



American Fuel & Petrochemical Manufacturers

Commitment to a Sustainable Future

2020 Sustainability Report



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A Message From the President and CEO of AFPM

America’s fuel and petrochemical manufacturers fulfill an indispensable role in today’s world. Our industries make modern life possible through affordable fuel and petrochemical products that enable everything from daily transportation and home heating, to advanced technologies, to critical health and medical products like N95 masks and syringes for life-saving vaccines. Our products make life better, safer and more productive not only for Americans, but for people around the world.

We are all currently navigating a pandemic that has brought hardship and loss, and driven millions of people into poverty. We also face the prospect of a global population that will grow by two billion over the coming decades. Our industries are prepared not only to help the world recover economically from COVID-19, but also to supply the fuel and petrochemical needs of a growing world and global middle class. We must do so in a way that is sustainable now and for generations to come, and in a way that addresses global issues such as climate change, the management of plastic waste and rising standards of living.

AFPM member companies, and the dedicated employees who comprise them, share and stand behind this commitment to a sustainable future. And every day, we are applying ingenuity and problem-solving to advance progress on sustainability — whether it be through the billions of dollars our members have invested to create cleaner fuels and operate more efficiently; the role petroleum products play in the manufacture of wind turbines, solar panels and electric vehicles; or our breakthroughs in advanced recycling for plastics.

AFPM’s aim is to be a voice for these efforts, and to forge partnerships at the state and federal levels to work collaboratively toward the vision of a more sustainable future that fuels American progress. We are committed to constructively engaging with policymakers, and to building and strengthening relationships based on sound science and transparency. Above all, we work to ensure that any policy allows us to continue delivering on our commitment to providing affordable and reliable energy and petrochemicals in a sustainable way.

In tandem, our industries will continue to advance our own innovation, research and progress. Supplying the fuel and petrochemicals that will enable growing global populations to thrive and prosper in a sustainable way is the task that will define our industries for years to come. With the ingenuity and problem-solving for which our industries are renowned, I am certain great things are ahead.



Chet M. Thompson

Chet M. Thompson
President and CEO

American Fuel &
Petrochemical
Manufacturers

Our Commitment

Our commitment to sustainability is comprehensive and enduring. It is about working to address climate change through our operations and our products. It is about being good stewards of our environment through compliance with strict regulations, and far-ranging innovation to preserve and protect the air, water and land around us — for today and generations to come.

Working for a more sustainable future also entails building stronger communities. We achieve that through the job opportunities we create for individuals of all backgrounds, education levels and skill sets; through our members’ support for STEM education; and by recognizing our role as an integral part of the fabric in the communities where we operate through our many non-profit partnerships and philanthropic initiatives.

Sustainability means fostering an ever-improving culture of safety in the workplace and the community through our collaborations across and outside of our industries. It’s about answering the call to keep our nation safe, as our members have done in the face of COVID-19 as we have rallied to produce essential personal protective equipment (PPE).

Finally, achieving our vision for a more sustainable future is about pushing the boundaries of human and environmental progress by producing cleaner fuels and advancing plastic recycling, and through innovation, research and development to create products that make life better, safer and more productive.

This report tells the story of our industries’ commitment in each of these areas. The following pages detail the progress we have made and highlight examples of the many ways that our members are advancing their commitment to sustainability. As we continue to forge ahead, we invite you to follow us at www.afpm.org.

Our Sustainability Pillars



**Environmental
Stewardship**



**Health and
Safety**



**Thriving People
and
Communities**



Driving Progress

Environmental Stewardship

As industries of scientists and engineers, problem-solvers and innovators, we challenge ourselves every day to operate more efficiently and do more with less. Today, as the world's population expands, we are engaged in one of society's most important tasks: to supply the fuels and petrochemicals that growing populations and economies need to thrive in a sustainable way. It's a journey that's made possible by our employees, who take seriously the commitment to safeguarding the environment now and for future generations, through both their work in the industries and their personal lives.

Our commitment to a sustainable future begins with harnessing ingenuity across our industries to drive new ideas and innovations — for example, many AFPM members recycle wastewater at their refineries, while others have initiatives that tie leadership compensation to greenhouse gas (GHG) reduction goals. Collectively, our member companies have invested billions of dollars to research, develop and implement solutions that have improved our energy efficiency, reduced our environmental impact and created cleaner fuels. As we see it, it is our industries' responsibility not simply to *ensure compliance* with emissions regulations, but to leverage our expertise to make it possible to *proactively do more*, for we believe that our business is stronger with sustainability at the core.

Reducing Emissions

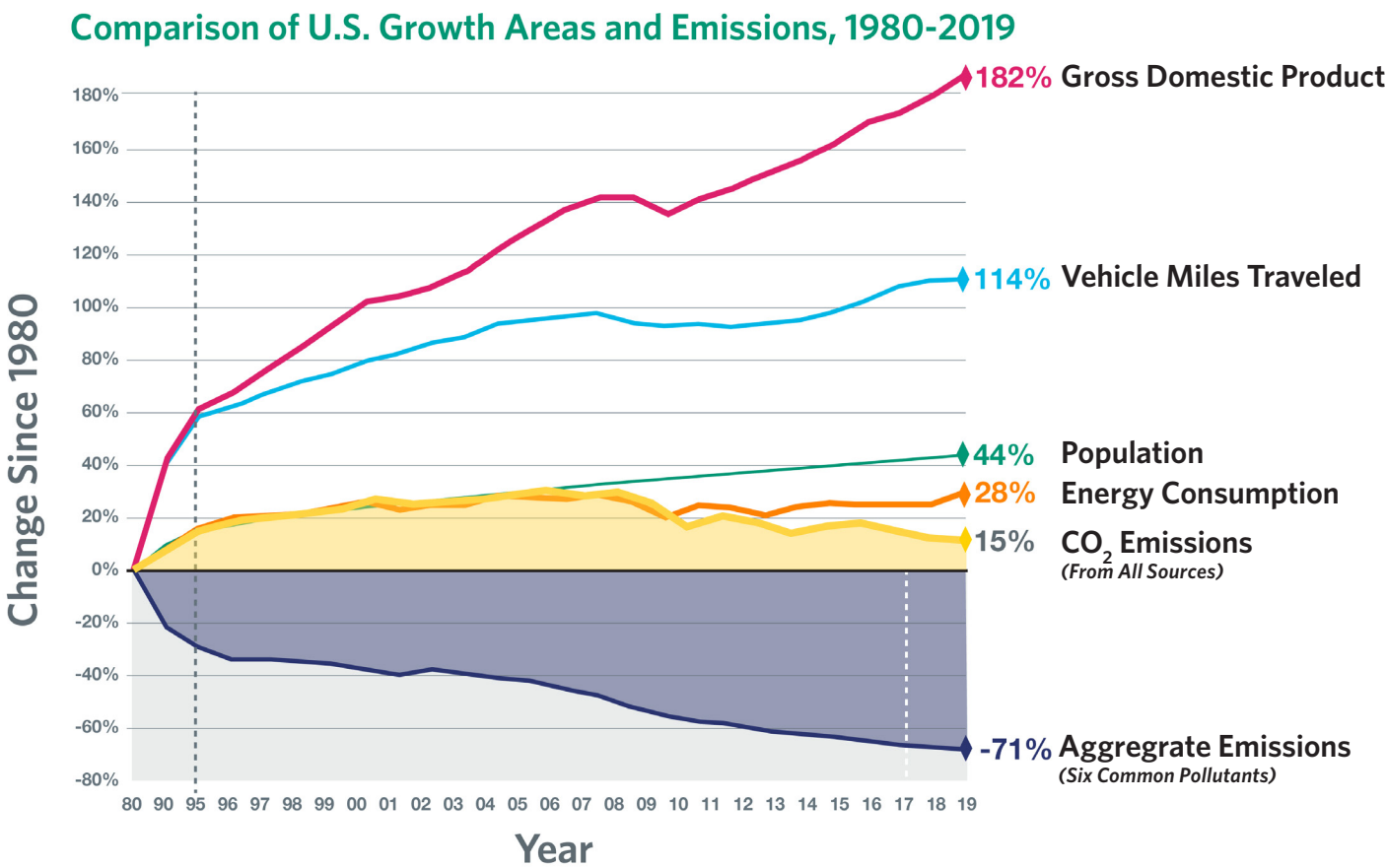
AFPM members have invested billions of dollars in research, infrastructure and equipment to reduce emissions, installing equipment across our operations designed to capture emissions and making use of additional monitoring technologies to track and reduce other potential emission sources. Industry members have worked with the U.S. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards for decades to support the development of the Clean Air Act Residual Risk and New Source Performance Standards programs, which aim to limit and reduce air pollutants.

AFPM members continue to achieve reductions in GHG emissions. From 2010 to 2018, the reported total U.S. carbon intensity (expressed as metric tons CO₂ equivalent per barrel of crude charged) of operating petroleum refineries dropped 12 percent.¹ And the increasing efficiency of U.S. petrochemical plants means lower emissions for each unit of product they produce. Despite a historic expansion in the petrochemical sector, EPA data show only a slight uptick in total carbon emissions in 2017.²

Environmental Stewardship AFPM Members in Action

- CITGO's Caring for Our Coast program partners with environmental organizations, local schools, industry stakeholders and employees to boost ecological conservation and habitat restoration through volunteer projects and educational programs. Since the program's inception, 1,042 acres of land have been restored or enhanced; 106,283 trees, shrubs and grass plugs have been planted; and 92,944 pounds of trash have been collected.³
- In 2021, Valero, through its joint venture Diamond Green Diesel, will produce 675 million gallons of renewable diesel, which is 100-percent compatible with existing engines and infrastructure. This will make Valero the largest producer of renewable diesel in the United States, utilizing recycled animal fats, used cooking oil and inedible corn oil to produce low-carbon intensity renewable diesel fuel.⁴
- PBF is committed to the continuous reduction of waste through reuse, recycling and source reduction efforts. One example involves the catalysts foundational to the refining process, many of which contain precious or rare earth metals, such as platinum, nickel, cobalt and molybdenum. When these catalysts reach the end of the refining process, the spent material is sent to reclaimers, who recover the metals before reusing them in the production of new catalysts or other goods. This reduces the need for metals to be extracted from mines and eliminates these materials from landfills.⁵
- Since 2015, CIRCON Environmental has repurposed 324,667 tons of hazardous tank residual waste from refinery cleaning operations into 54,219,389 million gallons of waste-derived fuel for use as a heat source in U.S. cement kilns. This effort alone displaced 162,336 tons of coal that would have been used as a heat source, provided a net carbon offset of 1,201,268 million tons, and prevented 162,336 tons of residual waste ash from being landfilled.⁶

Comparing Growth and Emissions 1980-2019



Source: U.S. EPA

Since 1980, the U.S. Gross Domestic Product has increased more than 180 percent, the U.S. population has grown by more than 40 percent, vehicle miles traveled have more than doubled and energy consumption is up by more than 25 percent. Yet, over the same period of time, emissions of the six most common pollutants decreased by more than 70 percent and ozone levels decreased by more than 30 percent, according to the EPA.⁷

In the last ten years alone, U.S. refineries have invested more than \$100 billion in facility upgrades, expansions and maintenance,⁸ improving refinery efficiency, reducing refinery GHG emissions, and enabling the production of cleaner fuels.

Investing in Flare-Reduction Technology

The early decision made by members of our industries to invest in flare reduction technology is a prime example of solutions that go beyond existing regulations. Flaring, or burning off excess gas from operations, is a trusted safety practice at refineries and petrochemical facilities. AFPM members have invested millions of dollars to test and deploy new technologies to reduce the need for flaring by recovering gases and recycling them internally. At some facilities, the gas that is captured can be rerouted to cogenerate steam and electricity to reduce the amount of energy that needs to be purchased — a reflection of our commitment to doing more with less.

Recycling Wastewater

Wastewater recycling is a major focus of our industries' ongoing effort to operate more efficiently and conserve natural resources. Water is essential in the cooling towers and boilers needed to produce fuel and petrochemicals. Member company partnerships with leading academic research institutions, such as The University of Texas at Austin, have yielded innovations that are reshaping how our industries use this vital resource, introducing new technologies that allow refineries to more efficiently separate oil and water to recycle and reduce wastewater. Through the ingenuity of our members, as much as 70 percent of the water used in refining processes and landscaping at certain facilities is now recycled or reclaimed.⁹



Partnering to Protect Ecosystems

While many in our industries are intensely focused on long-term global environmental goals, AFPM members are also deeply attuned to the immediate needs of the ecosystems in which they operate. Our members stretch from the Gulf Coast of Texas to the creeks of Wisconsin to the mountains of coastal California. Our industries are committed to using resources efficiently and to preserving the lands and waters where we operate. Our members’ partnerships with national and local nonprofits — such as Ducks Unlimited, The Nature Conservancy, The Conservation Foundation and the Wildlife Habitat Council — have been instrumental in our progress on environmental issues. Working both independently and in collaboration with these organizations, AFPM members restore regional landscapes, certify habitats, and host community education and engagement programs.

Our efforts reflect the unique needs of the communities surrounding member facilities. For instance, one initiative involves the collection of oyster shells from local restaurants to build reefs along the Louisiana shoreline, thus creating beds for new marine life and preventing erosion.¹⁰

These efforts wouldn’t be possible without the dedication of AFPM member company employees. In 2019 alone, petrochemical and fuel manufacturers’ employees spent hundreds of thousands of hours volunteering on environmental projects and cleanup efforts to restore wetlands, prairies and other wildlife habitats. For instance, one unique initiative in Artesia, New Mexico, annually engages employee volunteers in an eight-week citywide cleanup, with employees using their own vehicles and trailers to help clean the community. In 2019, efforts resulted in 116 tons of trash being collected.¹¹



Passionate Stewards of the Environment

Our industries are proud to employ individuals who are passionate about protecting the environment — both on and off the job.

One such individual is Bill Goulet, a senior environmental engineer and photographer who has worked in environmental remediation at Westlake for 41 years, including on substantial wetland restoration efforts in Louisiana.

When a century of industrialization on the banks of Bayou d’Inde threatened its diverse ecosystem, Westlake, led by Goulet, facilitated an entire remediation initiative, deploying teams and coordinating with agencies including the EPA, Louisiana Department of Environmental Quality and U.S. Fish and Wildlife Service to restore the habitat.

Goulet used his personal passion — wildlife photography, and capturing images like the hummingbird above — to document and bring attention to the environmental improvements. Featuring 175 acres of restored wetland, Goulet’s images, including aerial video taken by drone, capture phases and progress of the habitat restoration process. It now stands as a bold, visual testament to the value in caring for natural habitats.

“Because it’s so visible on both sides of Interstate I-210, people saw the progress,” said Goulet. “It’s shown that we can restore these wetlands. It demonstrates that it can be done.”

CITGO’s Ashley Guerredia, compliance analyst and environmental sustainability committee founder, is another committed environmentalist. Guerredia established CITGO’s environmental sustainability committee after noticing simple, yet actionable, steps the corporate office could take to support sustainability practices.

“It’s our responsibility as humanity to care and to take care, but especially being a petroleum company, our responsibility doubles,” said Guerredia. “We need to put our individual interests aside for the good of our home, ourselves and generations to come.”

Through Guerredia’s dedication, the committee has expanded to 40 people in just over a year. The team has already developed recycling programs and introduced training courses on waste management that are applicable to employees at home or at work. Their efforts are advancing a company culture of keen environmental awareness, starting at the individual employee level.



Health and Safety

In our industries safety always comes first. Our commitment to safety — of our employees, facilities and communities — goes beyond upholding the codes and protocols that guide each of our company operations. Safety is embedded in the culture of our industries and engrained in every employee from the day they set foot on the job.

Our goal is straightforward: we strive for zero injuries and incidents. Our focus is on both *process safety* and *occupational safety* — applying good operating, engineering and maintenance practices to manufacturing processes, and ensuring the safety of workers through proper techniques and continued training. Guided by this focus, our members invest heavily in preventative equipment maintenance, hazard recognition and extensive training, plus rigorous operating practices and procedures to mitigate risks and operate responsibly, all in an ongoing effort to get to zero safety incidents.

Our safety records are a testament to our commitment. AFPM data show that since 2011, process safety events have decreased by 60 percent at refineries and by 47 percent at petrochemical facilities. There has also been a 30-year decline in rates of injury and illness. According to the U.S. Bureau of Labor Statistics, the refining industry ranks first out of 503 manufacturing sectors for the lowest rates of injury and illness.¹²



Embracing Creative Approaches

We recognize that achieving our zero incidents goal will require new and creative approaches. One such approach is integrating new technologies to monitor precarious situations and better train employees through immersive simulations. Virtual reality allows employees to “fail safely” — sharpening their instincts and course-correcting through their virtual mistakes to ultimately work smarter and safer. The use of drone technology can help employees avoid potentially dangerous situations, such as climbing a high ladder to inspect a tower.

Health and Safety *AFPM Members in Action*

- In Newcastle, Wyoming, a community of about 3,000 people, employees of the local Par Pacific refinery initiated an emergency planning committee and have provided training to the mayor, school superintendent, county emergency services department, search and rescue team, and the local fire department in emergency response preparedness and coordination.¹³
- During the COVID-19 pandemic, Chevron-funded Fab Labs are producing personal protective equipment for first responders and health organizations in communities near Chevron’s U.S. facilities. Fab Labs — suites of digital fabrication and rapid-prototyping machines, including 3-D printers — are typically used to encourage STEM learning. Now, they are aiming to produce over 20,000 face shields for local hospitals, nursing homes and first responders.¹⁴
- Marathon Petroleum has an emergency response team that conducts simulations throughout the year. In 2018, the emergency response team conducted 43 regional simulation exercises and 40 regional equipment deployment simulations. Partially due to the rigor around simulation training, in 2018, Marathon Petroleum achieved its lowest combined Occupational Health and Safety Administration (OSHA) recordable incident rate since 2014.¹⁵



Collaborating and Sharing Good Practices

When it comes to safety, we place a premium on cooperation and sharing good practices across our industries. Over the years, our members have created different mechanisms to facilitate collaboration to achieve zero incidents and share knowledge for the benefit of all. In 2010, AFPM and member companies partnered with the American Petroleum Institute to launch Advancing Process Safety (APS), a groundbreaking, voluntary program designed to continuously improve process safety through data and knowledge sharing.

APS includes several ever-evolving programs and offerings for members, including the Process Safety Regional Networks. These eight regional networks across the country allow process safety professionals from refineries and petrochemical facilities to meet face to face, discuss process safety topics and share good practices. The networks collaborate with sites to tackle common regional challenges, create a close support network and help process safety professionals understand how to establish effective programs.

Building on the success of the Process Safety Regional Networks, AFPM introduced a similar program to enhance occupational safety. The Occupational Safety Regional Networks program consists of six regional occupational safety networks that facilitate peer-to-peer networking, provide a forum to exchange ideas and enhance occupational safety performance across sites in each region.

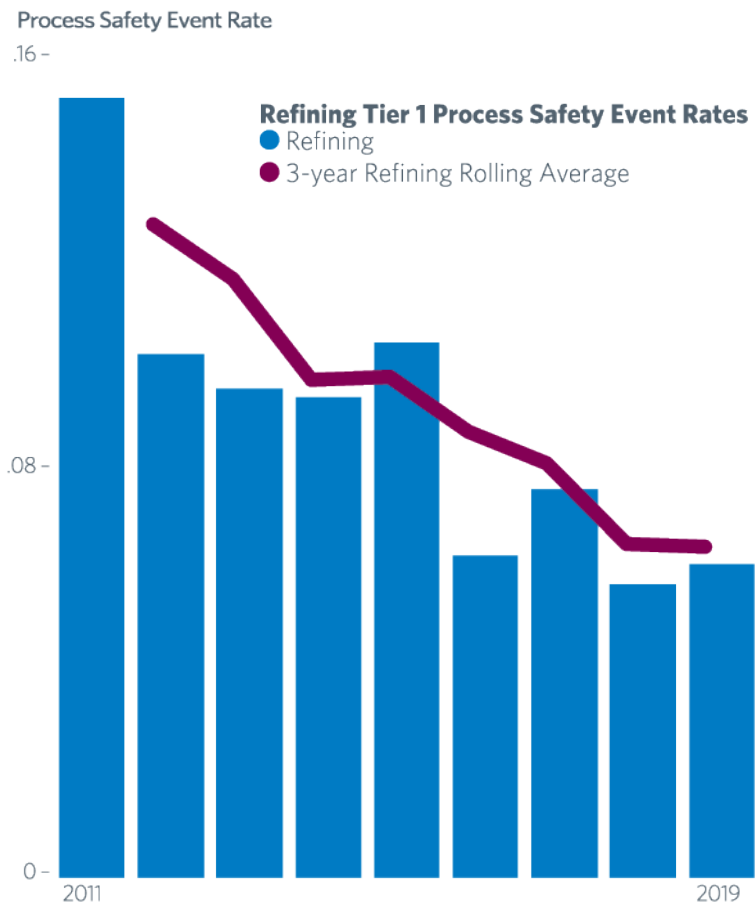


The Walk the Line program, also a component of APS, was developed by industry for industry, and is focused specifically on sharing practices to eliminate “open-ended lines and line-up errors” at refineries and petrochemical plants. These are places where accidental product releases may occur because valves and pipes aren’t properly sealed or closed within a unit. The core principle of the program is that every operator should know with 100 percent certainty where a material will flow. If they don’t, they need to “walk the line.” Through Walk the Line, members can evaluate their metrics, identify areas for improvement, use the program’s toolbox to address gaps and learn from other members.

The digital AFPM Safety Portal is another prime example of collaboration around safety. Initiated by AFPM members for members, the portal is a hub for ongoing education and a resource that enables members to identify solutions — based on other members’ practices and experiences — to address certain areas for improvement. The resources available on the AFPM Safety Portal make it possible for members to go beyond what is required by OSHA and other regulating bodies by providing a set of practical tools that members can apply to meet their unique facilities.

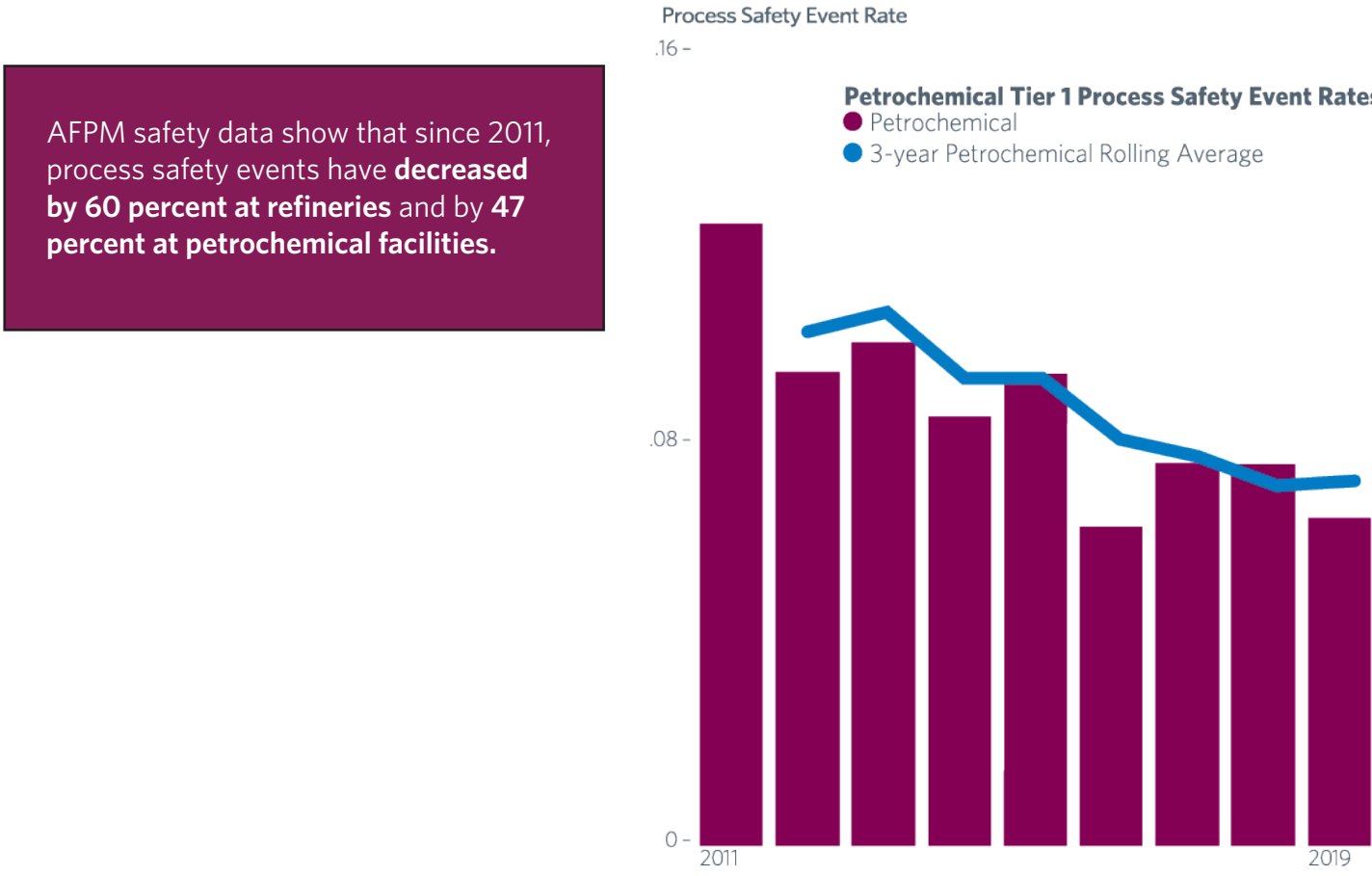
Our industries’ commitment to safety entails collaboration with government officials and first responders, as well as citizen and community groups. We work with them to share information, monitor facilities and surrounding areas for operational impacts, and ultimately improve operations and plans throughout the supply chain. For instance, one of the most important public safety initiatives for one AFPM member is its annual Corporate Fire School, located at the largest fire training facility in the world on Texas A&M University’s campus. In addition to training employees, municipal fire departments from refinery communities are invited to join the training, ultimately enhancing community-wide safety.

Process Safety Event (PSE) Rates



“For ten years the Advancing Process Safety program has been facilitating industry-wide knowledge-sharing and driving improvements, contributing to fewer process safety events in our industries. Today, collaboration on robust industry safety practices and programs is standard. This is how business is done.”

- Mike Bukowski, Vice President, Strategy & Planning, Phillips 66



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Protecting the Nation During COVID-19

Our industries' laser-sharp focus on safety translates into maximum preparedness when disaster strikes — from hurricanes to COVID-19. Most recently, the U.S. fuel and petrochemical industries' pandemic preparedness plans enabled a swift and dynamic response to COVID-19, both in facilitating workplace safety and helping keep the country safe — particularly America's frontline workers.

The early days of COVID-19 saw a critical shortage of medical supplies in the United States, from hand sanitizer to masks and medical gowns.

AFPM members make the products found in the majority of PPE — N95 masks, for example, rely on three petrochemicals: toluene, xylene and propylene — and stepped up to help meet demand.

Many of these same members also had reserves of protective garments and masks on site at their facilities, and immediately helped meet the national need for both. For instance, in March of 2020, Marathon Petroleum deployed its entire stock of PPE to frontline workers in need, resulting in the delivery of more than 570,000 N95 respirator masks to 46 hospitals and health care organizations in 20 states.

Meanwhile, Eastman Chemical produced and donated a copolyester, PETG, to make 10,000 face shields in Tennessee, as well as 3,000 protective lenses and 4,000 face shields in Indiana. Flint Hills Resources' Pine Bend facility and Pipeline & Terminals donated all their surplus PPE to the Salvation Army of Minnesota for the aid of frontline health care workers, and Chevron donated 100,000 surgical masks to various hospitals and health networks.



As demand for hand sanitizer spiked, members such as LyondellBasell contributed either the raw ingredient isopropyl alcohol — the main ingredient in hand sanitizer — or rushed to convert manufacturing facilities to produce hand sanitizer itself. This was just the beginning of a months-long effort to shore up the supply chain to respond to the unrelenting need for products that limit the spread of COVID-19.

"Now more than ever, our industry is stepping up to help safeguard our frontline workers," said Bob Patel, CEO of LyondellBasell. "It is in critical times like these where we have the ability to showcase our resilience, flexibility and commitment to do what we can to help our communities and position them to win the battle against the virus."

Members have also demonstrated innovation in the actual design process for PPE. One new and simplified design for a face shield developed by Dow contains just two pieces, ultimately streamlining what would typically be a multi-component assembly process. Dow has shared the design through an open-source file to help further accelerate production.

This focus on stemming the spread of COVID-19 naturally includes efforts to protect employees on the job. Augmenting existing safety precautions, members are taking steps, including using additional PPE and face masks; demarcating areas with spacing indicators to encourage physical distancing; deploying fever-detection technology like infrared cameras; and installing frictionless devices, such as foot pedals, in bathrooms and on high-traffic doors.

The response of our industries to the pandemic has been a testament to our commitment to safety, as well as a reflection of our agility and resilience in the face of adversity. It's an aptitude honed through experience in preparing for and responding to hurricanes and other natural disasters. Time and time again, our experience in safety helps us respond and adapt during the most challenging situations.

Thriving People and Communities

Every day, we see the positive impact of the jobs our industries create, both on the individuals who have built lifelong careers with our companies and on the local economies where our facilities are located. In total, our companies contribute more than \$60 billion in state and local taxes and more than \$70 billion to the U.S. economy through federal taxes annually. More than 3.5 million Americans across the country work in jobs supported by U.S. refiners and petrochemical manufacturers.¹⁶

Creating Opportunity Through High-Paying Jobs

U.S. refiners and petrochemical manufacturers are among the most sophisticated in the world, and the salaries in our industries reflect it. The average annual compensation of a refinery worker is almost \$225,000 a year, and the average petrochemical industry worker’s compensation is over \$149,000.¹⁷ We are proud of the high-paying, high-skilled career opportunities that our industries make possible for individuals of all education levels. We are even prouder of the global impact our employees have by using their skills to create products that improve mobility, healthcare, safety, technology and life in general. And as our industries have grown, we’ve worked to steadily create more well-paying jobs that utilize these skills and provide people with purposeful career opportunities.

We look for individuals who share our values, especially an emphasis on safety. As such, our member companies have focused specifically on hiring U.S. veterans who bring experience operating in another safety-conscious culture. Roughly 185,000 veterans are employed by the oil, gas and petrochemical industries, including about 6,000 women and 41,000 minority veterans.¹⁸ Partnerships with organizations like Hiring Our Heroes and American Jobs for America’s Heroes have been instrumental in helping us identify veteran recruits.



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Supporting Education in Communities Across the Country

Our members invest in myriad programs to enhance education in STEM — science, technology, engineering and math — and ultimately introduce students to careers in our industries. From partnerships with the Society of Women Engineers, which introduces girls to careers in engineering, to support for the University of Alaska’s Alaska Native Science and Engineering Program, which ignites middle school interest in engineering, to outreach providing transformative learning experiences for young students in Appalachia, our members are deeply committed to supporting education in the communities where they operate. One such initiative is AFPM’s partnership with the Chemical Education Foundation to provide hands-on science experiences for more than 1,000 third- to fifth-grade students, plus professional development for teachers in the Washington, D.C., region. As with the many educational programs that our members support, our goal is to build excitement for STEM careers at an early age.

The close relationships that members maintain with universities and community colleges are also integral to developing future talent. For instance, one such relationship in Texas through the San Jacinto College Center for Petrochemical, Energy and Technology offers professors the opportunity to spend six weeks at member companies to learn about new technologies and ways of operating. This initiative allows professors to better understand the knowledge and skills that are most valuable for their students to acquire and bring to future employers.

Supporting STEM Education

AFPM members have long supported STEM programs, and that support has never been more essential than in the wake of a widening digital divide caused by COVID-19.

Distance learning has exacerbated educational and economic disparities across the country, posing challenges for students who lack computer access and/or high-speed internet at home. The clear need to offer support to students without these tools is why many oil and petrochemical companies started funding STEM programs originally.

HollyFrontier Corp. is one company that has long supported STEM education.

The company’s Artesia, New Mexico, refinery is adjacent to one of the most low-income school districts in the U.S., where more than 50 percent of students receive free or reduced-price meals. In 2014, HollyFrontier began a STEM partnership with the nearby Lovington community’s public-school system by providing a state-of-the-art STEM Lab with 3D printers, a computer numerical control (CNC) machine, virtual reality computers and a robotics team.



When the pandemic’s effects began to impact the same Lovington community, HollyFrontier employees, like community affairs administrator Debbie Rowland, stepped up to help lead socially distanced after-school gatherings for students, fostering discussion of team projects, homework and general STEM questions.

“When I’m with the students, it just fills me with such pride knowing that we have impacted their lives in this way,” said Rowland. “Many of these kids are the first ones in their families to go to college thanks to the STEM program and their incredible teachers.”

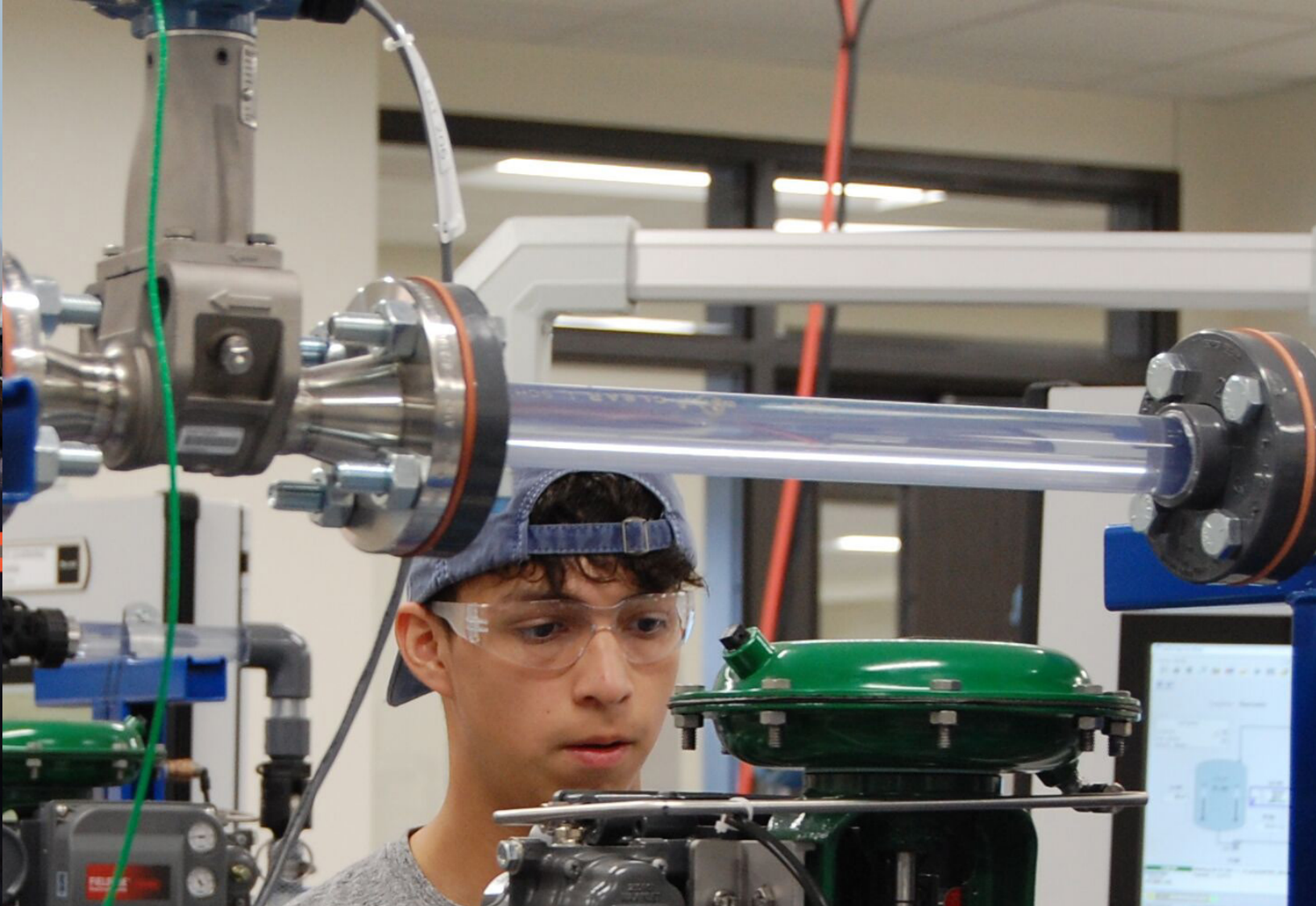
The commitment of our industries to STEM education during COVID-19 reflects our members’ belief in giving all students the chance to reach their potential and develop skills critical for the jobs of the future. HollyFrontier and other AFPM members remain steadfast in their commitment to augment the learning experience for teachers and students alike through STEM program support. In a digital learning environment where technological tools and acumen are essential, this could make a major difference in students’ lives — simultaneously sparking interest in careers they may never have considered before.



Recruiting Diverse Talent

AFPM members prioritize diversity, equity and inclusion in the workplace. As our companies focus on recruitment and training, they place a premium on reaching diverse talent. For instance, our members have formed partnerships with Spelman College to create the Women in Science and Engineering (WISE) program targeting high-achieving Black women pursuing degrees in the physical sciences and providing them with mentorship. Through partnerships with the Hispanic Heritage Foundation and the Society for Hispanic Professional Engineers, our members work to prepare future Latinx leaders for careers in STEM. Other members sponsor Minority Bridge Programs, which are designed to support students from socioeconomically, racially and ethnically diverse backgrounds as they transition from high school to college through staff and faculty guidance, skills development and professional mentoring.

As our members' commitment to education reflects, support for local communities extends well beyond the direct impact of job creation. In addition to supporting education, our member companies give back in numerous ways through philanthropic contributions that align with their values and their specific communities' needs. Our members' support for communities is wide-ranging and impacts nearly every societal challenge we face — whether it's supporting Truckers Against Trafficking to empower and mobilize members of the trucking and busing industries to combat human trafficking; sponsoring community festivals to make the arts accessible to more families; or strengthening HIV/AIDS prevention, testing and care in the greater New Orleans area.



Thriving People and Communities *AFPM Members in Action*

- The Phillips 66 Ferndale Refinery in Washington supports the Lummi Nation's education priorities, such as the Lummi Northwest Indian College and Boys and Girls Club education center, and also participates in many Nation activities and programs, including the annual First Salmon Ceremony.²²
- Through the Motiva Excellence in Education Scholarship, the company has awarded nearly \$2.5 million in scholarships to students pursuing higher education in the STEM field.²³
- Hunt Refining is strongly committed to the community and supports organizations including the United Way, Adopt-A-School, Junior Achievement, Big Brothers/Big Sisters and other local outreach programs.²⁴
- In 2018, Airgas expanded its High School Welding Education Initiative to support underserved welding programs across the United States. The partnership initially began in 2012 at the A. Phillip Randolph Technical High School near Airgas headquarters in Philadelphia, but now spans the country.²⁵
- In Silver Peak, Nevada, Albemarle employees not only support their volunteer fire department through annual grants, but also volunteer their time to serve with the department.²⁶

Driving Progress

In 2019, U.S. refineries supplied more than 300 billion gallons of gasoline, diesel, jet fuel and other products to consumers in the United States and 136 countries around the world.²⁷ Our products not only keep economies moving, they are essential ingredients in countless applications that facilitate better living. As we often say, “if you can imagine it, our products are part of it.”

The six basic petrochemicals that our member companies produce — ethylene, propylene, butylene, benzene, toluene and xylene — are found in and make possible everything from seatbelts and reusable plastic containers to space suits and solar panels. The health care industry relies on the products made by America’s petrochemical manufacturers — from advanced, lightweight prosthetics that enable Paralympic athletes to compete, to PPE such as face shields to keep frontline medical workers safe. Petrochemicals also improve the performance of a number of products — making phones water-resistant, ensuring first responder safety with fire-retardant clothing, and keeping food fresh with plastic films and containers.

Our industries’ aim is not simply to provide products the world needs, but to supply solutions to the most pressing challenges — whether it’s addressing the challenge of plastic waste, or driving sustainability in transportation through cleaner fuels and light-weight parts.

While facilitating these solutions, many fuel and petrochemical manufacturers are investing in research and development to make their own operations even cleaner, safer and more efficient, and further reduce GHG emissions. Many companies are addressing direct and indirect emissions in myriad ways — some are advancing carbon-reduction science including carbon capture and storage (CCS); others are exploring how process improvements can remove heat from key aspects of their operations; and others still are investing in operations to produce cleaner-burning fuels like renewable diesel and aviation fuels.

With an eye toward the future, our industries are advancing research to drive progress for a growing world.



Pioneering Waste-to-Value Technologies

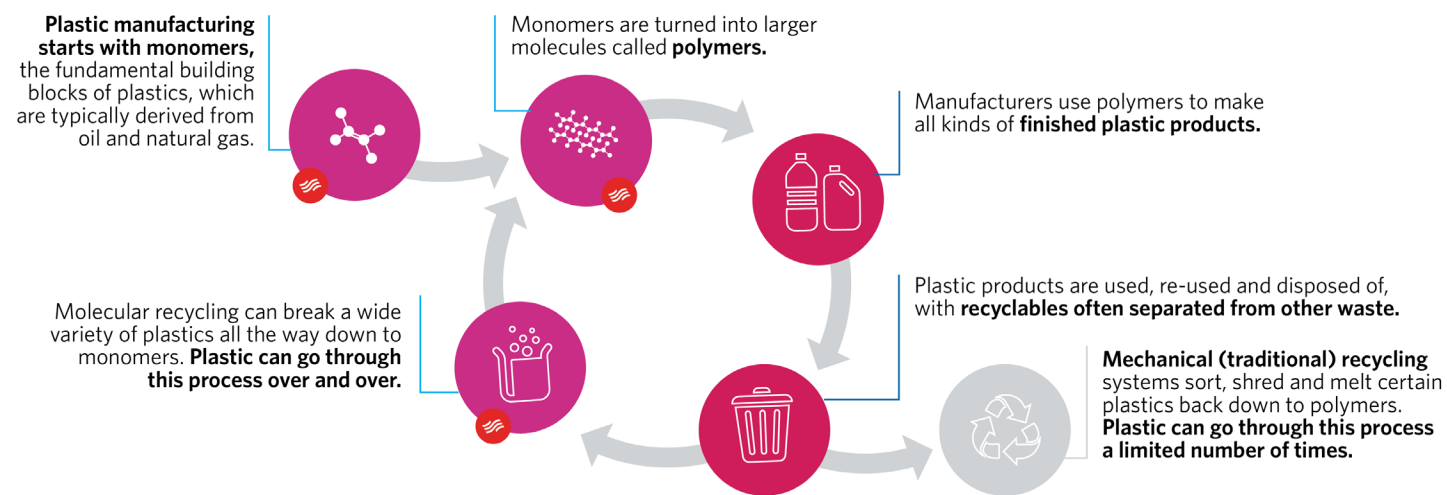
Our members share society's concern about plastic waste in the environment and agree that the issue needs to be addressed — in part through waste-to-value technologies. A challenge with traditional mechanical recycling is that material properties degrade during the process and plastic can only be recycled a limited number of times. AFPM members are pioneering new advances in advanced recycling processes to ultimately return plastics to their original monomers or building blocks. These building blocks can then be reformed into new products and molecularly recycled countless times, without quality or strength being compromised. This technology will enable society to successfully reuse the molecules of discarded packaging and other mixed plastics waste that might otherwise be sent to landfills.

Collectively, total new investments in U.S. recycling since July 2017 include 64 projects — including advanced recycling initiatives spearheaded by petrochemical manufacturers — valued at \$5.3 billion. Together they have the potential to divert 4 million metric tons of plastic and other waste from landfills.²⁸

Moreover, a number of AFPM members are part of the Alliance to End Plastic Waste (AEPW), a cross-sector alliance with a goal to better manage and minimize mismanaged plastic waste. Today, AEPW members are collaborating on 55 projects²⁹ around the world to bring their expertise and advance solutions to better manage and extract more value from plastic waste.

Advanced Recycling

Petrochemical manufacturers are innovating to extend the life of plastics



Denotes processes AFPM members execute

Cutting-Edge Innovation in Plastic Recycling

Petrochemical manufacturers are at the forefront of research and development into cutting-edge solutions to give new life to used plastic products, leveraging their in-depth understanding of plastics' molecular composition and the manufacturing process itself. Specifically, members are investing in technology, infrastructure and partnerships that will reduce mismanaged plastics by applying value to them as a feedstock and help redirect difficult-to-recycle-plastic items away from landfills and back into commerce using advanced recycling technology.

One such company, Chevron Phillips Chemical, recently announced success in its first commercial-scale production of polyethylene using advanced recycling technology, which converts plastic waste to valuable liquids that can be upgraded back to feedstock for new petrochemicals. This approach complements traditional mechanical recycling by converting a range of materials, including many difficult-to-recycle plastics, into important building blocks for new chemicals. Chevron Phillips Chemical is now working on scaling up its production of circular polyethylene in the United States to meet ambitious production plans.



"We are strongly committed to developing a circular economy, a mindset we didn't have 10 to 15 years ago," said Ron Abbott, sustainability technical manager at Chevron Phillips Chemical. "We've found a pathway where we can take difficult-to-recycle materials, reclaim the hydrocarbons and use them to make new plastic suitable for any application. Unlike mechanically recycled plastic, it has the performance of brand new plastic, but is also recycled from end-of-life plastics."

Advanced recycling technology is also being utilized by INEOS, which is partnering with AmSty to construct a joint 100-ton-per-day facility in Channahon, Illinois, that will recycle post-use polystyrene products back into virgin-equivalent styrene monomer. Discarded single-use items, like polystyrene foam cups and yogurt cups, can now go repeatedly back to the same applications at the same purity and performance without ever ending up in a landfill.

Beyond individual company efforts, a number of members participate in the Alliance to End Plastic Waste, a group of global leaders working together to drive change in the plastic value chain. AFPM members BASF, Dow, Chevron Phillips Chemical, ExxonMobil, LyondellBasell and Westlake Chemical participate in the alliance, sharing expertise and contributing to funding of projects and programs that recover and create value from plastic waste.

Our industries are problem-solvers by nature, constantly innovating to solve complex issues. Whether through collaboration or individual efforts, AFPM members will continue innovating to use resources more efficiently and keep plastic waste out of the environment.

Innovating for More Sustainable Transportation

Our industries are working every day to make transportation more sustainable — from aviation to commercial shipping, trucking and passenger vehicles. Our approach is multi-pronged and includes advocating for higher-octane gasoline that would lower GHG emissions and help address climate change; producing cleaner fuels and higher-performance fluids, oils and waxes; and enabling the light-weighting of vehicles using the petrochemicals we manufacture.

Leading the Transition to 95-RON

Today, we are leading the effort to transition the U.S. to high-octane gasoline through a nationwide high-octane, 95-RON fuel standard that would meet the most stringent air quality standards in every state, including California. Doing so would deliver emissions reductions equal to those of replacing over 700,000 internal combustion engine vehicles on the road with electric vehicles in the first year alone.³⁰ When used in the next generation of low CO₂-emitting gasoline engines, the high-octane, 95-RON fuel would allow vehicles to travel farther on each tank of gas, less expensively than other options. While investments will be needed to make modifications to produce the new, higher-octane fuel at a national scale, initial production can begin quickly at some refineries using existing hardware, enabling a consistent rollout nationwide.

Innovating for Cleaner Fuels

Our industries' push for a 95-RON fuel standard builds on decades of broader efforts to develop cleaner fuels and, along with automakers, to advance fuel-efficient technologies. Our members have invested billions of dollars in research and development to make fuels as clean and efficient as possible.

This has included reducing sulfur in diesel fuel for land transportation. More recently, U.S. refiners have invested to bring the marine industry cleaner, lower-sulfur fuel — thereby reducing emissions from tankers, freighters, cruise ships and other commercial vessels and making global trade more sustainable. The production of lower-sulfur fuel is expected to result in a 77-percent reduction in sulfur dioxide emissions and nearly a 50-percent reduction in particulate matter emissions.³¹

Overall, our members continue to invest and innovate to deliver cleaner, renewable fuels for a variety of uses. Some refineries are taking biowaste, like inedible corn oil and recycled cooking oil, and turning it into a low-carbon, lower-sulfur renewable diesel that is compatible with existing engines. Renewable diesel provides an immediate way for commercial trucking fleets — one of the hardest transportation sectors to decarbonize — to reduce their GHG emissions and improve the sustainability of supply chains cost-effectively, using existing vehicles and infrastructure. Other refineries are implementing new

techniques to extract usable oil from secondary waste materials through a method called “coker injection,” which reduces, or even eliminates, the amount of hazardous materials sent off-site for disposal. And as the airline industry seeks to reduce carbon emissions, members are investing in the production of renewable aviation fuel that can be blended up to 50 percent with traditional jet fuel and requires no changes to aircraft technology, helping the aviation industry to meet its goals.

Light-Weighting Vehicles and Aircraft

Research and development efforts have driven advancements in the light-weighting of vehicles and aircraft, in large part through composites. By using composites to manufacture 50 percent of the airframe of the Boeing 787 Dreamliner, the aircraft’s weight was decreased by 20 percent compared to conventional aluminum designs. In the 787 Dreamliner, composites made from ethylene, propylene, benzene and other petrochemicals can be found on nearly all exterior surfaces, including throughout the fuselage, wings, tail and doors. By 2050, these planes could reduce emissions from the global fleet by about 15 percent compared to a fleet that maintains its existing aluminum-based configuration.³²

The same principle applies to automobiles. For example, Jeep replaced the steel liftgate on its Cherokee with a plastic option for the 2019 model year, saving 12 pounds of weight.³³ The U.S. Department of Energy cites research estimating that a 10-percent reduction in vehicle weight can improve fuel economy by 6 percent to 8 percent, so continuously finding ways to lighten vehicles has a direct impact on fuel use and emissions.³⁴





Innovating for Sustainable Products and Solutions

The petrochemicals we manufacture are often critical to solutions to driving environmental progress. For instance, hydroponic farming, which minimizes the need for water and eliminates the need for soil, is made possible through advanced engineered plastics enabled by petrochemicals. Specifically, butadiene is used to make UV-stable Acrylonitrile-Butadiene-Styrene terpolymer, or ABS plastic. ABS is lightweight and doesn't corrode, which makes it a perfect material for hydroponic growing systems. Additionally, lightweight, flexible, semi-transparent and highly customizable solar panels are made possible by petrochemicals in the panels' coating. These new solar panels can be fitted on almost any surface, from building windows to semi-trucks.³⁵



Driving Progress

AFPM Members in Action

- CountryMark — a farmer-owned cooperative producing petroleum-based fuels and blending biofuels — is a strong advocate for the U.S. transitioning to a nationwide high-octane, 95-RON fuel standard, that would, in the first year alone, deliver emissions reductions equal to those of replacing over 700,000 internal combustion engine vehicles on the road with electric vehicles.³⁶
- ExxonMobil’s chemical business develops materials that provide a wide range of benefits in many consumer applications. For example, automotive manufacturers use ExxonMobil’s advanced, lightweight plastics to reduce vehicle weight and deliver greater fuel efficiency. For every 10-percent decrease in vehicle weight, fuel economy improves by an estimated 7 percent.³⁷
- Petrochemical products manufactured by AFPM members contribute to hospital hygiene and play an important role in keeping the world healthy and safe. Petrochemicals are found in more than 99 percent of pharmaceutical feedstocks,³⁸ computer systems providing doctors ready access to medical files and 3D-printed model hearts helping them plan intricate surgeries.



Reimagining the Future

Beyond the environment, our industries are driving progress by advancing solutions to some of the most complex challenges facing society today. For instance, ethylene and butadiene are some of the key components in exoskeleton mobility devices that are enabling people to take a step forward who never imagined walking again. The wearable device, with motors and sensors, is helping veterans and accident victims do the unimaginable. Toluene is addressing the challenge of water scarcity that afflicts many parts of the world through an innovative system for desalination. Toluene serves as the basis of a membrane that filters salt out of seawater to produce potable water, using substantially less energy than the typical desalination process³⁹ and supplying clean water that can be used in homes, restaurants, businesses and manufacturing centers.

And then there’s what lies ahead: namely a petrochemical-enabled parachute that could allow astronauts to land on Mars, or high-tech polymers that one day could enable medical professions to 3-D print a vital organ for a human transplant.

Our commitment to a sustainable future is a comprehensive commitment, and an enduring commitment. It’s about supplying the products that people need — and that make life better — while achieving our vision for a safer, cleaner, more sustainable world.

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