ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

01 NOVEMBER 2020

The ESD Newsletter is a monthly newsletter involving ALL members of ESD. Members are encouraged to forward materials, authored papers on Environmental and Environmental Systems topics, and comments on newsletter topics or current events to the Editor. Your participation is greatly appreciated.

The ESD newsletter features **Five** Sections:
(Please use the **blue** links below to navigate within the newsletter)

1. ESD DIVISION NEWS

ESD Technical Representative to Waste Information Exchange Planning Committee – Volunteer Opportunity

The Environmental Systems Division (ESD), in conjunction with the ASME Materials and Energy Recovery Division, the ASME Research Committee on Energy, Environment and Waste, and the Air and Waste Management Association (A&WMA) are planning a Waste Information Exchange (WIE) in 2021. The WIE will be based on the [Air] Information Exchange held annually in North Carolina. The main presenters will be EPA personnel.

ESD is looking for a volunteer to be the ESD Technical Representative to the Planning Committee. The individual should be familiar with the RCRA/HSWA regulatory program (including guidance and compliance/enforcement issues) on both solid and hazardous waste. Contacts in the Office of Resource Conservation and Recovery (ORCR) in DC would be a plus. Most of the work will be by telephone or electronic mail.

Submit a letter or email of interest to Arnie Feldman at jjdsenv@att.net or Ryan Neil, ESD Chair, at ryanneil84@hotmail.com **Back to Newsletter's Page 1**

Dixy Lee Ray Award Committee – Volunteer Opportunity

The Dixy Lee Ray Award Committee is looking for a volunteer to serve as a committee member. The Dixy Lee Ray Award is a prestigious ASME level award honoring those that have made a major impact in the environmental protection field. See https://www.asme.org/about-asme/honors-awards/achievement-awards/dixy-lee-ray-award for additional details.

Committee members' primary responsibility is to review nominations and select the annual Dixy Lee Ray Award winner. Committee members also help promote and publicize the award to their colleagues and friends. The committee normally meets thru conference calls and emails. Nominations are due to the committee by February 15 each year so most of the discussion and teleconference meetings occur February, March, and April. All committee members must be ASME members. The term of service is 5 years.

Submit a letter or email of interest to Ryan Neil, ESD Chair, at ryanneil84@hotmail.com.

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ICEM 2021 Call for Abstracts

ASME, the Nuclear Engineering and the Environmental Systems Divisions, are pleased to announce the Call for Abstracts for the International Conference on Radioactive Waste Management and Environmental Remediation (ICEM) (Virtual, Online). The Conference is set for October 10-13, 2021. ICEM promotes a broad global exchange of information on technologies, operations, management approaches, economics, and public policies in the critical areas of environmental remediation and radioactive waste management. The conference provides a unique opportunity to foster cooperation among specialists from countries with mature environmental management programs and those from countries with emerging programs.

The program Tracks below are shown below. The associated Topics for each Track can be seen on the ICEM website (https://event.asme.org/ICEM/Program).

Abstracts are due January 18, 2021. Abstracts should be submitted on-line via the website at https://icem.secure-platform.com/a/organizations/main/home. For additional information on submitting abstracts, please contact ASME at toolboxhelp@asme.org.

For additional general information on ICEM or to volunteer to support (e.g., Session Chair) please contact either Arnie Feldman (jjdsenv@att.net) or Bob Stakenboroghs (bob@advclean-energy.com).

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2. ENVIRONMENTAL TECHNOLOGIES

CRISPR Targets Climate Change

The big climate change conundrum is how to provide the necessary calories, nutrition, and living materials to an increasing population without destroying the planet that we live on. According to the United Nations, the world's population is expected to increase from 7.7 billion in 2020 to 9.7 billion in 2050 and could peak at nearly 11 billion around 2100. The UN's Intergovernmental Panel on Climate Change (IPCC) special report on land takes on the scope of the 197 million square miles of land on Earth and two extremely complex questions about how land use contributes to climate change and how climate change affects land. Genome editing may be one of the solutions to address climate change. A September 2020 report by the Information Technology & Innovation Foundation (ITIF), Gene Editing for the Climate: Biological Solutions for Curbing Greenhouse Emissions, emphasizes that gene-editing technology could be used to develop clean energy and climate solutions that policymakers have to date under-emphasized. Trees are excellent at capturing and sequestering carbon. To be more sustainable, healthier, climate- and disease-resistant, tree breeders need to adopt the best technologies available. CRISPR (CRISPR is a family of DNA sequences found in the genomes of prokaryotic organisms such as bacteria and archaea. These sequences are derived from DNA fragments of bacteriophages that had previously infected the prokaryote. They are used to detect and destroy DNA from similar bacteriophages during subsequent infections.) has tremendous power and promise and is already in use on a small scale at an early research stage to improve genotypes and phenotypes of trees of interest across the world. To illustrate the fragility of trees, a tree viral pandemic, like Citrus Tristeza Virus (CTV), or the rise of bacterial pathogens such as Citrus Greening (also known as Huanglongbing HLB-disease) can put an entire species at risk. Using classical techniques, breeding a tree can take decades; laboratory-based molecular techniques can reduce that time to 1–2 years along with other required resources. Recently, powerful CRISPR-based technologies grant the ability to accelerate and precisely manage the process by making informed genetic alterations to create beneficial outcomes. New green products are going to be dependent on available gene-editing tools, ranging from GMO techniques to CRISPR, TALENs, and other technologies. The technology used will depend on the goal, but, in reality, all available means need to be utilized (Ref. 1)

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From lab-grown meat to GMO: are you ready to embrace novel food tech?

From food irradiation to freeze drying, supply-chain technologies have enhanced the safety and sustainability of foods. Since 1961, global food supply per capita has increased more than 30 per cent. However, public acceptance of new technologies might prove a tricky obstacle to building a more sustainable food supply chain. According to a 2015 survey of more than 30,000 consumers, the most desirable food attributes are 'freshness', 'naturalness' and 'minimal processing'. It will come as no surprise then that a 2018 study found that a label stating that a product had been 'treated with food irradiation' was detrimental to consumers' perception of quality. Yet, progress towards a more sustainable and safer food system is difficult to envisage without innovation. Currently, 21–37 per cent of total greenhouse gas emissions are attributable to food production. While some people are taking action by making more sustainable choices, research identifies some confusion when it comes to food technologies. A 2018 study of more than 1,000 millennials, conducted by the US Department of Agriculture, showed that those more concerned about the sustainability of their diet were also least likely to accept 'shelf-life extension' technologies, considered one of the most sustainability-driving innovations. No novel food technology has been more divisive than the use of genetically modified organisms. The 2010 Eurobarometer survey, conducted in 32 countries, shows that opponents of GM foods outnumber supporters by three to one. An important driver of acceptance of food technologies are perceived benefits: taste, nutrition or price for example. Stem cell technology can now be used to grow meat in a laboratory. The first lab-grown burger was made in 2013, but production costs totaled US$300,000. When scaled up, lab-grown meat may offer a more sustainable and animal-friendly alternative to livestock rearing. But, once again, a 2018 survey showed that the public isn't quite ready for it. Survey respondents had a low understanding of the technology and a low level of acceptance. When the production process was explained to them, it actually reinforced the acceptance of traditionally reared meat. (Ref. 2)

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3. ENVIRONMENTAL REGULATIONS

Citizen Suits Lead the Way for Agencies on Plastics Enforcement

In recent years there has been significant attention on plastics pollution in the world's oceans and ecosystems, with iconic images of injured marine life that draw universal sympathy and calls to action. These concerns have found root in the U.S. in the form of citizen suits and government enforcement of existing environmental laws. The focus of this enforcement is not on the post-consumer plastic that has galvanized the public, but rather on pre-consumer plastic waste—squarely targeting operations that produce, transport, and manage plastic materials prior to incorporation into consumer or other products. Recent citizen suits by environmental non-governmental organizations (NGOs) are forcing courts to define vague qualitative standards, and that is in turn driving broad state agency enforcement of newly-defined standards against facilities that manufacture and manage plastics. Four NGO lawsuits are shaping the current state of play. Two are citizen suits against individual companies alleging violations of federal environmental laws, and two are against state or federal governments related to approvals involving plastics. In 2019, NGOs prevailed in a Clean Water

Act (CWA) citizen suit against a plastics manufacturer in the Southern District of Texas. The allegations involved a narrative water quality standard in Texas-issued CWA permits that forbids discharges of floating solids "in other than trace amounts." The plaintiffs introduced into evidence hundreds of bags of plastic waste collected from waters downstream of the facility. The judge determined that "trace" meant a "very small" or "barely discernable" quantity, and concluded the plaintiffs' evidence demonstrated a violation of this threshold. Notably, evidence of prior state enforcement did not have a preclusive effect, but rather was deemed proof the defendant was a "serial offender." The consent decree resolving the case ordered $50 million in new and improved technologies and operations to prevent plastics in wastewater, penalties and attorneys' fees, and various environmental projects—all with a sizable oversight role for the NGOs. As discussed below, although the lawsuit is over, its outcome is affecting all dischargers in Texas that produce or handle plastics. The second case of interest is pending in federal court in South Carolina and asserts CWA and Resource Conservation and Recovery Act (RCRA) claims. The defendant operates a facility on a marina in Charleston, and like the Texas case, plaintiffs' evidence includes plastic materials collected from nearby surface waters. The RCRA claim alleges an "imminent and substantial endangerment" from plastics waste spillage at the facility. The court recently held the plaintiffs have standing and may pursue discovery on both the CWA and RCRA claims. The other two lawsuits involve NGO actions to reverse government approvals related to plastics. A pending case in Louisiana is challenging the state's approval of air permits for a proposed new plastics manufacturing facility in St. James Parish. This case is part of a stated broader NGO objective to stop new plastics manufacturing in the U.S. The permit challenge here is largely premised on environmental justice and climate change concerns. In another recently resolved case, an NGO sued the EPA for approving Hawaii's CWA list of impaired waters when the list did not include waters from which plaintiffs had collected plastic materials. The EPA reversed its approval and sent the matter back to Hawaii, and later overrode Hawaii and listed two waters as impaired for plastics. These lawsuits have consequences beyond the immediate defendant and outcome in each case. Industries involved in manufacturing or managing plastics should be aware of these potential impacts even if they do not operate in Texas, South Carolina, Louisiana, or Hawaii. The best way to avoid a citizen suit is to not draw that negative attention in the first instance. This means examining current operations to take steps to reduce and prevent plastics from entering the environment where practicable and to the extent required by applicable law. (Ref. 3)

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Modernizing the EPA Ignitability Test: Alcohol, Thermometers, and Multi-Phased Substances

It took nearly thirty years, but EPA has updated the test methods used to determine whether a waste is an ignitable hazardous waste under the Resource Conservation and Recovery Act (RCRA). The revisions are intended to provide greater clarity and flexibility for generators navigating the alcohol exclusion, use of mercury-free thermometers, and evaluation of multi-phase wastes. Subtitle C of RCRA establishes a cradle-to-grave scheme for management of hazardous waste. A solid waste is a hazardous waste if it exhibits characteristics of ignitability, corrosively, reactivity, or toxicity or is otherwise listed as a hazardous waste by EPA. 40 CFR 261.3(a); 261.21-24. Ignitable hazardous wastes are designated Hazardous Waste Code No.

D001. 40 CFR 261.21. In April 2019, EPA published a proposed rule modernizing the test for ignitable liquids and updating related regulatory requirements. The final rule promulgated in July 2020 adopted only revisions to the test for ignitable liquids. As noted below, the final rule differed in a number of respects from what was proposed in April 2019. As stated in the proposed rule, EPA intended initially to expand on the exclusion for alcohol-related liquid ignitable waste. EPA suggested revising the test to (1) replace the undefined term ''aqueous'' with ''at least 50 percent water by weight,'' and (2) clarify that ''alcohol'' means ''any alcohol or combination of alcohols'' except for alcohol that had ''been used for its solvent properties and is one of the alcohols specified in EPA Hazardous Waste No. F003 or F005.'' The effect of this change was to narrow regulated alcohols to those also listed as Hazardous Waste Codes F003 and F005.

The second significant revision to the ignitability test involves an exclusion with broader application: revising the underlying test method to remove use of mercury thermometers as a requirement in determining flashpoint. The proposed rule proposed to update SW–846 air sampling and stack emissions Test Methods 0010, 0011, 0020, 0023A, and 0051 (all adopted by reference in the ignitability tests) to allow use of alternative temperature-measuring devices. This was proposed because EPA determined that "removal of the requirement to use mercury thermometers does not change the underlying technology of the test methods and is not expected to affect the precision or accuracy of the test methods." 85 Fed. Reg. at 40597. An added benefit of this proposed change was reducing the potential release of mercury to the environment from mercury thermometers. The final rule does not codify how to properly test multi-phase wastes for an ignitability determination, but does adopt specific guidance for generators dealing with these unique waste streams. In short, all phases of a containerized waste must be considered. The proposed rule sought to codify existing EPA policies requiring generators to make a hazardous waste determination on multi-phase wastes at the "point of generation." The point of generation as defined by regulation is the "act or process producing hazardous waste identified or listed in part 261 of this chapter or [the] act, which first causes a hazardous waste to become subject to regulation." 40 CFR 260.10 (defining "Generator"). The proposed rule posited means the test for ignitability applies when a single phase of a waste is first generated and during the course of normal management of that waste. Therefore, if multi-phase separation occurs during storage of a liquid, the proposed rule would have required the facility to consider each individual phase to be a separate waste stream. Revision to the ignitability test for non-listed hazardous wastes warrants attention because changes and policies may affect how your facility manages certain waste streams. The alcohol exclusion now requires 50% water in the waste stream to be considered "aqueous," mercury thermometers may be avoided in air emission tests, and guidance cautions generators about multiphase waste re-affirming use of the Paint Filter Liquid Test for each phase in a multi-phase solid waste to meet the solid phase designation.

(Ref. 4)

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4. EDITORIAL BOARD SELECTIONS

CRISPR-edited poplar trees could cut carbon emissions during paper production

Researchers by VIB-UGent Center for Plant Systems Biology have discovered a way to stably finetune the amount of lignin in poplar by applying CRISPR/Cas9 technology. Lignin is one of the main structural substances in plants and it makes processing wood into, for example, paper difficult. This study is an important breakthrough in the development of wood resources for the production of paper with a lower carbon footprint, biofuels, and other bio-based materials. Their work, in collaboration with VIVES University College (Roeselare, Belgium) and University of Wisconsin (USA) appears in Nature Communications. Today's fossil-based economy results in a net increase of CO_2 in the Earth's atmosphere and is a major cause of global climate change. To counter this, a shift towards a circular and bio-based economy is essential. Woody biomass can play a crucial role in such a bio-based economy by serving as a renewable and carbon-neutral resource for the production of many chemicals. Unfortunately, the presence of lignin hinders the processing of wood into bio-based products. A few years ago, they performed a field trial with poplars that were engineered to make wood containing less lignin. Most plants showed large improvements in processing efficiency for many possible applications. The downside, however, was that the reduction in lignin accomplished with the technology we used then – RNA interference – was unstable and the trees grew less tall. Undeterred, the researchers went looking for a solution. They employed the recent CRISPR/Cas9 technology in poplar to lower the lignin amount in a stable way, without causing a biomass yield penalty. In other words, the trees grew just as well and as tall as those without genetic changes. Poplar is a diploid species, meaning every gene is present in two copies. Using CRISPR/Cas9, they introduced specific changes in both copies of a gene that is crucial for the biosynthesis of lignin. Then inactivated one copy of the gene, and only partially inactivated the other. The resulting poplar line had a stable 10% reduction in lignin amount while it grew normally in the greenhouse. Wood from the engineered trees had an up to 41% increase in processing efficiency". The mutations that they have introduced through CRISPR/Cas9 are similar to those that spontaneously arise in nature. The advantage of the CRISPR/Cas9 method is that the beneficial mutations can be directly introduced into the DNA of highly productive tree varieties in only a fraction of the time it would take by a classical breeding strategy. The applications of this method are not only restricted to lignin but might also be useful to engineer other traits in crops, providing a versatile new breeding tool to improve agricultural productivity. (Ref. 5)

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Is It Possible To Turn Plastic Waste Into Affordable Housing?

For decades, companies have relied on disposable plastic packaging to bag and contain products worldwide. Today, the staggering detrimental effects of this plastic dependence are well-known: since the 1950's, over 9 billion tons of plastic have been produced, only 9% of which was recycled; around the world, one million plastic bottles are bought every minute and two million plastic bags are used every minute; and per the Plastic Pollution Coalition, by 2050, the oceans will contain more plastic than fish by weight. Moreover, plastic is a petroleum product, and its production only further contributes to the devastating climate effects of mass fossil fuel use. As concerns over pollution and global warming escalate, other humanitarian

issues, notably homelessness, remain equally pressing. According to the United Nations Human Settlements Program, 1.6 billion people around the world live in inadequate housing, and available data suggests that over 100 million people have no housing at all. In Sub-Saharan Africa alone, the immediate need for low-cost housing is 160 million units and is expected to increase to 350 million by 2050. Moreover, COVID-19 has only exacerbated this issue of homelessness and the houseless have been especially vulnerable to contracting the disease. Thus, on World Habitat Day earlier this month, UN-Habitat launched a partnership with the Norwegian startup Othalo to combat both issues—plastic pollution and homeless—at once. Othalo, formally established in 2019, is known for its patented technology that mass produces building systems from recycled plastic waste. These buildings can include housing, refugee shelters, temperature controlled mobile storage units for food and medicine, schools, and hospitals. Moreover, all of these structures are affordable, sustainable, eco-friendly, and meet modern living standards—and are all made of recycled plastic. A single 60 square meter home upcycles eight tons of plastic; with the amount of plastic waste currently polluting the planet, one billion Othalo homes could be manufactured. Furthermore, according to a press video by Othalo, these fabricated building systems are designed to be flexible and can be molded to meet endless possibilities. Othalo's designers created a series of modules that can be locked together, permitting a wide variety of buildings to be made from these core components. In the video, it suggests whole communities of Othalo plastic housing designed to meet the needs of the surrounding area. (Ref. 6)

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Achieving Wastewater Treatment Compliance with Efficient System for Aerospace Industry

In the manufacture, maintenance, and cleaning of aircraft, the aerospace industry must meet EPA and local wastewater requirements for effluent, including those under the Clean Water Act. Under the Clean Water Act, the EPA has identified 65 pollutants and classes of pollutants as "toxic pollutants," of which 126 specific substances have been designated "priority" toxic pollutants. Failing to do so can result in severe fines that quickly escalate. Typically, manufacturing military or commercial aircraft, jet engines, helicopters, or specialized parts can involve using process rinse water. This can be utilized while producing, deburring, or finishing aluminum, titanium, or composite parts. Water is also used for plating metals, molding composites, and manufacturing electronics. For example, in defense, to improve wear and tolerance, aerospace components can use cyanide cadmium plating, a process that produces a toxic waste that must be treated. In addition, in the maintenance and cleaning of aircraft, washing may be utilized to rid everything from components to fleets of any dirt, debris, or residues that could degrade performance or aesthetics. In the commercial airline portion of aerospace, even running onboard amenities such as toilets and sinks can produce wastewater.

For the aerospace industry, this means installing a wastewater treatment system that effectively separates the contaminants from the water so it can be legally discharged into sewer systems or even re-used. However, traditional wastewater treatment systems can be complex, often requiring multiple steps, a variety of chemicals and a considerable amount of labor. Even when the process is supposedly automated, too often technicians must still monitor the equipment in person. This usually requires oversight of mixing and separation,

adding of chemicals, and other tasks required to keep the process moving. Even then, the water produced can still fall below mandated requirements. Although paying to have aerospace industry wastewater hauled away is also an option, it is extraordinarily expensive. In contrast, it is much more cost effective to treat the industrial wastewater at its source, so treated effluent can go into a sewer and treated sludge passes a TCLP (Toxicity Characteristics Leaching Procedure) test and can be disposed of as non-hazardous waste in a local landfill. Fortunately, complying with EPA and local wastewater regulation has become much easier with more fully automated, wastewater treatment systems. Such systems not only reliably meet regulatory wastewater requirements, but also significantly reduce the cost of treatment, labor and disposal when the proper Clear treat separating agents are also used.
(Ref. 7)

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Designing batteries for easier recycling could avert a looming e-waste crisis

As concern mounts over the impacts of climate change, many experts are calling for greater use of electricity as a substitute for fossil fuels. Powered by advancements in battery technology, the number of plug-in hybrid and electric vehicles on U.S. roads is increasing. And utilities are generating a growing share of their power from renewable fuels, supported by large-scale battery storage systems. These trends, coupled with a growing volume of battery-powered phones, watches, laptops, wearable devices and other consumer technologies, leave us wondering: What will happen to all these batteries once they wear out? Despite overwhelming enthusiasm for cheaper, more powerful and energy-dense batteries, manufacturers have paid comparatively little attention to making these essential devices more sustainable. In the U.S. only about 5% of lithium-ion batteries – the technology of choice for electric vehicles and many high-tech products – are actually recycled. As sales of electric vehicles and tech gadgets continue to grow, it is unclear who should handle hazardous battery waste or how to do it. As engineers who work on designing advanced materials, including batteries, we believe it is important to think about these issues now. Creating pathways for battery manufacturers to build sustainable production-to-recycling manufacturing processes that meet both consumer and environmental standards can reduce the likelihood of a battery waste crisis in the coming decade. While it will be challenging to bake recyclability into the existing manufacturing of conventional lithium-ion batteries, it is vital to develop sustainable practices for solid-state batteries, which are a next-generation technology expected to enter the market within this decade.

A solid-state battery replaces the flammable organic liquid electrolyte in lithium-ion batteries with a nonflammable inorganic solid electrolyte. This allows the battery to operate over a much wider temperature range and dramatically reduces the risk of fires or explosions. A team of Nano engineers is working to incorporate ease of recyclability into next-generation solid-state battery development before these batteries enter the market. Conceptually, recycling-friendly batteries must be safe to handle and transport, simple to dismantle, cost-effective to manufacture and minimally harmful to the environment. After analyzing the options, they have chosen a combination of specific chemistries in next-generation all-solid-state batteries that meets these requirements. Compared to recycling lithium-ion batteries, recycling solid-

state batteries is intrinsically safer since they're made entirely of nonflammable components. Moreover, in the proposed design the entire battery can be recycled directly without separating it into individual components. This feature dramatically reduces the complexity and cost of recycling them. (Ref. 8) **Back to Newsletter's Page 1**

Common Fungicide Causes a Decrease in Antioxidant Responsible for Defense Against Diseases like COVID-19

Research from the University of Wisconsin—Madison (UWM), suggests that fludioxonil—a commonly used agricultural fungicide—decreases the human body's ability to defend itself against illnesses, like COVID-19, and promotes disease permanency. A pesticide-induced reduction in the antioxidant glutathione could be responsible for this lack of bodily defense against disease. Although many studies examine how pesticides adversely affect the human body (i.e., cancer, respiratory issues, etc.), very few studies assess how pesticides reinforce chemical disruption patterns that reduce levels of vital chemicals needed for normal bodily function. The steady rise in U.S. pesticide use, including disinfectants, threatens animals and humans, as exposure to indiscriminate dispersal of pesticides cause a whirlwind of health risks. As the total U.S. COVID-19 cases rise above 7.5 million, global leaders need to understand extensive pesticide spraying is not a viable solution to prevent illness and causes more chronic harm from exposure in the long run. Amidst the outbreak of SARS-CoV-2 (COVID-19), the global demand for pesticides, including disinfectants and sanitizers, has increased substantially as a means of preventing illness in domestic and community settings. Additionally, the increasing pervasiveness of moist environments from severe weather events like hurricanes increases the amount of mold and mosquito pests in some areas, causing higher inputs of fungicides and insecticides to combat the issue. However, exposure to these toxic pesticides can weaken the body's immune response to illnesses, creating an environment for underlying conditions (like respiratory issues such as asthma, or endocrine disruption problems like diabetes) to flourish among vulnerable individuals. Although the U.S. Environmental Protection Agency (EPA) deems fludioxonil safe for use, claiming "no harm will result to the general population, including infants and children, from aggregate exposure to fludioxonil residues," the previous findings suggest that the chemical can cause more potential to harm non-fungal cells than previously thought. (Ref. 9) **Back to Newsletter's Page 1**

5. ESD NEWSLETTER READER COMMENTS

None received this month.

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ESD NEWSLETTER BOARD

NEWSLETTER ARTICLE REFERENCES

1 https://www.genengnews.com/insights/crispr-targets-climate-change/
2. http://geographical.co.uk/people/development/item/3872-from-lab-grown-meat-to-gmo-are-you-ready-to-embrace-novel-food-tech
3. https://news.bloomberglaw.com/environment-and-energy/citizen-suits-lead-the-way-for-agencies-on-plastics-enforcement
4. https://www.jdsupra.com/legalnews/modernizing-the-epa-ignitability-test-71268/
5. https://geneticliteracyproject.org/2020/10/08/crispr-edited-poplar-trees-could-cut-carbon-emissions-during-paper-production/
6. https://www.archdaily.com/950213/is-it-possible-to-turn-plastic-waste-into-affordable-housing
7. https://www.aviationpros.com/aircraft/press-release/21160283/sabo-industrial-achieving-wastewater-treatment-compliance-with-efficient-system-for-aerospace-industry
8. https://theconversation.com/designing-batteries-for-easier-recycling-could-avert-a-looming-e-waste-crisis-146065
9. https://beyondpesticides.org/dailynewsblog/2020/10/common-fungicide-causes-a-decrease-in-antioxidant-responsible-for-defense-against-diseases-like-covid-19/

ABOUT 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 Systems Division (ESD) 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.

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