



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 **Five** Sections:

1. ENVIRONMENTAL TECHNOLOGIES
2. ENVIRONMENTAL REGULATIONS
3. EED CHAIRMAN/DIVISION NEWS
4. EDITORIAL BOARD SELECTIONS
5. READER COMMENTS

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 will be greatly appreciated.

1. ENVIRONMENTAL TECHNOLOGIES

DOE ADVANCED FOSSIL FUEL AWARD FOR CSS PLANT

The first loan guarantee from the Department of Energy (DOE) under an \$8B solicitation for Advanced Fossil Energy Projects may go to a methanol production facility in Lake Charles, Louisiana that will employ Carbon Capture and Sequestration (CCS) technology for enhanced oil recovery. It would be the first US facility to derive methanol from petroleum coke (petcoke), which is a byproduct of oil refining. The plant is designed to capture 77% of the exhaust CO₂ from the petcoke gasification plant. The gas will then be compressed and transported to oilfields in Texas to accomplish enhanced oil recovery. (Ref. 1)



STATE-OF-THE-ART WASTE FUEL POWER FACILITY

The Solid Waste Authority (SWA) Renewable Energy Facility (REF 2) is a \$672M Waste to Energy plant located in Palm Beach, Florida. It reduces landfill waste volume over 90% by processing more than 3,000 tons of solid waste daily to generate power for an estimated 44,000 homes and businesses. Each of its three B&W boilers process over 1,000 tons of waste per day using a state-of-the-art Volund Wave Grate system which produces more complete combustion and greater volume reduction of the solid waste fuel. Each boiler generates 284,400 LBS/HR of superheated steam that drives a turbine generator to produce 100 MW of electricity.

REF 2 recovers about 90% of the ferrous metals and 85% of the nonferrous metals from the ash of the waste fuel. The plant is expected to recover over 27,000 tons of steel, aluminum, copper and other metals annually. Pollution control measures at REF 2 include:

- Use of carbon powder to remove mercury and volatile organic compounds (VOCs) from ash.
- Utilization of lime slurry to control the acid gases in the Spray Dryer Absorber (SDA) units.
- Baghouses that filter fly ash, lime and carbon powder and prevent the release of particulates.
- The use of ammonia to turn nitrogen oxide (NO_x) into harmless nitrogen and water (H₂O) vapor in the plant's Selective Catalytic Reduction System (SCR). REF 2 will be the first US waste-to-energy facility to reduce NO_x emissions using SCR technology. (Ref. 2)

A REALLY COOL NEW ENGINEERED MATERIAL

A team of University of Colorado Boulder engineers has developed a scalable manufactured meta-material to act as an air conditioning system for structures. It has the ability to cool objects even under direct sunlight with zero energy and water consumption. When applied to a surface, the meta-material film cools the object underneath by efficiently reflecting incoming solar energy back into space while simultaneously allowing the surface to shed its own heat in the form of infrared thermal radiation.

The new material could provide an eco-friendly means of supplementary cooling for thermoelectric power plants that currently require large amounts of water and electricity to maintain the operating temperatures of their machinery. The glass-polymer hybrid material measures just 50 micrometers thick and can be manufactured economically on rolls, making it a potentially viable large-scale technology for both residential and commercial applications. The invention is the result of a \$3M grant awarded in 2015 to the University of Colorado, Boulder by the Advanced Research Projects Agency-Energy (ARPA-E) program. (Ref. 3)



BIO-BASED ADHESIVES FOR NEW WOOD PRODUCTS

VTT Technical Research Centre of Finland has developed a technology known as "CatLignin" to produce reactive lignin from pulp industry side streams. CatLignin can be substituted for toxic phenol compounds in adhesives that are used in plywood and wood laminate products. As such, CatLignin could become a new, high-value entity for pulp mills. In addition, the CO₂ footprint of CatLignin is only 20% of the footprint of phenol! This is significant when one considers that six million tons of phenol resins are produced annually in the US.

Both society and wood product manufacturers have sought to find bio-based and safe alternatives to oil-based, toxic and expensive adhesive components. This new material brings noteworthy business opportunities to the entire lumber value chain - from lignin producers to adhesive and wood product manufacturers. Furthermore, the CatLignin material has potential as a substitute for a wide range of fossil-based chemicals in adhesive, rubber and plastic materials applications. (Ref. 4)

2. ENVIRONMENTAL REGULATIONS

CONCRETE TEMPERATURE PROFILING

Through the National Strong Cities - Strong Communities Initiative (SCSCI), the NASA Glenn Research Center worked with the city of Cleveland, surrounding Cuyahoga County, and the Manufacturing Advocacy & Growth Network (MAGNET) to select companies that could receive a complementary 40 hours of professional mentoring from NASA experts. One of the chosen companies - Pile Dynamics Inc. (PDI) of Cleveland, OH – developed a commercialized version of a Thermal Integrity Profiler (TIP) instrument created by University of South Florida professor Gray Mullins but needed a way to protect the wire sensors within the prototype from the caustic environment of curing concrete.

Concrete warms as it cures and TIP sensors can monitor the temperature within a concrete column to identify whether it was poured properly. PDI was using an extrusion process for sealing its sensors but wanted to find a more economical glue sealant. An adhesive company working with PDI found a substance that had potential and PDI requested NASA to test the product. NASA validated the strength of the seal that the glue made inside the PDI sensor shell and the strength of the bond between the shell and the wires used to transmit the concrete temperature readings to a monitor.



The American Society for Testing and Materials (ASTM) certified the Thermal Integrity Profiling process in 2014. The TIP system has also been accepted as a standard tool by the Ohio Department of Transportation for bridge foundation projects. This entire technology development process – from the National Government Policy Initiative (SCSCI) – involving State (OHIO), Private Enterprise (PDI) and Technical Community (MAGNET) entities - incorporating a University Research Development (TIP sensor from University of South Florida) into a Commercial Application (PDI system for concrete integrity) - Validated by a National Laboratory (NASA Glenn Center) – and Standardized by a Professional Society (ASTM) – can rightfully serve as A MODEL FOR FUTURE ENVIRONMENTAL TECHNOLOGY DEVELOPMENT. (Ref. 5)

3. EED CHAIRMAN/DIVISION NEWS

On behalf of the ASME Environmental Engineering Division (EED) and the ASME Power & Energy Conference we would like to formally invite you to participate in the EED Panel Discussion during the Conference to be held at the Charlotte Convention Center, Charlotte, NC during the week of June 26-30, 2017. Potential Discussion Topics are:

- Status of the Clean Power Plan in National Policy
- Emissions/Waste Reduction in Carbon Capture/Storage (CCS) Units
- Permitting (Multi-Media) in CCS Units at Power Plants
- Water Conservation Developments in Power Plants
- Role of ASME Codes & Standards in Environmental Regulations
- Environmental Impacts and Mitigation of Renewable Energy Sources

4. EDITORIAL BOARD SELECTIONS

CALIFORNIA HYDROGEN-REFUELING STATIONS

As of December 5, 2016, 25 retail stations are selling hydrogen for use as a fuel in California and another 23 stations are under development to sell hydrogen to the public. Combined with 2 California Air Resources Board (CARB) funded stations that are open for non-retail (not selling hydrogen to the public), the state hydrogen refueling station network will soon be composed of 50 stations. When the December 2015 Joint Report was published, 6 stations were open for sales. One might say that the CA Hydrogen Fuel Station market is exploding! (Ref. 6)



BATTERY POWER BOOST TO RENEWABLES

Researchers at Harvard University have developed a long lasting Flow Battery capable of storing renewable generated power that could operate for up to 10 years, with minimum maintenance. Flow Batteries store energy in liquid solutions in external tanks. Conventional Flow Batteries are costly since they use expensive polymer tank wall coatings to contain the potent chemical solutions inside the battery. Flow Battery components have to be frequently replaced in order to retain power system capacity. Replacement costs and long down times heretofore have hindered widespread utilization of Flow Batteries in Renewable Power Generation Systems.

The Harvard research team modified molecules used in the Flow Battery electrolyte solutions to make them soluble in water and vastly increased the Flow Battery ability to retain power. "Because we were able to dissolve the electrolytes in neutral water, this is a long-lasting battery that you could put in your basement," says Roy Gordon - a leading member of the university research team. The finding indicates that future Solar and Wind Power systems may very well be able to compete on a long-term basis with Fossil Fuel Power systems. (Ref. 7)

THE "BIG SMOKE'S" DIESEL SMOG

London is choking from record levels of pollution, much of it caused by diesel cars and trucks. The current problem is, in part, an unintended consequence of previous efforts to aid the environment. The British government provided financial incentives to encourage a shift to diesel engines because **laboratory tests** suggested that diesel cars would cut harmful emissions and combat climate change. Yet, it turned out that diesel cars emit on average five times as much emissions in real-world driving conditions as in the laboratory tests, according to a British Department for Transport study (April 2016). Note - these results are not to be confused with the results from engine control system "cheating" on emission tests run on engine dynamometer systems. (Ref. 8)

ALL FROM EED ASSOC ED - DR. J. ZUCCHETTO, NATIONAL ACADEMY OF SCIENCES, USA

5. EED NEWSLETTER READER COMMENTS

"I'm afraid your new newsletter has a misguided view on climate change and global warming. I suggest you read *Nothing to Fear* because it describes why CO2 probably isn't the problem described in your news latter, and why the sun probably is the cause of global warming and climate change. The new book, *Clexit For a Brighter Future*, will be published next month, and it explains why it's a fool's game to try to cut CO2 emissions enough to prevent a CO2 caused catastrophe, if CO2 is the problem."

Donn Dears, Retired GE Company Senior Executive - Received 1 Feb 2017



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NEWSLETTER ARTICLE REFERENCES

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