2021

AIChE® ANNUAL REPORT

AIChE
The Global Home of Chemical Engineers

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June C. Wispelwey
AIChE Executive Director
and Chief Executive Officer

Deborah L. Grubbe
2021 AIChE President

A personal note from June Wispelwey

On a personal note — This will be my final opportunity as AIChE's Executive Director and CEO to welcome you to our annual report. I will retire in Spring 2022. It has been an honor for me to participate in the growth of our Institute for the past 13 years and I am especially grateful to have met and worked with so many wonderful members of the AIChE community.

I am proud of all that AIChE has accomplished during my tenure. AIChE is a remarkable global organization of chemical engineers, guided by our members, our staff and our indispensable volunteers, who every day enable us to strive to make our world a better place for all. I look forward to becoming an active volunteer in AIChE, as I remain dedicated to participate in the continued success of the Institute.

Each year, within the pages of our annual report, we offer an update on the Institute's progress over the past year. Our achievements in 2021– like those in 2020 – were remarkable.

In 2021, we continued to weather the evolving challenges related to the COVID-19 pandemic. Many of our meetings and projects continued virtually. Through all of the adjustments to our programs and work processes, AIChE's leadership is gratified by the dedication, resilience, and partnership demonstrated by our membership and volunteers. Their individual and collective commitment to the chemical engineering profession – and to AIChE as their professional home – has helped to contribute to the Institute's continued growth.

After a year of producing our conferences virtually, AIChE returned to holding in-person conferences with our Annual Meeting in Boston, MA. AIChE also enhanced our commitment as a key provider of online content and opportunities for chemical engineers – including virtual participation and learning opportunities related to our many conferences and the AIChE Academy.

In 2021, AIChE continued to advance the professional growth of chemical engineers as we launched our new Institute for Learning and Innovation. ILI creates a bridge between industry and academia, offering an all-inclusive approach to career development, training, and practical application for chemical engineers throughout all stages of their careers. Among its highlights, ILI conducted six career discovery workshops, launched a new data analytics internship program, developed credentials in process intensification and process safety, and planned the launch of the Sustainable Engineering Corps (SEC).

AIChE took a lead in establishing the Future of STEM Scholars Initiative (FOSSI) for students pursuing STEM degrees at Historically Black Colleges and Universities (HBCUs). FOSSI is the chemical industry's first major program to increase the participation of underrepresented minorities in STEM professions. We are gratified to report that, in this first year, FOSSI provided scholarships to 151 STEM scholars. We are also pleased to announce that, by the end of 2021, nearly $15 million had been raised from supporting organizations, with a goal of funding 1,000 scholarships by 2025.

In this report, you'll also learn about the growth of our Center for Hydrogen Safety (CHS), the deepening influence of our Center for Chemical Process Safety (CCPS), and the impact of the Undergraduate Process Safety Learning Initiative (UPSLI), which prepares the future workforce for the needs of industry.

Underscoring all of this, AIChE – with the support of its stakeholders – continues to advance our profession along the IDEAL path of Inclusion, Diversity, Equity, Anti-racism, and Learning. We developed three learning modules to help engineers from the classroom through the boardroom to travel along this IDEAL path. AIChE's programming for still-underrepresented engineers, including women, minorities, LGBTQ+ members, those with disabilities, and others, would not have reached its current and impactful state without the dedication of our members and many volunteers.

As we optimistically enter into a new era, we are shaped by the lessons we have learned from the pandemic regarding our work, our shared challenges, and ourselves. The demonstrated abilities and innovative spirit of our chemical engineering community give us reason to be confident about our future.

We hope this look back at our accomplishments in 2021 will encourage you to continue to look to AIChE as the global home of chemical engineers and to continue to connect with us as we look ahead and discover the impact the profession will have on our future.

June C. Wispelwey
AIChE Executive Director and Chief Executive Officer

Deborah L. Grubbe
2021 AIChE President

Membership

AIChE encourages chemical engineers to "go further" in their careers by becoming active members of the Institute. Among the benefits, members are able to participate in AIChE's many communities — such as technical divisions, forums, local sections, and other groups — in order to expand their networks, keep up with trends in their areas of interest, and increase their own visibility and influence in the chemical engineering arena.

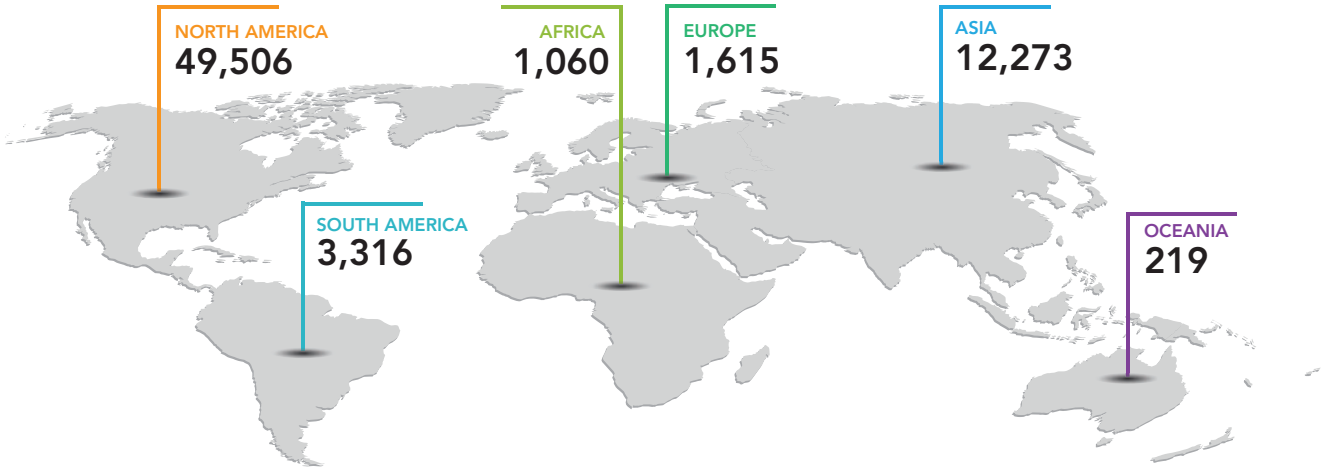
In 2021, AIChE members continued to connect with education opportunities and with one another through AIChE's expanding online and virtual activities.

60K+
TOTAL MEMBERS

136
COUNTRIES

40K+
MEMBER PROFESSIONALS

International distribution of all members



Technical Divisions and Forums

11,000+
AIChE MEMBERS
are also members of at least one technical division or forum. Learn about **divisions and forums** at: **aiche.org/divisions-forums**

Local Sections

7,100+
MEMBER PROFESSIONALS
participate in **local sections** across North America and at international locations.
aiche.org/local-sections

AIChE's **Virtual Local Section** offered a full slate of monthly meetings in 2021, and continues to help members connect online.
aiche.org/virtual

Communities

More than a century ago, a community of chemical engineers gathered together to establish AIChE. Since then, members of the Institute have continued to affiliate through AIChE's many communities, fueled by their shared interests and expertise. Recently, AIChE has created even more of these communities, allowing like-minded engineers to exchange knowledge, shared technical interests, and pursue professional, societal, and personal development objectives.

In addition to entities based on geographic location or technical interest, AIChE is building distinct communities that serve process engineers, chemical engineers with disabilities, LGBTQ+ engineers, engineers working toward climate solutions, and more, to help members to strengthen the profession and thrive as individuals.

Technical Entities

AIChE's Technical Entities are distinct communities of chemical engineers and other professionals that address such societal grand challenges as health, energy, environment, sustainability, water, and safety. These entities organize dozens of conferences each year, and continued to do so during 2021, conducting nearly all of their conferences on virtual platforms.

AIChE's **Society for Biological Engineering (SBE)** and the other entities also extended their reach and shared technical content through peer-reviewed journals, credentials, and educational offerings. Additional technical entities include the **Center for Energy Initiatives (CEI)**, the **Design Institute for Emergency Relief Systems (DIERS)**, the **International Metabolic Engineering Society (IMES)**, the **Institute for Sustainability (IfS)**, the **International Society for Water Solutions (ISWS)**, the **Center for Innovation and Entrepreneuring Excellence (CIEE)**, and the **Regenerative Engineering Society (RES)**.

In 2021, with the generous support of corporations, foundations and individual donors, the Regenerative Engineering Society established a new award named for its founder, Cato T. Laurencin of the University of Connecticut and The Connecticut Convergence Institute for Translation in Regenerative Engineering.

Read more about the activities and conferences of the technical entities at: **aiche.org/community/itg**

New in 2021

Feed Institute

Food Engineering, Expansion and Development

A new global community of food technologists and engineers from industry, academia, government, and national labs, FEED is dedicated to advancing food safety and innovation. The new AIChE entity will support the sustainable application of engineering techniques, technologies, and expertise across the food industries.

Engineers and scientists can join the FEED Institute as members, and can become involved with the FEED community at a slate of conferences. In its inaugural year of 2021, FEED participated in AIChE's Emerging Meat Alternatives Conference (Oct. 6–7) and the Food Innovation and Engineering (FOODIE) Conference (Dec. 6–7).

aiche.org/feed

Center for Energy Initiatives
An AIChE Technological Community

Center for Innovation & Entrepreneuring Excellence
An AIChE Technological Community

DIERS

imes
International Metabolic Engineering Society

institute for sustainability
An AIChE Technological Community

International Society for Water Solutions
An AIChE Technological Community

Regenerative Engineering Society

Society for Biological Engineering
An AIChE Technological Community

DIPPR
Design Institute for Physical Properties
An AIChE Technology Alliance

The DIPPR 801 Database is a widely used resource for the design and operation of safe, reliable, and sustainable processes. End-users have access to accurate and complete thermodynamic and transport properties for the chemical compounds used across a broad segment of the chemical processing industries, as well as validated environmental and process safety and risk assessment properties. Each year, DIPPR funds research to improve the ability to evaluate and predict properties of pure chemicals such as liquid viscosity, heat capacity, and auto-ignition temperature. End-users may embed the 801 Database in third-party software and in-house applications, and may add their own proprietary data.

aiche.org/dippr

47
CORPORATE MEMBERS

85
GLOBAL LICENSEES

Student Membership

AIChE saw continued expansion of its undergraduate student activities in 2021, with the establishment of 16 new student chapters — including six in Peru, two in Brazil, and two in Lebanon. AIChE also launched new chapters in Bangladesh, Canada, India, Kazakhstan, Saudi Arabia, and the United States.

One new AIChE Student Regional Conference was hosted virtually in Indonesia in February 2021. AIChE also hosted virtual Student Regional Conferences and competitions in its nine North American regions, plus Brazil, China, India, and Latin America. **aiche.org/students**

26,000+
STUDENT MEMBERS

MORE THAN
380
STUDENT CHAPTERS

ACROSS
107
COUNTRIES

ACROSS
50
COUNTRIES

An IDEAL Path to Equity, Diversity, and Inclusion

In 2020, AIChE revised its statement on equity, diversity, and inclusion. This revised statement was further advanced in 2021 by former AIChE Director Cato Laurencin (University of Connecticut), who proposed the concept of the IDEAL Path, which is characterized by inclusion, diversity, equity, anti-racism, and learning. The IDEAL Path emphasizes the active components of anti-racism and learning as crucial additions to the aspirational components of inclusion, diversity, and equity, in order to create a more fair and just society.

The core of the statement reads:

AIChE is committed to creating, nurturing and expanding an inclusive, respectful and welcoming environment where people of all backgrounds and identities are valued and respected and can achieve their full potential, regardless of: (i) race, ethnicity, or national origin; (ii) religious or spiritual practice, or absence thereof; (iii) sex, gender identity and expression, or sexual orientation; (iv) family or relationship structure; (v) any type of disability or perceived disability, past or present; (vi) age; (vii) any ascribed status or visible or invisible difference.

AIChE's many entities — including local sections, committees, technical divisions, and operating councils — have assisted the Institute in communicating the IDEAL concept to constituents.

The full statement on the IDEAL Path, can be found at **aiche.org/ideal.**

AIChE ScaleUp

AIChE undergraduate student membership is subsidized through the generosity of its ScaleUp sponsor organizations. Thank you to our ScaleUp program sponsors for their generous support in helping to enrich the next generation of chemical engineers.

aiche.org/scaleup

PLATINUM SPONSOR

Chevron

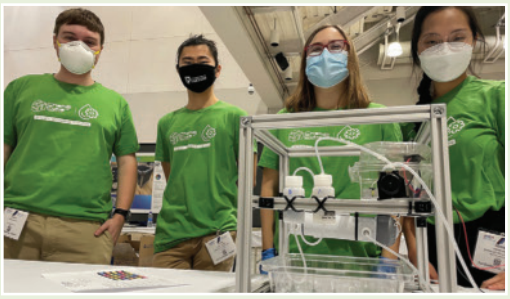
GOLD SPONSOR

Honeywell UOP

ChemE Cube™
PRESENTED BY RAPID®

Launched by AIChE's Rapid Advancement in Process Intensification Deployment (RAPID) Manufacturing Institute in 2020, ChemE Cube™ is an annual competition in which undergraduate teams design, build, and demonstrate a 1-cubic-foot plant to produce a chemistry defined in the annual problem statement. Teams compete on cube performance in a head-to-head duel, promoting their technology through a one-minute ad, poster, and 20-minute "shark tank" style pitch to a panel of mock investors.

In 2021, undergrads were tasked with building a water purification unit in a 1-ft cube. Teams squared off at AIChE's Annual Student Conference in Boston, MA. A team from the University of Delaware took first prize.



Here, a team from Carnegie Mellon University presents its ChemE Cube. *Photo credit: Katie Agin*

Education

AIChE INSTITUTE FOR LEARNING & INNOVATION

In 2021, AIChE opened the virtual doors to its Institute for Learning and Innovation (ILI), launching a new website and marking an increase in offerings and participation.

The Institute for Learning and Innovation creates a bridge between industry and academia, offering an all-inclusive approach to career development, training, and practical application for chemical engineers at all stages of their careers.

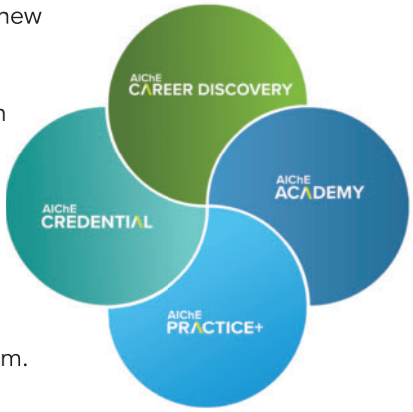
The ILI is delivering content and opportunities along four dimensions:

- **Career Discovery and services** — including skills assessment to help learners identify goals and the skills and experiences needed to achieve them
- **Education and training** — including courses offered via AIChE Academy
- **Certificates and credentials** — validating engineers' proficiency in such disciplines as safety, process intensification, sustainability, and more
- **Practice+** — aligning learners with opportunities to gain practical experience in applying their new skills, and offering a head-start on their next career steps.

Among its highlights in 2021, ILI:

- completed design and testing, and launched a new website in November 2021 — with more than 20,000 views in its first month
- conducted six Career Discovery workshops, with participation by more than 160 professionals
- developed new credentials in areas such as process intensification and process safety
- introduced plans for a new Sustainable Engineering Corps
- held six international in-company courses
- launched a new data analytics internship program.

aiche.org/ili



AIChE ACADEMY

An integral component of the Institute for Learning and Innovation (ILI), AIChE Academy continues to deliver training to chemical engineers and their organizations worldwide. In 2020 and 2021, the Academy responded to the COVID-19 pandemic by adapting its in-person courses for online presentation.

Members and non-members alike use the Academy's live and archived courses, webinars, conference presentations, and other eLearning resources to improve their professional skills, train teams, and brush up on trending topics. Many Academy products offer continuing education units (CEUs) and professional development hours (PDHs).

aiche.org/academy

Awards and Honors


Kristi S. Anseth


David Rosenthal

AIChE and its entities honor the breadth of chemical engineering accomplishments through award programs. The highest honors are the Board of Directors' and Institute awards, which were presented at the Honors Ceremony during AIChE's Annual Meeting. The 2021 Honors Ceremony was held during the Annual Meeting in Boston, MA. The Institute Award recipients are listed at:

aiche.org/awards/institute

The Board of Directors' 2021 **Founders Award** was presented to **Kristi S. Anseth** (University of Colorado) for pioneering the fields of biological engineering and polymers, with applications in biomaterials, tissue engineering, drug delivery, and biosensing. The Board's **Van Antwerpen Award for Service to the Institute** was presented to **David Rosenthal** (Vysus Group), AIChE's President in 2012, for leading the Institute during times of uncertainty to ensure a continuing home for chemical engineering professionals.

Learn about all of AIChE's award programs and the 2021 honorees at:

aiche.org/awards

Publications

Journal Highlights

The publications team worked on creating a more cohesive network between AIChE's six journals — *AIChE Journal, Bioengineering & Translational Medicine (BioTM), Biotechnology Progress (BTPR), Environmental Progress & Sustainable Energy (EP&SE), Process Safety Progress (PSP), and the Journal of Advanced Manufacturing and Processing (JAMP)* — such that these journals are viewed as one portfolio covering topics relevant to chemical engineers. This initiative continues into 2022.

The five journals that have impact factors (IF) all received improved IFs for 2021 (see table below), with the IF of *BioTM* increasing dramatically.

Journal	2021 IF	2020 IF
AIChE Journal	3.993	3.519
BioTM	10.711	6.091
BTPR	2.681	2.334
EP&SE	2.431	1.989
PSP	1.344	0.734

Additional highlights from 2021:

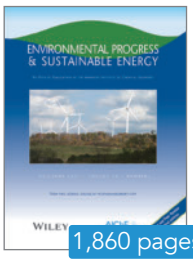
- *AIChE Journal* selected its next editor-in-chief, David Sholl (Oak Ridge National Lab), to succeed Michael Harold, who stepped down as editor after 10 years of distinguished service, per the *Journal*'s policy of limiting the position to two five-year terms.
- *BioTM* moved into the fourth slot among the 90 biomedical engineering journals after receiving its latest IF of 10.711.
- *BTPR* selected Matthew DeLisa (Cornell Univ.) to receive its 2021 Biotechnology Progress Award for Excellence in Biological Engineering Publication.
- *EP&SE* published a virtual issue, "US-China EcoPartnership," which focused on pathways toward decarbonizing economies to mitigate climate change.
- *JAMP* published a RAPID special issue, "Advancing U.S. Manufacturing: A focus on the AIChE RAPID Manufacturing Institute for Process Intensification and Modularization."
- *PSP* published a special issue on the Latin American Process Safety Conference.

aiche.org/journals

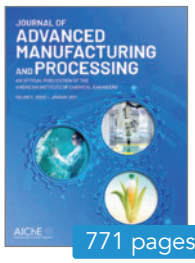
4,469 pages

319 pages

1,701 pages



1,860 pages



771 pages

299 pages

New in 2021

Open Access and the Publishing Landscape

The publishing landscape continues to be revolutionized by the trend toward open access (OA), whereby research outputs are distributed online, free of cost or other barriers to access, copying, or reuse by the user/reader. The costs of open access publishing are borne by the author, who pays an article publishing charge (APC), rather than subscription fees paid by users.

To understand the impact of publishing open access on readership, citations, and media attention, Wiley — AIChE's publishing partner — performed a comprehensive study in 2021, in which they analyzed 203,000 articles over a four-year period and 459,000 articles over a two-year period. They found that articles published open access are on average downloaded more than three times more, cited 1.7 times more, and attract more than five times more attention than articles that are not.

One major driver of the accelerating move to OA journals are global policies requiring that government-funded research be published in an OA journal. These policies and initiatives are different depending on where you are in the world. Our publisher Wiley also has different strategies for different parts of the world with the goal of remaining globally competitive while not undermining the publishing process and value. To do this, Wiley is involved in advocacy (mostly in the U.S.), creating hybrid journals, as well as full OA journals where it makes sense, and entering into transitional agreements with governments and other entities.

Publications

CEP Highlights

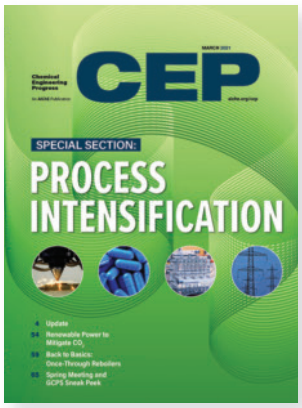
Chemical Engineering Progress (CEP) — the Institute's flagship publication — reached more chemical engineers than ever in print, online, and via the *CEP* app. *CEP*'s monthly printed magazine is a favorite benefit among AIChE members. In 2021, the *CEP* website logged over 1.8 million pageviews — a 60% increase over 2020. In addition, the number of users visiting *CEP* webpages grew by 21% over the previous year, to more than 450,000.

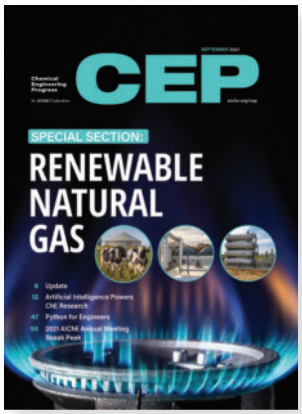
MORE THAN **450K** USER SESSIONS

One notable accomplishment for *CEP* in 2021 was the publication of the biennial AIChE Salary Survey, in addition to the publication of four special sections:

- **Process Intensification, a collaboration with the RAPID Manufacturing Institute (March)**
- **Waste Plastics Recycling (July)**
- **Renewable Natural Gas (September)**
- **Society for Biological Engineering: Biosafety and Biosecurity (November)**

aiche.org/cep



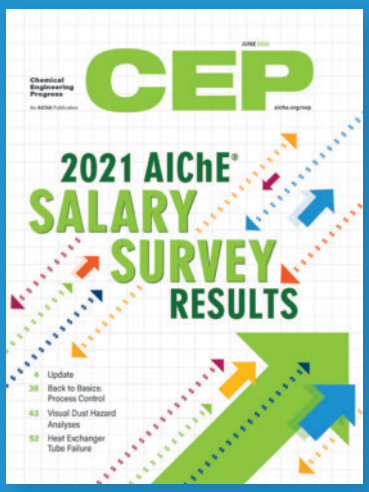


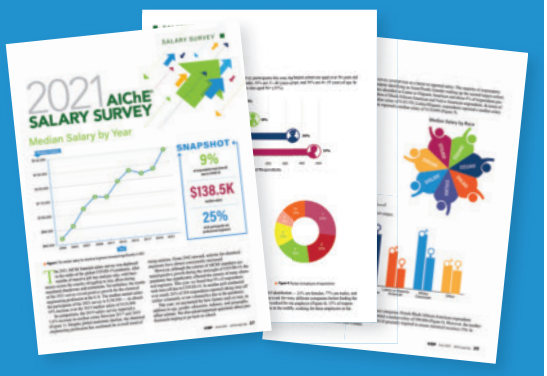
New in 2021

CEP Publishes the 2021 AIChE Salary Survey

The 2021 biennial salary survey was deployed in the midst of the COVID-19 pandemic, and the survey found that 9% of respondents took time off due to the pandemic. Of the respondents who took time off, 44% were furloughed, 16% dealt with personal illness, and 10% were laid off. Nevertheless, the results of the 2021 survey revealed positive growth for the chemical engineering profession. Check out the June 2021 issue of *CEP* to review the full report.

aiche.org/cep

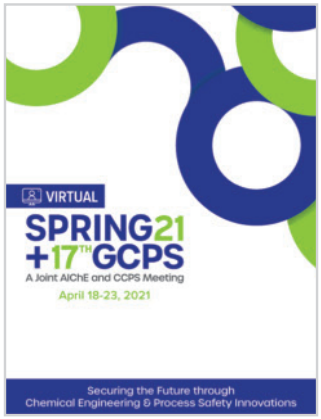




Events

In 2021, AIChE's major conferences saw a return to in-person attendance with continued virtual growth, attracting chemical engineers and allied professionals working in industry, labs, and academia around the world. Strong technical programs consisting of live and recorded presentations were rounded out by technical and fun networking events.

2021 AIChE Spring Meeting & 17th Global Congress on Process Safety



The Spring Meeting and Global Congress on Process Safety is AIChE's key technical conference for practicing chemical engineers and process safety practitioners. Emphasizing technology in core and emerging areas, the 2021 meeting was held virtually April 18–23, and showcased sessions devoted to ethylene production, distillation, Industry 4.0, leadership skills, clean energy, gas utilization, refinery processing, and more. The Global Congress on Process Safety (GCPS) addresses the needs of process safety practitioners, with programming devoted to loss prevention, process plant safety, process safety management, lessons learned, and global perspectives.

aiche.org/spring

New in 2021


Ilham Kadri

Ilham Kadri, CEO and President of the Executive Committee of Solvay, delivered the AGILE Keynote Address: "Leading with Purpose, Heart and Mind." Daily keynote topics included digital transformation, advancing the circular economy, and industry perspectives on learning and innovation.

The Industrial Wastewater Management and Water Reuse Topical Conference made its debut. In addition to well-established approaches to water management, the conference provided thought-provoking discussions on water in the circular economy.

Corrie Pitzer, Founder and CEO of SAFEmap, delivered the GCPS plenary keynote address, advising engineers and safety personnel to remain vigilant for latent danger in their companies' processes. His discussion outlined new roles for leaders and practitioners in an evolving world.

ASC21
AIChE Annual Student Conference

Participation at the Annual Student Conference (November 5–14), topped 1,600. Highlights included a keynote by **Paul Mensah**, Vice President of Biotherapeutics Pharmaceutical Sciences at Pfizer Inc., as well as career sessions, competitions, and networking events. New events in 2021 included the AIChE ChemE Cube Competition organized by RAPID, as well as a guest speaker, John Warner (co-founder of Beyond Benign), for the Student Conference Night of Networking — with the help of the AIChE Ichthyologists (Boston) Local Section.

aiche.org/asc21


Paul Mensah

2021 Annual Chem-E-Car Competition®

Thirty teams participated in the 23rd annual AIChE Chem-E-Car Competition® — held virtually and in-person in two separate competitions. The University of Toledo interrupted Virginia Tech's two-year winning streak to claim first place in the in-person performance competition with "Zinc-asaurus Rex." Their car stopped 10 cm from the target distance of 21.05 meters. Dalian University of Technology won the virtual performance competition with their car "Ling Han" reaching 70 cm away from the target distance of 21.75 meters. Best video went to Virginia Tech, which also received the award for most consistent performance. The competition is sponsored by Chevron. The $2,000 first prize is funded by the H. Scott Fogler Endowment, named for the competition's founder.

2021 AIChE Annual Meeting

2021 AIChE ANNUAL MEETING

AIChE's premier educational forum for chemical engineers interested in innovation, collaboration, and professional growth, the AIChE Annual Meeting was hosted in-person in Boston, MA, November 7–11, 2021, and virtually November 15-19, with attendees from 50 countries and 48 U.S. states (plus Puerto Rico and Washington, DC). The meeting featured a mix of live and pre-recorded content from 22 of AIChE's technical divisions and forums as well as several of AIChE's communities.

aiche.org/annual

New in 2021

The meeting's theme of "Building the Bridge in 21st Century Education" was amplified in two panel discussions, featuring Yang Luo (Honeywell Advanced Materials), Roger Hart (Amgen, retired), Patricia Hurter (Lyndra Therapeutics), and Phillip R. Westmoreland (North Carolina State University).

The **John M. Prausnitz AIChE Institute Lecture** was presented by **Arup K. Chakraborty** of the Massachusetts Institute of Technology (MIT). The 73rd annual lecturer, Chakraborty's talk was entitled "Viruses, Immunity, and Vaccines."

Additional featured lectures were presented by some of the profession's thought leaders, including **David V. Schaffer** (UC Berkeley), **Eric S. G. Shaqfeh** (Stanford), **William E. Bentley** (University of Maryland), and **James J. Collins** (MIT).

AIChE was pleased to feature lectures from the 2020 and 2021 Hoover Medal recipients, both chemical engineers: **William S. Hammack** (University of Illinois – Urbana-Champaign) and **Cato T. Laurencin** (University of Connecticut). (See page 16.)

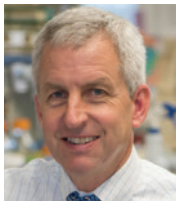
The 2021 Langer Prize was presented to **Aditya Kunjapur**, who discussed the status of his research. Remarks from Robert Langer and a presentation from the 2020 Fellow, Maria Eugenia Inda, rounded out the session. (See page 16.)

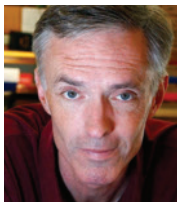
The session "Celebrating the Life and Achievements of H. Scott Fogler" honored the contributions of AIChE Fellow and former president H. Scott Fogler, the Vennema Professor of Chemical Engineering and Arthur F. Thurnau Professor at the University of Michigan, who passed away on August 21, 2021, at age 81.


Arup K. Chakraborty


David V. Schaffer


Eric S. G. Shaqfeh


William E. Bentley


James J. Collins

K–12 STEM Showcase and Outreach Competition

Grade school students, parents, and teachers were inspired by hands-on demonstrations of chemical engineering concepts at AIChE's third K–12 STEM (Science, Technology, Engineering, Math) Showcase and Outreach Competition, held during the 2021 Virtual Annual Meeting on November 14–15.

Sixteen teams — consisting of AIChE member undergraduates — exhibited tabletop demos and participated in mentoring sessions. Volunteers judged the entries for originality, technical content, safety, and suitability for classroom use. AIChE is archiving the top entries in its online STEM outreach database, containing lesson plans that can be used by anyone who wants to stimulate STEM interest among future engineers and scientists.

This year's event was organized by AIChE's K–12 and Executive Student committees, and supported by the AIChE Foundation and 3M.

aiche.org/k12

AIChE K-12

ALL FOR GOOD
Engineering for Inclusion

3M Science. Applied to Life.™

Industry Technology Groups

RAPID® Manufacturing Institute

In 2016, the U.S. Department of Energy established AIChE's Rapid Advancement in Process Intensification Deployment (RAPID) Institute. One of the Manufacturing USA institutes, RAPID's public-private collaborations focus on breakthrough process-related technologies aimed at boosting energy productivity and energy efficiency by 20% over five years. Process intensification (PI) is any technology development that leads to smaller, cleaner, or more energy efficient processes.

RAPID's Education and Workforce Development initiative aims to leverage existing training resources to enable the workforce to research, develop, and operate processes that incorporate new PI and modular chemical process intensification (MCPI) technologies.

aiche.org/rapid

90 MEMBER ORGANIZATIONS

2021 IMPACT

- **38** RESEARCH PROJECTS TO DATE
- **4** TECHNOLOGIES SCALED FROM R&D TO COMMERCIALIZATION
- **24** WEBINARS TO DATE

POTENTIAL IMPACT

- **$150MM** PUBLIC-PRIVATE INVESTMENT
- **3,500+** PEOPLE TRAINED
- **20%** REDUCTION OF ENERGY INTENSITY AND MODULE COSTS

*Potential impact of PI on U.S. process industries

New in 2021

- Launched three new eLearning courses. Topics included a Guide to Techno-Economic Analysis, Process Safety for Process Intensification, and Intensified Distillation Processes.
- Launched the Process Intensification Credential Program.
- Launched the RAPID Software Toolbox, an online, members-only tool enabling the RAPID community to keep up with recent advances in software tools, models, and data on modular chemical process intensification technologies (MCPI) or equipment.
- At the 2021 Annual Student Conference, RAPID and five student teams piloted the ChemE Cube™ competition — where teams design, build, and operate a mini-plant in a 1-ft cube. The University of Delaware team won the inaugural 1st prize.
- Continued operating RAPID's 10-week virtual summer intern program to develop future leaders in PI and MCPI. 102 students have completed the RAPID Intern Program to date.
- Piloted two instructor-led courses: one virtual course, "Strategies for Computer-Aided Process Intensification," and one in-person course, "Fundamentals of Batch-to-Continuous-Process Conversion in Specialty and API Chemistries."

CENTER FOR Hydrogen™ SAFETY

Established in 2019, AIChE's Center for Hydrogen Safety (CHS) guides industry stakeholders in the transition to the hydrogen economy by promoting the safe handling and use of hydrogen. It provides international partner organizations with resources that address traditional uses of hydrogen as a feedstock and hydrogen's growing use as a fuel source.

CHS experienced a breakout year in 2021, and is quickly becoming recognized as a global leader for hydrogen safety. Despite an international pandemic, CHS membership grew to 72 organizations and 12 strategic partners. CHS added six hydrogen safety training courses; conducted three technical webinars with more than 1,900 registrants; and held 12 virtual training events and an Asia-Pacific conference with attendees from 14 countries.

aiche.org/chs

An AIChE Technology Alliance

CCPS

Center for Chemical Process Safety

The Center for Chemical Process Safety (CCPS®) is a not-for-profit, corporate membership organization within AIChE that identifies and addresses process safety needs for facilities that handle, store, use, process, or transport hazardous materials. CCPS member companies, working in project subcommittees, define and develop useful, time-tested guidelines that have practical applications in industry.
CCPS educates employees of member companies through its events, courses, books, tools, online resources, and publications.

aiche.org/ccps

Conference highlights in 2021:

CCPS held 28 virtual events in nine countries

- 5 Virtual Student Boot Camps
- 4 Faculty Workshops
- 5 Conferences
  - 17th Global Congress on Process Safety
  - 2021 European Conference on Process Safety and Big Data
  - Latin American Conference on Process Safety
  - 3rd Middle East Process Safety Conference
  - 6th Global Summit on Process Safety
- Many other regional meetings, conferences, round tables, panel discussions, and webinars

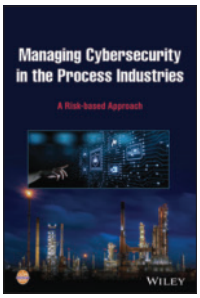
Process Safety Beacon 20 YEARS ANNIVERSARY

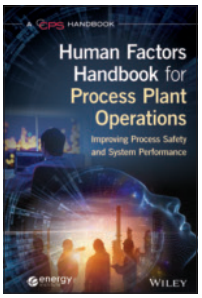
Now in its third decade, the monthly **CCPS Process Safety Beacon** continued to publish valuable process safety information for plant operators. The Beacon is available in 41 languages, with an estimated distribution of 1,000,000 readers. In 2021, CCPS published three **"Book of Beacons"** to expand the details of each of the published issues of Beacon. The Book of Beacons is available to CCPS members only.

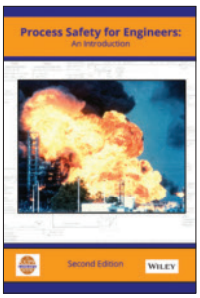
aiche.org/beacon

Highlights in 2021

3 **BOOKS** PUBLISHED IN 2021







- CCPS membership remained stable, despite the economic and social impact of the pandemic
- Three books were published as well as three new CCPS Golden Rules and Key Principles (Combustible Dust, Chlor-Alkali, and Key Principles for Management of Change)
- One new monograph addressed "2020 Significant Process Safety Incidents"
- Launched the CCPS Process Safety Fundamentals Certificate Program (CCPSf) for students and early-career professionals
- The Process Safety Incident Database (PSID) was upgraded to include a new software design, and offered enhanced reporting and increased functionality
- CCPS conducted its 10-week CHEF/RAST Training Workshop
- Newly upgraded and reissued RAST and CHEF software
- Developed the "Leading and Lagging Indicators to Improve Process Safety Performance" guide
- Advanced process safety education for students and professors in collaboration with companies and the AIChE Foundation via the Undergraduate Process Safety Learning Initiative (UPSLI). These efforts included CCPS Virtual Faculty Process Safety Training Workshops (sponsored by BASF, Bayer, Chevron, and Dow) and five virtual Student Boot Camps. **aiche.org/upsli**
- **New CCPS Vision Statement: A World Without Process Safety Incidents**

Foundation

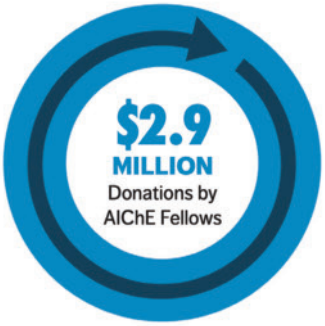
The AIChE Foundation launched its Doing a World of Good campaign in 2015 with a goal of raising $15MM to expand the profession's positive impact by funding five transformative priorities. The campaign unites the chemical engineering community in addressing society's grand challenges to benefit humanity.

Thanks to the continued generosity of individual supporters and industry partners, the campaign surpassed its goal, raising more than $36 MM. We are dedicated to creating an equitable, diverse and inclusive profession and safer workforce for all chemical engineers. Together, we are supporting the extraordinary.

doingaworldofgood.org

AIChE The Global Home of Chemical Engineers | DOING A WORLD OF GOOD

Exceptional Numbers Extraordinary Impact



*2 million campaign goal; Refers to overall Foundation donations

PARTICIPATION

134
TOTAL COMPANIES PARTICIPATING IN CAMPAIGN

6,688
INDIVIDUAL AND CORPORATE **SUPPORTERS**

PROGRAM IMPACT

SAFETY & ETHICAL PRACTICE

226,148
SAFETY CERTIFICATES AWARDED TO STUDENTS WORLDWIDE

62,008
STUDENTS COMPLETED SAChE MODULES WORLDWIDE

789
NEW FACULTY MEMBERS EDUCATED IN PROCESS SAFETY AT INDUSTRY WORKSHOPS

734
UNIVERSITIES PARTICIPATED IN UPSLI CURRICULUM

979
UNDERGRADUATES PARTICIPATED IN PROCESS SAFETY BOOT CAMPS

ATTRACTING THE BEST AND THE BRIGHTEST

151
FUTURE OF STEM SCHOLARS INITIATIVE (FOSSI) SCHOLARSHIPS AWARDED

426
PARTICIPANTS IN THE LEADERSHIP WORKSHOP FOR RISING STAR WOMEN ENGINEERS SINCE 2018

70
LEADERSHIP EQUITY IN ENGINEERING PARTICIPANTS SINCE 2019

RESEARCH & INNOVATION

$225K
AWARDED TO EARLY-CAREER RESEARCHERS THROUGH THE LANGER PRIZE FELLOWSHIP

3,147
INDIVIDUALS TRAINED IN PROCESS INTENSIFICATION

102
UNDERGRADUATES PARTICIPATED IN RAPID'S INTERNSHIP PROGRAM

EDUCATION AND CAREER DEVELOPMENT

5,000+
K-12 STUDENTS PARTICIPATED IN AIChE STEM OUTREACH PROGRAMS

532
MEMBERS JOINED THE AIChE PROCESS ENGINEERS COMMUNITY

CHANGING PERCEPTIONS

212,914
VIEWS OF *WHAT IN THE WORLD DO CHEMICAL ENGINEERS DO?* VIDEO

50
ATTENDEES AT THE INAUGURAL IDEAL RECEPTION

2021 AIChE® Annual Gala

CELEBRATING THE EXTRA ORDINARY

Held on December 1 in New York City, the 2021 AIChE Gala recognized industry leaders for solving societal problems and bettering humanity through chemical engineering. A livestream of the gala program was available for those who could not attend the in-person event.

The Gala raised more than $540,000 and was attended live and virtually by 300 guests. Funds raised will underwrite the expansion of the Doing a World of Good campaign's priorities.

The Gala honored Stéphane Bancel, Chief Executive Officer of Moderna, for his and Moderna's discovery and development of innovative solutions that are saving and improving people's lives through healthcare. The 2021 Doing a World of Good Medal was presented to AIChE's co-founding partners of the Future of STEM Scholars Initiative (FOSSI): FOSSI Chair Mark Vergnano, former Chairman of the Board of Chemours; Chris Jahn, President and CEO of the American Chemistry Council; and Ashley Christopher, esq., Founder and CEO of HBCU Week Foundation. All were honored for their esteemed contributions to the advancement of society.

aiche.org/gala

Founding partners of the Future of STEM Scholars Initiative were honored at the 2021 AIChE Gala. From left: June C. Wispelwey, AIChE's Executive Director and CEO; Deborah Grubbe, AIChE's 2021 President; Ashley Christopher (HBCU Week Foundation); Chris Jahn (American Chemistry Council); and Mark Vergnano (Chemours). Photo credit: Natural Expressions NY

FOUNDERS' CIRCLE

Changemaker
$5M and up

Chemours

Visionaries
$2M – $4,999,999

Chevron, DOW

Benefactors
$750,000 – $1,999,999

AdvanSix, BASF We create chemistry, Celanese The chemistry inside innovation, DuPont, Eastman, lyondellbasell Advancing Possible

Underwriters
$500,000 – $749,999

CABOT, Chevron Phillips Chemical, سابك sabic

Patrons
$250,000 – $499,999

ADM, ARKEMA, BAYER, covestro, ECOLAB, EVONIK POWER TO CREATE, ExxonMobil, Lubrizol, MERCK, Pfizer, polarispartners, SOLVAY, UNIVAR CHEMISTRY DELIVERED

The Future of STEM Scholars Initiative

Now in its second year, FOSSI is a national program which seeks to increase the number of underrepresented professionals in the chemical industry workforce by providing scholarships to students pursuing preferred STEM degrees at Historically Black Colleges and Universities (HBCUs). FOSSI also connects scholars to leadership development, mentoring, and internship opportunities at sponsoring companies.

The 2021 inaugural class of 151 FOSSI scholars is from 28 states and attends 26 HBCUs. With donations exceeding $16 million and the support of more than 50 chemical manufacturers and related organizations and individuals, FOSSI recently announced the ambitious goal of funding 1,000 scholars by 2025.

In giving these deserving students the opportunity to realize their dreams, FOSSI will create a dynamic and diverse workforce equipped to tackle the global challenges ahead, and one that is truly representative of the communities in which we live.

futureofstemscholars.org

New in 2021

Laurencin

Hammack

Honoring the 2020 & 2021 Hoover Medalists

The inter-engineering-society Hoover Medal was presented to two chemical engineers, who received their honors at the 2021 AIChE Annual Meeting. **Cato T. Laurencin** (left) of the University of Connecticut received the 2021 Hoover Medal for mentoring underrepresented engineers and for his work on the policy level to foster justice, equity, fairness, and diversity in institutions. The 2020 Hoover medalist, **William S. Hammack** (right) of the University of Illinois at Urbana-Champaign, was honored for using broadcast and social media to bring engineering education to the public. Both Laurencin and Hammack delivered lectures at the 2021 Annual Meeting.

Kunjapur

Launched in 2019, AIChE's **Langer Prize for Innovation and Entrepreneurial Excellence** is named for biomedical pioneer Robert Langer (MIT). The prize — administered by AIChE's Center for Innovation and Entrepreneuring Excellence (CIEE) — provides an unrestricted grant of up to $100,000 to enable early-career creative researchers and engineering entrepreneurs to pursue game-changing innovations.

The 2021 Fellowship was awarded to **Aditya Kunjapur**, Assistant Professor of Chemical and Biological Engineering at the University of Delaware, for his work to boost the efficacy of live vaccines by engineering cells to produce an immunogenic amino acid.

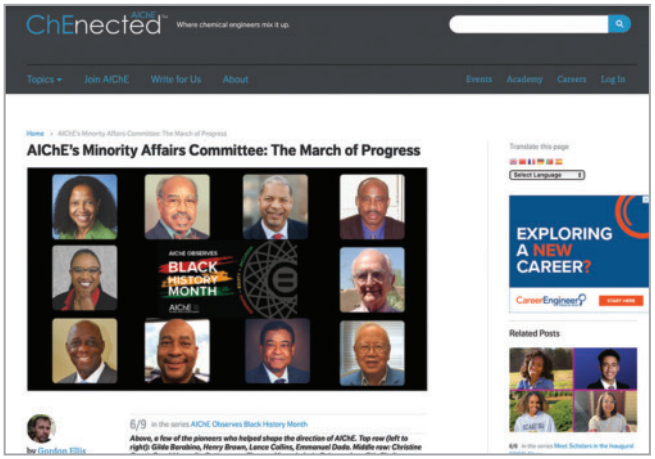
AIChE's Reach

ChEnected by AIChE
Where chemical engineers mix it up.

AIChE made an impact on media throughout the world via its communication and social media channels.

A key component of this connection is AIChE's ChEnected blog. Originally launched by AIChE young professionals, ChEnected provides insights into AIChE, the profession, and the people in the broad chemical engineering community. In addition to ongoing series devoted to young professionals and LGBTQ+ engineers, special series presented in 2021 commemorated Black History Month and Women's History Month.

aiche.org/chenected



New in 2021

ChEnected's Top Posts in 2021 (by pageviews):

1. 2021 AIChE Salary Survey (9,178 views)
2. Engineering Ethics (6,040)
3. Remembering H. Scott Fogler, AIChE Fellow and Past President (5,534)
4. A Chemical Engineering Pioneer and Some of Her Descendants (4,616)
5. Pfizer's Paul Mensah is AIChE's 2021 Industrial R&D Award Recipient (4,520)
6. Charles Pierce: A Name Every Chemical Engineer Should Know (3,667)
7. Obafemi Awolowo University and the AIChE Chemical Engineering for Good Challenge (ACE4G) (3,281)
8. University of Toledo Wins 1st Place Award in Chem-E-Car Competition® (3,219)
9. Video Tutorial: Using Excel Solver for Nonlinear Equations (2,766)
10. Excel for Chemical Engineering Problems (2,635)

AIChE Engage

The Engage forum connects AIChE members with their chemical engineering communities. It serves as the Institute's directory, discussion platform, and volunteer hub. Discussion Central offers ongoing technical and professional development discussions, and includes several private or subject-specific communities.

aiche.org/engage

Find AIChE daily on Twitter, Facebook, Instagram, LinkedIn, and YouTube.

In 2021, AIChE's overall audience for these accounts increased by 35.9% over 2020.

TWITTER @CHENECTED
18.2K
FOLLOWERS

INSTAGRAM @CHENECTED
3.5K
FOLLOWERS

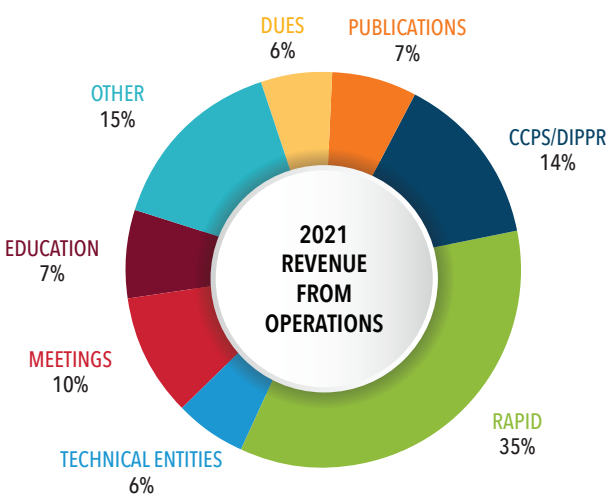
YOUTUBE
15.5K
SUBSCRIBERS

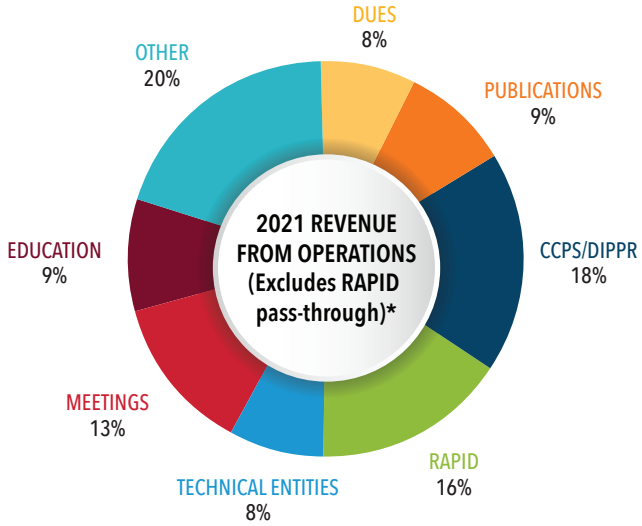
LINKEDIN
62.3K
FOLLOWERS

FACEBOOK
24.2K
PAGE LIKES

Among the new activities, AIChE's Advanced Manufacturing and Processing Society (AMPs) launched a LinkedIn Showcase page.

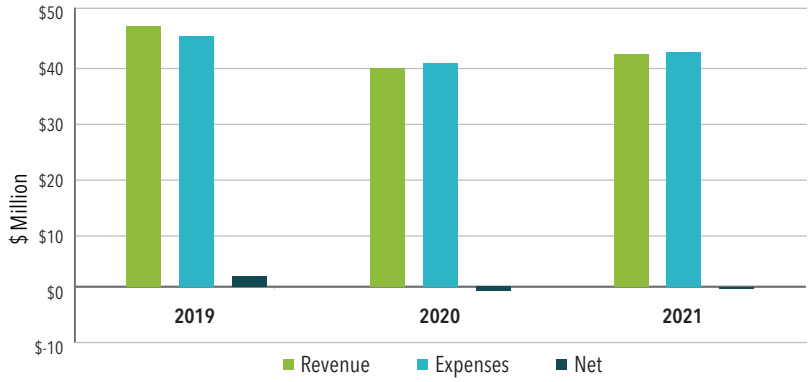
Financial



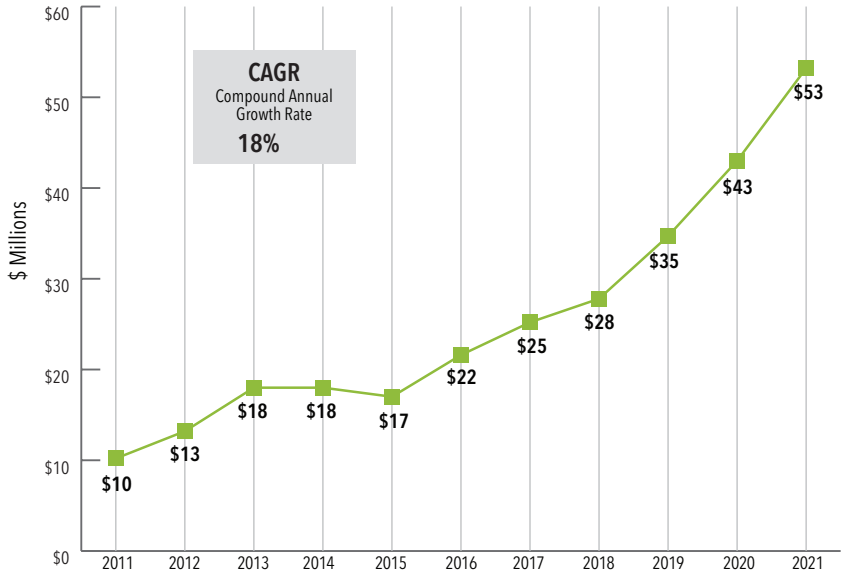


*Graphs reflect RAPID Project Revenue with (left) and without (right) sub-awards from RAPID to fund technical projects.

AIChE OPERATIONS



NET ASSETS



Financials reflect pre-audit numbers

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