



ENVIRONMENTAL ENGINEERING
DIVISION NEWSLETTER
AUGUST - 2017

EED NEWSLETTER

ENVIRONMENTAL ENGINEERING features the Application of ENVIRONMENTAL Technologies to ENGINEERING Systems to attain OPTIMAL Performance according to ESTABLISHED Standards.

The Newsletter of the Environmental Engineering Division (EED) will attempt to highlight a Variety of Environmental Technology Applications aimed at Enhancing Engineering Systems Performances in accordance with the Latest Standards by presenting Excerpts of and Links to Selected Articles from a Variety of Websites. EED Members are encouraged to forward materials on Environmental Engineering topics for review by the Newsletter Editorial Staff. EED Newsletter Readers are urged to forward comments on materials that appear in its content.

The EED Newsletter will feature presentations in **NINE** Sections:

1. ENVIRONMENTAL TECHNOLOGIES
2. ENVIRONMENTAL REGULATIONS
3. EDITORIAL BOARD SELECTIONS
4. CHAIRMAN/DIVISION NEWS
5. NEWSLETTER READER COMMENTS
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7. NEWSLETTER REFERENCES - TECH
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9. EDITORIAL BOARD SELECTION REFERENCES

It is envisioned that the EED Newsletter will be Monthly enterprise involving ALL members of the EED in its production. Your participation in providing and reviewing EED Newsletter materials is encouraged and will be greatly appreciated by the EED Newsletter Editors.

1. ENVIRONMENTAL TECHNOLOGIES

GRAPHENE ELECTRODE SPLITS WATER INTO HYDROGEN AND OXYGEN

Rice University chemists have produced a catalyst based on laser-induced graphene that splits water into hydrogen on one side and oxygen on the other side. They said the inexpensive material may be a practical component in generating the hydrogen for use in future fuel cells. The easily fabricated material developed by the Rice lab of chemist James Tour offers a robust and efficient way to store chemical energy. Tests showed the thin catalyst producing large bubbles of oxygen and hydrogen on either side simultaneously. (Ref 1)

1. ENVIRONMENTAL TECHNOLOGIES

CARBON CONVERSION

Chemists have figured out a new, more efficient way to create carbon-based fuels from carbon dioxide (CO₂). In chemical reactions performed in the lab, a Caltech team has identified a new additive that helps selectively convert CO₂ into fuels containing multiple carbon atoms -- a step toward ultimately making renewable liquid fuels that are not derived from coal or oil. (Ref 2)

VERTICAL AXIS WIND TURBINES CAN OFFER CHEAPER ELECTRICITY

Small vertical axis wind turbines (VAWTs) possess the ability to effectively operate in the presence of high turbulent flow, which makes them ideal energy harvesting devices in urban and suburban environments. In a new article, researchers present results indicating that an optimally designed VAWT system can financially compete with fossil-fuel based power plants in urban and suburban areas, and even spearhead the development of a net-zero energy building or city. (Ref 3)

MAZDA TO OFFER WORLD-FIRST COMPRESSION INJECTION GASOLINE ENGINE

In 2019, Mazda will release the first commercial compression-ignition gasoline engine. The new SkyActiv-X line of Mazda car engines will deliver spark-free ignition of the air and fuel mix through compression. The process allows the engine to operate at lower temperatures, which reduces a lot of the heat energy normally lost in gasoline engines. This, in turn, allows Mazda to run with a much leaner air-fuel mix for better fuel consumption and lower emissions. According to the company, the technology is an evolution of the ultra-high compression ratio being used in its current range of engines. (Ref 4)

1. ENVIRONMENTAL TECHNOLOGIES

TURNING HOMES INTO POWER STATIONS COULD CUT HOUSEHOLD FUEL BILLS

Energy bills could be cut by more than 60% if homes were designed to generate, store and release their own solar energy, The concept has already been proven and is operating successfully on a building in Swansea which is the UK's first energy-positive classroom.

It combines an integrated solar roof and battery storage with solar heat collection on south-facing walls. Over 6 months of operation the Active Classroom has generated more energy than it has consumed.

The new development by Pobl Group, the largest housing association in Wales, features solar roofs, shared battery storage and the potential for charging points for electric vehicles. Water heating comes from a solar heat collector on south facing walls. Waste heat is captured and recycled within the building. The combined technologies could see household energy bills reduced by 60%. (Ref 5)

US ARMY CREATES POWDER THAT RECHARGES EQUIPMENT IN THE FIELD

The US Army Research Laboratory has created an aluminum-based powder that produces a surprisingly high amount of energy when placed in water. The unexpected discovery came when researchers mixed a nano-galvanic aluminum-based powder with water, and noticed that the water began bubbling away. On closer inspection, they soon realized the reaction was the product of hydrolysis, meaning the material was splitting the water into its composite molecules of oxygen and hydrogen.

The Army calculated that one kilogram of aluminum powder can produce 220 kilowatts of power in just three minutes. That's a lot of power to run any electrical equipment. These rates are the fastest known without using catalysts such as an acid, base or elevated temperatures. (Ref 6)



1. ENVIRONMENTAL TECHNOLOGIES

POLYMER MADE FROM COOKING OIL SOAKS UP MERCURY POLLUTION

Industrial activity like coal burning and mining has greatly increased the amount of mercury in our environment. Scientists at Flinders University in Adelaide have now developed a low-cost polymer that can soak up mercury in its most harmful forms, raising the prospect of a cheap and sustainable way to clean up mercury pollution.

The new polymer developed at Flinders can be crafted using second-hand cooking oil and sulphur, a common by-product of petroleum production. It can apparently be used to trap the most harmful kinds of mercury pollution, both mercury metals and vapor, along with highly toxic organo-mercury compounds. (Ref 7)

RECHARGEABLE ZINC-AIR BATTERIES ZERO IN ON LITHIUM

Zinc-air batteries are an enticing prospect thanks to their high energy density and the fact they're made with some of the most common materials on Earth. Unfortunately, those advantages are countered by how difficult it is to recharge these cells. Now, a team at the University of Sydney has created new catalysts out of abundant elements that could see rechargeable zinc-air batteries vying with lithium-ion batteries in mobile devices. To create their new electro-catalysts, the researchers made metal oxides out of common elements like iron, cobalt and nickel.

Their production method ups the efficiency by very carefully controlling the composition, size and crystallinity of these metal oxides. To test their new batteries, the team charged and discharged them for 60 cycles of 120 hours, and found that the cells lost less than 10 percent of their efficacy.



That means they are not as effective yet as their lithium-air cousins, but they should be cheaper and easier to produce. (Ref 8)

1. ENVIRONMENTAL TECHNOLOGIES

PROBIOTICS HELP POPLAR TREES CLEAN UP CONTAMINATED GROUNDWATER

Researchers from the University of Washington and several small companies have conducted the first large-scale experiment on a Superfund site using poplar trees fortified with a probiotic -- or natural microbe -- to clean up groundwater contaminated with trichloroethylene (TCE), a common pollutant found in industrial areas that is harmful to humans when ingested through water or inhaled from the air. The successful field trial could be a game changer to quickly and effectively clean up Superfund sites around the country and polluted sites abroad that have high levels of TCE.

Contaminated sites containing TCE and other pollutants can be expensive to clean up when using engineering methods such as excavating or pumping toxins from underground. As a result, many sites sit untreated. This new method allows contaminated sites to be dealt with more effectively, often at lower costs, promoting human health. (Ref 9)

RENEWBLE CAR TIRES

A team of researchers, led by the University of Minnesota, has invented a new technology to produce automobile tires from trees and grasses in a process that could shift the tire production industry toward using renewable resources. The car tires produced from biomass that includes trees and grasses are identical to existing car tires with the same chemical makeup, color, shape, and performance. The invention of renewable tire technology is part of a larger mission of the



Center for Sustainable Polymers, an NSF-funded Center for Chemical Innovation led by the University of Minnesota. Initiated in 2009, the CSP has focused on transforming how plastics are made and unmade through innovative research. Researchers aim to design, prepare and implement polymers derived from renewable resources for a wide range of advanced applications. (Ref 10)

1. ENVIRONMENTAL TECHNOLOGIES

DUTCH STUDENTS GROW THEIR OWN BIODEGRADABLE CAR

What is made of sugar - can carry four people and travel at 50 miles per hour? A biodegradable car created by students on the TU/Ecomotive team at the Eindhoven University of Technology in the Netherlands. The vehicle is made of a resin derived from sugar beets and covered with sheets of Dutch-grown flax. Only the wheels and suspension systems are not yet composed of bio-based materials. The structure of the car has a similar strength-weight ratio as that of fiberglass and weighs only 310 kg. The students plan to test the car later this year - once given the green light by the Netherlands Vehicle Authority. (Ref 11)

NEW METHOD TO REDUCE WATER USAGE IN POWER PLANTS

Infinite Cooling, an energy startup founded at MIT, pitched its business plan to a panel of energy experts and won first place at the second annual Cleantech University Prize (UP) national competition in Austin, Texas, hosted by the U.S. Department of Energy (DOE). Infinite Cooling's patent-pending technology uses electrical fields to recapture up to 80 percent of the water vapor plumes that would normally escape from cooling towers of power plants through evaporation. The resulting water from the collected steam is then recycled back into the cooling system.

A 250-megawatt power plant uses approximately 3,000 gallons of water every minute. With over 7,000 power plants just in the United States, Infinite Cooling



technology could have a significant environmental and economic impact worldwide, particularly in the U.S., China, India, and Europe. (Ref 12)

2. ENVIRONMENTAL REGULATIONS

MANURE-TO-ENERGY PROJECTS IN CALIFORNIA'S DAIRY INDUSTRY

In early August 2017, several dozen farmers, government officials, dairy industry representatives and clean energy professionals met in rural Madera County, 160 miles southeast of San Francisco. They congregated near where 5,600 dairy cows contribute to the region's growing dairy industry – as well as the state's greenhouse gas emissions. The ceremony at this dairy marked the launch of an anaerobic digester - a technology that more industry leaders and policymakers say can help the dairy sector reduce its emissions.

[Maas Energy Works](#) - the lead contractor for this anaerobic digester - claims that the cows roaming on this dairy property expel enough manure to power a 600 kW generator that produces 250,000 kWh of electricity a month. That is enough power to electrify this dairy farm's operations and is equal to the power needs of 300 homes. The company says it will reduce this dairy farm's emissions by 240,000 metric tons of carbon, which is equivalent to eliminating 5,000 cars from the road each year. (Ref. 1)

PROJECT TURNS STATE ROADWAYS INTO A RENEWABLE ENERGY SOURCE

The Illinois Department of Transportation has approved implementation of a renewable energy demonstration project using grasses collected from mowing highway rights-of-way (ROW). The work will implement the findings of a three-year study by a multi-disciplinary team including the Illinois Sustainable Technology Center at the Prairie Research Institute of the University of Illinois. The team concluded that nearly \$2 million in energy could be recouped by harvesting the biofuel for energy. They also calculated that this would not only offset the cost of mowing, but also generate net revenue. The biomass will be



used to provide heat at IDOT transportation garages and also the U of I Energy Farm's new biomass boiler, which is part of the low-carbon energy strategy developed in the university's Illinois Climate Action Plan (iCAP). (Ref 2)

3. EDITORIAL BOARD SELECTIONS

COMBINED SOLAR AND METHANE ENERGY PLANT

In what's believed to be an Australian first, a combined solar and methane power plant will channel thermal energy from solar panels and methane gas from decomposed garbage through a shared turbine inter-connector. A generator will then convert the two sources of energy into electricity to be fed into the South Australian grid. It is anticipated that the plant, managed by the Northern Adelaide Waste Management Authority (NAWMA), will start exporting electricity in September 2017..

NAWMA manages waste in three council districts in northern Adelaide, the capital of South Australia. Gas produced from rotting garbage will act as the plant's base-load power, and will produce about 11,000 megawatt hours of electricity each year to power about 1800 homes. The site's 5000 square meter sized solar panel farm is expected to produce about 2000 megawatt hours of electricity each year, powering around 300 homes. The project is a joint effort between NAWMA and South Australian energy companies LMS Energy Joule Energy who will negotiate commercial contracts with the state's public power network to feed electricity into the grid.

This isn't the first time South Australia has made in-roads in environmentally sustainable waste management solutions. The first systems to use anaerobic digestion technology to turn waste plastics into energy are currently being developed in the state, and are expected to operate commercially in about 12 months. South Australia has a goal of 50 per cent renewables by 2025 and plans to make Adelaide the world's first carbon neutral city by 2025. The state has become a hub for renewable energy recently, following Elon Musk's



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announcement last month that TESLA will build the world's biggest lithium ion battery in South Australia before the end of the year. (Ref 1)

(CONTRIBUTED BY DR. JAMES ZUCCHETTO, EED NEWSLETTER ASSOCIATE EDITOR)

4. CHAIRMAN/DIVISION NEWS

ASME ENVIRONMENTAL ENGINEERING DIVISION LOGO

The Environmental Engineering Division (EED) has a Newsletter and is looking to establish social media accounts. We have noted that some of the other ASME Divisions have similar accounts and have Logos that represent them.

EED is looking for Logo ideas that we can use in the Newsletter and on social media accounts. We would for you to send us your ideas. We are limiting the search to EED members only at this time.

If you have a suggestion or an idea for a Logo please send it to me at the following address: Arnie Feldman. Chair, EED, jjdsenv@att.net

5. EED NEWSLETTER READER COMMENTS

YOU ARE ENCOURAGED TO FORWARD YOUR COMMENTS ON THE TOPICS AND DISCUSSIONS PRESENTED IN THE EED NEWSLETTER. PLEASE FORWARD YOUR COMMENTS BY EMAIL TO ANY MEMBER OF THE EED NEWSLETTER EDITORIAL BOARD. THEIR EMAIL ADDRESSES APPEAR IN THE SECTION BELOW

6. EED NEWSLETTER EDITORIAL BOARD

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7. NEWSLETTER REFERENCES - TECHNOLOGIES

1. <https://www.sciencedaily.com/releases/2017/08/170803174329.htm>
2. <https://www.sciencedaily.com/releases/2017/08/170804082232.htm>
3. <https://www.sciencedaily.com/releases/2017/08/170803103140.htm>
4. http://newatlas.com/mazda-skyactiv-x-compression-ignition/50803/?utm_source=Gizmag+Subscribers&utm_campaign=7ca88a5015-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-7ca88a5015-91116065
5. <https://www.sciencedaily.com/releases/2017/08/170809073344.htm>
6. http://newatlas.com/army-powder-battery/50862/?utm_source=Gizmag+Subscribers&utm_campaign=5573fe22a6-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-5573fe22a6-91116065
7. http://newatlas.com/polymer-cooking-oil-mercury-pollution/50807/?utm_source=Gizmag+Subscribers&utm_campaign=31d8d24f42-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-31d8d24f42-91116065
8. http://newatlas.com/rechargeable-zinc-air-batteries-catalyst/50899/?utm_source=Gizmag+Subscribers&utm_campaign=5eb2975ac7-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-5eb2975ac7-91116065
9. <https://www.sciencedaily.com/releases/2017/08/170814161955.htm>



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10. <http://viewer.zmags.com/publication/01480022#/01480022/54>
11. <http://www.reuters.com/article/us-tech-netherlands-biocomposite-car-idUSKBN1AO1BL>
12. <https://www.azocleantech.com/news.aspx?newsID=24219>

8. NEWSLETTER REFERENCES - REGULATIONS

1. http://www.triplepundit.com/2017/08/competition-fierce-manure-energy-projects-californias-dairy-industry/?utm_source=Daily+Email+List&utm_campaign=daeb6e364f-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_9dedefcee3-daeb6e364f-220508121
2. <http://www.biomassmagazine.com/articles/14603/project-turns-state-roadways-into-a-renewable-energy-source>

9. EDITORIAL BOARD SELECTIONS REFERENCES

1. <http://theleadsouthaustralia.com.au/mining-resources/combined-solar-and-methane-energy-plant-set-to-open/>

NOTE: IN ORDER TO VIEW THE REFERENCES LISTED ABOVE, IT IS NECESSARY TO SWIPE OVER THE REFERENCE TEXT ON YOUR SCREEN – THEN COPY THE REFERENCE TEXT – AND THEN ENTER THE TEXT COPY INTO A WEB ADDRESS AREA ON A SECOND WINDOW SCREEN TO VIEW THE REFERENCE MATERIAL.

DISCLAIMER

Disclaimer: This Newsletter may contain articles that offer differing points or



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views regarding energy and environmental engineering issues. Any opinions expressed in this publication are the responsibility of the Editor, Editorial Board and the Environmental Engineering Division and do not represent the positions of the American Society of Mechanical Engineers (ASME).