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:
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5. READER COMMENTS TO THE EDITOR
   None received this month

1. ESD DIVISION NEWS

International Conference on Radioactive Waste Management and Environmental Remediation (ICEM) 2023
Submit Abstract by January 29, 2023
ASME, the Nuclear Engineering and the Environmental Systems Divisions, are pleased to announce the return of the International Conference on Radioactive Waste Management and Environmental Remediation (ICEM). The Conference is set for Oct 3 - 6, 2023 in Stuttgart, Germany that had been postponed due to COVID. As with past ICEM’s the Conference will feature Plenary and Luncheon speakers, breakout sessions and an exhibit hall suitable for large equipment displays for radioactive D/D&D tasks. The breakout sessions will feature panel discussions, invited speakers, articles and presentations as well as peer reviewed papers.

Plans continue for the Conference with the first call for Abstracts for Articles, Papers & Presentations to be published on Oct 31, 2021. An announcement will be to ASME members, ASME Division Chairs, Facebook & Linked-In pages.

If you are interested in chairing Track 5 (Low and Intermediate Level Waste (L/ILW) Radioactive Waste Management), becoming a Session Chair or helping to develop the conference please do not hesitate to contact Arnie Feldman (jjdsenv@att.net) or Bob Stakenborghs (Bob@advclean-Energy.com).

Look for additional news and announcements on ICEM 2023 on our new website, LinkedIn, Facebook or the ESD Newsletter. For further information contact Arnie or Bob at the above email addresses.

**ASME Student/Early Career Competition - General Topic**

The [Environmental System Division (ESD) in conjunction with 2022 ASME eFest](https://esdnuclear.org) will be holding its 2nd Annual Student/Early Career Competition. The Competition will take place March 25 – 26, 2022 and will be similar to 2021, it will be divided into three levels:

**Participation Requirements**
- Undergraduate Students
- Graduate Students
- Early Career Engineers

**Prizes**
- 1st Place $250
- 2nd Place $150
- 3rd Place $100

There are some minor changes in the rules for 2022 including the ability for all participants to choose which of four topics they want to compete on. The topics include:
ENVIRONMENTAL SYSTEMS DIVISION
NEWSLETTER
OCTOBER 2021

<table>
<thead>
<tr>
<th>TOPIC #</th>
<th>TOPICS</th>
<th>FOCUS AREAS</th>
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<tr>
<td>1</td>
<td>Powering the Future</td>
<td>The environmental impact of the infrastructure needed to provide power to support a non-hydrocarbon future</td>
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<td>2</td>
<td>Turning Trash into Useful Products</td>
<td>Converting of organic and inorganic waste (e.g., food, plastic, wood, metal, and others) into useful products.</td>
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<td>3</td>
<td>Effects on Environment in the times of COVID-19</td>
<td>Impact/Trends due to increased biomedical wastes, mitigation measures, management plan on the same.</td>
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<td>4</td>
<td>Access to clean drinking water for low-income groups</td>
<td>Low-cost technologies, water management plans to ensure access to clean water for low-income groups</td>
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For more information, please contact Arnold Feldman at jjdsenv@att.net.

ASME/A&WMA WASTE INFORMATION EXCHANGE

ESD, the Research Committee on Energy, Environment and Waste (RCEEW) and the Materials Energy Recovery Division (MER), in conjunction with the Air and Waste Management Association (A&WMA) are planning a Waste information Exchange (WIE) in the Fall of 2022 in the DC Metropolitan Area. The WIE is being modeled after the [Air] Information Exchange, which has been held annually since 1975 in Research Triangle Park (RTP), NC, in which USEPA (QAQPS and ORD) are key participants. The WIE will not require a written paper and any graphics used will be made available to attendees at the discretion of the speaker. The purpose of the Information Exchange is to make participation as a speaker as easy and simple as possible. The idea is to invite experts to come talk about research or regulations on which they are working without having to spend a lot of time in preparation. The WIE will cover policy updates, regulatory changes, and research on the latest waste topics.

ESD, RCEEW and MER are looking for individuals who want to participate in the planning including Track Chairs, Session Chairs, and Panel Chairs. In addition, ESD is looking for a Technical Chair to represent them on the planning Committee. If you are interested in volunteering or want further information, please contact Arnold Feldman at jjdsenv@att.net.

Look for more information on the WIE in future ESD Newsletter's and on the web in LinkedIn and Facebook.
**ASME Dixy Lee Ray Award**

Nominations must be submitted by January 15, 2022

The Dixy Lee Ray Award, established in 1998 "for outstanding engineering achievement in environmental protection through improvements in technology, science and policy" recognizes significant achievements and contributions in the broad field of environmental protection.

Achievement in the following areas will be recognized:
- Environmental engineering, including environmental technology and related topics;
- Other environmental areas, including environmental health, environmental sciences, environmental management and policy, and related topics.

The award was established in honor of Dixy Lee Ray’s advocacy to the development of those technologies that serve humanity. She believed that the engineering profession was uniquely qualified to develop and implement environmentally acceptable technologies.

The person winning this award will be presented with:
- a $1000 honorarium, a bronze medal, a certificate, and will also receive a travel grant (not to exceed $750) to attend the presentation ceremony.

Click here for nomination instructions. Nominations should be submitted by January 15, 2021.

Those seeking additional information should contact the Award Committee Chair. A list of past winners of this award is available on the ASME website (https://www.asme.org/about-asme/honors-awards/achievement-awards/dixy-lee-ray-award).

Questions?
Contact the Dixie Lee Ray Award Committee Chair, Arnie Feldman at jjdserv@att.net.

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**2. ENVIRONMENTAL TECHNOLOGIES**

**Environmental Causes of ADHD: Is It Nature or Nurture?**

When it comes to attention deficit hyperactivity disorder (ADHD), you may wonder whether nature or nurture plays the largest role in causing it. For example, say more than one of your children has been diagnosed with ADHD. Maybe you’re wondering if you’re doing something to cause it. Or, if you or your partner have ADHD and then your child is diagnosed with it, you might be wondering if the diagnosis was inevitable. (In short: Inevitable, no. Likely, yes). The truth is, “the cause of ADHD in an individual, like many other health conditions, cannot be clearly identified.” Environmental factors don't directly cause ADHD. At least, not on their own. Nature, aka genetics, plays a big role. But your environment can also contain factors that lead
to ADHD. In fact, “there is clear evidence that certain environmental risk factors are strongly tied to later ADHD diagnoses.” These environmental factors can include:

- in-utero, or in the uterus, exposure to substances or chemicals
- early birth or low birth weight
- environmental toxins
- illnesses like bacterial disease and encephalitis

Research from 2012 Trusted Source has shown that pregnant women who drink alcohol or smoke tobacco are more likely to have a child with ADHD. One 2018 study found that kids were at greater risk of having ADHD if their mothers were heavy smokers, while another study found that mothers who drank at least 4 alcoholic drinks in one sitting were likely to have a child with ADHD. Maternal diet can also play a role, as can an infection during pregnancy.

“Particular medications, such as antidepressants, antihypertensives, and caffeine,” can also factor in. The American Psychiatric Association adds that babies born early or at a low birth weight also have a greater chance of having ADHD. These can be toxins that you’re exposed to in utero or during your childhood. They can include:

- lead
- mercury
- pesticides
- specific chemical compounds

For example, the Centers for Disease Control and Prevention (CDC) Trusted Source says that lead appears to be associated with inattention, hyperactivity, and impulsivity. These are all symptoms of ADHD. (Ref. 1)

**Persistent Organic Pollutants, including Banned Pesticides, Remain Present in all Fetal Organs Regardless of Maternal Chemical Contamination**

A study published in Chemosphere finds persistent organic pollutants (POPs), including organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs), are present in the serum and placenta of pregnant mothers, as well as multiple fetal organs. Many studies indicate prenatal and early-life exposure to environmental toxicants increases susceptibility to diseases, from learning and developmental disabilities to cancer. However, this study is one of the first to demonstrate the presence of chemical toxicants in fetal tissue that are not present in maternal serum or placental samples. Prenatal development is one of the most vulnerable periods of exposure when the fetus is most susceptible to the harmful effects of chemical contaminants. Therefore, studies like these help government and health officials better identify fetal exposure contaminants and subsequent health concerns otherwise missed by current chemical monitoring methods. The researchers note, “These findings call for further evaluation of the current matrices used to estimate fetal exposure and establish a possible correction factor for a more accurate assessment of
exposure in utero. We disclose the full data set on individual exposure concentrations to assist in building in silico models for prediction of human fetal exposure to chemicals.”

Several studies associate early-life exposure to toxic chemicals with adverse birth/health effects. However, fetal exposure measurements typically use maternal and placenta chemical concentrations rather than actual fetal exposure. Researchers used tandem mass spectrometry to measure chemical concentrations from maternal blood and placenta samples, as well as the liver, heart, lungs, brain, and fatty (adipose) tissues of fetuses. Using gas chromatography, the researchers tested for concentrations of nine different OCPs, ten different PCBs, and three different PBDEs. The cohort included women from 20 pregnancies who gave birth to a stillborn infant. Furthermore, scientists incorporated data from fetal exposure to perfluoroalkyl substances (PFASs) in the same cohort.

All 22 POPs are detectable in fetal fatty tissue samples regardless of chemical detection in the mother. Chemical concentrations are highest among later gestations (pregnancy), male infants, and pregnancies with standard placental function. Of chemical measurements, organochlorine pesticides are present in the highest amount in tissue and blood serum samples, followed by PCBs and PFAS. Adipose (fatty) tissue within the fetal organs has the highest chemical burden, while the brain has the lowest. Overall, more chemicals are detectable in fetal tissue samples than maternal blood/placenta samples.

Doctors and pediatricians strongly agree that pregnant mothers should avoid pesticide exposure during critical development periods. Exposure concerns about POPs are increasing significantly, especially for adults and children more vulnerable to their toxic effects. Moreover, many contaminants are subject to regulatory standards that do not fully evaluate disease implications associated with exposure. Advocates say that addressing the manufacturing and use of pesticides is essential to mitigate risks from chemical exposure to toxic pesticides. Therefore, advocates urge that policies strengthen pesticide regulations and increase research on the long-term impacts of pesticide exposure. Beyond Pesticides tracks the most recent studies related to pesticide exposure through the Pesticide Induced Diseases Database (PIDD). This database supports the clear need for strategic action to shift away from pesticide dependency. For more information on the multiple harms of pesticide exposure, see PIDD pages on Birth/Fetal Effects, Sexual and Reproductive Dysfunction, Body Burdens, and other diseases. To learn more about how the lack of adequate pesticide regulations can adversely affect human and environmental health, see Beyond Pesticides’ Pesticides and You article “Highly Destructive Pesticide Effects Unregulated.”

One way to reduce human and environmental contamination from pesticides is buying, growing, and supporting organic. Numerous studies find that levels of pesticide metabolites in urine significantly drop when switching to an all-organic diet. Furthermore, given the wide
availability of non-pesticidal alternative strategies, families and agro-industry workers alike can apply these methods to promote a safe and healthy environment, especially among chemically vulnerable individuals. (Ref. 2)

3. ENVIRONMENTAL REGULATIONS

With 12 Months’ Notice, EPA Bringing Temporary Disinfectant Supply Chain Flexibilities to a Close

In response to the COVID-19 pandemic’s spread in early 2020, the U.S. Environmental Protection Agency (EPA) began implementing a series of policies to provide supply chain flexibility to disinfectant manufacturers faced with nationwide ingredient shortages. Noting that “supply chains have stabilized” and “disinfectant products expected to kill SARS-CoV-2 (the virus that causes COVID-19) have become consistently available to consumers,” EPA has determined that these flexibilities will sunset on September 15, 2022. Surface disinfectant manufacturers should review their current supply chains to ensure that, come that day, their products are produced using only active and inert ingredient sources in compliance with EPA’s pre-2020 requirements under PR Notice 98-10.

Since March 2020, EPA has added over 570 disinfectant products to its List N of products effective against SARS-CoV-2. EPA’s latest announcement is consistent with an overall shift away from a prioritization of surface disinfectant approvals over the course of the COVID-19 pandemic. In April 2021, EPA announced that it would no longer expedite registration review of new surface disinfectant products intended for use against SARS-CoV-2. However, the Agency’s latest action does not affect its expedited review of more novel products making residual efficacy claims. Under its Temporary Amendment to PR Notice 98-10, EPA permitted numerous regulatory flexibilities to registrants of currently registered pesticide disinfectant products on EPA’s List N in order to facilitate production of those products. Those temporary flexibilities included:

- Registrants of products that contain certain “commodity chemicals” as active ingredients may use any similar source of such ingredients—including unregistered sources—upon notification to EPA, without having to first apply for and receive EPA approval of an amendment to their pesticide registration identifying the new source;
- Registrants may use a registered, similar source of any non-commodity active ingredient upon notification to EPA;
- Registrants may use a registered, non-similar source of any active ingredient upon notification to EPA, as long as the nominal concentration of active ingredient in the product remains the same and the requisite adjustment in inert ingredients is limited to water only;
- Registrants may substitute a similar inert ingredient source upon notification to EPA and submission of composition information from the individual inert supplier; and

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Registrants seeking to add the EPA-registered establishments for formulations that have a registered source of active ingredient, and where there are no other changes to the formulation other than those described above, may make such changes by notification.

The above flexibilities also apply to registrants of food contact surface sanitizers containing the active ingredient isopropyl alcohol. With its latest announcement, EPA is providing manufacturers and other registrants of surface disinfectants and food contact surface sanitizers one year’s notice that the above flexibilities will end on September 15, 2022. By that date, registrants should ensure that their products are either produced using sources of active ingredients identified in those products’ approved Confidential Statements of Formula, or otherwise comply with EPA’s relevant registration requirements under PR Notice 98-10. (Ref. 3)

ESG: How it Applies to the Oil & Gas Industry and Why It Matters

The institution of environmental, social and governance (ESG) values and metrics represents a true revolution in how corporations are managed, measured, and operated. This sea change will continue to drive companies away from the familiar framework of short-term profits toward success that is not only defined by profitability, but also by a “sustainable” and measurable contribution to the betterment of society at large. This new paradigm brakes a long-established mold. While ESG is perceived by some to be– and can be– difficult to implement, and it may seem like a profit-killer, the irony is that for most companies that implement ESG programs, including those within the oil and gas industry, it has the opposite effect.

According to the International Energy Association’s (IEA) 2021 Global Energy Review, renewable energy grew 3% in 2020, inclusive of a 7% increase in electricity generation from renewable sources. Logic would imply that, all things being constant, fossil fuel demand would decline. But all things are not constant, and due to an estimated 4.6% increase in global energy demand this year, a year when the world continues to feel the effects of COVID-19, the demand for fossil fuels has not diminished and will not any time soon. Why is that? Certainly the societal implications of a focus on ESG represents an ethical imperative. But the truth is that money talks. Despite all the talk about the energy transition, net zero economy goals and the importance of ESG overall, energy companies should not lose site of the fact that 1) it is unlikely there will be a decline in global energy demand - populations are continuing to grow - and 2) broad index funds, as opposed to actively managed funds, simply cannot abandon the sector or create stranded assets. But, a lack of an ESG strategy will ultimately affect a company’s access to public, and increasingly private, capital. And that will happen to all companies, whether publicly funded or not.

Aside from the monetary pressure on companies to implement ESG programs, there also is increasing pressure on companies to properly manage ESG issues stemming from the federal government due to this Administration’s effort to address global climate imperatives and
environmental justice. The Biden Administration has made both the fight against climate change and environmental justice foundational to its agenda. Upon his inauguration, President Biden quickly rejoined the Paris Agreement and set a 2030 target to cut GHG emissions by 50 percent from 2005 levels. Getting there will require stepped-up federal regulation and enforcement of environmental protection across a wide range of industries. Additionally, within days of his inauguration, President Biden signed Executive Order 14008 entitled Tackling the Climate Crisis at Home and Abroad, further making clear his intent to establish a government-wide approach to address the “climate crisis” and ensuring environmental and economic justice issues are key considerations in how the Administration governs.

The prospect of such catastrophic change makes a compelling case that long-term economic prosperity is dependent on the mitigation of greenhouse gas (GHG) emissions as quickly as possible. And the social unrest and realities of COVID-19 over the last two years have pushed to the forefront of everyone’s mind the importance of social issues across the board. These images drive a belief that the “E” in ESG is defined only by climate change caused by fossil fuel production and consumption and the “S” is defined by diversity, equity and inclusion programs. But both definitions are too narrow. “E” includes a much broader range of considerations and takes into account a company’s utilization of natural resources, including land and water use, and the effect of its operations on biodiversity and the environment generally, both in their direct operations and across their supply chains.

The key for any company is to know where it stands now so that it can get where it wants to be. Every company must understand where they stand within the ESG framework and have policies tailored to that company with goals aligned with business strategies. It seems basic, but it is critical. Only then can progress be measured. There is no rule prohibiting creativity. In fact, looking at your business through a different lens may offer some opportunities for reframing your basic assumptions and unlocking value in hidden corners. In many cases, embracing ESG and it has to offer is a journey that produces long-term benefits for a company. Good sustainability practices can sometimes produce savings over time and satisfy some of your company’s most-important constituencies. It also may create a value proposition and a marketing narrative to bring in new investors, along with new capital. (Ref. 4)

4. EDITORIAL BOARD SELECTIONS

Laser Treatment Shows Potential for Reducing Industrial Chemical Processing for Vehicles

Long-lasting protection from corrosion is essential for materials used for vehicles and aircraft to ensure structural integrity amid extreme operating conditions. Two chemical pre-treatment processes are widely used in industrial settings to prepare for coating adhesion and protect
aluminum alloy surfaces against corrosion. While highly regulated, both processes use large quantities of hazardous compounds with known environmental and health risks. A multidisciplinary team of scientists at the Department of Energy’s Oak Ridge National Laboratory has applied a laser-interference structuring, or LIS, technique that makes significant strides toward eliminating the need for these hazardous chemicals. The novel application of the LIS method answers a call from the U.S. Department of Defense for research projects that explore non-chemical alternatives for corrosion protection in military vehicles and aircraft systems. Chromate conversion coating, or CCC, uses hexavalent chromium, a known carcinogen, to inhibit corrosion. Sulfuric acid anodizing, SAA, uses sulfuric acid, which can severely irritate skin and eyes, and when inhaled, can lead to permanent lung damage. Millions of gallons of used chemical solutions are disposed of annually as hazardous waste.

In their experiments, they treated aluminum alloy sheets by splitting the primary beam of a pulsed nanosecond laser into two beams and focusing them on the same spot on the specimen surface. This process roughened the surface with periodic structures, changed the surface chemistry and sub-surface microstructure. After an aluminum alloy sheet is cleaned, often the surface energy prohibits the coating from sticking properly, a known issue in industrial surface coatings. The team’s next publication, for the International Journal of Adhesion and Adhesives, looked at coating adhesion and found that the LIS method provided adhesion as well as the industry-standard and solvent-intensive CCC and SAA techniques.

A patent for coating adhesion was awarded in 2021 based on this LIS technique. ORNL is managed by UT-Battelle for the Department of Energy’s Office of Science, the single largest supporter of basic research in the physical sciences in the United States. DOE’s Office of Science is working to address some of the most pressing challenges of our time. (Ref. 5)

**Blue, Green… Turquoise? Carbon-To-Value And Sustainability In the Hydrogen Palette?**

Decarbonization efforts and commitments from governments and industries are rising due to global climate and sustainability targets, and many are exploring and adapting innovative technologies and business models with the goal of zero-carbon or low-carbon energy and carbon utilization strategies. Hydrogen, a zero-carbon energy carrier that can be stored prior to use, has the potential to significantly transform the global energy landscape. It could be a cheaper energy option for freight transport and heavy trucks than electrification, and could be used in industrial process where electrification is difficult and costly. Multiple pathways for hydrogen production are available. For hydrogen to be low carbon, the negative CO2 externality must be abated, which pushes the production technology options away from grey and brown, which represent the dominant production technology deployed today, to other options. “Turquoise” hydrogen presents an interesting opportunity because it introduces a carbon-to-value proposition that can improve the commercial viability of the technology. In particular, the solid carbon that is recovered during hydrogen production via pyrolysis can be used in existing applications that involve carbon black, graphite, carbon fiber, carbon...
nanotubes (CNTs), graphene and other derivatives. Moreover, it can be applied in various applications, ranging from new advanced carbon materials to soil amendments, across different economic sectors, such as construction, transportation, and agriculture. The resultant impacts for CO2 emissions are potentially enormous because not only is energy use decarbonized, other CO2-intensive materials, such as metals and concrete, are displaced. Hence, by utilizing a methane pyrolysis process to create hydrogen and solid carbon, turquoise hydrogen taps into existing hydrocarbon value chains without CO2 emissions associated with the process. Classification is complicated by the fact that not all methane pyrolysis processes yield an identical carbon output. The quality, morphology, and chemical constituents of the resultant carbon material can differ depending on the type of methane pyrolysis technology employed (thermal, catalytic, plasma) as well as the operating parameters used in process (temperatures, pressure, natural gas feed, methane conversion, reactor space, power, etc.). Although impurities can be processed and removed, the economics of stabilization and removal may be cost prohibitive.

The challenges of developing a hydrogen and advanced solid carbon economy are vast. Identifying and appropriately addressing issues such as (1) negative public perception, (2) opposition to decarbonization strategies based on natural gas and hydrocarbons, (3) perceived risk of adequate long-term natural gas supplies, (4) the logistics of solid carbon transport, storage, and reuse, and (5) environmental, human health, and safety implications are all important considerations. Knowing the “what, where and how” regarding potential risks, barriers and strategies to navigate them to drive investment will help shape the future of innovative energy and materials production. It will also create viable pathways for solid carbon to provide a positive value proposition that supports broader scale hydrogen production, and facilitates achieving climate and sustainability goals. (Ref. 6)

**GMO Beans and Beyond: How Does it Work and Why Does it Matter?**

The application of biotechnology in agriculture has resulted in many benefits to producers and consumers that tend to be overlooked or unknown by the general public. This technology has helped make both insect pest control and weed management safer and easier, while also safeguarding crops. Producers and consumers alike are also looking for ways to be better stewards to the environment and make things safer for the farmer — it can be done with genetically modified crops — aka GMOs. Ever wondered about the future of soybeans and their bean relatives? Soybeans are currently the only genetically modified organism (GMO) beans commercially available in the United States, but more new technology is on the horizon! For example, Brazil is experimenting with genetic modification of pinto beans due to a devastating virus; therefore this GMO could increase pinto bean yield significantly while simultaneously decreasing waste due to contaminated crops.

In the United States, gene editing technology is on the increase versus gene modification by other methods. Modified soybeans through the gene editing method may be the new industry standard for speeding up and streamlining soybean modification and production. In addition,
genetic modification could also improve the overall plant growth and nutritional profile of the food end-product. Traditionally, soybeans have been modified with the use of transgenic technology, which is the process of transferring genes (such genes related to herbicide resistance) from one organism to another. This could be from another plant, the soil, or other natural organism. Genome editing (also known as gene editing), however, is different and seems to be more accepted by the general public. Rather than inserting new genes into the soybean’s existing genetic profile, scientists modify the genetic structure of the soybean. Genome editing allow genetic material to be added, removed, or altered at particular locations in the genome.

One of the most popular methods used for gene-editing is called CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats). The CRISPR protein that’s used “searches for” the appropriate gene sought by the plant breeder in the soybean and rearranges it in such a way that the soybean then carries the desired trait. This could be herbicide resistance for example, without adding in a new gene to the soybean plant. Some scientists think this could be an easier, more efficient way to modify soybeans so that they have the qualities that benefit farmers and the general population. What once took many years to achieve can now be done in a fraction of the time with GMO methods. One of the main focuses of agricultural biotechnology is to feed a growing world population in a more sustainable way. Some current farming methods internationally are inefficient as they require larger amounts of water, fertilizer, and pesticides. Biotechnology is “one tool in the toolbox” to solving these problems by starting at the seed level. This helps the producer and the environment and reduces the cost of products or specialty products for the consumer. This technology has potential to revolutionize other fields beyond agriculture, including the field of medicine. (Ref. 7)

**Drip Irrigation By An Israeli Business Might Transform Agriculture Forever**

Most crops across the world rely only on rain for water, but in regions where rainfall is insufficient, we are compelled to irrigate. Despite all of the advancements in agriculture in recent years, from GPS-guided tractors to genetically modified seedlings, 85 percent of all irrigation is still accomplished by dumping large amounts of water across the surface of a field, just as it did 4,000 years ago in Mesopotamia. All of this was meant to be solved with microdrip irrigation. Simcha Blass, a student engineer in the 1930s, observed a tree that had grown considerably higher than the others in the same row and discovered that its roots were being nourished by a minor leak from a nearby irrigation line when he examined it closer. An Israeli irrigation firm called N-Drip developed a technology that promised dramatic water reductions without the exorbitant expenses.

It was ready to test N-Drip because agriculture uses the great bulk of Arizona’s freshwater. CRIT Farms received the system from CAP in 2020 to utilise 40 acres of sorghum. They discovered that it lowered water usage in half while boosting crop quality slightly: a remarkable outcome, although on a modest scale. In 2021, CAP expanded the pilot to roughly...
200 acres of sorghum and cotton in Arizona, with the goal of deploying the system regionally by 2023 if everything goes well, while continuing to cover the cost of the equipment for farmers who install it. Uri Shani, a professor of soil physics at the Hebrew University of Jerusalem and a former head of Israel’s water board, is the creator of N-Drip. He began working on a microdrip irrigation system seven years ago with the goal of making it affordable enough to be used not just for lettuces and berries, but also for commodity crops like soy and maize, which account for the majority of the world’s agricultural production.

To comprehend Shani’s challenge, you must first comprehend what occurs within those simple black plastic dripper lines. Each one has a sequence of holes, with an emitter, a plastic widget approximately the size of a Tic Tac, placed inside each one. Water flows via an extremely tiny, maze-like channel inside the emitter, where it is controlled and released in precise droplets. In a conventional system, the resistance created by the emitters is the reason why so much pressure is necessary to transport water from one end of a field to the other. Shani devised a new type of emitter with so little resistance that the water pressure generated by gravity alone—accrued during the 1- to 2-foot drop from the irrigation canal to the field below—would be sufficient to push the water hundreds of feet of tubing and out into the earth. He began by weaving plastic and metal threads into a variety of three-dimensional lattice constructions. But, he claims, it was on a walk that he had the epiphany: instead of a zigzag channel, his emitter would be made up of a rod hung within a cylinder, with water flowing through the tube shape produced between them. Unlike a conventional emitter, no one particle of trash may now obstruct the flow of water.

N-Drip set up its first formal field experiment in Eswatini (formerly Swaziland) towards the end of 2017, on five acres of sugarcane, collecting water straight from a river. They discovered that not only did the system function and consume less water, but it also boosted crop yields by 30%. N-Drip moved on to larger trials in Australia and the United States after receiving positive results, and has now spread to 17 nations, ranging from Vietnam to Nigeria. If Shani’s vision comes true, N-Drip has the potential to modernise millions of farms and change global freshwater usage. (Ref. 8)

5. ESD NEWSLETTER READER COMMENTS

None received this month.

ESD NEWSLETTER BOARD

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

ABOUT NEWSLETTER

Disclaimer: This newsletter may contain articles that offer differing points of view. Any opinions expressed in this publication do not represent the positions of the ESD Executive Board members of the American Society of Mechanical Engineers (ASME).
Upcoming ASME Conferences

**AMRGT**
Advanced Manufacturing & Repair for Gas Turbines
October 5 – 8, 2021
Hosted by ASME’s Gas Turbine Segment and IGTI Division, this 4-day symposium, October 5 - 8, will bring together engineers, designers, researchers, repair professionals and business leaders at companies that design, manufacture, repair and own gas turbines.

**ICEF**
The Internal Combustion Engine Fall Conference
October 13 – 15, 2021
The ASME Internal Combustion Engines Fall Conference (ICEF) is a premier conference on internal combustion engines and their applications. It features a robust technical paper program, two days of keynote speakers, work-in-progress poster session, undergraduate student competition, industry tour, and focused workshops. Attended by industry experts, academicians, students and professionals, ICEF aims to explore the cutting edge of this important, and dynamic field. The conference explores fundamental advancements and technologies related to IC engines of various sizes ranging from automotive light- and heavy-duty engines to large bore engines for locomotive, propulsion and power generation applications. The conference provides an excellent networking opportunity for students and young professionals with leading industry experts.

**FPMC**
ASME/BATH Symposium on Fluid Power and Motion Control
October 19 – 21, 2021
The Fluid Power Systems & Technology Division (FPST) of the American Society of Mechanical Engineers (ASME) and University of Bath Centre for Power Transmission and Motion Control (PTMC) invite you to this international symposium on fluid power and motion control. The Bath/ASME Symposium on Fluid Power and Motion Control (FPMC) has been an annual event since 1988, and in the past decade, it has been being held in alternate years at Bath, UK and in the USA.

**InterPACK®**
International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems
October 26 – 28, 2021
InterPACK is the premier international conference for exchange of state-of-the-art knowledge in research, development, manufacturing, and applications of electronics packaging and heterogeneous integration. It is the flagship conference of the ASME Electronic and Photonic Packaging Division (EPPD). InterPACK is a systems-focused conference covering topics on Heterogeneous Integration, Servers of the Future, Edge and Cloud Computing, Internet of Things, Additive Printed Electronics, Flexible and Wearable Electronics, Photonics and Optics, Power Electronics, Energy Conversion and Storage, and Autonomous, Hybrid and Electric Vehicles. The international nature of the meeting has been highly beneficial in promoting global interactions between industry, academia, research institutions, funding agencies, start-ups and entrepreneurs. In addition to paper presentations and exhibits, InterPACK 2021 will include panel discussions, workshops, tutorials, keynote and technology talks by prominent speakers, and a joint industry, national laboratory, and academia poster session.
IMECE®
*International Mechanical Engineering Congress & Exposition®*
November 1 – 5, 2021
The International Mechanical Engineering Congress and Exposition (IMECE) is ASME's largest research and development conference focused primarily on mechanical engineering, but encompasses perspectives from many engineering disciplines. IMECE is THE place for you to present your technical research and expertise, while also learning from and connecting with thousands of your peer researchers on a global level.

Gas Turbine India Conference
December 2 – 3, 2021
The 2-day virtual event attracts the industry's leading professionals and key decision makers, whose innovation and expertise are shaping the future of turbomachinery. Authors and presenters are invited to participate in this event to exchange ideas on research, development and best practices on Gas Turbines and allied areas. The conference is an excellent opportunity to initiate and expand international co-operation.
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