# 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**
**6. NEWSLETTER EDITORIAL BOARD**
**7. NEWSLETTER REFERENCES - TECH**
**8. NEWSLETTER REFERENCES – REGS**
**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

## 1. IMPROVING GREAT LAKES WATER QUALITY

The NASA Glenn Research Center in collaboration with Kent State (KS) University won a NASA water quality grant in June 2017 that offers an opportunity to implement KS research operations toward identifying harmful algal blooms in Lake Erie. The KS operations are based upon the fact that color-producing agents

in the water have different absorption and scattering effects on light. The KS light beam decomposition method separates out the noise from atmospheric errors to produce a cleaner spectral signal. Researchers can then compare the spectral data to the pigments in the KS library of water and sediment samples to determine the various algal materials present in the test water containers. (Ref 1)

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### 2. WATERSHED RAINFALL UNDER CLIMATE CHANGE SIMULATIONS

Convective precipitation - which can lead to huge floods - is generated by heat from the Earth's surface. Moisture quickly rises into the atmosphere and then condenses very rapidly to form sudden rainstorms that are poorly understood with current climate models. Hydrologists from UC Santa Barbara have developed a rainstorm model - STORM - that simulates watershed rainfall under different climate change scenarios. Using the STORM model allowed the researchers to gain insights into decadal trends in monsoonal rainfall intensity under climate change. They found that there has been an increase in rainfall occurrences on the US west coast - but less water delivered in heavy storms. The finding opposes previous notions of how rainfall should respond to atmospheric warming. The researchers attributed the phenomenon to less moisture being imported into the region from Pacific Ocean regions during monsoons. STORM is globally applicable and will enable scientists to examine the details of where rainfall has occurred over multiple decades and how much water fell on a per-minute basis in the storm region under evaluation. (Ref 2)

### 3. US ARMY DISCOVERS NEW ENERGY SOURCE

At the US Army Research Laboratory in Aberdeen, MD, a team of researchers observed a bubbling reaction when water was added to a nano-galvanic aluminum-based powder. Further investigation found that water split into $H_2$ and $O_2$ molecules when coming into contact with the nanomaterial. Scientists had known for a long time that adding a catalyst to aluminum could produce

hydrogen. However, previous catalytic methods required long process times, elevated temperatures, significant electric power and/or toxic chemicals such as sodium hydroxide or acids. The new Army process generated 220 KW of energy in just 3 minutes with just 1 KG of aluminum powder catalyst. Since the nanomaterial powder has the potential to be 3-D printed, Army researchers envision future robots powered by their very own structures. (Ref 3)

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### 4. TURNING TRASH INTO ENERGY

A Danish energy company is working on a new technology that separates household trash from recyclable products while rapidly breaking down organic materials like food wastes to create a biogas that will power the process. The Dong Energy plant 19 miles outside of Manchester, England is one of the first facilities to combine the use of enzymes on a waste stream with the traditional recycling sorting process. The $95M plant will be finished at the end of 2017.The Dong “Renescience Process” technology begins with a cleansing of a waste stream with proprietary enzymes for 12 hours in holding tanks. The resulting organic matter “slurry” flows to an anaerobic digestion plant where it is used to create electricity to supplement the solar and wind generated power for the plant. Leftover solid materials - now clean and reusable - are sorted into ferrous metals – which can be sold as scrap - and plastics – which can be recycled. NOTHING goes to landfill. Dong has plans to develop Renescience plants for a worldwide market. Britain was chosen for the first plant site because the filling of landfills in the country with mountains of trash is becoming cost prohibitive. (Ref 4)

### 5. MIT BATTERY BREATHES AIR TO CUT COSTS OF ENERGY STORAGE

An MIT team has developed a new type of battery that breathes air and can store energy long-term for 1/5 the cost of existing technologies. The new design is a rechargeable flow battery. The cathode and anode components are liquids (catholyte and anolyte) that pass ions back and forth to store or release energy. The anolyte is made of sulfur dissolved in water. The catholyte is an oxygenated

liquid salt solution. The catholyte "breathes" air in from the outside while discharging and “exhales” while recharging. By this mechanism, the battery creates negatively charged hydroxide ions in the catholyte while inhaling. When recharging, that oxygen is released - creating hydrogen ions - which then send electrons back into the anolyte. The researchers say that their battery would cost far less to produce and run than existing lithium-ion batteries - while retaining almost the same energy density. (Ref 5)

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### 6. FIRST “NEGATIVE EMISSIONS” PLANT BEGINS OPERATION - 1

Climeworks – a technology spin-off company originating from ETH University in Zurich, Switzerland – opened the world’s first COMMERCIAL Carbon Capture/Sequestration (CCS) facility in June 2017. The CCS plant consists of three stacked shipping containers - each holding six CO2 collector plates. Each CO2 collector plate is a porous plastic structure that features a maze of hexagonal-hole cutout patterns whose surfaces are coated by a proprietary amine that absorbs the CO2 from ambient air.

To begin the ambient air CO2 cleansing process in the CCS facility, electric fans draw ambient air through the porous collector plates within each container. The fans are operated using electricity produced at an adjacent geothermal power plant. Water pumped through an underground network of pipes in a nearby volcanically active region is turned into steam to run power turbines that produce 300 MW of electric power for the CCS facility.

In regular operation of the system, CLEAN AIR – FREE OF CO2 - is released from each collector plate surface back into the container atmosphere from the ambient air being pulled through the collector plate maze of hexagonal cutouts. The clean air is continually removed from each container until the collector plate surfaces are fully saturated with CO2. Upon saturation, ambient air inlets to the containers are closed and remaining ambient air in the containers is evacuated.

Once evacuation is complete, the container outlets are closed and the containers are then heated to a temperature of 100C. Upon reaching this temperature, PURE CO2 gas is released into the container spaces from the collector surfaces. The PURE CO2 is then removed from the containers and prepared for future use. The process time is 3-hours in duration and is repeatable at least 6 times daily.

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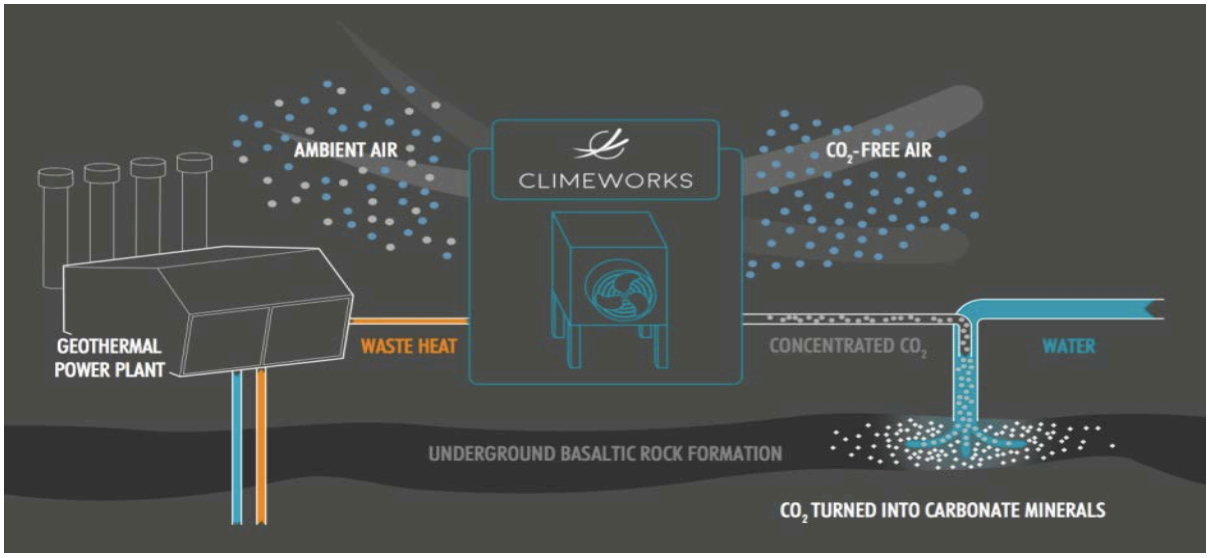
### 6. FIRST "NEGATIVE EMISSIONS" PLANT BEGINS OPERATION – 2

Future utilization of PURE CO2 can be realized in many endeavors. Presently, an operating greenhouse next to the CCS plant uses part of the captured CO2 to enhance vegetable production. A high concentration of CO2 gas has been shown to boost crop yield by 20%. Another significant utilization avenue for PURE CO2 is the multi-billion dollar beverage industry of carbonated drinks.

If all else fails, the Sequestration of CO2 may also yield a lucrative payback. In 2016, scientists found that carbonated water was reacting with basaltic rock formations in Iceland to produce calcite. The natural formation process - which takes thousands of years to complete – was now being completed in a 2-year timeframe. The study showed that storing CO2 underground is easier and safer than was previously envisioned. Moreover, basaltic rock is present in large deposits around the world with a capacity to absorb decades of fossil-fuel emissions. A schematic of the CCS Process is shown in the figure below. (Ref 6)




**CARBON CAPTURE/SEQUESTRATION SCHEMATIC**

## 1. ENVIRONMENTAL

### 7. FORD MARKS 10-YEAR ANNIVERSARY OF BIO-BASED FOAM

It has been 10 years since Ford Motor Company rolled out the 2008 Mustang with seats comprised of soy-based foam. Since then, the automaker says it has installed this bio-based form in at least 18.5 million cars. According to Ford, the use of soy-derived foam has prevented 288 million pounds of carbon from entering the atmosphere. The 578 billion soybeans churned into foam were equivalent to 4 million trees removing carbon from the earth's atmosphere over the course of a year. This decade, Ford has joined with Coca-Cola, Heinz, Nike and Procter & Gamble to boost the development of bio-based plastics. Upholstery made from recycled plastic bottles has appeared in Ford F-150 trucks. (Ref 7)

### 8. A NEW WAY TO HARNESS WASTED METHANE

Methane gas is often disposed of through burning but new research by scientists at MIT could make it easier to capture this gas for use as fuel. The researchers have developed a low-temperature electrochemical process that continuously

replenishes a catalyst material that can rapidly carry out the conversion. The electricity to power such systems could come from renewable sources close to the site. The key new advance was adding an electrical driving force that could be tuned precisely to generate more potent catalysts with very high reaction rates. From the reactions, a pair of liquid chemicals - methyl bisulfate and methane sulfonic acid – are produced which can be further processed to make liquid methanol - a valuable chemical intermediate to fuels, plastics, and pharmaceuticals. The additional processing steps needed to make methanol remain very challenging and must be perfected before this technology can be implemented on an industrial scale. The researchers are actively refining their method to tackle these technological hurdles. The Italian energy company Eni S.p.A. through the MIT Energy Initiative supports the work. (Ref 8)

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### 9. REDUCING POWER PLANT FRESHWATER CONSUMPTION

Power plants draw more freshwater than any other consumer in the United States - more than 50 percent of the nation's freshwater use of about 500 billion gallons daily. To help save this water, researchers at Sandia National Labs have developed a new silica filter for power plant cooling waters that decreases the amount of freshwater power plants consume by increasing the number of times cooling tower water can be reused and recycled. In a two-year project, the Sandia research team created special filters, pellets and powders made of hydrotalcite to study the material's ability to filter for silica. They found hydrotalcite could remove about 90 percent of accumulated silica in recycled water and be reused for five or more cycles. This ability to reuse the filter and recycle the cooling tower water could significantly save both money and natural resources. (Ref 9)

### 10. $6 MILLION BIOFUEL, CARBON CAPTURE PROJECT

The University of Wyoming (UW) is part of a four-year, $6M NSF project working with Montana State University (MSU) and the University of South Dakota (USD) to determine if changes in commodity production and capturing carbon are sustainable, or even feasible, in the Upper Missouri River basin. Each university is receiving $2 million. UW's role is developing the economic models. MSU will study agriculture and bio-fertilizers, food security, clean **e**nergy, and water supply and quality. USD will focus on land use, biodiversity and ecosystem services assessment. The goal is to decrease atmospheric carbon—perhaps even remove more than is created—through alternative agricultural and energy approaches, such as biofuels, and above- and below-ground carbon sequestration. The Upper Missouri River Basin refers to the Missouri River and all its tributaries upstream of Sioux City, Iowa. The area includes all or parts of Wyoming, Montana, South and North Dakota and Nebraska, and more than 20 Native American reservations**.** **(**http://waferx.montana.edu/index.html.) (Ref 10)

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### 11. TRANSPARENT SOLAR TECHNOLOGY

Researchers at Michigan State University (MSU) have pioneered the development of a transparent luminescent solar concentrator that when placed on a window creates solar energy without disrupting the view. The thin, plastic-like material can be used on buildings, car windows, cell phones or other devices with a clear surface. The solar-harvesting system uses organic molecules to absorb invisible wavelengths of sunlight. The researchers can "tune" these materials to pick up just the ultraviolet and the near-infrared wavelengths and then convert this energy into electricity. There is an estimated 5 billion to 7 billion square meters of glass surface in the United States. With that much glass to cover, transparent solar technologies have the potential of supplying some 40% of energy demand in the U.S. -- about the same potential as rooftop solar units. The complimentary deployment of both technologies could get us close to 100% generation of our demand if we also improve energy storage. (Ref 11)

### 12. CUT OFFSHORE WIND CONSTRUCTION COSTS BY $1.6B

Working closely with industry partners, University of Delaware researchers have developed a new method for constructing offshore wind farms and proven that it is cheaper, faster and could make possible offshore wind deployment at a scale and pace able to keep up with the region's scheduled retirements of nuclear and coal-fired power plants. The researchers calculated that their innovative process will cost up to $1.6 billion less per project and take half the construction time. The key insight that allowed such considerable optimizations in cost and deployment speed was that the entire structure - from seafloor mounting to the top of the turbine - can be assembled in one piece in port - moved as a unit - and in one step placed into the sea floor. It may seem like a simple idea, but it was by no means obvious that it would work with existing equipment until completing detailed engineering and cost analyses. This project was funded by the US Department of Energy as Project DE-EE0005484. (Ref 12)

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### 13. BREAKTHROUGH ON BRITTLE SMART PHONE SCREENS

Scientists at the University of Sussex may have developed a new way to make smart phone touch screens that are cheaper, less brittle, and more environmentally friendly. On top of that, the new approach also promises devices that use less energy, are more responsive, and do not tarnish in the air. The problem has been that indium tin oxide - which is currently used to make smart phone screens - is brittle and expensive. The primary constituent – indium - is also a rare metal and is ecologically damaging to extract. Silver - which has been shown to be the best alternative to indium tin oxide - is also expensive. The Sussex breakthrough has been to combine silver nanowires with graphene - a two-dimensional carbon material. The new hybrid material matches the performance of the existing technologies at a fraction of the cost. (Ref 13)

### 14. FORTIFYING CONCRETE WITH RECYCLED PLASTIC

MIT undergraduate students have found that by exposing plastic flakes to small, harmless doses of gamma radiation - then pulverizing the flakes into a fine powder - they can mix the plastic powder with cement paste to produce concrete that is up to 20% stronger than conventional mixes. Concrete is - after water - the second most widely used material on the planet. The manufacturing of concrete generates about 4.5% of the world's human-induced carbon dioxide emissions. Replacing even a small portion of concrete with irradiated plastic could thus help reduce the cement industry's global carbon footprint. Reusing plastics as concrete additives could also redirect old water and soda bottles - the bulk of which would otherwise end up in a landfill – into useful construction products. (Ref 14)

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### 15. TESTING MICRO-SCALE COMPRESSIVE STRENGTH OF CEMENT

Cement is used to make concrete - one of the most widely used construction materials in the world. The compressive strength of cement is a primary factor in determining how much load concrete can bear -- a critical consideration for civil engineering projects. Engineers have long known that cement derives its strength from an ingredient called calcium silicate hydrate (C-S-H) -- the primary product formed when cement powder is mixed with water. Scientists, however, have not been able to accurately measure the compressive strength of the C-S-H in a cement sample -- the sample sizes needed for isolating and testing the C-S-H components are too small to fabricate by conventional sample preparation methods. To address this challenge, researchers at North Carolina State University (NCSU) turned to a materials science technique called micro-pillar compression. Normally used on crystalline materials, micro-pillar compression treats very small samples to determine the compressive strength of a material.

Because cement is a heterogeneous material, made up of multiple components, the NCSU team used a scanning electron microscopy/X-ray technique to find the areas in cement samples that had the highest ratio of C-S-H relative to other constituent materials. Once the C-S-H sites were identified, they were milled into cylinders 2 micrometers wide and 4 micrometers in height. These samples could then be subjected to micro-pillar compression. There are many ways to make cement, and it can be made with different constituents in different ratios. NCSU research showed that the micro-pillar technique could provide a precise measure of C-S-H compressive strength in different types of mixtures. This information can ten be used to understand how various processes - and the constituents added during cement production - can affect its ultimate strength. (Ref 15)

## 2. ENVIRONMENTAL

### 1. POLLUTION'S ANNUAL PRICE TAG: $4.6 TRILLION & 9 MILLION DEAD

Pollution in all its forms killed 9 million people in 2015 and, by one measure, led to economic damage of $4.6 trillion, according to a report by the Lancet Commission on Pollution and Health that was published in the UK Medical Journal. The most fatal type of pollution is airborne - causing about 6.5 million of 9 million annual deaths. That includes smog from power plants, factories and vehicles, as well as household emissions from dirty indoor stoves used in poorer countries. Contaminated water, soil and occupational exposures to dangerous chemicals contribute significantly to the death toll as well. Report authors argue that countries can correlate pollution reduction and economic growth, pointing to the US as an example. Gross domestic product - adjusted for inflation - has increased by 250% since 1970, when President Richard Nixon signed the Clean Air Act. Over the same period, concentration levels of such common air pollutants as particulate matter and sulfur dioxide have notably dropped in the US on the order of 70% in total value. (Ref 1)

### 2. EIA GAZES INTO ITS CRYSTAL GLOBE -1

The Energy Information Administration's (EIA) latest International Energy Outlook 2017 (IEO) is hot off the presses. It provides a look at global trends in energy supply and demand from 2012 out to 2050. Some highlights from the report are:

Energy demand from 2017 to 2050 is expected to grow by about 57%. Combined petroleum, natural gas, and coal use is forecast to grow 29% by 2050, with natural gas leading the way (up 67%) followed by petroleum (25%) and coal (3%—essentially flat). Although the share of energy demand met by fossil fuels declines

## 2. ENVIRONMENTAL

### 2. EIA GAZES INTO ITS CRYSTAL GLOBE -2

by 2050, hydrocarbons nonetheless are expected to account for 77% of total global demand in 2050 compared to 83% in 2017. Of that 77% total from hydrocarbons - 30% is from petroleum, 26% from coal, and 22% from natural gas.

EIA expects demand for renewable energy (hydropower, wind, solar, biofuels, etc.) will nearly double - growing 96% between 2017 and 2050. The share of energy demand met by these technologies should climb from about 13% in 2017 to about 18% in 2050. Hydroelectric power will remain the largest single source of renewable electricity, accounting for about 54% of all of the renewable electricity generation technologies in 2050. (Ref 2)

### 3. GLOBAL CO2 EMISSIONS STALLED

The annual assessments of global greenhouse gas (GHG) emissions by the European Joint Research Council (JRC) and the Netherlands Environmental Assessment Agency (PBL) confirm that global $CO_2$ emissions have stalled for the third year in a row. The report provides updated results on the continuous monitoring of the three main greenhouse gases: carbon dioxide ($CO_2$), methane (CH4) and nitrous oxide ($N_2O$).

Global GHG emissions continue to be dominated by fossil carbon dioxide ($CO_2$) emissions, which however show a slowdown trend since 2012, and were stalled for the third year in a row in 2016. Russia, China, the US and Japan further decreased their $CO_2$emissions from 2015 to 2016, while the EU's emissions remained stable with respect to the previous year, and India's emissions continued to increase. (Ref 3)

## 3. EDITORIAL BOARD

### 1. CERAMIC PUMP PROMISES CHEAP, EFFICIENT GRID STORAGE

Interest in liquid metals as a heat storage medium has been growing, but the challenge has been developing pumps and pipes that don't deteriorate under high temperatures. Ceramics can withstand incredibly high temperatures, but they're also brittle, which makes them difficult materials for creating machine components. Researchers at Georgia Tech, along with collaborators at Stanford and Purdue, got around this limitation by utilizing new composite materials for parts - along with diamond tooling and precision machining operations. They also employed seals made from graphite - another material that stands up to very high temperatures. The prototype pump they developed successfully operated for 72 hours straight pushing molten tin, at average temperatures of around 1,200 ˚C and a peak temperature of 1,400 ˚C. The pump did show signs of wear after the tests. As a next research step, the scientists are developing a pump made from silicon carbide - a harder ceramic material that should be able to last much longer. The research was funded by $3.6M grant from ARPA-E, the US Department of Energy (DOE) Moonshot Energy Research Division. (Ref 1)

### 2. DIESEL FUEL ECONOMY FROM GASOLINE ENGINE - 1

Previous attempts at Homogenous-Charge-Compression-Ignition (HCCI) engines from Daimler, General Motors, Nissan, and other manufacturers varied the compression ratio within the engine combustion chambers mechanically. From hinged connecting rods to crankshafts whose throws could be varied, these

compression ratio systems were fiendishly complex and added numerous additional parts within already complex internal combustion engines. Mazda has taken a different path - the compression ratio applied to a lean air-fuel mixture is increased inside the combustion chamber by combusting a very small amount of mixture close to the cylinder spark plug during the piston's compression stroke. That spreads a pressure wave throughout the cylinder space that further compresses the lean air-fuel mixture in the cylinder, which then ignites on its own. Mazda has dubbed the technology Spark-Controlled-Compression-Ignition (SPCCI). Its simplicity is indicated by the use of a slightly strengthened conventional engine block, with three alterations to ancillary components that make the lean combustion possible.

## 3. EDITORIAL BOARD

### 2. DIESEL FUEL ECONOMY FROM GASOLINE ENGINE - 2

First, a very precise direct-injection system that operates at much higher pressures than customary for a gasoline engine - about 2,900 PSI – was installed. This isn't as high as the most recent diesel engines (32,000 PSI) but it allows the fuel to be precisely injected into the right place below the spark plug. Second, an air compressor packs more air into the cylinder to keep the main air-fuel mixture sufficiently lean. Finally, sensors in each cylinder coupled to a powerful engine control processor allows real-time adjustment of the air-fuel mix and spark timing for EACH successive combustion event.

Previously, a 4-cylinder engine would be adjusted after all four cylinders had fired once. Now, the mix in EACH individual cylinder can be adjusted ON THE FLY to ensure maximum efficiency depending on the operating demands. Two prototype Mazda cars were recently tested. The manual transmission model delivered 34.6 MPG while the automatic transmission model returned 39.9 MPG! The test drive cycle featured standard traffic in a suburban setting including low-speed residential stop-and-go scenarios as well as a few miles at speeds up to 100 MPH on freeway runs. (Ref 2)

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

## 4. CHAIRMAN/DIVISION NEWS

**EED will be sponsoring a Joint Meeting with the St. Louis, MO Section of ASME and is currently looking for a Speaker for the event. The meeting will be scheduled in either February or March of 2018 at the Engineers Club in St. Louis, MO. We are looking for a speaker to present for 1-2 hours on an environmental topic such as Remediation/Superfund sites. If you are interested please email Ryan at ryanneil84@hotmail.com with a potential topic and availability.**

## 5. EED NEWSLETTER READER

**YOU ARE ENCOURAGED TO FORWARD YOUR COMMENTS ON THE TOPICS AND DISCUSSIONS PRESENTENTED 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

## 7. NEWSLETTER REFERENCES -

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**1.** https://www.technologyreview.com/s/609093/ceramic-pump-that-takes-the-heat-promises-cheap-efficient-grid-storage/?utm_source=MIT+Technology+Review&utm_campaign=dcda7008d7-The_Download&utm_medium=email&utm_term=0_997ed6f472-dcda7008d7-154359469

**2.** http://www.greencarreports.com/news/1112524_mazdas-skyactiv-x-diesel-fuel-economy-from-gasoline-engine

**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 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).**

## DIVISION NEWS – SPECIAL

**ASME Enhances Environmental Impact Through EED Education Support Program**

PROPOSAL DUE DATE: FEBRUARY 15, 2018

**Environmental engineers use the principles of engineering, soil science, biology, and chemistry to make the air, water and land better and safer for humans. To engage students and educators in this discipline, and foster the impact of environmental engineering education in communities around the world, the ASME Environmental Engineering Division (EED) Announces the 2018 Environmental Engineering Education Support Program. This program will fund a maximum of $25,000 per year. No more than five proposals will be funded with a limit of $5,000 per award to students, educators and EED members who propose interesting ways to impact environmental education in their communities. Based upon judgment of final reports, at least one proposer will be invited to discuss their project at the annual EED meeting. All travel expenses will be provided.**

**Examples of Environmental Engineering Education Support Program Proposals**

- **Funding an EED Member Paired with a Local Educator to Develop a Curriculum Unit Over a Summer that can be Put Into Practice the Following School Year. EED Members will Share Units that are Successful with Other Educators.**
- **Funding support for a non-ASME member educator (Primary and/or Secondary School Teacher) to Attend an ASME Sponsored Environmental Event (e.g., Conference, Training/Certification Program, Workshop, etc.) in Support of Curriculum Development.**
- **Funding of a Project Based on Environmental Engineering and Mechanical Engineering Principles that Appears Promising for Enhancing Environmental Education.**
- **Funding Support for a College, or a Graduate Student to Attend an ASME Sponsored Environmental Event (e.g., Conference, Training/Certification Program, Workshop, etc.).**

## DIVISION NEWS – SPECIAL

**ASME Enhances Environmental Impact Through EED Education Support Program**

**This will be the THIRD YEAR that EED has funded an Education Support Program. Projects supported in the first two years of the program were:**

- **"*Wind Energy Student Organization;*" Iowa State University (ISU)**
- **"*Lab Component for Sustainability Course,*" Philadelphia University**
- **"*Using Interactive iPython Simulations to Model Life Cycle Analysis of Ethanol Production,*" Marshalltown High School (Iowa), ISU**
- **"*High School Student Laboratory Education Module: Use of Abundant Waste Materials in Concrete Mix Design,*" University of Akron**
- ***"Education of Rural Community Members and Leaders About the Health Effects, Current State, and Minimizing of Particulate Matter Exposure in Rural Households that Use Biomass for Cooking,"* FEU Institute of Technology, Manila, Philippines**
- ***"Experimental Design: Development of a High School Environmental Research Program, "* Hope College, Holland, MI.**
- ***"Water for Life: A Project-Based Approach to the 7th Grade Classroom,"* Mission Achievement & Success Charter School, Albuquerque, NM**
- ***"Citizen Science: Effects of Stream Restoration on Water Quality," George Mason High School, Falls Church, VA**
- ***"Designing a Sustainability Makerspace," Rose-Hulman Institute of Technology, Terre Haute, IN.**

PROPOSALS - INCLUDING A BUDGET - MAX 5 PAGES - MUST BE SUBMITTED ELECTRONICALLY BY 15 FEB 2018 TO:

edelsonm2@asme.org

**PROJECTS THAT PAIR AN EED MEMBER WITH AN EDUCATOR WILL RECEIVE THE HIGHEST PRIORITY. EXPECTATION IS THAT THE MAJOR SHARE OF FUNDING WOULD SUPPORT EFFORTS OF THE EDUCATOR.**