

American Institute of Chemical Engineers, Cleveland Section

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Tuesday, January 28, 2025, 6:00 PM

AICHE Membership is Not Required to attend any meetings

Burntwood Tavern, 3750 West Market Street, Fairlawn, Ohio 44333

Phone 234-466-7372

“SARTA ARCH2 Ohio Project Update”

The Burntwood Tavern, Fairlawn by I-77 and Route 18

By **Kirt Conrad**, SARTA CEO, Stark Area Regional Transit Authority, Ohio kconrad@sartaonline.com



ABSTRACT: The [Appalachian Regional Clean Hydrogen Hub](#) (ARCH2) includes a Canton, OH location, per Shawn Bennett, energy and resilience division manager at Battelle. The Columbus-based Battelle is leading the Appalachian hydrogen hub, which is referred to as [ARCH2](#) and consists of sites across Ohio, West Virginia and Pennsylvania. The hub received \$30 million in July 2024 for the first phase of their work. The Stark Area Regional Transit Authority (SARTA) and Enbridge Gas Ohio want to use the electrolysis process to produce hydrogen fuel for SARTA buses on or near the 1600 Gateway Blvd. SE facility.

SARTA's hydrogen fuel cell buses currently are fueled by what is known as gray hydrogen, with no capture of the carbon created during its production in Canada. Electrolysis uses electricity and water to produce hydrogen without emitting carbon and would remove the associated transportation emissions. Hydrogen is a cleaner option than fossil fuels.

The project would include on-site storage and connective infrastructure to refuel SARTA's bus fleet, according to ARCH2 documents.

The Ohio ARCH2 was led by Kirt Conrad, CEO of SARTA and a founding member of OH2. He has successfully been operating a hydrogen fuel cell fleet of 16 buses in the Stark area for the past five years.

The OH2 / ARCH2 effort was supported by Ohio Governor Mike DeWine, U.S. Senator Sherrod Brown, Steve Stivers, President of the Ohio Chamber of Commerce, J.P. Nauseef, President and CEO of JobsOhio, and Pat Tiberi, President and CEO of the Ohio Business Roundtable. The Bipartisan Infrastructure Investment and Jobs Act has \$1.2 trillion in the bill and has portioned an \$8 billion investment in hydrogen hub funding through the U.S. Department of Energy (DOE).

BIOGRAPHY:

Mr. Conrad is a senior executive in public transit with expertise in alternative energy and public policy. Has increased ridership over 30% and increased revenues by 20%. Has secured over \$50 million in competitive grants and managed construction programs from railroad rehabilitation to LEED certified building in the transportation industry. He led the purchase of 50 miles of railroad right-of-way and use of transportation infrastructure as a multi-modal corridor for both freight and commuter service. Currently, Mr. Conrad is working with a number of private sector companies to commercialize fuel cell based public transportation and researching the best business models to support public hydrogen infrastructure.

For those attending this event, a Professional Development Hour Certificate (1 PDH) will be sent to you in the following days by Joe Yurko.

Meeting Location:

3750 West Market Street
Fairlawn, OH 44333

fairlawn@burntwoodtavern.com

234-466-7372

Burntwood Tavern, Fairlawn, Ohio

6:00 – 6:30 pm: Social Gathering

6:30 – 7:30 pm: Dinner

7:30 – 8:30 pm: Presentation with Q&A

Cost: \$26 members & guests, \$5 students

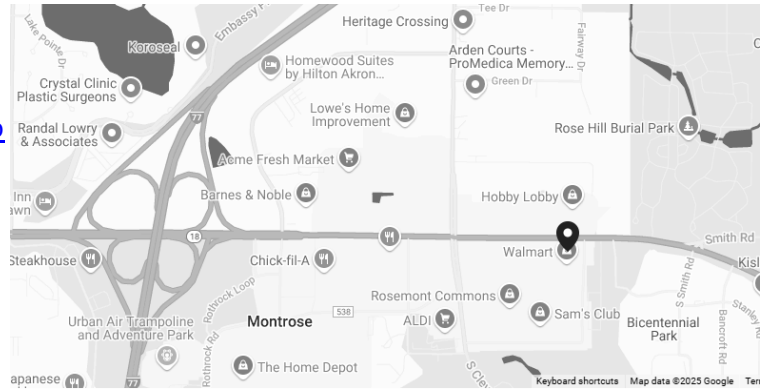
Menu: <https://www.burntwoodtavern.com/ohio>

Choice of:

Lobster bisque or House salad

Choice of:

Salmon salad,
Angus burger,
Fish & chips



RSVP Required by 27Jan2025 with Joseph Yurko and AIChE at: yurkojoe5@gmail.com

December CLE AIChE Meeting at the Sanctuary Restaurant in Independence for a joint meeting with the CLE AIChE Young Professionals talk on “Nuclear Accident Analysis”



Andrew Ohrablo shared his Nuclear Accident Analysis experience from Perry Nuclear Power Plant with CLE AIChE

Gary Peck, PE; CLE AIChE Secretary awarding Andrew Ohrablo with an AIChE Letter of Appreciation!

Many Congratulations go to **Frank van Lier**, for his 2025 election to the Office of Director with National AIChE, along with three other directors, Frank will serve for three years beginning in 2025!

Please see Frank's Campaign Message below that describes his continued support of AIChE and its mission.



Frank van Lier – National AIChE Director

Frank van Lier was Global Senior Director of Process Technology for The Lubrizol Corporation retiring in 2022 with 40+ years industrial experience across R&D, Operations and Technology. His experience included numerous Leadership roles at Lubrizol's Ohio and Texas plants and a year as the General Manager of Lubrizol's Zhuhai, China manufacturing facility (2018). He also spent 6 years on the board for the Lubrizol/Indian Oil joint venture located in Mumbai, India. Frank earned a BSChE from the University of Cincinnati and an MBA from Case Western Reserve University.

Frank has been involved with AIChE as a member since 1980. Most recently he was on the inaugural Governing Board of the RAPID National Manufacturing Institute acting as Chair in 2022. He was a director of the Chemical Technology Operating Council (CTOC) and Chair in 2015. Frank joined the Management Division as Chair in 2005 and was a director from 2007-2014. He is an AIChE Fellow. Current AIChE activities include acting as a reviewer for the Virtual Technician and Operator Training Program (VTOP) being developed by AIChE/ILI and continued active engagement with the Management Division.

My hopes for AIChE are to continue to build on the successes of the past. I see RAPID and CCPS as key examples of successful efforts to further engage chemical engineers from across various industries. RAPID has been very successful in creating valuable industry and academia collaborations focused on more sustainable, safer, and more economical manufacture as exemplified by the successful implementation of process intensification projects at Lubrizol plants in close collaboration with the University of Pittsburgh. The next five years of RAPID are all about shifting to a more institute sustainable model while still delivering value to AIChE members and their organizations.

Continuing to improve and add member value through AIChE's education efforts will lead to expanded membership and increased corporate engagement if members can cost effectively learn from experts in the field.

The number of Divisions, Forums and Technology Groups can make it confusing to even veteran members to find the value in the massive volume of offerings. Opportunities to continuously improve targeted communications are critical to keeping members engaged and attracting new members.

The above are the areas I've supported in the past and intend to support as a Director of the Institute. We need to continue to build the network of engineers and encourage/engage with the younger and more diverse cohorts to bring out the best in all as part of AIChE's mission to build an inclusive community united in "doing a world of good".

I am honored to be elected for the AIChE Board of Directors and ask for your support.

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**The Year End Summary Report from the NSPE-OH
National Society of Professional Engineers, Ohio
(Government Interaction)**

By: Joseph Yurko, PE (Attended Zoom Meeting 20Dec2024)



Format

- Learn about policy impacting Ohio PEs
- Get the top news within 20 minutes, quarterly
- Please keep microphone off; ask questions by email

For Your Calendar: Upcoming “Briefings”

- Be on the lookout for an email update with briefings on April 4, 2025, and June 27, 2025.

Briefings will begin at 12:00 PM. Watch email each quarter for your Zoom invitation.

E-mail Your Questions

Holly Flanigan, Legislative Agent
PR@OhioEngineer.com

Sydney Sanders, Director of Policy & Communications
Governmental Policy Group, Inc.
ssanders@gpgrhr.com

Ohio Society of Professional Engineers
400 South Fifth Street, Suite 300, Columbus, Ohio 43215
(614) 223-1144

State Board of Registration news

- Governor Mike DeWine recently appointed Edward Kagel, PE, to the State Board of Registration for Engineers and Surveyors for a term that began on November 8, 2024, and ends September 24, 2029.
- Kagel fills the PE seat vacated by NSPE-Ohio member Walid Gemayel, PE. He is currently the Vice President of American Structurepoint, and he holds bachelor's and master's degrees in civil engineering, respectively from Ohio University and the University of Akron.
 - More information on the qualifications and duties of the Board members can be found under [Ohio Revised Code Chapter 4733](#).

135th General Assembly Timeline

- The 135th General Assembly convened January 2, 2023, and will adjourn December 31, 2024.
- **99 members in the Ohio House**
 - 67 Republicans, 32 Democrats
- **33 members in the Ohio Senate**
 - 26 Republicans, 7 Democrats

136th General Assembly Timeline

- The 136th General Assembly will convene on January 6, 2024.
- **99 members in the Ohio House**
 - 65 Republicans, 34 Democrats
- **33 members in the Ohio Senate**
 - 24 Republicans, 9 Democrats

136th General Assembly Leadership Teams

House Majority Leadership

- **Speaker of the House Matt Huffman** *(R-Lima)*
- Speaker Pro Tempore Gayle Manning *(R-N. Ridgeville)*
- Asst. Speaker Pro Temp. Phil Plummer *(R-Dayton)*
- Majority Floor Leader Marilyn John *(R-Shelby)*
- Asst. Majority Floor Leader Adam Bird *(R-Cincinnati)*
- Majority Whips:
 - Riordan McClain *(R-Upper Sandusky)*
 - Steve Demetriou *(R-Bainbridge Twp.)*
 - Nick Santucci *(R-Howland Twp.)*
 - Josh Williams *(R-Sylvania Twp.)*

House Minority Leadership

- **Minority Leader Allison Russo** *(D-Upper Arlington)*
- Asst. Minority Leader Dontavius Jarrells *(D-Columbus)*
- Minority Whip Dani Isaacsohn *(D-Cincinnati)*
- Asst. Minority Whip Michele Grim *(D-Toledo)*

136th General Assembly Leadership Teams

Senate Majority Leadership

- **Senate President Rob McColley** *(R-Napoleon)*
- President Pro Tempore Bill Reineke *(R-Tiffin)*
- Majority Floor Leader Theresa Gavarone *(R-Bowling Green)*
- Majority Whip George Lang *(R-West Chester Twp.)*

Senate Minority Leadership

- **Minority Leader Nickie Antonio** *(D-Lakewood)*
- Asst. Minority Leader Hearcel Craig *(D-Columbus)*
- Minority Whip Kent Smith *(D-Euclid)*
- Asst. Minority Whip Beth Liston *(D-Dublin)*

House Bill 497

HB 497 – VARIOUS CHANGES TO COUNTY LAW (Stewart, Klopfenstein) – To make various changes regarding county law and to amend the version of section 153.39 of the Revised Code that is scheduled to take effect January 1, 2025, to continue the change on and after that date.

HB 497 aims to address and streamline various administrative processes and increase efficiency at the county government level. The bill includes provisions for county commissioners, county coroners, county prosecutors, county auditors, and more. During the first hearing for the bill, sponsors noted:

"We worked with the County Commissioners Association of Ohio (CCAO) and solicited input from the associations representing all other countywide officials as well, in drafting this legislation. We asked each association to provide feedback on tangible, but largely uncontroversial, changes to state law that could allow their offices to operate more efficiently to better serve Ohioans. From there, we pared down the list a bit further, and the result is House Bill 497."

House Bill 497 (cont.)

The exception for this requirement will now only apply for "minor repairs," which the bill defines as "the reconstruction or renewal of any part of an existing building for the purpose of its maintenance when the work has limited impact on access, safety, or health." The bill specifically excludes the following from the definition of "minor repair:"

- The cutting away of any wall, partition, or portions of walls;
- The removal or cutting of any structural beam or load bearing support;
- The removal or change of any required element of accessibility, means of egress, or rearrangement of parts of a structure affecting the egress requirements;
- The addition to, alteration of, replacement of, or relocation of any standpipe, water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring, mechanical work, or other work affecting public health or general safety.

House Bill 497 (cont.)

NSPE-Ohio sent a letter to members of the House State & Local Government Committee explaining our concerns with the original language and why the amendment was necessary.

"AM_135_2313...allows county commissioners the flexibility needed to perform minor repairs and improvement projects without compromising the integrity of professional design services. With the acceptance of AM_135_2313 we at NSPE-Ohio believe that HB 497 more appropriately maintains the highest safety standards necessary to ensure the well-being of Ohio's residents."

Current Status: HB 497 passed in the House by a vote of 87-0 in June before it began the committee process in the Senate this past fall. The Senate Local Government Committee held four hearings on the bill and eventually adopted a substitute version of the bill on December 10th. The bill was then passed by the full Senate unanimously (30-0) on Dec. 11th, and the House concurred to the Senate's changes on Dec. 18th (87-2). The bill will now await a signature from Governor DeWine, and will take effect 90 days after it has been signed.

Senate Bill 44

SB 44 - ELECTRONIC LICENSING, LAND TRANSFERS, PORT AUTHORITIES (Brenner, A) - To require a state occupational licensing agency to accept electronic license applications; to modify the law regarding county engineers; to modify the law governing transfers of abandoned land subject to tax foreclosure proceedings; and to allow certain counties to create an additional port authority.

SB 44 requires that an online application be offered for individuals applying for professional licensure, certification or other credentials. It also expressly allows an agency to offer a paper-based application as an option if they so choose, so long as there is still an option to apply digitally. Many boards and commissions, including the State Board of Registration for Professional Engineers and Surveyors, already comply with this requirement.

House Bill 430

HB 430 - COUNTY ENGINEERS (Klopfenstein, Rogers) - Regarding county engineers.

Permit a board of county commissioners, when the office of county engineer is vacant, to contract with another county's engineer to perform the duties of that county engineer and give the county engineer supplemental compensation for doing so.

House Bill 315

HB 315 - GOVERNMENT LAW, HEARING AID INSURANCE, HOMEBUYER PROTECTION (Hall, Seitz) - To make various changes to township and other local and state government law, to name a portion of the act Madeline's Law, to name a portion of the act the Homebuyer Protection Act, and to make an appropriation.

The Senate Local Government Committee loaded up the bill with more than a dozen changes before the full chamber passed it last week. Revisions covered topics from economic development programs to public notice publication requirements to public records exemptions for elections workers' personal information to an official definition of antisemitism to be used in discrimination investigations. The House voted last week to reject the Senate version. The Senate insisted on its changes Monday and appointed incoming Senate President Robert McColley (R-Napoleon), Minority Leader Nickie Antonio (D-Lakewood) and Sen. Nathan Manning (R-North Ridgeville) as conferees. The House in turn appointed Reps. D.J. Swearingen (R-Huron), Bill Seitz (R-Cincinnati) and Bride Sweeney (D-Cleveland) as conferees.

House Bill 315 (cont.)

The biennial township law omnibus bill that was passed on the last day of session after the legislature added a 441-page amendment that covered a variety of changes. The Conference Committee Report on HB 315 was accepted by the House by a vote of 76-7 and in the Senate by a vote of 27-1. The bill will now head to Gov. DeWine for a signature and will go into effect 90 days after being signed.

House Bill 238

HB 238 – REVISE OCCUPATIONAL REGULATIONS (Fowler, Klopfenstein) - To revise and streamline the state's occupational regulations and to make an appropriation.

The bill reviews each licensing body to evaluate: their primary purpose, goals, objectives, budget, funding sources, and a demonstration of public need for their continued existence. This year, there are 16 licensing bodies up for review, **including the State Board of Registration for Professional Engineers and Surveyors**. The review process aims to achieve the following:

- Ensure each board is fulfilling its statutory purpose;
- Remove unnecessary barriers to entry in our workforce;
- Promote professional development and job creation; and
- Align Ohio's occupational license standards with those in other states.

House Bill 238 (cont.)

HB 238 received four hearings in the House State & Local Government Committee before it was passed on the House floor by a vote of 61-30. The bill was then sent to the Senate Government Oversight Committee for further consideration.

The Senate Government Oversight Committee recommended additional changes to a few of the occupational licenses that were under review. The committee adopted substitute versions of the bill on Dec. 4th and Dec. 11th. Chair Sen. Kristina Roegner (R-Hudson) said the latest version of HB 238 incorporates the recommendations of the Sunset Review Committee, or **SB 335**.

The recommendations of the Sunset Review Committee were introduced as two identical bills (SB 335 and HB 694) in late November. The committee recommended the legislature sunset 31 entities following several meetings where members were tasked with holding hearings and receiving testimony from over 160 state agencies to evaluate their usefulness, performance, and effectiveness over the spring/summer.

House Bill 238 (cont.)

HB 238 (with the Senate's changes) was passed by the Senate on Dec. 11th with a vote of 24-7. The House voted on Dec. 19th to agree with the Senate's changes by a vote of 65-28.

The bill will now wait to be signed into law by Gov. DeWine. Following his signature, the bill will go into immediate effect because of the emergency clause that was added to the bill.

Introduce Yourself to Your Legislators and Candidates



Invite your legislator/candidate out to tour/visit your business, job site, chapter meetings



Be sure to attend the Chapter meetings when your legislator will be in attendance.



Visit your legislator/candidate in the district. Open door meetings, public events, etc.



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E-mail Your Questions

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**Chemical Engineering Progress, CEP, Magazine Editorial, December 2024 ISSUE
The American Institute of Chemical Engineers (AIChE)**

All Hands on Deck for Net Zero

Editorial, page 3

By: [Emily Petruzzelli, Editor-in-Chief](#)

<https://www.aiche.org/resources/publications/cep/2024/december/editorial-all-hands-on-deck-net-zero>

This year's AIChE Annual Meeting was held in late October in San Diego, CA. At the meeting, I got to spend some time at the ChemE Cube competition, which focused on direct air capture (DAC). Eighteen undergraduate teams from universities around the world competed. These teams were tasked with a difficult goal: build a modular DAC plant within a 1-ft³ footprint and a \$1,500 price constraint. The pavilion where the competition was held was buzzing with energy and anticipation as student teams faced off in head-to-head duels, while other teams presented their posters to judges. ExxonMobil, a key sponsor of the event, was on site to help judge the competition, and students could meet some of the process researchers who work at ExxonMobil's DAC pilot plant, currently operating in Baytown, TX.

As evidenced by the ChemE Cube competition and many other events at the AIChE Annual Meeting, achieving the world's net-zero goals will require many solutions — and DAC is just one possibility in an ever-expanding toolbox. Large energy companies whose portfolios consist primarily of fossil fuel products are positioning themselves for the future by investing in DAC, carbon capture and storage (CCS) technologies, low-emission transportation fuels, and blue/green hydrogen solutions...

Inventing a Net-Zero Carbon Future

Profile, page 16

By: **Marissia Beatty, PhD**

<https://www.aiche.org/resources/publications/cep/2024/december/profile-inventing-net-zero-carbon-future>

Likely all entrepreneurs can agree that starting your own company is no easy feat. Neither is developing a technology that has the potential to decarbonize the fossil fuel industry. Marissa Beatty, PhD, founder and CEO of Turnover Labs — a start-up that produces electrolyzers that synthesize carbon-neutral chemicals from manufacturing emissions — has done both.

Beatty grew up in the suburbs of Detroit, MI, in a family of Ford engineers and computer whizzes. As a kid, she often found herself building projects in the garage with her dad and tagging along on his Home Depot supply runs. In 2008, when gas prices began to spike, she remembers how it sparked a national discussion around alternative fuels. Her dad — an owner of a Ford F350 truck — experimented with creating homemade biodiesel fuel. “That’s where I first got involved with chemical engineering,” recounts Beatty. As someone who was always interested in sustainability, she considered various career paths where she could exercise this passion, such as environmental biology. However, her love of chemistry, physics, and mathematics inspired her to pursue chemical engineering instead.

Beatty attended Michigan State Univ. for her BS in chemical engineering, where she continued to explore her excitement for sustainable technology. “I think sustainability and the transition to a net-carbon-zero future exists in chemical engineering because that’s how we get fuels and materials,” she points out. In college, she became fascinated with CO₂ transformation and its potential applications, including solar panels and CO₂-based *in situ* resource utilization in outer space. Toward the end of her undergraduate career, she pursued academic research, where she worked on electrochemical sensors. It was this experience that inspired her to attend graduate school. “I think I was just really hungry to work on stuff that would have a really big impact,” she recalls...

Key Learnings from Shell’s Energy Transition Journey

Special Section, Page 21

By: **ELISE H. NOWEE**

<https://www.aiche.org/resources/publications/cep/2024/december/key-learnings-shells-energy-transition-journey>

There is a strong business case for refiners and petrochemical companies to decarbonize their operations and produce lower-carbon liquids and fuels. However, decarbonizing an asset is a complex process that can take many years to implement. Fortunately, experience in this space is growing. Shell has made significant progress toward its energy transition goals, and learnings from this ongoing process could help others. Moreover, companies have the opportunity to leverage a growing number of increasingly effective solutions.

Shell Catalysts & Technologies uses Shell's decarbonization experience to help other companies achieve their energy transition objectives by developing effective strategies customized to their unique needs.

How is Shell doing?

Shell's target is to halve Scope 1 emissions (which come from the facilities under a business's operational control or the equity boundary) and Scope 2 emissions (which come from utility providers that supply electricity or heat and steam to a facility) from its operations by 2030, compared with 2016 levels. By the end of 2023, the company was more than 60% of the way to achieving this target. This progress is a result of implementing comprehensive carbon management plans across its assets. Shell is also exploring ways to electrify its offshore oil facilities so they can use wind and solar power to reduce operational emissions...

Chemical Engineering Progress, CEP, Magazine ARTICLE, December 2024 ISSUE
The American Institute of Chemical Engineers (AIChE)

Geologic Carbon Storage in Saline Formations

Special Section, Page 26

by [Alex Lee](#), [Lisa Lun](#)

<https://www.aiche.org/resources/publications/cep/2024/december/geologic-carbon-storage-saline-formations>

Carbon capture and storage (CCS) is the process of capturing carbon dioxide from industrial activities or power plants that otherwise would be released into the atmosphere and transporting it to a location where it can be injected deep into underground geological formations for safe, secure, and permanent storage. Driven by societal environmental goals, the need for CCS technologies has never been greater.

Every proposal aimed at reducing emissions put forth by organizations like the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) highlights the central role that CCS must play — particularly for hard-to-abate but essential sectors like cement, steel, and chemical manufacturing — to meet ambitious climate goals (1, 2). If the availability of CCS is limited, the cost of IEA's Clean Technology Scenario would increase by 40% (to \$13.7 trillion) due to the reliance on more expensive and nascent technologies (3).

To reach the goal of significantly reducing emissions by 2050, the IEA estimates that CCS can contribute approximately 15% of the necessary emissions reductions, but only if the technology is adopted at a scale to capture and sequester 5.6 gigatons per annum (GTA) of CO₂ by 2050 (4)...

Decarbonizing the Aviation Industry with Lower-Carbon Aviation Fuel

Special Section, Page 39

by [Nasiru M. Tukur](#)

<https://www.aiche.org/resources/publications/cep/2024/december/decarbonizing-aviation-industry-lower-carbon-aviation-fuel>

Globally, there is no sign of a decrease in carbon dioxide emissions. The International Energy Agency highlighted that global energy-related CO₂ emissions grew by 1.1% in 2023 to reach a new record high of 37.4 billion tons (Gt). Global aviation — including domestic and international; passenger and freight — accounts for about 2.0% of total emissions, approximately 0.75 Gt. If the aviation sector were a country, it would be the sixth largest emitter of CO₂ in the world behind China, the U.S., India, Russia, and Japan.

As a response to the growing concern over climate change, the International Civil Aviation Organization (ICAO) has set a long-term aspirational goal (LTAG) of attaining net-zero carbon emissions by 2050 in support of the Paris Agreement's temperature goal. Although the contribution from the sector is about 2% of total global emissions, the fact that emissions from aviation are at high altitudes, which have a different impact than those at ground or sea level, has made the aviation industry a prime target for decarbonization.

The ICAO's approach consists of a basket of measures — including use of sustainable aviation fuel (SAF), lower-carbon aviation fuel (LCAF), new aircraft technology, operational improvements, other aviation cleaner energies, and market-based measures. While the focus has been on SAF on the fuel side, there has been very little awareness of LCAF, which will also be an integral part of the carbon-reduction measures...

From Gray to Blue: The Push to Decarbonize Ammonia

Special Section, Page 46

by [Anu Mahesh](#)

<https://www.aiche.org/resources/publications/cep/2024/december/gray-blue-push-decarbonize-ammonia>

Ammonia plays a pivotal role in global food production, especially in fertilizers. Traditionally, ammonia is produced using the Haber-Bosch process, which requires purified atmospheric nitrogen as well as hydrogen, typically produced via steam methane reforming (SMR) of natural gas. This high-pressure process is highly efficient for industrial ammonia production but generates significant carbon dioxide (CO₂) emissions. The ammonia produced this way is termed “gray” ammonia and contributes substantially to climate change due to its heavy carbon footprint. In today's world, the urgent need for sustainable alternatives has driven the search for innovative ways to decarbonize ammonia production.

Fortunately, optimizing processes and adopting carbon capture technologies offer a clear path forward. Steps can be taken immediately to begin reducing carbon emissions in the ammonia value chain. Producers can modify current facilities to generate ammonia from lower-emission production methods, and implement more sustainable practices like converting waste products into sustainable fertilizers made from nitrogen byproducts like urea and ammonium sulfate.

The CO₂ challenge in ammonia production

Producing gray ammonia releases a staggering amount of CO₂ into the atmosphere. With the world increasingly aware of the dangers of climate change, the ammonia industry faces a tough challenge: How can it continue to produce this essential chemical while reducing its carbon footprint? Answering this question is important because approximately 1.8–2.0 tons of CO₂ are emitted for every ton of ammonia produced.

Shifting to blue ammonia. Blue ammonia presents a viable solution to this challenge. Like gray ammonia, it is produced using hydrogen derived from natural gas, where 95% of hydrogen (H₂) in the U.S. comes from. Roughly 178 kg of H₂ is needed to produce 1 ton of ammonia. The key distinction between the two processes is that blue ammonia production involves the use of carbon capture and storage (CCS) technologies. These technologies capture as much as 90% of the carbon dioxide emitted during production, storing it underground and keeping it from entering the atmosphere. As a result, blue ammonia is a more efficient, lower-carbon option than gray ammonia. An added benefit of the blue ammonia process is that captured CO₂ can be used for other industrial applications like carbonated beverages, chemical feedstocks for methanol, concrete, and plastics...

Chemical Engineering Progress, CEP, Magazine ARTICLE, December 2024 ISSUE The American Institute of Chemical Engineers (AIChE)

The Electric Vehicle Transition Could Improve Human Health

Special Section, Page 4

by Schmitt, J., *et al.*, "Health Benefits of US Light-Duty Vehicle Electrification: Roles of Fleet Dynamics, Clean Electricity, and Policy Timing," *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.2320858121 (Oct. 14, 2024).

<https://www.aiche.org/resources/publications/cep/2024/december/cep-news-update/electric-vehicle-transition-could-improve-human-health>

The switch to electric vehicles and a greener power grid could cut deaths from car pollution in the U.S. to a quarter of today's numbers, new research finds.

Today, pollution from the tailpipes of light-duty vehicles leads to approximately 3,000 deaths per year in the U.S. This number is expected to decline to approximately 1,800 per year by 2050 even without electric vehicles, according to the new study, as older cars reach the end of their lifetimes and are replaced by newer vehicles held to stricter emissions standards. But electrifying the passenger car fleet with a renewable-energy power grid could further decrease this number to only 800 deaths a year.

"With electric vehicles taking over in the next ten to 15 years, we continue to see declining trends in air-quality-related mortality," says Jean Schmitt, a postdoctoral researcher in environmental engineering at the Univ. of Toronto who led the new study. Without electric vehicles, he adds, the benefits plateau.

The transition to electric vehicles is a key part of policy efforts to reduce carbon dioxide emissions, and thus, climate change. But transitioning from gasoline to electric vehicles will also reduce tailpipe emissions of pollutants like nitrogen oxides and particulate matter of 2.5 μm or less in diameter (PM_{2.5}). This should have positive health impacts, because these pollutants increase the risk of stroke, lung cancer, cardiovascular disease, and other deadly conditions...

The Bhopal Gas Tragedy – Part III: Runaway Reaction Prevention

Spotlight on Safety, Page 52

By: [Kenneth Bloch](#), [Bruce K. Vaughn P.E.](#)

<https://www.aiche.org/resources/publications/cep/2024/december/bhopal-gas-tragedy-part-iii-runaway-reaction-prevention>

The original “Bhopal Methyl Isocyanate Incident Investigation Team Report,” published by Union Carbide Corporation (UCC) in 1985, serves as the primary reference for the first two articles in this series (3). However, the original 1985 report is not the only investigation report issued by UCC. In 1988, UCC released a technical paper entitled “Investigation of Large-Magnitude Incidents: Bhopal as a Case Study” with the engineering consulting firm Arthur D. Little, Inc. (4). UCC used this platform to communicate additional information that became available after the 1985 report was published. While the original 1985 report is no longer actively distributed, the follow-up 1988 report can be freely downloaded from www.bhopal.com, UCC’s official website for dispensing information about the Bhopal gas tragedy. Reviewing information from the 1988 report promotes a better understanding of the events that led to history’s worst industrial disaster.

Design specifications

The methyl isocyanate (MIC) storage tank diagram designates how tank vapor was handled under both normal and emergency situations (3). Two separate vent lines were connected to each tank, which delivered tank gas into the vent gas scrubber (VGS) and flare tower for destruction. Under steady-state operation at 2 psig (1.14 atm), low-pressure MIC storage tank headspace vapor vented into the scrubber through the process vent header (PVH) connection, which was normally kept open. If the tank pressure rose above 40 psig (3.7 atm), it was considered an emergency situation, and a safety valve would automatically open to route MIC gas into the flare tower through the relief valve vent header (RVVH). This safety precaution mitigated leak and explosion hazards that could result from exceeding the 60 psig (5.1 atm) MIC storage tank hydrostatic test pressure...

Chemical & Engineering News, C&EN Magazine ARTICLE, December 16, 2024 ISSUE
The American Chemical Society (ACS)

University of Akron proposes cuts to polymer program

by [Krystal Vasquez](#) , Page 14

<https://pubs.acs.org/doi/10.1021/cen-10239-polcon1?articleRef=control>

Faced with a budget shortfall, the University of Akron (UA) is proposing to merge its department of chemistry; department of chemical, biomolecular, and corrosion engineering; and school of polymer science and polymer engineering and to cut up to 15 faculty positions across these disciplines. If the the Ohio public research institution moves forward with the proposal as is, 10 of the cuts are slated to come from the polymer school, says Toni Bisconti, president of the Akron chapter of the American Association of University Professors, the union that represents the university’s full-time faculty. The school currently has 19 full-time faculty members. The planned cuts, first reported by Signal Akron in November, are being proposed through a process known as retrenchment, which allows the university administration to eliminate faculty positions in the event of a significant financial crisis. The retrenchment follows several other cost-cutting and revenue-generating measures that the university...

The challenge of being neurodivergent in STEM

by [Krystal Vasquez](#) , Page 16

<https://pubs.acs.org/doi/10.1021/cen-10239-feature1?articleRef=control>

Charlotte Fuqua's love of chemistry ignited when she was 7 and her parents bought her a book filled with science experiments for kids. One of them, she recalls, introduced her to the concept of molecules. "I was completely awestruck." Fuqua was so captivated by her newfound knowledge of chemistry that it was all she could focus on; she spent the next week spouting facts about molecules to anybody who crossed her path. "My teacher had to be like, 'Charlotte, we're in the middle of a lesson. You can tell people about molecules later,'" Fuqua says. "Coincidentally, that's the year I got diagnosed with ADHD." ADHD, or attention deficit hyperactivity disorder, is a neurodevelopmental condition often marked by difficulty regulating one's thoughts and actions. It's considered a form of neurodivergence, an umbrella term that refers to thinking, learning, or communicating differently than what...

Saving produce from spoilage without electricity

by [Geoffrey Kamadi, special to C&EN](#) , Page 22

<https://pubs.acs.org/doi/10.1021/cen-10239-feature3?articleRef=control>

Spoilage of perishable farm produce is a major challenge facing smallholder farmers in rural, low-income settings in Africa, where grid electricity is inaccessible, unreliable, or nonexistent. That's why a team called FruiFresh, made up of students at the Rwanda Institute for Conservation Agriculture, the University of Rwanda, and the Institute of Applied Sciences–Ruhengeri, has developed a cold-room facility that helps solve the longstanding problem of postharvest losses in the region. In June, the FruiFresh team won first place at the 2024 Wege Prize , organized by Ferris State University's Kendall College of Art and Design. The prize, which comes with a \$30,000 cash reward, is awarded every year to college or university students around the world who come up with innovative solutions to difficult problems. The team's effort was cited for alleviating postharvest losses for tomato farmers and retailers in Rwanda by building large, naturally evaporative, charcoal-based cooling facilities...

Mystery chemical in drinking water identified

by [Bethany Halford](#), Page 6

<https://pubs.acs.org/doi/10.1021/cen-10237-scicon1?articleRef=control>

For decades, scientists have known that a mysterious chemical forms when inorganic chloramines are used to disinfect water. But they didn't know this chemical's molecular formula or structure. Now the mystery molecule has been identified as the chloronitramide anion. Little is known about this anion or its toxicity. Approximately 113 million people in the US consume drinking water disinfected with the inorganic chloramines NH_2Cl and NHCl_2 , according to the US Environmental Protection Agency (EPA). This type of water treatment has grown in popularity as people seek to avoid dangerous disinfection by-products that form with chlorine treatment, which is more common. But chloramine treatment also creates disinfection by-products, and the identity of one of these had long eluded researchers. "Despite being able to reproducibly form the unidentified product for over 30 years now, prior characterization efforts have been stymied by analytical limitations and an incomplete..."

Coated seeds may make birds mosquito-killing machines

by [Priyanka Runwal](#), Page 8

<https://pubs.acs.org/doi/10.1021/cen-10237-scicon5?articleRef=control>

Every year between spring and fall, many local governments and mosquito control districts in the US spray insecticides to kill mosquitoes. Now researchers in California and Colorado are testing another approach to manage populations of these potentially disease-carrying insects. The research teams are filling bird feeders with ivermectin-coated seeds. Ivermectin is an antiparasitic drug, but it can also paralyze and kill mosquitoes that ingest a blood meal laced with ivermectin. In many African countries where malaria is widespread, scientists have been mass administering ivermectin to humans to control malaria. "So it's basically an extension of that same idea," said Brian Foy, a vector-borne infectious diseases expert at Colorado State University. He presented the work on Nov. 14 at the American Society for Tropical Medicine and Hygiene conference in New Orleans. In the continental US, West Nile virus is the most common mosquito-borne disease. Birds are the natural hosts of..

Managing microplastics

by [Prachi Patel](#), Page 14

<https://pubs.acs.org/doi/10.1021/cen-10237-cover1?articleRef=control>

The world produces around [430 million metric tons \(t\) of plastic a year](#), according to the United Nations. That's the weight of almost 1,300 Empire State Buildings. Without a binding treaty to limit plastic production, the number is on track to [more than double](#). In that same period, mismanaged plastic waste is [expected to double](#), reaching over 120 million t.

Images of plastic bottles washed up on beaches and six-pack rings choking marine animals have become symbols of plastic pollution. In this issue, C&EN takes a deep dive into the less visible, insidious side of our plastics problem: microplastics.

As the name implies, microplastics are tiny particles—specifically designated as less than 5 mm in size. Some are purposefully made small for use in products like cosmetics, where they can serve as exfoliants. Most result from the disintegration of larger plastic items. *Microplastic* is a relatively new term in the vernacular, coined 20 years ago. And research on microplastics and even smaller particles—nanoplastics, which are smaller than 1 μm —has boomed in the past decade.

Scientists have quickly found the particles everywhere: in our land, water, food, bodies, and air. Micro- and nanoplastics have been discovered in the [clouds above Mount Fuji](#), in the Mariana Trench—the deepest point on Earth—and in Arctic ice. They have been detected in nearly every part of the human body. In October, researchers reported finding [microplastics in dolphin breath](#)...

A macroscopic view of microplastic formation

by [Fionna Samuels](#), Page 16

<https://pubs.acs.org/doi/10.1021/cen-10237-cover2?articleRef=control>

Twenty years ago, Richard Thompson, a marine biologist at the University of Plymouth, and his colleagues first used the term microplastic to describe the microscopic bits of plastic they were [finding and trying to quantify](#) in marine sediments around Plymouth, England. Four years later, participants of an international workshop hosted by the US National Oceanic and Atmospheric Administration defined microplastics as “[plastic particles smaller than 5 mm](#).” Policy makers started using the term shortly thereafter.

Since then, scientists have embraced this definition and published hundreds of papers on the environmental accumulation of microplastics and their possible sources. “We use so much plastic in our daily life, and it breaks down and sloughs off over time,” ecologist Chelsea Rochman of the University of Toronto says. “So microplastics, truly at this point, are everywhere.” The most prevalent source of plastic, however, will vary from place to place. With proper monitoring, she adds, people “can start to mitigate based on those sources.”

The onus to find and implement solutions falls on all of us—individuals, policymakers, and industry leaders, Thompson says. “We know an awful lot more now than we did 20 years ago about the pervasive nature, the

accumulation, the distribution, and the impacts” of microplastics, he says. Thompson and his colleagues collated such information in a recent review (*Science* 2024, DOI: [10.1126/science.adl2746](https://doi.org/10.1126/science.adl2746)). “To me, what all that is pointing towards is that we need to move towards solutions.”...

Chemical & Engineering News, C&EN Magazine ARTICLE, November 25, 2024 ISSUE The American Chemical Society (ACS)

Should we be worried about the microplastics in our bodies?

by [Priyanka Runwal](#), Page 18

<https://pubs.acs.org/doi/10.1021/cen-10237-cover3?articleRef=control>

Microplastics and nanoplastics are almost everywhere—even in human bodies. Over the past 5 years or so, scientists have found them in the blood and brain, heart and kidneys, liver and lungs, human milk and placenta, and testicles and semen.

If and how these plastic particles—defined as smaller than 5 mm in size—harm our health remains unclear, but clues are emerging. In the laboratory, scientists are feeding mice microplastics to understand whether these particles pose risks to the animals’ health. Researchers are also tracking health outcomes in relation to the microplastics they find in human bodies.

“It’s just such a new field,” says Matthew Campen, a toxicologist at the University of New Mexico who studies micro- and nanoplastics in human tissues. But even as the research continues to evolve from its early stages, the [widespread presence of these plastic fragments in humans and the environment](#) is already something “we absolutely need to be concerned about,” Campen says.

To learn about the potential harm from micro- and nanoplastics, scientists will need to overcome technical challenges. The most fundamental among them is accurately detecting nanoplastics, which are less than 1 µm in size, in our tissues and bloodstream. Studies indicate that [nanoplastics could be more damaging than microplastics](#) because they’re smaller and can easily enter cells. And their larger ratio of surface area to volume makes such particles more reactive...

Can biodegradable polymers make microplastics?

by [Brianna Barbu](#), Page 21

<https://pubs.acs.org/doi/10.1021/cen-10237-cover4?articleRef=control>

The more people hear or read about microplastics turning up in air, drinking water, placentas, and brains, the more they want solutions. “It becomes very personal,” says Shannon Pinc, senior circular economy manager at [NatureWorks](#), a Minnesota-based company that makes polylactic acid (PLA), one of the most common compostable plastics.

NatureWorks and other makers of biodegradable plastic are putting forward their products as one of those solutions.

But even biodegradable plastics shed microplastics, though they won't persist indefinitely. They will continue to break down and eventually become food for microbes. While some experts emphasize that this is an unambiguous improvement on conventional plastics, which will stick around for hundreds of years, others stress that the degree of improvement depends enormously on what these polymers are used for and where they wind up at the end of their lives.

[Richard Thompson](#), director of the Marine Institute at the University of Plymouth and coiner of the term “microplastic” in 2004, is one of those urging caution. “We need to be careful that we don't spread the sphere of benefit wider than actually it should be,” he says.

There are many types of biodegradable plastic, but the ones synthesized on the largest scale currently are PLA, [polybutylene adipate terephthalate \(PBAT\)](#), and polybutylene succinate (PBS). [Polyhydroxyalkanoates \(PHAs\)](#) are a smaller but rapidly growing part of the market. And researchers are continuing to work on developing new materials and improving established ones. For example, the [California-based start-up Algenesis](#) is working on creating biodegradable polyester polyurethanes using compounds derived from algae and plants...

Enzymes to make plastics disappear

by [Alex Tullo](#), Page 23

<https://pubs.acs.org/doi/10.1021/cen-10237-cover5?articleRef=control>

Synthetic polymers have been on the planet for only about a century. But because of their strength, light weight, convenience, and low cost compared with other materials, these plastics have captured such a presence in humans' daily lives that the world is overrun with the waste they create.


A century is a wisp of time on an evolutionary scale, however, and nature hasn't had the chance to catch up with the new materials. Microorganisms will digest a paper bag discarded in the woods in a matter of months.

In contrast, a plastic bag will persist for decades, eventually shredding and disintegrating in the wind and sun, and forming microplastics that turn up on mountaintops and even in our blood.

Better waste management and less use of plastics might slow the accumulation. Substituting biodegradable, biobased plastics for fossil fuel–based plastics could also help, but they have many years to go before attaining significant scale in the market.


But what if there were a way to break down market-dominant synthetic polymers as if they were biodegradable?

Enzymes might be a solution. Synthetic polymers don't exist in the wild, but similar molecules, such as waxes, do. And nature has provided enzymes to break those down. Recent evidence shows that some microbes are already learning how to work on petroleum-derived polymers. In 2016, Japanese scientists made waves when they reported a [bacterium that eats polyethylene terephthalate \(PET\)](#) in samples taken from a recycling plant. This discovery inspired other researchers to scour the world in search of plastics-degrading microbes, and more are turning up...



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CLE AIChE: Cleveland Chapter

Fall 2024 – Spring 2025 Program Planning

(as of Jan2025)

Month	Topic, Speaker	Location	AICHe Officer Responsible
September 7, 2024 (6 PM)	Oktoberfest Social Event	German Central Farm, Parma	Joe Yurko, \$7/guest admission + \$ food & beverage free for CSU AICHe students. https://germancentralfoundation.com/oktoberfest
September 11, 2024 Wednesday 2:30 – 3:30 PM	Dr. Yu, CSU, IEEE Quantum Computer	CSU, Engineering CSU AICHe & IEEE Students	Joe Yurko & Dr. Gatica, Dr. Holland, Members: \$10; Students: Free CLE AICHe: Pizzas & Beverages
October 10, 2024 (Thurs. 6 PM)	M.W. Wilson Company Steam Safety Class & Tour	M.W. Wilson Company 2579 Center Road Hinckley, OH 44233	Joe Yurko, Jeff Wilson, Dinner provided by M.W. Wilson Co.? M.W. Wilson Co.: 330-225-0663 https://www.wmsilsoncoinc.com
October 2024 (6 PM) Wed. 16Oct2024 Wed. 30Oct2024 Wed. 06Nov2024	Chemical Process Safety Analysis Seminars: by Gurmukh Bhatia, CPISA	Strongsville Fire Dept. Ward 1 Community Rm 11297 Webster Road, Strongsville, OH 44136	Joe Yurko, Dinner cost is included in the seminar expense. Seminar expense: \$25 per session with a total of 3 sessions. Certificates will be awarded for each class as well as a final certificate. std: 440-580-3210: https://www.strongsville.org/departments/fire-emergency-services/stations-and-equipment
November 13, 2024 Wednesday (4:00 – 6:00 PM)	Benjamin A. Horwitz "Portrait of a Chemical Engineer" Career Discussion with students and professionals	CSU AICHe Section Joint Meeting, Washkewicz College of Engineering AICHe Chap	Joe Yurko, Dr. Gatica, Dr. Holland, CLE AICHe Meals: Professional members: \$10; Students: Free CLE AICHe: Pizzas & Beverages
December 17, 2024 (6 PM)	Nuclear Power Accident Analysis, Speaking: Andrew Ohrablo, Vista Life Cycle Manag, Fleet Engineer	The Sanctuary, Rockside Road Independence, 44131	Joe Yurko, Dinner menu ordering for professional members; Students cost: \$5 http://places.singleplatform.com/shulas-steak-house-8/menu#menu_5599999
January 28, 2025 (6 PM)	SARTA Hydrogen Fuel Cell Bus Fleet Expansion Funding from DOE ARCH2 Award, Kirt Conrad CEO	Burntwood Tavern Fairlawn, Akron Rt.18 and I-77	Joe Yurko, Dinner menu \$26 ordering for professional members; Students cost: \$5 Lobster Bisque Soup or House Salad Salmon Salad, or Angus Burger, or Fish & Chips
February 27, 2025 (6 PM ?)	1976 Diamond Shamrock plant Fortran Simulation Startup. Speaking: Dr. Don Harvey & Dr. James Fowler	CLE AICHe (TBA)	Joe Yurko, (TBA) CLE AICHe Meals: Professional members: \$10; Students: Free CLE AICHe: Pizzas & Beverages
March 2025 Wednesday (2:30 PM)	Benjamin A. Horwitz "The Good, The Bad, & The Ugly" Chemical Process Simulation with process algorithmic solutions	CSU AICHe Section Joint Meeting, Washkewicz College of Engineering AICHe Chap	Joe Yurko, Dr. Gatica, Dr. Holland, CLE AICHe Meals: Professional members: \$10; Students: Free CSU AICHe Students recommended to bring notebook PCs with Aspen CLE AICHe: Pizzas & Beverages
April 2025 (6 PM)	NEOSEF Awards Banquet	CCPL Branch Library?	Joe Spagnuolo, Moderator NEOSEF Students, CCPL Branch Library Dinner: Pizza, professional members: \$10; Students: Free
May 2025 (6 PM)	Tour of Perry Nuclear Power Plant Reactor Simulator?	Perry Nuclear Power Plant Training Tour	Ray Zucker, Joe Yurko, Andrew Ohrablo & _____(Perry Nuc. Plant)

