



# ENVIRONMENTAL ENGINEERING DIVISION NEWSLETTER

JUNE - 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 **Seven** Sections:

1. ENVIRONMENTAL TECHNOLOGIES
2. ENVIRONMENTAL REGULATIONS
3. EDITORIAL BOARD SELECTIONS
4. EED CHAIRMAN/DIVISION NEWS
5. NEWSLETTER READER COMMENTS
6. EDITORIAL BOARD MEMBERS
7. NEWSLETTER ARTICLE 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

### **DIESEL VEHICLES RELEASE 50% MORE TOXIC GAS IN “REAL” WORLD**

An international team of researchers examined more than 30 “in-use” vehicle emission tests that represented more than 80 percent of new diesel vehicle sales in 2015. According to lead author Susan Anenberg at the International Council on Clean Transportation (ICCT), test personnel used both portable measurement systems (PEMs) to track tailpipe emissions as well as complimentary roadside monitors to track emissions from traffic as it passed.



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Comparing the data on “real” world emissions to official laboratory tests revealed an alarming disparity. The researchers found that “real” world” vehicles emitted 13.2 million tons of nitrogen oxide (NO<sub>x</sub>) emissions on the road - 4.6 million tons more than the 8.6 million projected from the laboratory testing. Heavy-duty vehicles, such as commercial trucks and buses were by far the largest contributor to worldwide emissions - accounting for 76 percent of the total excess gas emissions. For light-duty vehicles, such as passenger cars, trucks, and vans, the European Union produced nearly 70 percent of the excess diesel NO<sub>x</sub> emissions. (Ref 1)

### **REDOX SYSTEM PRODUCES AND STORES ENERGY IN THE HOME**

Imagine having a fridge-sized box in your home that generates and stores electricity on-site, heats and cools the house, provides hot water and even churns out oxygen and hydrogen to use or sell. That's the vision a team from the University of Newcastle and Australian company Infratech Industries is working towards. The team calls the device a Chemical Looping Energy System (CLES). Professor Behdad Moghtaderi of the University of Newcastle bases it upon an original invention. The Infratech Company - spearheaded by CEO Rajesh Nellore - has been involved from the start, helping out with the technical development of the system as well as with plans to eventually commercialize it.

The system is based upon a reduction-oxidation (redox) reaction, with a canister of blended particle mixture that cyclically gains and loses electrons. When those particles oxidize, they heat up, creating steam that drives a turbine to generate electricity. Then, when they reduce again, they release oxygen that can then be collected. Along with power and oxygen, the excess heat that the CLES device produces can be captured and used to directly heat a building, or provide hot water. The process can also be tweaked to create hydrogen! (Ref 2)

### **WIRELESS CHARGING FOR ELECTRIC VEHICLES**

Qualcomm has demonstrated how electric vehicles could be charged wirelessly while driving - a technology some believe will help accelerate the adoption of self-driving cars. The smartphone chipmaker said a so-called "dynamic charging" test took place on a test track in Versailles, France. It used two Renault Kangoo vehicles driving over embedded pads in the road that transferred a charge to the cars' batteries at up to 20 KW levels at highway speeds. (Ref 3)



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### **LIHIUM METAL BATTERY BOASTS 3 TIMES THE CAPACITY OF LITHIUM ION BATTERY**

The high-energy capacity of lithium-ion batteries has led to them powering everything from tiny mobile devices to huge trucks. But current lithium-ion battery technology is nearing its limits. One thing stands in the way - dendrites. If a new technology by Rice University scientists lives up to its potential, it could solve this problem and enable lithium-metal batteries that can hold three times the energy of lithium-ion ones.

Dendrites are microscopic lithium fibers that form on the anodes during the charging process, spreading like a rash till they reach the other electrode and causing the battery to short circuit. This can cause the battery to catch fire or even explode. The new technology from Rice is able to stop dendrite growth in its tracks. Key to it is a unique anode made from a material that was first created at the university five years ago. By using a covalent bond structure, it combines a two-dimensional graphene sheet and carbon nanotubes to form a seamless three-dimensional structure. The anode material is capable of a lithium storage capacity of 3,351 milliamp hours per gram, which is close to pure lithium's theoretical maximum of 3,860 milliamp hours per gram, and 10 times that of lithium-ion batteries. (Ref 4)

### **"GREEN" SHOES MADE FROM ALGAE**

In 2015, bioplastics firm Algix and clean tech company Effekt were collaborating to make an eco-friendly foam based on algae instead of petroleum. The material is now being marketed by the Bloom Company as "Bloom Foam". Bloom utilizes algae harvested out of waste streams in the US and Asia, where an over-abundance of nutrients in the water often causes algal blooms. These blooms kill aquatic wildlife such as fish. This means that no fertilizers need to be added in order to grow the algae, and its removal actually *helps* the environment. The harvested algae biomass is dewatered and dried, polymerized into pellets, then combined with other compounds to ultimately form pliable foam. UK-based shoe manufacturer Vivobarefoot has announced its collaboration with San Diego-based Bloom to produce the world's first full shoes made of the material. (Ref 5)



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### ROOFTOP CO<sub>2</sub> CAPTURE SYSTEM

A new CO<sub>2</sub>-filtering plant has just opened up near Zurich, Switzerland. Climeworks, the company behind the technology, calls it a Direct Air Capture (DAC) plant. From its perch on the roof of a waste recovery facility, the DAC plant collects CO<sub>2</sub> that the facility pumps into the air, and chemically deposits it onto the surface of a filter. When each filter is completely full, it's heated to about 100° C (212° F) to isolate the CO<sub>2</sub>, which can then be purified and sold. Climeworks says the gas could also be used for a variety of industrial applications, like creating other climate-neutral fuels, carbonating beverages, or be stored underground. (Ref 6)

### CONCRETE FOR TALLER WIND TURBINE TOWERS PASSES TESTS

Taller turbine towers can enable wind energy production in all 50 states, including those in the Southeast. Winds at higher elevations, generally, are stronger and more consistent, even in wind-rich states such as Iowa and Texas. A new technology called "Hexcrete," combines concrete with steel tubular technology to create hybrid wind turbine towers. The basic idea of Hexcrete is that it's assembled from precast panels and columns made with high-strength or ultra-high-performance concrete. Those panels and columns can be cast in sizes that are easy to load on trucks. They are tied together on-site by cables to form hexagon-shaped cells. A crane can stack the cells to form towers as high as 140 meters.

A research group at Iowa State University has pushed and pulled an assembled Hexcrete test section with 100,000 pounds of force for more than 2 million cycles. The test section passed that fatigue test. The researchers have also tested a full-scale, cross-section of a tower cell for operational loads and extreme loads for a 2.3 MW Siemens turbine. Again, Hexcrete passed the tests. Economic models show using Hexcrete technology to build 120- to 140- meter wind turbine towers could drop the levelized costs 10% to 18% under the costs of current 80-meter technologies. The levelized cost is the total cost of installing and operating an energy project over its expected life. (Ref 7)



## 1. ENVIRONMENTAL TECHNOLOGIES

### **HARNESSING ENERGY FROM GLASS WALLS**

Perovskites are hybrid organic-inorganic photovoltaic materials, which are cheap to produce and easy to manufacture. They have recently received much attention, as the efficiency of perovskite solar cells has rapidly increased to the level of silicon technologies in the past few years. Using perovskites, a research team at the Korea Advanced Institute of Science and Technology has developed a semi-transparent solar cell that is highly efficient and functions very effectively as a thermal mirror.

The semi-transparent solar cells made with the top transparent electrodes (TTEs) exhibited a power conversion efficiency as high as 13.3%, reflecting 85.5% of incoming infrared light. Currently available crystalline silicon solar cells have up to 25% efficiency but are opaque. The team believes that if the semi-transparent perovskite solar cells are scaled up for practical applications, they can be used in solar windows for buildings and automobiles, which not only generate electrical energy but also allow smart heat management in indoor environments, thereby utilizing solar energy more efficiently and effectively. (Ref 8)

### **ENGINES FIRE WITHOUT SMOKE**

By observing the soot particles formed in a simple flame, researchers at King Abdullah University of Science and Technology (KAUST) have developed a computational model capable of simulating soot production inside the latest gasoline automobile engines. KAUST researchers burned a chemically simplified "gasoline surrogate" mixture in an experimental setup called a counter-flow diffusion flame. By shining lasers into this open flame, they could monitor soot and its precursors as the fuel burns. These experiments have been done previously with gaseous fuels, but this is the first time they have been done with gasoline-relevant liquid fuels. Carmakers can use the KAUST model in their own simulations to test whether changes, such as altering engine geometry or the timing of fuel injection, might cut soot production. (Ref 9)



## 1. ENVIRONMENTAL TECHNOLOGIES

### **SCALABLE WATER SPLITTING FUELS THE FUTURE HYDROGEN ECONOMY**

Scientists from Penn State and Florida State University have developed a lower cost and industrially scalable catalyst to produce pure hydrogen through a low-energy water splitting process. Industrial processes use platinum as the catalyst to drive the water-splitting process. Although platinum is a near-perfect catalyst, it is also expensive. A cheaper catalyst could make hydrogen a reasonable alternative to fossil fuels in transportation, and power fuel cells for energy storage applications. Molybdenum disulfide (MoS<sub>2</sub>) has been predicted as a possible replacement for platinum, because the Gibbs free energy for hydrogen absorption is close to zero. The lower the Gibbs free energy, the less external energy has to be applied to produce a chemical reaction.

However, experimentally, there are drawbacks to using MoS<sub>2</sub> as a catalyst. In its stable phase, MoS<sub>2</sub> is a semiconductor, which limits its ability to conduct electrons. To get around that problem, the research team added reduced graphene oxide, a highly conducting form of carbon. Then, to further decrease the free energy, they alloyed the MoS<sub>2</sub> with tungsten to create a thin film with alternating graphene and tungsten-molybdenum disulfide layers. The addition of tungsten lowers the electrical voltage required to split water by half, from 200 millivolts with pure MoS<sub>2</sub>, to 96 millivolts with the tungsten-molybdenum alloy. (Ref 10)

### **JAPANESE TECHNOLOGY SQUEEZES MORE POWER OUT OF COAL**

A demonstration plant built by Osaki CoolGen of Japan began operations at the end of March 2017. For conventional coal-fired power generation, heat from coal burned at a temperature of around 700 C produces steam, which rotates a turbine. CoolGen's plant is totally different as it roasts coal at above 1,300 C while simultaneously blowing oxygen over it in order to convert the solid fuel into a gas. The system can drastically cut the discharge of CO<sub>2</sub> because it uses gas from the roasted coal to generate power instead of burning the rock.



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The plant also makes use of exhaust heat, generated when power is produced, for power generation. It has a fuel cell power generation facility that extracts hydrogen from some of the gas and forces a reaction with oxygen to create electricity. Using three energy sources -- gas, exhaust heat and hydrogen -- the plant can maximize some 55% of coal's energy for power generation, compared with up to 40% for conventional coal-fired power generation stations.

Osaki CoolGen will operate the demonstration plant on the Osakikamijima Island for more than 5,000 hours. If the demonstration proves successful, it will make commercial use of the technology available in the first half of the 2020s. The small island is busy hosting inspection tours to the plant from coal-producing nations like Poland and Australia as well as Southeast Asian and African where demand for energy is soaring. (Ref 11)

### **HARNESSING ENERGY GENERATED WHEN FRESHWATER MEETS SALTWATER**

Penn State researchers have created a new hybrid technology that produces unprecedented amounts of electrical power where seawater and freshwater combine at the coast. Though methods currently exist to capture this energy, the two most successful methods, pressure retarded osmosis (PRO) and reverse electro-dialysis (RED), have thus far fallen short.

A third technology, capacitive mixing (CapMix), is a relatively new method also being explored. CapMix is an electrode-based technology that captures energy from the voltage that develops when two identical electrodes are sequentially exposed to two different kinds of water with varying salt concentrations, such as freshwater and seawater.

The Penn State researchers have combined both the RED and CapMix technologies into an electrochemical flow cell. At 12.6 watts per square meter, this technology leads to peak power densities that are unprecedentedly high compared to previously reported RED (2.9 watts per square meter), and on par with the maximum calculated values for PRO (9.2 watts per square meter), but without the fouling problems. (Ref 12)



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### **LARGE-SCALE TIDAL POWER PROJECT LAUNCHES IN SCOTLAND**

The MeyGen project is a large-scale effort to deploy up to 398 MW worth of offshore tidal stream turbines - connected to the UK National Grid by 2020. The project is now officially underway with the unveiling of four 1.5 MW turbines, which together make up Phase 1A of the project at the Nigg Energy Park in Scotland. The four 1.5 MW turbines are built by two companies – three by Andritz Hydro Hammerfest, and a single AR1500 turbine from Atlantis Resources. Each turbine weighs an impressive 220 tons. The Atlantis Resources turbine features a mechanism that lets it turn 180 degrees - allowing it to switch direction with the tide. (Ref 13)

### **COLORFUL SOLUTION TURNS RUSTY MESH INTO BATTERIES**

Stainless steel mesh is often used as filters and screens in facilities such as wastewater treatment plants or in ventilation shafts. But once the material gets coated in rust and weakened, it's usually just discarded. Now Chinese scientists have figured out a way to take that metal trash and turn into high-performing treasure as electrodes in potassium-ion batteries. While lithium-ion batteries are widely used today, they're not without their issues. For starters, they degrade over time, especially if they're not stored in a cool place. They also have the annoying tendency to explode sometimes and, compared to sodium- or potassium-ion batteries, they are expensive.

But potassium batteries, which could be a cheap and stable alternative to lithium batteries, have their challenge as well: Potassium ions are fairly large, so storing them as they transfer back and forth between electrodes in a battery tends to degrade the electrodes themselves. The new method developed by a team from the Chinese Academy of Sciences and Jilin University tackles both the problem of handling the large potassium ions and the problem of excess steel-mesh waste. In tests, coin cells made with these new electrodes demonstrate excellent capacity, discharge voltages, rate capability, and outstanding cycle stability. Because the inexpensive, binder-free electrodes are very flexible, they are highly suitable for use in portable electronic devices. (Ref 14)



## 2. ENVIRONMENTAL REGULATIONS

### **MORE TREES IN A CITY CAN MAKE SMOG WORSE**

Trees and other plants are known to release volatile organic compounds (VOCs). In the presence of sunlight, VOCs and nitrous oxide (NO<sub>x</sub>) react to form ozone, a key pollutant that when produced at ground level causes smog and respiratory problems in humans. Researchers at the Institute for Advanced Sustainability Studies and Humboldt University used computer models to study air pollutant concentrations in an area of Berlin. They looked at the data from a heat wave in summer 2006 and compared it to a more typical seasonal stretch in the summer of 2014. The team concluded that ozone levels did indeed spike in areas of urban greenery during the heat waves. Their determinations estimated the VOCs contributed to anywhere from six to 20 percent of the ozone formation during the heat wave, with spikes of up to 60 percent at some points. The study highlights the hidden complexities involved in managing our urban air environments. Simply planting more trees can sometimes result in increases of certain types of air pollution, despite the other benefits of greener urban spaces. (Ref 15)

### **BETTER BUILDINGS CHALLENGE NETS ALMOST \$2 BILLION IN ENERGY SAVINGS**

The latest numbers released by the DOE's [Better Buildings Challenge](#) amounted to 240 trillion BTUs in energy cuts and \$1.9 billion in cost savings. The [Challenge](#), which was first implemented during the George W. Bush administration, seeks to make all commercial, residential and public buildings 20 percent more energy-efficient over the next decade. The program largely relies on partnerships and market-based solutions to develop new energy-efficiency innovations and encourage investment and green jobs in the process. The latest [results](#) indicate the 345 public sector and private sector organizations participating in the program have made a difference. In addition to energy and financial savings, the Challenge entities avoided 15 million tons of carbon emissions and prevented 4 billion gallons of water waste. According to a DOE [report](#) released in January, 2.2 million Americans work in in the energy efficiency field, an increase of 133,000 jobs during 2016. It is those jobs that helped to [retrofit](#) 200 million square feet of building space last year thanks to a \$650 million investment. Those efforts spawned at least 1,000 [solutions](#) in a DOE database that are ready to be tapped by any organization looking to save money by investing in new energy-saving designs and technologies, (Ref 16)

## 2. ENVIRONMENTAL REGULATIONS

### **LATIN AMERICA'S FIRST WASTE-TO-ENERGY PLANT IN MEXICO CITY**

Veolia (Paris, France), through its subsidiary Proactiva Medio Ambiente Mexico S.A. de C.V., has won the public call for tenders published by the government of Mexico City and just signed the contract to design, build and operate the first waste-to-energy facility in Latin America. With a capacity twice that of the largest facility in France, this unit will treat 1.6 million metric tons per year of household waste. The 30-year operation and maintenance contract of this facility will represent a revenue of 886 million euros for Veolia. Each day, it will convert about one-third of the city's household waste into energy. The 965,000 MWh of electricity produced each year by the plant will be used directly by the Mexico City Subway Metro. Plant construction is due to begin in 2017. Operations are scheduled to start in 2020. (Ref 17)

### **CLEAN ENERGY EMPLOYS ALMOST 10 MILLION PEOPLE WORLDWIDE**

Despite political volatility, the low cost of fossil fuels and infrastructure challenges, 9.8 million people worked in the clean energy sector worldwide as of 2016. That is a 1.1 percent increase from the previous year. The International Renewable Agency (IRENA), an intergovernmental organization based in Abu Dhabi, announced the numbers in 2017. IRENA has estimated that in 2015 and 2016, 400,000 people in the oil and gas industry across the world lost their jobs and 40 percent of those losses occurred within the U.S. alone. IRENA has noted that China closed 5,600 coal mines last year, which could lead to the loss of as many as 1.3 million jobs. Similar trends are underway in India, where the country's largest coal producer has shed 185,000 jobs.

Solar led the way in the global renewables boom last year. The addition of 71 Gigawatts worldwide boosted employment within the sector by 12 percent for a total of 3.1 million jobs. China accounted for half of those job increases, but head count in the U.S. industry grew as well with a 24 percent increase to 241,000 jobs. The liquid biofuels industry is the world's second largest renewables employer, with over 1.7 million people working within the sector. IRENA estimates that 1.2 million across the world now work for the wind power industry, a 7 percent increase from 2015. IRENA sees continued growth in the wind power industry, and projects the sector to support 3 million jobs by 2030. (Ref 18)



## 2. ENVIRONMENTAL REGULATIONS

### URBAN EMISSIONS COULD BE CUT BY SEVENTY PER CENT

A researcher at Twente University in the Netherlands has developed a mathematical model that determines the optimal conditions for sustainable urban distribution. The model can reduce logistical pressure in cities and make goods transport more sustainable. In some cases, it may be possible to reduce emissions in cities by seventy per cent. Input variables to the model include subsidy arrangements, local regulations and transport schedules, as well as information sharing and collaboration between transport companies. (Ref 19)

### BIG OIL SEES NEW REWARD IN OLD PRODUCTION TECHNIQUE

One so-called enhanced oil recovery (EOR) strategy used to prolong the productive lifespan of oilfields and increase output, underpins around five percent of U.S. oil output, or about 450,000 barrels per day, according to energy consultancy Advanced Resources International. The drilling method harnesses the carbon dioxide produced during the extraction of oil or from power plants, and forces it back into the fields. That boosts the pressure underground and drives more oil to the surface. EOR can help firms to produce between 30 percent and 60 percent of all the oil held in a reservoir. That's far more than the 10 percent usually recovered from initial traditional drilling, according to the Department of Energy.

An oil company spends about \$18 to \$25 per barrel to collect oil from its EOR operations. In contrast, its shale-focused well costs are lower - \$16 to \$19 per barrel. But because EOR wells pump consistently for decades, their value to the company over time exceeds shale wells, whose production quickly tapers off. Across Texas and New Mexico, Occidental Petroleum Company runs one of the world's largest fleet of enhanced oil recovery projects, injecting 2 billion cubic feet of carbon dioxide each day into wells that first produced oil nearly a century ago. Congress is expected this summer to debate extending an existing tax credit that could pave way for wider use. The proposed Carbon Capture Utilization and Storage Act would boost the credit to \$35 per metric ton of carbon dioxide used, up from the \$10 per ton credit limit now in effect.



## 2. ENVIRONMENTAL REGULATIONS

Electricity generator NRG Energy Inc earlier this year opened a \$1.04 billion carbon capture facility at a Texas coal-fired power plant, using its carbon dioxide emissions to extract crude from a 1930s-era oilfield. Expanding the credit could, supporters hope, encourage more coal fired power plants to follow NRG's lead by capturing and selling carbon to oil producers. Most oilfields are not located near carbon dioxide supplies, so the tax credit also could spur the companion build-out of carbon pipelines. (Ref 20)

### **AMERICA'S FIRST ALL-WOOD HIGH-RISE WILL BE BUILT IN PORTLAND, OREGON**

City officials in Portland, Oregon, have approved a construction permit for the first all-wood high-rise building in the nation. State officials hope it could help parts of rural Oregon reboot a dwindling timber industry. The 11-story building called Framework will use a technology called cross-laminated timber, or C-L-T, that tests have shown can withstand big earthquakes. Developers worked with scientists at Portland State University and Oregon State University to prove that the materials meet all building and fire safety codes. (Ref 21)

### **DELPHI AIMS FOR 42% EFFICIENCY WITH NEXT-GEN ENGINE**

Delphi Automotive PLC has projected that engines employing its upcoming third-generation gasoline direct-injection compression-ignition (GDCI) combustion system will attain a thermal efficiency of 42%. The company said that thermal efficiency would top any current production-vehicle gasoline engine - the most efficient of which are claimed to have a peak thermal efficiency of about 40%. Much of Delphi's GDCI research is being conducted under the auspices of a four-year, \$9.8-million program funded by the U.S. Department of Energy; Delphi's partners in the project include Oak Ridge National Laboratory, Umicore and the University of Wisconsin-Madison. The GDCI system will require a variety of emissions-reduction measures that, in addition to a newly formulated low-temperature catalyst, include an intake-air heater, a gasoline particulate filter and urea injection. Delphi was confident those measures, coupled with the combustion-related design advances of the third-generation system, will enable a production engine to be Tier 3, Bin 30 compliant—a vital achievement to advance the system for production-vehicle readiness. (Ref 22)

## 2. ENVIRONMENTAL REGULATIONS

### EPA PATENTS E30 ENGINE

On June 5, the U.S. EPA received a patent for an “internal combustion engine adapted to combust alcohol blended fuels” of greater than 20 percent alcohol by volume – essentially an E30 engine – perhaps the Holy Grail of the ethanol industry.

The agency has been pursuing the patent since 2008, with the goal of creating an “internal combustion engine that operates at high efficiency with alcohol fuels [to] improve the potential for alcohol fuels to reduce petroleum consumption. In their patent application, EPA notes that either a 30 percent blend of ethanol or methanol is the “preferred fuel” as “it shows a 10 – 12% increase in efficiency over a comparable gasoline engine.”

A mid-level ethanol blend, such as E30, would reduce petroleum consumption and increase engine efficiency. But a chicken-and-egg problem has beset the issue for years. Which will come first, higher blends, or the engines to use them? While the automotive industry has expressed interest in designing engines compatible with higher octane blends (such as an E30 blend) to enable smaller, more efficient engines, there are currently no models on the market that are specifically designed to utilize a high-octane fuel. (Ref 23)

### HARVARD BUILDING UNDERGOES ULTRA-EFFICIENT RETROFIT

The Harvard Center for Green Buildings and Cities (CGBC) at the Harvard University Graduate School of Design (GSD) are using their own building for a prototype in what they are calling the HouseZero project. When the retrofit is complete, the pre-1940s stick-built house will not have an HVAC system or have a need to use electric light during the day. It will be achieve 100% ventilation, create almost zero energy and produce zero carbon emissions, including embodied energy of materials.

Thermal mass and a ground source heat pump will replace the HVAC system, a solar vent will “instigate buoyancy-driven ventilation and triple-glazed windows will employ natural cross ventilation through a manual and automated system that monitors for temperature, humidity and air quality,” according to a press release about the project. The building itself will also double as a laboratory to help develop technologies, façades, and materials for other ultra-efficient buildings. The “flexible, highly-controlled and monitored experimental lab” will be connected to the building’s energy exchange system. (Ref 24)



### 3. EDITORIAL BOARD SELECTIONS

#### **OPPOSED-PISTON ENGINE TRUCK WITH REMARKABLE EFFICIENCY**

During industry days at the 2017 North American International Auto Show, CEO David Johnson announced that by 2018 the Achates Power Company would produce a drivable prototype truck powered by a 2.7-liter 270-hp, 479-lb-ft supercharged turbo-diesel Opposed Piston (OP) Engine capable of complying with Tier 3, LEV III, Euro 6 emissions while exceeding projected 2025 CAFE Standard values of 25/32/28 mpg city/highway/combined, yielding a 37-mpg unadjusted CAFE figure when 33 is the requirement for trucks with a footprint of 65-70 square-feet. Johnson further claimed that it would be 30 percent more efficient than the best diesel engines of comparable output, and 50 percent thriftier than the best similar gas engines. But the bigger bombshell was his announcement that of the nine automakers who have signed on as development partners, at least one of them has begun tooling up to build an opposed-piston engine in modern production line volume.

The pace of OP Engine development picked up in 2015 thanks to a \$9 million Department of Energy ARPA-E grant to develop the concept for light duty trucks. Another \$14.4 million came in to develop military applications of the engine for the Army. Since then Achates has run OP engines on gasoline and natural gas as well as diesel and JP8. All OP engines featured compression ignition. Lower peak cylinder pressures and temperatures reduce the amount of NO<sub>x</sub> and other pollutants produced in OP engine cylinders. Further, two fuel injectors spray across the cylinders instead of onto hot pistons which can cause the quenching that leads to particulate formation. Also, OP engine stroke is long enough to fully burn the hydrocarbons.

Achates claims that meeting 2025 CAFE regulations with this engine will cost about \$1,000 less than doing so by further modifying and/or electrifying the current crop of engines. This should allow manufacturers to meet the more stringent standards without forcing customers to “pay for fuel economy” they don’t care about with cheap gas, and without forcing them to compromise on their vehicle’s size or capability. Meeting EPA regulations in the future can be done by applying current technologies like 48-volt electrification to the OP engines. (Ref 25)

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



## 4. CHAIRMAN/DIVISION NEWS

### EED Environmental Panel Discussion

EED will hold a panel discussion at the ASME Power Conference in Charlotte, NC on Tuesday June 27<sup>th</sup> from 11 AM until 12:30 PM (check the Power Conference schedule for exact location). Potential discussion topics include but are not limited to:

- Status of the Clean Power Plan
- Emissions/Waste Reduction in Carbon Capture and Storage (CCS) Units
- Role of ASME Codes & Standards in Environmental Regulations
- Environmental Impacts/Mitigation of Renewable Energy Sources (Solar, Wind, Hydro)
- Startup/Shutdown/Malfunction (SSM) on Plant Operations and Emissions Control
- Life Cycle Analysis and Supply Chain Analysis
- Role of Research in Environmental Topics Affecting the Power Industry
- Water Conservation in Power Plants

The list of initial topics will be finalized just before the Conference. The panelist include: Margaret Thompson, Clemson University      Frank Princiotta, Retired – USEPA  
Robert Sommerlad, ASME      Tom Houlihan, Retired – APT      Arnold Feldman -Moderator

Questions - Contact T. Houlihan ([tmhoulihan@aol.com](mailto:tmhoulihan@aol.com)) or A. Feldman, ([jjdsenv@att.net](mailto:jjdsenv@att.net))

### Environmental Engineering Division Open Meeting

The EED Executive Committee will hold an Open Meeting for EED members and guests at the ASME Power Conference in Charlotte, NC on Monday June 26<sup>th</sup> between 9 AM and 11 AM. You do NOT have to register at the Conference to attend and there is NO charge. Subjects to be discussed include:

Division Status - Path Forward

Dixy Lee Ray Award

Technical Subcommittees

Input/Ideas from EED members

Environmental Education Support Program

Upcoming EED Sponsored Events

EED & Section Meetings – Possible Locations

The EED Exec Committee encourages you to attend if you are in (or near) Charlotte in order to get your input to Divisions activities. If you have any thoughts or questions please contact Arnie Feldman, EED Chair ([jjdsenv@att.net](mailto:jjdsenv@att.net)) or Ryan Neil, EED Vice-Chair ([ryanneil84@hotmail.com](mailto:ryanneil84@hotmail.com))



## 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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