



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

01 APRIL 2021

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.

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1. ESD DIVISION NEWS

ASME ENERGY STORAGE COMMITTEE

The Energy Generation and Storage Technology Group (EGSTG) formed a new Energy Storage Committee (ESC) in the Spring of 2020. The ESC is dedicated to the advancement of energy storage systems: for both utility and distributed systems. The focus of ESC extends across most of the other ASME Divisions and Sectors. This Committee works with the government, industry, academia, ASME Codes & Standards, ASME Government Relations and other relevant



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professional and regulatory organizations to discuss, review, and promote practices that lead to the development, enhancement, and deployment of energy storage technologies.

The core values of ESC are to:

- Support international/intersociety professionals wishing to advance the application of energy storage thru basic research applied research, development, and implementation
- Create and publish peer-reviewed high-value content, reference documents
- Facilitate the creation, dissemination, and application of knowledge (science, engineering, technology) and information in energy storage within and outside ASME
- Attract students and young engineers into this area and provide them a forum to grow and advance their careers
- To encourage and facilitate a process for members to provide their expertise in the standards-setting process for energy storage
- To promote codes and standards for new areas energy storage
- To provide closer interface within and outside ASME through joint efforts/collaboration
- To help members keep pace with the latest developments

The main purposes of the Committee are fivefold:

- To develop and maintain the Energy Storage Matrix so that all (not only those on the Committee) know the status of the various technologies
- To develop standards (both ASME and IEEE as well as others) for energy storage: the Committee is a resource (e.g., people, volunteers, knowledge) for the various groups working on standards
- As central coordinating Committee (group) for sharing knowledge and answering questions on Energy Storage
- As a networking center for those directly (and indirectly) working on Energy Storage
- To develop events on Energy Storage such as webinars, forums, and conferences

ESC members include engineers (and others) conducting research and practicing engineers in energy storage, storage equipment design, regulatory programs, operations, design, maintenance, and testing of energy storage systems. Membership on the ESC is open to all ASME members, other professional society's (e.g., IEEE, AIChE, etc.), the governmental and regulatory community, and other interested individuals. Membership on the Committee is free to all. The intent is for the ESC to transition into an ASME Energy Storage Division in approximately one to two years. If you are interested in becoming a member of the Committee or need more information, please contact Arnie Feldman, Chair (jjdsenv@att.net).

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Request for Applications: Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere

EPA is providing flexibilities to applicants experiencing challenges related to COVID-19. Please see the Flexibilities Available to Organizations Impacted by COVID-19 clause in Section IV of [EPA's Solicitation Clauses](#).



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URL: [Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere Request for Applications \(RFA\)](#)

Open Date: March 25, 2021

Close Date: June 2, 2021

Register for the Informational Webinar on April 28 at 2 p.m. ET: [Information Webinar: Request for Applications: Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere](#)

Background: The U.S. Environmental Protection Agency (EPA), as part of their Science to Achieve Results (STAR) program, is seeking applications for research to advance measurement and monitoring methods for air toxics and contaminants of emerging concern in the atmosphere that pose health concerns. Air toxics are a subset of air pollutants known or suspected to be acutely toxic or cause chronic human health effects, or to have adverse environmental and ecological effects. There is extensive evidence that minority and low-income communities are disproportionately burdened with exposures to air toxics.

Specifically, EPA looking for research that will provide:

1. Advancements in measurement techniques for real-time, continuous measurements of ambient air pollutant concentrations with minimum detection limits below background concentrations or health risk-based thresholds; and
2. Advancements in stationary or mobile near-source measurement methods for quantifying emission rates of fugitive emissions.

The goal is that this research will support state, local and tribal air monitoring efforts to address community-based initiatives regarding air toxics and emerging contaminants of concern, as well as environmental justice issues. Additionally, EPA hope research from this grant opportunity will lead to improved source measurement methods that can be used to quantify emissions, develop emissions inventories, inform the development of effective emission control strategies and ultimately improve public health.

How to Apply: [Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere Request for Applications \(RFA\)](#)

[Learn more about the Air and Energy \(A-E\) Research Program.](#)

[Learn more about EPA Research Grants.](#)

Informational Webinar for Applicants

Date: Wednesday, April 28, 2021



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Time: 2:00 p.m. – 3:00 p.m. EST

Register: [Information Webinar: Request for Applications: Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere](#)

Join EPA for an informational webinar that will provide an overview and cover application information for the Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere RFA.

Webinar Objectives:

- Share general information on research areas for the RFA
- Learn about the administrative, submission, eligibility and peer review processes
- Question and answer session

The webinar slides will be available at [Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere Request for Applications \(RFA\)](#) for those unable to participate in the scheduled webinar. [Back to Newsletter's Page 1](#)

2. ENVIRONMENTAL TECHNOLOGIES

New crop protection strategy to boost immune system of plants

The University of Sheffield Institute for Sustainable Food has identified a way to commercialise 'priming chemicals' that can be used as a crop protection technology to boost the immune system of plants.

- University of Sheffield Institute for Sustainable Food to commercialise priming chemicals that can be used as a viable crop protection technology
- Priming chemicals boost the immune system of a plant and offer long-term protection against pests and diseases
- Using priming chemicals will help the agricultural sector reduce reliance on harmful pesticides
- The Institute hopes their advances in methods to minimise effects chemical primers on plant growth will help in future adoption by the agricultural sector

The University of Sheffield Institute for Sustainable Food has identified a way to commercialise 'priming chemicals' that can be used as a crop protection technology to boost the immune system of plants. The chemicals increase the resistance of plants and enable a faster and stronger defence reaction against pests and diseases. This alternative crop protection strategy offers long-term immune protection for plants, unlike more popular pesticides. A large proportion of global crop yield is lost to plant pests and diseases every year and whilst



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pesticides help to reduce these losses, there is increasing worry about their use in agricultural food products and the effect they have on the environment. Despite concerns about pesticide usage, both on the environment and to human health, it has actually increased in most European countries due to increased disease pressure and resistance developing to the most common pesticides. So there is an urgent need for alternative and effective crop protection strategies that allow us to reduce, and ultimately eliminate, our reliance on pesticides. These strategies must not only be economically feasible for farmers, but also address consumer concerns about environmental sustainability and the potential health risks of chemical residues in our food. (Ref. 1)

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Are Biodegradable Additives for Food Packaging a Solution?

We know that biodegradable additives in packaging are the wrong solution to the plastics problem, so why are they still on the table? As we all know, packaging plays a major role in achieving a more sustainable food system. However, consumers hear of and sometimes encounter rivers clogged with packaging, islands in oceans made of garbage, and discarded packaging littering the roadside. We all would like this ill-disposed packaging to "just go away!" And, we do have the technology to make it disappear. Yes, this packaging in the oceans, rivers, lakes, and streets can easily be degraded, and we can have more space in our landfills if we add degradable technology to packaging. Right? Wrong! Degrading packaging waste is a neat, plausible, and wrong answer because:

1. Compounds that remain will be released that are not intended to enter oceans and land.
2. Cleaning up these remaining compounds is much more complicated than retrieving a plastic bottle from the water or roadside.
3. We need to adopt more environmentally sustainable sourcing of packaging materials and design, and properly collect and sort packaging for proper disposal.

If we know that degrading packaging is the wrong answer, why is it still on the table, so to speak? There is an issue because degrading packaging waste is once again being promoted as a solution. Besides the old OXO additives currently in disfavor, there are apparently a host of new ones available. We have named them distractors, as they distract our attention from the real goal: reduce the negative environmental impact of food packaging both by itself and, in its more important role, to protect the food it contains. Distractors include technology for use on and in packaging materials to promote their biodegradation and degradation. A few years ago, the OXOs, which promote degradation of packaging in water, on land, and in landfills, were adopted and then "unadopted", once more rational minds prevailed. OXOs are an array of additives that are added to packaging to facilitate degradation. OXOs were banned because they break down packaging into macro-, micro-, and nano- sized pollution. As packaging professionals know, proper disposal of the packaging is essential. Much packaging can be minimized, reused, and recycled to limit the impact on the environment of getting food to people. Other packaging can be used to recover energy in waste-to-energy incineration or biologically active and inactive landfills. Some can be degraded in controlled facilities. When



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research showed that uncontrolled degradation of packaging (primarily paperboard and plastic) would result in the release of compounds that would cause macro-, micro-, and nano-sized environmental disasters, these so-called OXOs have been banned in some countries and regions, including the EU. Organizations such as the Sustainable Packaging Coalition and businesses (e.g., Walmart) also frown upon or ban them, as well. However, the distractors are on the rise — we have OXOs, as well as non-OXO technology, promoted again to degrade packaging. Four reasons why distractors should be banned.

1. Using distractors, biodegradation and general degradation occur where it is not desired.
2. Overall, distractors promote "business as usual" by not addressing the central issue of promoting more environmentally sustainable packaging and design.
3. Distractors could pose a significant health risk when used in food packaging.
4. Distractors' use in a biologically active landfill has a strong value proposition because it is a controlled environment. However, there are major concerns with the claims.

(Ref. 2)

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3. ENVIRONMENTAL REGULATIONS

CBD Regulatory Enforcement Continues with Over-the-Counter CBD Pain Relief Products

Enforcement by the Food and Drug Administration (FDA) against cannabidiol (CBD)-containing products continues through the issuance of two new warning letters. On March 22, 2021, FDA published a press release cautioning companies against illegally selling over-the-counter (OTC) CBD products for pain relief. In the warning letters, FDA cited products listing CBD as an inactive ingredient for unapproved drug and misbranding violations. We have previously blogged about the regulation of CBD products by the FDA and provided updates to the government's actions to create a comprehensive regulatory framework for CBD. But as a brief refresher, FDA does not permit adding CBD as an ingredient of food products or dietary supplements. And while the Agriculture Improvement Act of 2018 (the Farm Bill) legalized the production of industrial hemp and products derived from hemp, it did not legalize all uses of and products containing hemp derivatives (such as CBD). Under the Federal Food, Drug and Cosmetic Act (FD&C Act), any product intended to diagnose, cure, mitigate, treat or prevent a disease, and any product (other than a food) that is intended to affect the structure or function of the human body is a drug. This definition includes articles and components of drugs, which are regulated as drugs. OTC drugs must be approved by the FDA or meet the requirements for marketing without an approved new drug application under federal law; this includes drug products containing CBD.

Currently, nonprescription drug products containing CBD may not be legally marketed without an approved new drug application, regardless of whether the CBD is represented on the labeling as an active ingredient or an inactive ingredient. To date, no CBD-containing drug has met applicable FDA requirements to be legally marketed for nonprescription use.



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However, as noted in a prior blog post, the FDA has approved one CBD-containing prescription drug product for the treatment of seizures associated with tuberous sclerosis complex, Lennox-Gastaut syndrome, and Dravet syndrome in human patients. FDA's primary concerns pertaining to CBD use in products include a lack of safety data and the quality of the CBD products on the market. Currently, there is insufficient safety data to establish cumulative exposure to CBD (and THC), impact on vulnerable populations, or impact on drug development. There are also concerns about contaminants such as heavy metals, microbials, pesticides, and THC. In addition, FDA is concerned that there is a lack of appropriate processing controls and practices regarding the quality of CBD products, which puts consumers at additional risk. (Ref. 3) [Back to Newsletter's Page 1](#)

The 'Green Energy' That Might Be Ruining the Planet

Here's a multibillion-dollar question that could help determine the fate of the global climate: If a tree falls in a forest—and then it's driven to a mill, where it's chopped and chipped and compressed into wood pellets, which are then driven to a port and shipped across the ocean to be burned for electricity in European power plants—does it warm the planet? Most scientists and environmentalists say yes: By definition, clear-cutting trees and combusting their carbon emits greenhouse gases that heat up the earth. But policymakers in the U.S. Congress and governments around the world have declared that no, burning wood for power isn't a climate threat—it's actually a green climate solution. In Europe, "biomass power," as it's technically called, is now counted and subsidized as zero-emissions renewable energy. As a result, European utilities now import tons of wood from U.S. forests every year—and Europe's supposedly eco-friendly economy now generates more energy from burning wood than from wind and solar combined. Biomass power is a fast-growing \$50 billion global industry, and it's not clear whether the climate-conscious administration of President Joe Biden will try to accelerate it, discourage it or ignore it. It's usually obvious which energy sources will reduce carbon emissions, even when the politics and economics are tricky; everyone agrees that solar and wind are cleaner than coal. But when it comes to power from ground-up trees, there's still a raging substantive debate about whether it's a forest-friendly, carbon-neutral alternative to fossil fuels, or an environmental disaster. Even within the Biden administration, senior officials have taken different sides of that debate.

Biden's answer will be extremely important, because as odd as it sounds during a clean-tech revolution driven by modern innovations like advanced batteries and smart grids, there's been a resurgence in the old-fashioned technique of burning wood to produce energy. The idea that setting trees on fire could be carbon-neutral sounds even odder to experts who know that biomass emits more carbon than coal at the smokestack, plus the carbon released by logging, processing logs into vitamin-sized pellets and transporting them overseas. And solar panels can produce 100 times as much power per acre as biomass. Nevertheless, the global transition away from fossil fuels has sparked a boom in the U.S. wood-pellet industry, which has built 23 mills throughout the South over the past decade, and is relentlessly trying to brand itself as a 21st-century green energy business. Its basic argument is that the carbon released while trees are burning shouldn't count because it's eventually offset by the carbon absorbed while other trees are growing. That is also currently the official position of the U.S. government, along with many other governments around the world. In February, more than 500 scientists and economists wrote to President Joe Biden and other leaders to warn that converting wood into



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power is a carbon disaster, a forest destroyer and an absurdly inefficient way to generate energy. Supplying just 2 percent more global energy from biomass, they estimated, would require doubling total global wood harvests. The letter made it clear that any governments that encourage biomass electricity will be ravaging biodiverse forests and damaging humanity's chances to avert the worst climate catastrophes. "Trees are more valuable alive than dead," the letter said.

The Trump administration's industry-friendly Environmental Protection Agency declared biomass power inherently carbon neutral, although it never finalized a rule to that effect. Congress passed a similar decree in an unrelated 2020 budget bill. It's not yet clear whether Biden will maintain the status quo, or whether he'll deem biomass power inconsistent with his larger climate push. (Ref. 4) [Back to Newsletter's Page 1](#)

4. EDITORIAL BOARD SELECTIONS

Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance (2021)

Climate change is creating impacts that are widespread and severe for individuals, communities, economies, and ecosystems around the world. While efforts to reduce emissions and adapt to climate impacts are the first line of defense, researchers are exploring other options to reduce warming. Solar geoengineering strategies are designed to cool Earth either by adding small reflective particles to the upper atmosphere, by increasing reflective cloud cover in the lower atmosphere, or by thinning high-altitude clouds that can absorb heat. While such strategies have the potential to reduce global temperatures, they could also introduce an array of unknown or negative consequences.

This report concludes that a strategic investment in research is needed to enhance policymakers' understanding of climate response options. The United States should develop a transdisciplinary research program, in collaboration with other nations, to advance understanding of solar geoengineering's technical feasibility and effectiveness, possible impacts on society and the environment, and social dimensions such as public perceptions, political and economic dynamics, and ethical and equity considerations. The program should operate under robust research governance that includes such elements as a research code of conduct, a public registry for research, permitting systems for outdoor experiments, guidance on intellectual property, and inclusive public and stakeholder engagement processes. (Ref. 5)

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Over 100 Chemicals Detectable in Pregnant Women, Including 98 "New" or Unknown Compounds

A new University of California San Francisco (UCSF) study, published in Environmental Science & Technology, finds over 100 chemicals present in U.S. pregnant women's blood and umbilical cord samples. This discovery ignites concerns over prenatal exposure to chemicals from consumer and industrial products and sources. Furthermore, 89 percent of these



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chemical contaminants are unknown sources and uses, lacking adequate information, or are not previously detectable in humans. This discovery ignites concerns over prenatal exposure to chemicals from consumer and industrial products and sources. A National Health and Nutrition Examination Survey (NHANES) finds U.S. pregnant women experience frequent exposure to environmental pollutants that pose serious health risks to both mother and newborn. Many known environmental pollutants (i.e., heavy metals, polychlorinated biphenyl, and pesticides) are chemicals that can move from the mother to the developing fetus at higher exposure rates. Hence, prenatal exposure to these chemicals may increase the prevalence of birth-related health consequences like natal abnormalities and learning/developmental disabilities.

Current chemical biomonitoring methods only analyze a targeted few hundred chemicals—a small portion of the over 8000 chemicals the U.S. manufactures and imports. However, this study employs new technology that identifies a more comprehensive range of industrial chemicals. Therefore, research like this is essential for future technological development that can identify likely omnipresent chemical exposures for future health risks. UCSF scientists note, “Our study is an important methodological approach for future studies that will aim at characterizing the presence and toxicity of newly detected chemical compounds in the human body and assess the fate of these compounds in various human tissues, particularly between the mother and the fetus. Understanding these exposures and how they may contribute to adverse health outcomes is crucial in characterizing the human exposome and eventually preventing the development of disease.”

This research represents a new proof-of-concept study that develops a suspect screening technique to characterize chemicals. The method combines non-target data from high-resolution mass spectrometry (HRMS) with target data from an industrial chemical database of approximately 3500 high-production volume chemicals. Researchers assessed maternal and umbilical cord blood samples for differences in chemical presence and enrichment. Lastly, chemical identification compared the structure of chemicals found in blood samples to those within the industrial chemical database. The study detects 109 chemicals within blood samples of mothers and newborns, including pesticides, plasticizers, compounds in cosmetics and consumer products, pharmaceuticals, flame retardants, and per- and polyfluoroalkyl substances (PFAS) compounds. Of the 109 chemicals, 55 lack preceding reports on their presence in humans, and 42 chemical compounds have little to no information regarding chemical classification, use, and source of contamination.

Environmental contaminants like pesticides are ubiquitous in the environment, with 90 percent of Americans having at least one pesticide compound in their body. The presence of pesticides in the body has implications for human health, especially during vulnerable life stages like childhood, puberty, pregnancy, and old age. Pesticide exposure during pregnancy is of specific concern as health effects for all life stages can be long-lasting. Just as nutrients are transferable between mother and fetus, so are chemical contaminants. Studies find pesticide compounds present in the mother’s blood can transfer to the fetus via the umbilical cord. Therefore, pesticide exposure during pregnancy has implications for both mother and child’s health. Many studies indicate prenatal and early-life exposure to environmental toxins



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increases susceptibility to disease. A 2020 study finds the first few weeks of pregnancy are the most vulnerable periods during which prenatal exposure to pesticides can increase the risk of the rare fetal disorder holoprosencephaly. This disorder prevents the embryonic forebrain from developing into two separate hemispheres. Moreover, women living near agricultural areas experience higher exposure rates that increase the risk of birthing a baby with abnormalities. Some of these birth abnormalities include acute lymphoblastic leukemia and Attention-Deficit/Hyperactivity Disorder (ADHD). Even regular household pesticide use during pregnancy can increase nephroblastoma (kidney cancer) and brain tumor risk in children. (Ref. 6) [Back to Newsletter's Page 1](#)

Urban sanitation, a major challenge for sustainable cities in Africa

On the occasion of World Water Day, Afrik 21 raises this issue. "Why is sustainable sanitation in African cities important?" Three answers: the preservation of people's health, the preservation of the environment and resources, and the prevention of natural disasters such as floods. Africa is still far behind in all these areas. In all countries south of the Sahara, for example, barely 28% of the population has access to basic sanitation facilities and 32% still practise open defecation. This faecal sludge ends up in the waterways, where these same populations get their water, leading to the spread of diseases such as neglected tropical diseases (diarrhoea, cholera, typhoid, etc.). "In Nigeria, for example, diarrhoea causes the death of more than 70,000 children under the age of five each year," says the United Nations Children's Fund (UNICEF). With 36% of the population indulging in unrestrained behaviour, Mozambique is also among the sub-Saharan African countries where open defecation remains very high.

Senegal is one of the few countries south of the Sahara that have realised the urgency of the situation, which has been exacerbated by the health crisis caused by Covid-19. Access to sanitation is a reality for 67.4% of the urban population of this West African country. Senegal has achieved this level through the application of standards ISO 30500, ISO 24521 and ISO 31800. ISO 30500 sets out specifications for new domestic toilets that treat waste on site, while ISO 24521 provides recommendations for improving the quality of services and the safe management of sanitation services. ISO 31800 specifies requirements to ensure the performance, safety, operability and maintainability of faecal sludge treatment units. All these standards aim to introduce the necessary requirements for the quality and safety of sanitation infrastructures and systems. With the difficulties of accessing a safe source of water for sanitation, some African countries are focusing on more environmentally friendly solutions. In Uganda, for example, the Professional Town Planning Association of East Africa (Pupaea) plans to install one million eco-friendly toilets in rural and suburban areas by 2030. Apart from faecal sludge, other wastes such as sewage sludge, petroleum waste, plastic bottles also end up in waterways in Africa, clogging the drains. This prevents rainwater from flowing normally, leading to flooding.

In Ivory Coast, for example, the government is implementing the Urban Sanitation and Resilience Project (Paru). It will allow for the construction or rehabilitation of drainage systems for better channelling of rainwater in the most exposed neighbourhoods such as



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Yopougon and Abobo, the two most populated neighbourhoods in Abidjan, as well as Grand Bassam. The discharge of untreated industrial effluent into rivers in Kano, Nigeria, also causes significant damage to its riverbeds, adjacent agricultural land, and contamination of groundwater and dam water reservoirs. In order to clean up the rivers in Kano, three wastewater treatment plants are currently under construction in the West African country. Egypt implements a strict policy to preserve its resources. The country has been able to improve the management of its wastewater through the multiplication of wastewater treatment plants. Preserving the environment in Africa will also require the collection of solid waste (plastic, electronic, cocoa, palm, pineapple, etc.), as some of this rubbish pollutes streets and neighbourhoods and ends up in waterways or clogging up rainwater drains, causing flooding. Among the countries most affected by this phenomenon of insalubrity on the continent are Mali, Niger, Ethiopia, Congo, Chad, Tanzania, Burkina Faso, Mozambique and Nigeria. And when it comes to waste treatment, these countries are no further ahead. The urgent need today is to build an integrated waste management system. For each sanitation project, the emphasis must be placed on both the collection and treatment of waste. This will prevent tragedies such as explosions in landfills, collapses of dumps or landslides as happened at the Koshe landfill in Addis Ababa, Ethiopia, in 2017. It will also help combat global warming by limiting the accumulation of organic waste in methane-emitting landfills. The creation of the integrated waste management chain will be done with all the links in the chain. While in previous years the focus was on waste management by government enterprises, more delegation will be required, especially to the private sector. Informal activities should also be encouraged at the neighbourhood level. (Ref. 7)

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The Who's Who of Lithium-ion Battery Recycling

In recent years, there have many investments in battery technologies, including technologies for battery recycling. This article will present the current major battery recycling projects around the globe.

Due to serious issues surrounding global warming, it has become imperative to implement energy transformation. The Paris Agreement between counties around the world is an effort to collaborate on this transformation. It is estimated that to maintain the global temperature rise within 1.5 degrees, the consumption of electric energy as a renewable energy source will rise from 24 percent to 86 percent Demand is growing for lithium-ion (Li-ion) batteries. With increasing power density and declining prices, these batteries seem to be the answer to all our problems, including EVs. The automotive industry is shaping up to be the biggest end-user of Li-ion batteries. The costs for battery metal separation are usually quite high. Similar to the methods used in the mining industry, recycled batteries undergo smelting. The procedure includes using high temperatures to perform the melting and extraction process. The metals conventionally recovered during the recycling process were cobalt, nickel and copper, but not lithium since it was not in high demand. However, with the energy transformation movement and increasing demand for lithium, that is all about to change. Many battery recycling companies have formed around the globe in recent years.

American Battery Technology (ABT, formerly American Battery Metals Corporation) is focused on a clean-technology platform that provides more effective production of metals used in EVs, grid storage and electronics batteries. Its green battery-production platform seeks to enable a circular economy that provides sustainable sourcing of critical battery materials.



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Using the closed-loop battery recycling process, it recovers individual metals from old batteries and advances them to battery-grade specifications to be sold back for new battery production. **Battery Resourcers** is a startup company focused on making new cathode powders for Li-ion from postindustrial waste. The company recycles Li-ion batteries and manufactures valuable cathode materials. **Northvolt** is a Swedish battery startup founded by former Tesla executives in 2016. Northvolt has already built a pilot recycling project called Revolt. In cooperation with aluminum company Hydro, Northvolt plans to open a recycling plant in Norway in 2021 with a recycling capacity of 8,000 tons per year. **Tesla**, the world's most valuable EV manufacturer, has announced that its batteries can be 100 percent recycled. Tesla has already started a battery recycling service building at its Shanghai Gigafactory in China. However, Tesla's first focus is to extend battery life before they are recycled. **Brup Recycling Technology** is a high-tech company established in 2005 specializing in the recycling and processing of rechargeable battery waste from various battery types, such as nickel-hydrogen, nickel-cadmium and Li-ion batteries. The company's focus is to promote the sustainable development of the EV industry, which also includes properly handling battery waste. **Ganfeng Lithium** is a Chinese Li-ion battery manufacturer that also plans to build a battery-recycling plant in Mexico. This plan should supply the growing U.S. EV market, recycling Tesla batteries and the batteries from Chinese electric buses used in Latin America. **Green Li-ion** is a Singapore startup planning to open its second recycling plant in the first half of 2021. Its goal is to recycle Li-ion battery cathodes with a purity of 99.9 percent. It plans to introduce innovative recycling technology to make the process much faster and more economical—10 times faster with a quarter of the cost—than current technologies. **Li-Cycle** is a Canadian company founded in 2016. They are building a \$175 million recycling plant in Rochester, New York, which will be the largest Li-ion battery recycling plant in North America. **Umicore** is a leading battery materials recycler with 11,000 employees worldwide. Umicore is focused on recycling all components of electric vehicles. Its recycling plant in Hoboken, Belgium, has a Li-ion recycling capacity of 7,000 metric tons a year. (Ref. 8)

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Navigating the latest changes in waste legislation

Waste legislation is the backbone of our industry and, for the most part, any changes in legislation are to be welcomed because they are almost always aimed at further improving recycling quality standards or boosting recycling rates – whether at a local, national or international level. Despite more countries gradually putting in place measures and legislation to recover and recycle plastics, landfilling remains the first option for millions of tonnes of plastics globally. During the Basel Conference which took place in spring 2019, governments agreed to amend the Basel Convention to include plastic waste in a legally-binding framework. One hundred and eighty-six countries agreed to this amendment which places new restrictions on the movement of plastic waste that is not destined for environmentally sound recycling. These new restrictions do not apply in the United States. The amendments came into force on 1 January 2021. Any non-hazardous plastic waste that is not recyclable, or is 'difficult' to recycle, is now categorised as waste requiring 'special consideration' and its movement is now subject to the Basel Convention prior notice and consent requirements. The aim of the amendments is to control international shipments of most plastic scrap and waste destined for recycling or disposal, making global trade in plastic waste more transparent and better



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regulated. The legislation is also intended to stop non-recyclable plastic being 'hidden' in recyclable plastic shipments that are being sent to developing countries which have no way of managing this material. Although most mixed plastics will now require prior informed consent, there are some exceptions. Referred to as 'Green List' waste, waste operators will be permitted to continue exporting this material without prior informed consent. Green List waste includes plastics which consist almost exclusively of one type of plastic that are destined for recycling operations, and mixtures of polypropylene (PP), polyethylene (PE), and polyethylene terephthalate (PET) that are destined for separate recycling. All other plastic wastes exports and imports must be notified and receive consent for export prior to movement.

Advances in automated sorting technology are making it possible to achieve exceptional purity results in plastics recycling – from coloured and clear types of plastic, such as PET and HDPE, to other polymers like polypropylene, polystyrene and PVC. As long as the right legislation, infrastructure and, in particular, the right combination of sorting technology is in place, it is possible to achieve previously unfeasible purity levels of over 99.99% on single polymer streams. This material will not only be able to be shipped internationally without prior consent, but it will also command a much higher market price than mixed plastics, so there are both commercial and legislative drivers for separating and sorting mixed plastics into single streams.. (Ref. 9)

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5. ESD NEWSLETTER READER COMMENTS

None received this month.

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Editor: DR. K. J. SREEKANTH - (sreekanthkj@kisar.edu.kw)

Assoc: DR. JAMES ZUCCHETTO - (jimzuc@comcast.net)

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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.

DISCLAIMER

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