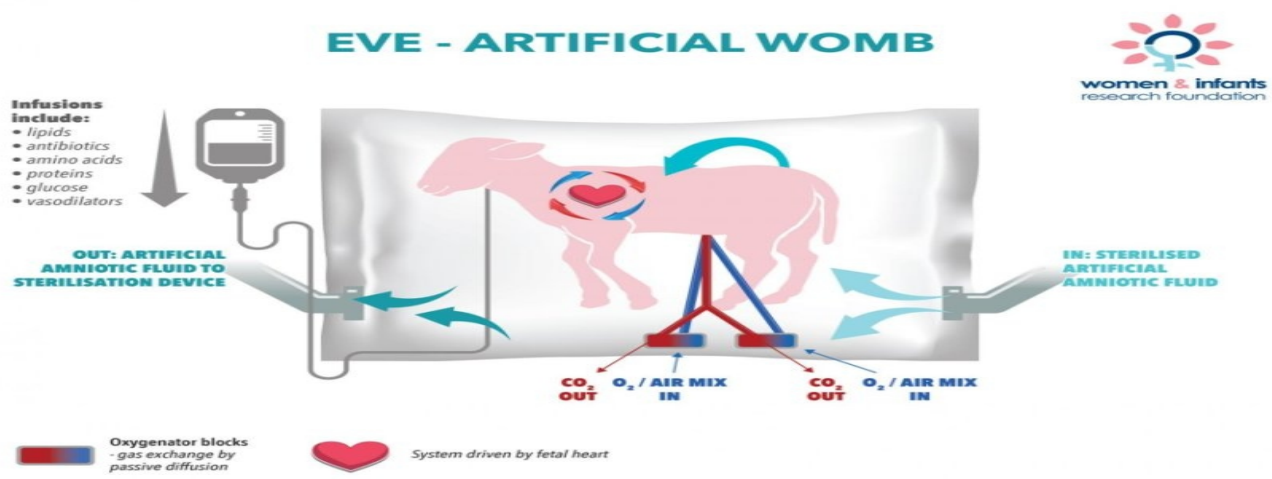
greater crew comfort, less fatigue and leads to safer working conditions onboard. The award of the contract for energy storage aboard the electric fish farm vessel Elfrida is one of the latest in an ongoing trend toward adoption of green technology in Norway.

Source: **www.worldfishing.net/news101/fish-farming**

Artificial Womb Raises hope for Premature Babies

Researchers hope an artificial womb used to incubate healthy baby lambs can be used in future technology for premature babies.

The long-standing collaborative Western Australian-based program, involving researchers from the Women



and Infants Research Foundation, the University of Western Australia, and Tohoku University Hospital, Japan, has sought to develop an effective treatment strategy for extremely preterm infants born at the border of viability (22-23 weeks).

Findings published this week in the medical journal, *The American Journal of Obstetrics & Gynecology*, have shown that preterm lambs were successfully maintained in a healthy, infection-free condition with significant growth, for a period of one week using ex-vivo uterine environment (EVE) therapy.

Chief Investigator in Australia, Associate Professor Matt Kemp, said that with further development, EVE therapy could prevent the severe morbidity suffered by extremely premature infants by potentially offering a medical technology that does not currently exist.

"This project is a wonderful example of international collaboration; it brings together leading academic researchers from Japan and Western Australia, and is undertaken in close partnership with one of Japan's foremost biomedical technology companies, Nipro Corporation" he said.

Source: **https://www.sciencedaily.com/releases/2017/08/170817141714.htm**

Forthcoming Tech Events

National

International Conference on Science, Technology, Engineering & Management
29-30 September, 2017
Rawalpindi,
www. Conference2017/Pakistan/2/ICSTEM/

International Multi-Disciplinary Research Conference
7th October, 2017
Mandi Bahauddin
www.imdrc.com.pk

International Conference on Agricultural and Food Science
25-27 October, 2017
Lahore, Pakistan
www.icbb.vu.edu.pk

National Exhibition on IT & Computer Tools for Science and Education
17-19 November, 2017
Pak China Center, Islamabad
www.pastic.gov.pk

International Events

International Conference on Management, Engineering, Science & Technology
1-2 October, 2017
United Arab Emirates
www.icmest.net

IP EXPO
4-5 October, 2017
Ex-Cel London
www.ipexpoeurope.com

International Energy Conference
8-10, November 2017
Ankara, Turkey
www.energy-congress.com

International Conference on New Energy and Applications
2-4 November, 2017
Tokyo Japan
www.10times.com/renewable-energy/conferences

Tech & Trade Offers

POWER PAKISTAN Pvt Ltd.
LTS SERIES

Design, Manufacture, Install & Service:
Industrial& Commercial Refrigeration Products

We Manufecture:

Pref-Fabricated Refrigrated Buildings & Walk-In Rooms
Refrigrated Transport Containers & Trailer Bodies
Condensing Unit & Unit Coolers

We Provide

- **Complete Meat Slaughtering**
- **& Processing Line**
- **Cattle**
- **Goat & Sheep**
- **Chiken**
- **Quail**
- **Turkey**

Company Contact:-
KOLDKRAFT TONGDA PVT LTD.
Head Office
247-S Industrial Estate Kot Lakhpat
Lahore-54770
Telephone: +92 (42) 35116727-8
Fax: +92 (21) 35122528
Email:kkraft@brain.net.pk
www.koldkraft.com

About PASTIC

PASTIC serves as a gateway for Scientific & Technological Information for R&D by catering to the information needs of researchers, entrepreneurs, industrialists, educationists, policy makers and planners through anticipatory and responsive information services.

Technology Information Section works exclusively for support and promotion of technological information on trade and industry in the country. "Technology Roundup" is a news bulletin that provides latest and innovative technology news, forthcoming events, etc. It also promotes products, technologies and services globally in sectors such as Agro-Industry, Bio-Technology, Building Material, Business, Chemicals, Electronics, Energy, Fisheries, Food Processing, Machinery, Packaging, Mining Pharmaceuticals and Textiles.