AFPM

117th American Fuel & Petrochemical Manufacturers

ANNUAL MEETING

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DAY TWO | #AFPMAM

Tuesday | March 19, 2019

Senator Cruz calls for defense of American oil and gas jobs

ADRIENNE BLUME, Executive Editor, *Hydrocarbon Processing*

Chet Thompson, President of AFPM, presented the AFPM Leadership Award to the Honorable Ted Cruz, US Senator (R-Texas), at the General Session on Monday morning. Thompson lauded Senator Cruz for his longtime advocacy of the US refining and petrochemical industries and his work for Renewable Fuel Standard (RFS) reform.

TED CRUZ, US Senator (R-Texas)

After receiving a standing ovation, Senator Cruz took the podium to welcome attendees to Texas and to thank AFPM for the award. He touted the US refining and petrochemical industries for providing both jobs and essential fuels and products for Americans.

"I am proud to be here today as the foremost defendant of oil and gas, and abundant energy jobs in the United States," Cruz said.

Texas is the leading US producer of crude oil and natural gas, providing one-third of the nation's oil and gas.

The refining and petrochemical industries alone support 688,000 jobs in Texas and more than 3 MM jobs nationwide, with salaries that are well above the nationwide average.

"That is why I continue to fight for oil and gas jobs," Senator Cruz asserted, "because the primary beneficiaries are American workers and their families."

Moving on to energy regulation, Senator Cruz called the RFS "a broken regulatory system" that has imposed billions of dollars of unnecessary costs on US refiners. In November 2017, when Cruz and several other senators met with President Trump to discuss RFS reform, Renewable Identification Numbers (RINs) for biofuels were trading at $0.80 apiece, equating to more than $13 B of artificial regulatory costs for fossil fuel producers.

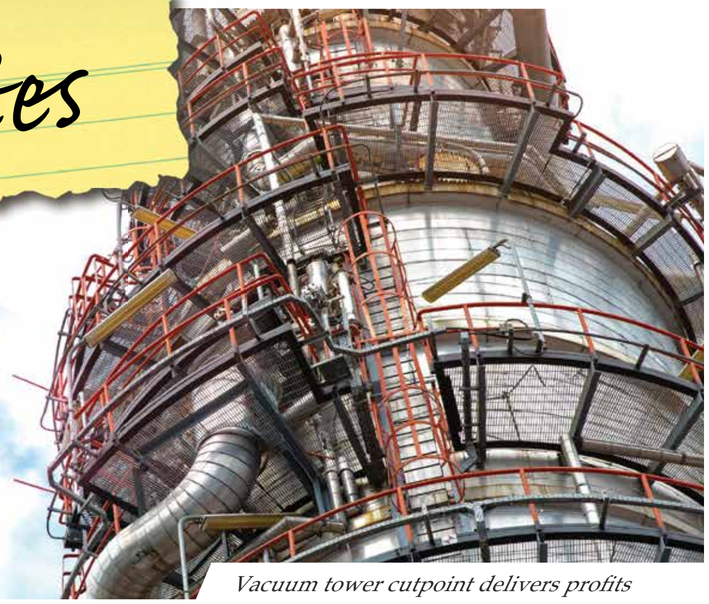
The marketplace, rather than politicians, should determine "the cornucopia of energy" resources in ways that will best benefit American jobs, Cruz asserted. The senator called the Green New Deal economic stimulus proposal "a $19-T proposal so unrealistic, every Democrat will be sure to embrace it."

"Looking ahead, there's still a lot more to do," he said. "Energy equals jobs. It isn't complicated—and when it comes to energy, I believe, and Americans believe, and Texans believe that all sources of energy should be used."

In closing, Senator Cruz remarked, "We know there will come a time when the US—and the world—moves away from fossil fuels … But the move to new energy sources will be driven by innovation in the private sector, not by radical politicians in Washington."

"I am honored and proud to stand with each and every one of you," he said. •

Process Notes



Vacuum tower cutpoint delivers profits

Cutpoint Concerns

Crude unit vacuum tower performance is often critical to a refiner's bottom line. The vacuum tower bottoms stream is valued far below the gas oil cuts, so most refineries look to minimize it. Many vacuum columns are also designed or revamped to produce a diesel cut, recovering diesel slipped from the atmospheric column that would otherwise be downgraded to VGO product.

Good vacuum column performance can maximize the profitability of downstream units by removing distillate hydrotreater feed (diesel) from FCCU or hydrocracker feed (VGO) and removing VGO from coker feed (resid).

One important measure of vacuum column performance is VGO/resid cutpoint. The cutpoint is the temperature on the crude TBP curve that corresponds to the vacuum tower resid yield.

Vacuum column cutpoint depends on three variables:

1. Flash zone temperature
2. Flash zone pressure
3. Stripping section performance (if present)

Flash zone temperature is driven by vacuum heater coil outlet temperature (COT). Increasing COT increases cutpoint. Vacuum heater outlet temperature is typically maximized against firing or coking limits. When processing relatively stable crudes, vacuum heaters with better designs and optimized coil steam can avoid coking even at very high COT (800°F+, 425°C), but poorly designed heaters may experience coking with COT below 700°F (370°C).

Flash zone pressure is set by vacuum system performance and column pressure drop. Lower flash zone pressure increases cutpoint until the tower shell C-factor limit is reached, at which point the packed beds begin to flood. Vacuum producing systems are mysterious to many in the industry, so a large number of refiners unnecessarily accept poor vacuum system performance. With technical understanding and a good field survey, the root causes of high tower operating pressure can be identified and remedied.

In columns with stripping trays, stripping steam rate and tray performance are important. Stripping steam rate is limited by vacuum column diameter (C-factor) and vacuum system capacity. Any steam injected into the bottom of the tower will act as load to the vacuum system, so vacuum system size, tower operating pressure, and stripping steam rate must be optimized together. Depending on the design, a stripping section with 6 stripping trays can provide between zero and two theoretical stages of fractionation, which can drive a big improvement in VGO yield.

Although the variables for maximizing vacuum tower cutpoint are simple, manipulating them to maximize cutpoint without sacrificing unit reliability is not. Contact Process Consulting Services, Inc. to learn how to maximize the performance of your vacuum unit.

American fuel producers, media face continued political pressure

ADRIENNE BLUME, Executive Editor, *Hydrocarbon Processing*

At the opening of the 2019 AFPM Annual Meeting's General Session, Association President Chet Thompson praised the responsiveness and innovation of AFPM members. "By working together, we have dramatically improved the safety of our industries," he said.

Thompson touted a 30-year decline in illness and injuries in the refining and petrochemical industries, largely as a result of sharing best practices. Furthermore, over the last three decades, US industry air emissions have dropped by 73%, while domestic refining capacity has increased by 20% and energy consumption has risen by 15%.

Green New Deal would hurt energy sector. Thompson noted that the Green New Deal proposal "calls for the total elimination of the fossil fuel industry." Although the proposal seems "almost too extreme to be taken seriously," he noted that it is supported by 100 members of Congress.

Thompson called the proposal "out of touch with the fact that fossil fuels and petrochemical products form the underpinning of the global economy and the products that make modern life possible." It is also out of touch with what consumers want—including access to affordable, reliable, clean energy, Thompson said.

"We have to continue to collaborate and do our part to find an appropriate path forward, and engage in rational conversations about the value of our products to society and about climate change." Through 2030, petroleum products are expected to meet 90% of transportation fuel demand in the US, the AFPM President noted.

Efforts for the research and development of alternative fuels and for carbon-capture technologies should continue, alongside the manufacture of base products needed for modern life. "However, doing our part does not mean that we should accept bad public policy," Thompson said. "We need to be prepared to stand our ground and stand up for what our industries mean to our society."

US political climate faces continued turbulence. Thompson next introduced Chris Wallace, Host of *FOX News Sunday.* During his 50-year broadcast career, Wallace has won every major journalism award.

Wallace called President Trump "the biggest political stunner" in US history, and alluded to a looming split in the Republican party. Addressing the border wall controversy, Wallace noted that 12 Republican senators joined with democrats to oppose Trump's call for emergency funds to build a wall at the US-Mexico border.

At the mid-term elections in November 2017, several warning signs were evident for the Trump administration and for the Republican party. "Two years into his presidency, President Trump still seems obsessed with playing to his shrinking base," Wallace said. "Of course, no politician can win without supporting his base … but Trump has done surprisingly little to expand his base and win over his opponents."

"Hunkering down with less than 40% of voters is a perfect way [for Trump] to lose the general election next year," Wallace said. With 10 possible presidential candidates on the platform from both parties, next year will see "debate weeks" rather than "debate nights," he said. "How voters are going to sort through all of this will be very interesting to see."

"Don't fool yourselves, though," Wallace warned. "Even if Democrats elect a strong candidate, this will be a tough election and Trump will remain a strong opponent."

Trump vs. the American media. Wallace concluded his remarks by addressing Trump's relationship with the media. "I would argue that President Trump is engaged in the most direct assault on the free press in our history," he said.

According to the Trump Twitter archive, the president has tweeted more than 150 times that "fake news" is harmful to the American people. What this essentially means, Wallace said, is that if the media reports unfavorably on something Trump is doing, then it automatically becomes "an attack on Americans."

The media, in turn, has blasted Trump with scathing weekly headlines. "Some reporters believe this President has gone so far over the line in bashing the media that they have gone in the opposite direction, trying to do the same," Wallace said. "The media must stand together. No matter how we cover the news, there's a lot more that unites us than divides us."

"Someone is always going to criticize us, and sometimes we do make mistakes," Wallace acknowledged. "But the founding fathers knew what they were doing when they declared freedom of the press." ●

At Monday morning's General Session, award-winning journalist **CHRIS WALLACE** (left) and AFPM President **CHET THOMPSON** discussed the outlook for the petrochemicals and refining industries, the current political landscape and its effect on industry and the media.

SCHEDULE OF SESSIONS AND SPECIAL EVENTS

TUESDAY, MARCH 19, 2019

7 a.m.–12 p.m.	**Registration**
7:30–9 a.m.	**Industry Leadership Breakfast featuring*** Gary Heminger, CEO, Marathon Petroleum *Open to registered attendees only.
9–10 a.m.	**Concurrent Breakout Sessions:** Pulling Back the Curtain on Environmental Activism, Global Oil Outlook, Operational Excellence, Tech Sessions
10–10:30 a.m.	**Coffee Break**
10:30–11:30 a.m.	**Concurrent Breakout Sessions:** Future of Transportation, Tech Session, Operational Excellence, Tech Sessions
12–2 p.m.	**Annual Luncheon (SOLD OUT) featuring*:** The Honorable Condoleezza Rice, Former U.S. Secretary of State *Open to registered attendees only. No tickets or same-day seating will be available onsite.
2–3 p.m.	**Concurrent Breakout Sessions:** Pulling Back the Curtain on Environmental Activism, What Lies Ahead for the Renewable Fuel Standard, Operational Excellence, Tech Sessions
3–3:15 p.m.	**Coffee Break**
3:15–4:15 p.m.	**Concurrent Breakout Sessions:** EMpower, Tech Session, Operational Excellence, Tech Sessions

AFPM
117TH ANNUAL MEETING CONFERENCE NEWS

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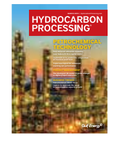


Digital transformation: Start simple to generate low-risk, immediate returns

RICK KAISER and **ROGAN JONES,** AIS Software

As digital transformation plays a growing role in today's business decisions, organizations must consider what they hope to transform, where to invest their resources, and what technologies best serve their strategic needs. Fifty percent of companies see productivity goals (improving efficiency) and operational goals (reducing risks) as the top factors driving their digital transformation initiatives, with more than 57% seeing most digital innovation occurring in operations and production.

The digital footprint in the refining business has been changing ever since integrated digital instrument and control systems began replacing earlier pneumatic and analog systems in the early 1980s. Digitalization, along with cheaper data storage, spawned vast collections of stand-alone digital data. Today, Industry 4.0, along with its big data, robotic process automation, the Industrial Internet of Things (IIoT) and sensor technologies are driving an ever-expanding demand for new tools, and refineries are looking to upgrade. Those who adopt these new technologies will realize a competitive advantage over those who do not.

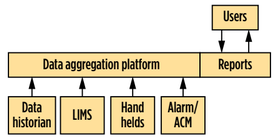


FIG. 1. DA platforms extract real-time queried data to users via custom report templates.

Determining investment levels. Embracing these new digital initiatives requires not only a giant leap of faith by management, but also significant up-front costs in equipment, infrastructure and manpower. While major downstream companies plan to invest an average of 30% of their operational/IT budgets on digital transformation, many small-to-midsized refineries are unable to match this investment level.

No matter how large or small the facility, all refineries will eventually be implementing digital transformation to remain competitive. While digital transformation promises to significantly improve safety, production and profit margins, it will also greatly increase the volume of data that organizations must confront, understand and respond to.

How can the smaller refiners, with fixed margins and limited manpower, benefit from the digital transformation movement while minimizing the associated high costs and risks? The easiest solution, with a proven return on investment (ROI), is to install a data aggregation (DA) platform. This sophisticated software resides on the enterprise layer of a facility's IT network, and interfaces with the stand-alone systems and extracts information from a wide range of sources, including:

- Data historians
- Alarm journals
- Lab databases
- Handheld device databases
- Controlled document management systems
- Asset databases.

Results are made available to users via an intuitive and intelligent human-machine interface (HMI), as modeled in FIG. 1.

Features and benefits. The data is filtered to display queried results to all users with proper authorization. This also allows workers to openly comment on this information and collaborate on tasks and job assignments using their mobile devices. Workers can be given daily assignments, managers can track key performance indicators (KPIs), operators can manage production targets and maintenance crews can easily monitor equipment performance. It opens data up to the creativity of its users with customizable report templates, filters and email options, and forms a solid foundation enabling raw digital information to be refined into value-added products.

A DA platform should provide the following features:

- Uses existing hardware
- Can be used on any device (desktops, laptops, pads and handhelds)
- Is available to everyone with a valid connection to the company's intranet
- Requires no additional manpower
- Generates user-created and managed reports
- Is scalable to include other data sources over time
- Protects source integrity and authenticates who can access the data.

Benefits include:

- Increased efficiency
- Improved safety
- Managed production targets
- Better business decisions
- A searchable record of worker actions and responses
- Reduced energy use
- Reduced nuisance alarms
- Improved internal communication across independent work groups.

Facilities using DA technology have seen significant and positive results in daily operations and productivity.

Examples. Remote platforms in the Gulf of Mexico and North Sea, as well as the world's largest floating natural gas production vessel, use a data-rich process visualization and worker collaboration DA platform to monitor and manage production, deliver job assignments, maintain targets, create shift handovers and mitigate nuisance alarms. A large refinery in Louisiana saw significant improvement in safety metrics using simple communications apps that afforded workers instant access to safety meeting minutes and past safety audits, as well as group text/chat messaging for safety topics and reporting. A US refinery specializing in processing heavier crudes saw a significant increase in its light ends production by using a DA platform to monitor and manage daily production targets.

Takeaway. The goal of digital transformation is to uncover new and untapped information that promises to improve productivity, enhance performance, increase safety and provide a competitive advantage. As the amount of data increases, it must also be filtered to meet the specific needs of the workers. Since data must be shared, collaboration is a key factor in leveraging digital information that, in return, leads to increased cost savings and significant improvements. A properly implemented DA platform can start simple and, almost immediately, begin to generate low risk and positive returns. ●

RICK KAISER is a licensed professional engineer with 28 years of experience in the oil and gas industry. He has extensive upstream and downstream experience as an automation engineer in the oilfields of northern Alaska and as a mechanical engineer at refineries in Washington State. He works for AIS Software in Bellingham, Washington as a Product Manager for software solutions used at oil, gas and petrochemical facilities around the world.

ROGAN JONES is VP and Co-founder of AIS Software in Bellingham, Washington. He has extensive coding and programming experience across multiple industries and has consulted with numerous clients around the world to improve operations management. Mr. Jones graduated with a BS degree from California Polytechnic Institute (Cal Poly) and has spent the last 25 years in the oil and gas industry.

THREE LEGACIES ONE FUTURE

For years, the energy and petrochemical industries have counted on the catalysts, technology licensing, and services provided by the companies that comprise Criterion, CRI, and Shell Global Solutions. Today, these companies have come together under the Shell Catalysts & Technologies brand, working together as a more integrated partner to solve the industry's most complex challenges. As Shell Catalysts & Technologies, we channel years of experience providing value-adding solutions, technologies, and services that drive the industry — and the world — forward.

That's the promise of Shell Catalysts & Technologies.

SHELL CATALYSTS & TECHNOLOGIES
TRANSFORMING ENERGY TOGETHER

IMO 2020 and beyond

VIC SCALCO, General Atomics

Refiners around the world have learned to adapt to ever-changing market demands—even the advantages of opportunistic crudes have come with their own set of challenges. To overcome the need for technical advancements in the refining industry, processing tight oils and heavier crudes has just been dealt another blow.

The hottest topic at oil and gas conferences is the International Maritime Organization Regulation 2020 (IMO 2020). The understanding of what the future holds is mixed, but what is known are the limits of today's technical solutions to meet the IMO 2020 < 0.5% sulfur requirement. For smaller refineries, this may mean doing nothing and waiting for the shipping industry to react by installing more scrubbers (FIG. 1). For mid-size refineries, investment may be considered for blending or desulfurization, but a long-term, higher capital expense may not be in the cards for them. Larger refineries, however, are already capable of producing low-sulfur fuel oil (LSFO), making them ready for IMO 2020 regulations with only minor investments.

Production changes. IMO 2020 and the regulations of MARPOL Annex VI will shake up the bunker fuel market. The bottom of the barrel will still flow from refineries after the regulation requiring LSFO for maritime use is enforced beginning in 2020. Although the requirements have been in constant change, this new regulation represents the most dramatic change since 1996, when ISO 8217 MARPOL standards held a limit of 5% sulfur and a maximum of catalyst fines at 80 ppm. In 2012, MAPROL standards called for limits of 3.5% sulfur and maximum catalyst fines at 60 ppm. Today, the MARPOL standard requires < 0.5% at 50 ppm, creating an excess of high-sulfur fuel oil (HSFO) with catalyst fines.

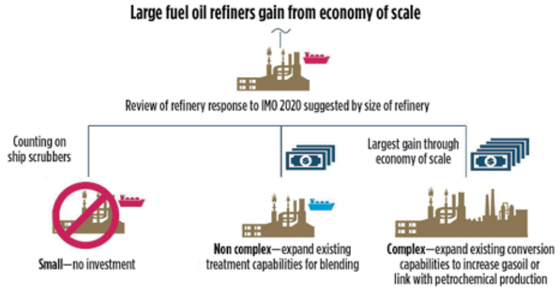


FIG. 1. The challenges and opportunities with impending MARPOL bunker fuel regulations. Source: Euro Petroleum Consultants.

Recent studies illustrate that 60% of refining capacity will remain HSFO, although supply will begin to become less severe. More than 70% of the industry will either make plans to reduce overall fuel oil supply due to IMO 2020 regulation tightening, or ultimately find other markets for HSFO. The global supply of HSFO is approximately 3.3 MMbpd, with a maximum 3.5% sulfur and less than 100 ppm catalyst fines. The new requirement for all ships to use marine fuel regulated under IMO 2020 will not only require LSFO with sulfur content under 0.5%, but Annex VI of the MARPOL requirements will also enforce reduction of the catalyst fines content known to cause engine wear and pollution.

Refiners will have little incentive to produce HSFO after the new regulations begin to be enforced. A small demand will remain from shipping companies installing scrubbers, but tight regulations on backwash scrubbers and even vessels containing HSFO can become a concern for shipping companies relying solely on exhaust scrubbers. The increase in scrubber-equipped ships and the increased demand for power generation will play a large role in balancing the call for HSFO in the market.

Facing the challenge. The fuel oil market or residue fuel is the bottom of the crude distillation unit (CDU). To extract more value from this stream, it can be processed using fluidized catalytic cracking (FCC), hydrocracking or cokers to produce products that are more valuable. This will come at a higher capitol expense. In the case of using FCC, catalyst fines must be removed from the slurry oil to produce a higher quality bunker fuel for selling into this market.

Catalyst fines are very small particles < 25 micron from the catalytic cracking process. Removal of these particles is complicated and, in most cases, even using settling tanks does not allow the refiner to meet the specifications required for marine bunker fuel. Refiners with successful fines separation have found the best technologies available are the di-electrostatic separator for clarified slurry oil, and some mechanical filtration methods. It is important to note, however, that mechanical separation is burdened with high maintenance costs and frequent blockage from asphaltenes or waxes.

To succeed in the dramatic switch to LSFO, refiners will want to cut their HSFO as much as possible to offset the anticipated drop in value. For refiners unable to upgrade in time to meet the expected demand, a shift in refinery low-sulfur crude processing will be the next step in meeting production without reducing CDU production. This will alter refineries' bottom lines by causing them to seriously consider the extra cost of upfront purchases of low-sulfur crude.

For refineries bracing for the upcoming tide of HSFO, the only certainty is how each refinery will uniquely prepare to address IMO 2020. In this emerging market, one solution will not fit all. ●

Since 1997, **VICTOR SCALCO** has been an integral part of process design and developmental downstream solutions for hydrocarbon recovery. Working in support of key players in the industry, his current position allows for new development of filtration and separation systems. He is principally involved in the technical development and training with engineering, procurement and construction (EPC) and FCC/RFCC licensors worldwide. His experience includes program development for commercial applications, scoping studies and commissioning. He earned an MA degree from San Diego State University and has worked for more than 20 years in the design and implementation of hydrocarbon filtration systems.

MERIDIAN ENERGY GROUP INC. ESTABLISHES SITE CONTROL FOR PERMIAN BASIN REFINERY

Meridian Energy Group Inc. has entered into agreement with a Winkler Co. subsidiary establishing site control in Winkler County, Texas for a new Meridian full-conversion crude oil refinery that will process local Permian (Delaware Basin) crude oil into a full slate of refined products for local and regional markets. With site control established, Meridian will proceed with design and permitting. Meridian Energy's first refinery, being constructed in Billings County, North Dakota, is proving that advanced technology can be used to meet strict environmental controls to build and operate full-conversion petroleum processing facilities.

The Meridian facility in the Permian Basin will have a throughput capacity of approximately 60,000 bpd and will otherwise be modeled on the Company's Billings County Davis refinery, which is under construction. The Davis refinery is a full-conversion greenfield refinery that was permitted for air quality purposes as a synthetic minor source, demonstrating substantially lower emissions on a per barrel basis than the industry average. The Permian facility will also be permitted as a synthetic minor source. The Davis refinery is the first full-conversion crude refinery ever to be permitted as a synthetic minor source, and Meridian believes that Davis, and now Permian, will be the cleanest refineries in the world when operational. ●

HEAR THE REST OF THE STORY

Stan Carp, Senior Manager
IPS Configurations & Process Consultancy
Honeywell UOP

TUESDAY, MARCH 19
9:30 AM
TECH SESSION

FIND NEW **VALUE**

A Future-Forward Philosophy

As market conditions, regulations and technologies change, UOP continues to redefine the future of refining and petrochemical production. We're helping future-forward refiners rethink their business models, and together, we're creating real, bottom-line value by integrating refining and petrochemicals to meet changing market demands.

Honeywell UOP works with operators and owners across the downstream sector to develop unique and comprehensive approaches for diversification and to capture more value out of every barrel of oil.

Honeywell UOP

THE REFINERY OF THE FUTURE IS FLEXIBLE, INTEGRATED AND CONNECTED

Crude-to-chemicals to deliver profitable growth

To remain competitive and grow in the face of softening fuels demand, refiners are turning to Honeywell UOP to unlock new value from every barrel of crude though flexibility in configurations, higher asset utilization and integration into petrochemicals. They are relying on UOP technology and know-how to capitalize on the rising demand for petrochemicals and changing global markets.

The refinery of the future is within reach

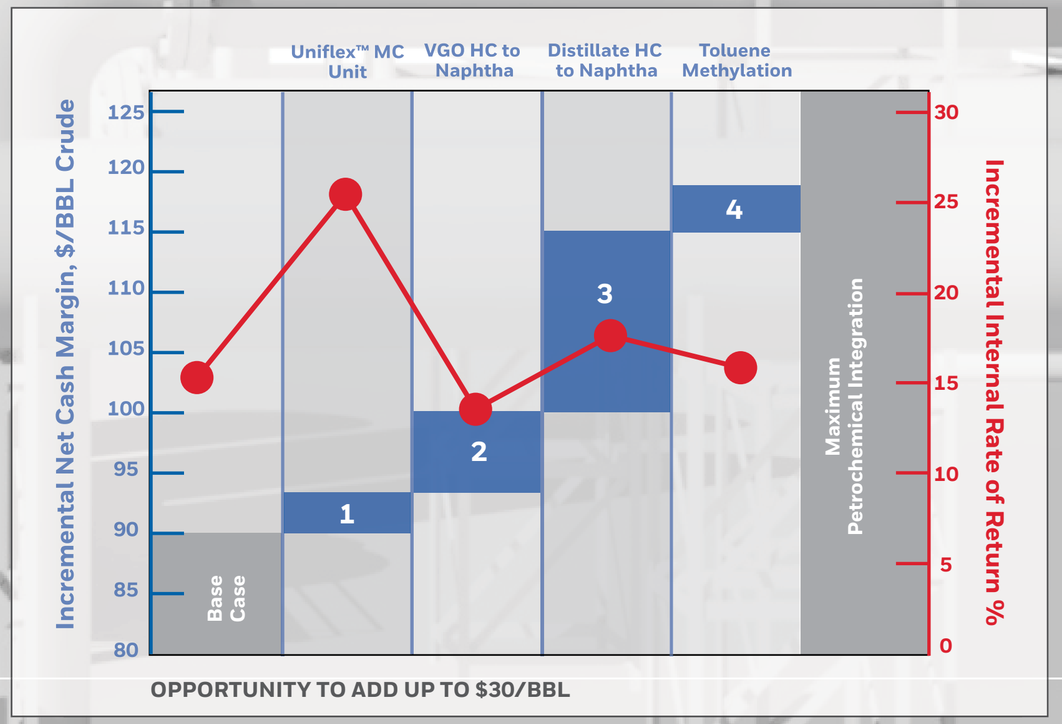
New, integrated refining and petrochemical projects are targeting 50–70 percent petrochemicals production. The technology to achieve this is available today, and the key to success lies in planned investments in the latest process technology with advanced molecular management, targeting the lowest value stream for conversion first.

Strategic, step-wise investment in new process technology

Through a series of strategic investments, refiners can gain a competitive edge and unlock new value previously not possible. In a Honeywell UOP conversion study, net cash margin was improved by almost $30/BBL, and each step in the conversion resulted in incremental Internal Rates of Return (IRR) up to 24%. With the right technology and UOP know-how, the Refinery of the Future is now within your reach.

Join Stan Carp, Senior Manager of Configurations at Honeywell UOP, on Tuesday, March 19, for more details on this valuable case study.

The Honeywell UOP Conversion Study outlines step-wise investments in bottom-of-the-barrel conversion, maximum-conversion Hydrocracking technologies and an Aromatics Complex integrated with Toluene Methylation generating up to 24% incremental IRR for each step. (Figure 1)



Annual Luncheon featured guest

At Tuesday's Annual Luncheon, AFPM is proud to welcome the Honorable Condoleezza Rice. From 2005–2009, Dr. Rice served as the 66th Secretary of State of the US, the second woman and first African American woman to hold the post. She also served as President George W. Bush's Assistant to the President for National Security Affairs (National Security Advisor) from 2001–2005, the first woman to hold the position.

THE HONORABLE CONDOLEEZZA RICE

From 1989–March 1991, she served on President George H.W. Bush's National Security Council staff, and was Director, Senior Director of Soviet and East European Affairs, and Special Assistant to the President for National Security Affairs. In 1986, while an international affairs fellow of the Council on Foreign Relations, Dr. Rice also served as Special Assistant to the Director of the Joint Chiefs of Staff.

She now serves as Denning Professor in global business and the economy at the Stanford Graduate School of Business; the Thomas and Barbara Stephenson Senior Fellow on public policy at the Hoover Institution; and a Professor of political science at Stanford University. She served as Stanford University's Provost from 1993–1999, during which she was the institution's chief budget and academic officer, responsible for a $1.5-B annual budget and the academic program involving 1,400 faculty members and 14,000 students.

She has authored and coauthored numerous books, including three bestsellers: *Democracy: Stories from the Long Road to Freedom; No Higher Honor: A Memoir of My Years in Washington;* and *Extraordinary, Ordinary People: A Memoir of Family.* She also wrote *Germany Unified and Europe Transformed: A Study in Statecraft* with Philip Zelikow; *The Gorbachev Era* with Alexander Dallin; and *Uncertain Allegiance: The Soviet Union and the Czechoslovak Army.*

In 1991, Dr. Rice cofounded the Center for a New Generation (CNG), an innovative, after school academic enrichment program for students in East Palo Alto and East Menlo Park, California. In 1996, CNG merged with the Boys and Girls Club of the Peninsula (an affiliate club of the Boys and Girls Clubs of America). CNG has since expanded to local BGCA chapters in Birmingham, Atlanta and Dallas. She remains an active proponent of an extended learning day through after school programs.

Since 2009, Dr. Rice has served as a founding partner at RiceHadleyGates LLC, an international strategic consulting firm based in Silicon Valley and Washington D.C. The firm works with senior executives of major companies to implement strategic plans and expand in emerging markets. Other partners include former National Security Advisor Stephen J. Hadley and former Secretary of Defense Robert M. Gates.

Dr. Rice currently serves on the boards of Dropbox, an online-storage technology company; C3, an energy software company; and Makena Capital, a private endowment firm. In addition, she is Vice Chair of the board of governors of the Boys and Girls Clubs of America; a member of the board of the Foundation for Excellence in Education; and a trustee of the Aspen Institute. Previously, she served on various additional boards, including: the George W. Bush Institute; the Commonwealth Club; KiOR Inc.; the Chevron Corp.; the Charles Schwab Corp.; the Transamerica Corp.; the Hewlett-Packard Co.; the University of Notre Dame; the John F. Kennedy Center for the Performing Arts; and the San Francisco Symphony Board of Governors. Born in Birmingham, Alabama, Dr. Rice earned her BS degree in political science, cum laude and Phi Beta Kappa, from the University of Denver; her MS degree from the University of Notre Dame; and her PhD from the Graduate School of International Studies at the University of Denver. She is a Fellow of the American Academy of Arts and Sciences and has been awarded fourteen honorary doctorates.

AFPM is pleased to welcome such an accomplished leader to its Annual Meeting. ●

Shaping partnerships and the emergence of the refinery of the future

LEE NICHOLS, Editor/Associate Publisher, *Hydrocarbon Processing*

"*Our* success depends on *your* success," said John Gugel, President and CEO of Honeywell UOP, setting the atmosphere for the company's customer appreciation dinner Sunday night during the AFPM Annual Meeting. The dinner brought together colleagues in the industry to enjoy a relaxing evening of good food and lively conversation.

The evening was highlighted by Gugel's welcome address, which focused on Honeywell UOP's drive to advance technology within the industry. "At UOP, technology is our business," Gugel said. "We continually invest in R&D to ensure that we have the right solutions for our customers." In 2018, 40% of the company's total revenues were generated from technologies and products that were introduced into the market in the last five years, according to Gugel. "This tells you two things: our technologies remain on the cutting edge, and our customers are not waiting to adopt them."

The adoption of new technologies segued into UOP's vision of the future of refining. "Looking ahead, we expect to see single-digit growth in global transportation fuels until 2035," he said. "Conversely, global demand for petrochemicals is growing three times faster than fuels, and the US is re-emerging as a major petrochemicals exporter." These major trends are leading to greater integration of refining and petrochemical operations. "We are working with customers around the world who are investing in new, integrated complexes with flow schemes that can convert 65%–70%, or more, of crude oil into petrochemicals."

With the forecast demand growth in petrochemicals, UOP can envision the day when a refinery will produce only petrochemicals, a movement the company refers to as the *refinery of the future*—a concept that will be detailed in Gugel's executive viewpoint in the upcoming April issue of *Hydrocarbon Processing*. "The refinery of the future is not just a new set of technologies, but also a philosophy we have held for many years," Gugel said. "Plants must be designed to efficiently manage molecules and be flexible to adapt to new product slates, respond to changes in regulations and competition, and remain competitive in production cost and capital efficiency."

He explained that the refinery of the future will be digitally connected, with cloud-based services that analyze plant performance and proactively recommend ways to improve profitability, reliability and safety, while mitigating waste. These benefits are the basis of UOP's Connected Plant—a cloud-based service to monitor, predict and improve plant performance. The solution, with more than 60 customers worldwide, provides constant monitoring of plant operations to increase efficiency and profitability. Recommendations from Connected Plant can help refiners and petrochemical producers recover millions of dollars that would otherwise be lost to unplanned downtime and underperformance.

Gugel concluded his remarks with a new concept on how UOP can work better with its customers. "Imagine that instead of paying us when things go *wrong,* you paid us because everything was going right. The central idea is that we align our business interests with yours. UOP will proactively deploy its expertise, products and services to ensure that we meet—or exceed—performance KPIs for your unit. This way, UOP's best day is your best day. These new business models are based on managing outcomes, and we believe they will make us a better partner for our customers. We take on some of the risk, and we share in the reward." ●

JOHN GUGEL, President and CEO of Honeywell UOP

Capturing value through refinery and petrochemical integration

MATT FLANAGAN, Opportune LLP

As US refiners continue to confront an increasingly volatile crude oil market driven by increased US shale production and a lag in offtake pipeline takeaway capacity, especially from the prolific Permian Basin, they also continue to seek new areas to drive earnings growth.

We are seeing an increased focus on the benefits of integrating the processes of petroleum refining and petrochemicals production. The concept of oil refining and petrochemicals manufacturing integration is not new; however, declining profit margins have recently compelled refining companies to re-examine petrochemicals integration as a means of increasing revenues among independent and large integrated refiners.

Downstream and chemicals applications

Salesforce provides a platform to digitize the core downstream functions:

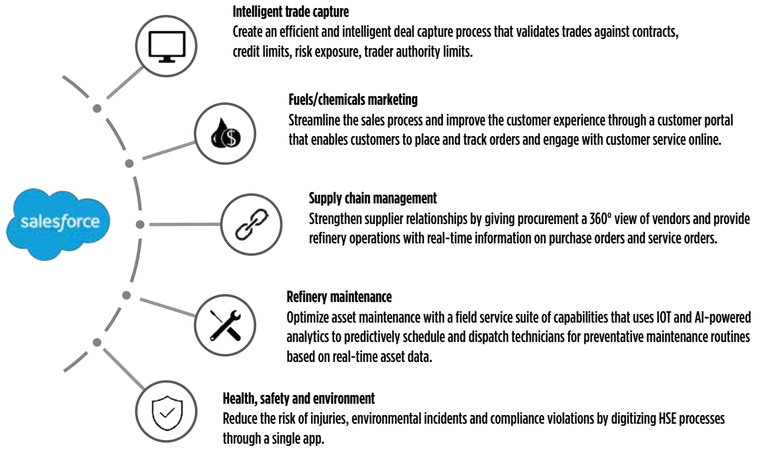


FIG. 1. Digital technologies, such as SalesForce, provide a platform to digitize core downstream functions.

Necessity vs. luxury. With downstream operators facing flat-to-declining demand for transportation fuels in the years ahead, investments in integrating petrochemicals with crude refining may be a necessity as opposed to a luxury. According to the International Energy Agency (IEA), petrochemicals will account for more than a third of the growth in world oil demand by 2030, and nearly 50% of the growth to 2050, adding some 7 MMbpd of oil by then.

While downstream operators can capture additional value around petrochemicals integration, we are also seeing a renewed focus around commercial optimization, especially among independent refiners.

Several of our downstream clients have active programs in place to achieve earnings growth through commercial optimization. As most have grown through acquisition of geographically advantaged sites, they are now integrating those assets at the commercial level, optimizing crude purchasing and logistics across their downstream networks and leveraging more diverse refined product networks to drive margin growth.

▶ See VALUE, page 16

Use data analytics to optimize batch processes

JON PETERSON, Seeq Corporation

In a perfect world, every batch manufacturing process performs as engineered, and every quality specification is consistently achieved. In the real world, variability can creep into even the most tightly controlled process. This is especially true in the chemical and refining industries. To improve this situation, an analysis of historical data can be performed to create critical process parameter profiles, with tolerances, to serve as guides for reducing processing variability and increase yield.

This approach makes sense but does not always work, and it can sometimes be quite difficult to perform. Out-of-tolerance events occur, despite applying the greatest diligence in controlling the critical process parameters (CPPs) of a recipe, as measured by a group of critical quality attributes (CQAs). Eventually, it becomes clear that the number of variables and the cause-and-effect relationships connecting CPPs and CQAs are more complex than realized.

Overcoming complexity. In these instances, successful batch production necessitates acquiring and analyzing detailed production data. Historians and other data repositories are an ideal source. Perfect batches can be identified, including all the associated data. A careful review of this information can then yield actionable insights.

One option is to manually extract data from an industrial control system or historian to create graphs in Excel. This methodology can generate some answers, but it is often necessary to dig deeper. There are limits on how a spreadsheet can be used to understand complex process variability.

Need for better advanced analytics. Applications focused on advanced analytics, such as those offered by Seeq, offer a viable alternative and can be implemented within a simplified infrastructure to offer more robust functionalities. These applications offer better mechanisms to aggregate and analyze data than spreadsheets, revealing greater insights and intelligence.

Cumbersome techniques such as spreadsheets, data cubes and data warehouses are no longer required. Advanced analytics applications run on typical office computers, communicating directly with historians to quickly extract data and present results.

As an example, let's assume an examination of a production process with six CPPs connected to a unit procedure. Using historical data from perfect batches with acceptable specs on all CQAs, it is now a simple matter to graph these six variables from all previous unit procedures. Curves representing performance from historical CPPs can then be superimposed on top of each other using identical scales to reveal new insights (FIG. 1).

It is easy to see if the curves tend to form a tight group, or if they are spread out showing different values at various times. Advanced analytics applications can easily aggregate these curves, without the need for complex formulas or macros, to establish an ideal profile for each CPP. This procedure can then be replicated, resulting in an updated reference profile and boundary for every variable. In the end, this process reveals new opportunities for process optimization.

▶ See DATA, page 16

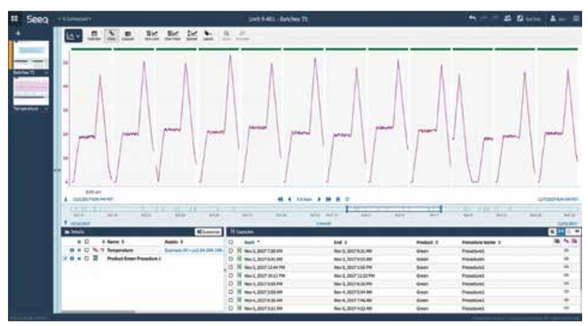


FIG. 1. A more sophisticated analytical platform can easily capture CPPs by automatically extracting data out of the historian.

Athlon's offering bolstered by Halliburton

When Halliburton acquired Athlon Solutions last year, the leadership team of the downstream chemical solutions provider knew the impact to their market offering would be big, but they did not fully understand how big.

"It is really a journey of discovery of what is available and applying it to our business," said Eric Axcell, who heads up Athlon's sales, field and engineering teams. "We are learning that many opportunities exist to leverage Halliburton's existing and growing capabilities for the benefit of our customers."

As Athlon transitioned into Halliburton's specialty chemical product service line, Multi-Chem, it completed the upstream-to-downstream value chain for the energy service giant. It also gave Athlon, whose core competency is industrial water and process treatment to refineries and petrochemical plants, access to resources, advanced technology and services from Halliburton's 14 product service lines.

Jeff Miller, Halliburton Chairman, President and CEO, said, "The Athlon team is an excellent complement to our fast-growing specialty chemicals business, and provides us with new capabilities to accelerate growth."

Common foundation to deliver value. Miller, who recently returned from the ground-breaking ceremony for Halliburton's oilfield specialty chemical manufacturing plant in Saudi Arabia, added, "Athlon's exemplary safety culture and performance are a good fit with our values. The downstream chemicals approach to drive customer value through collaboration and engineered solutions is perfectly aligned with Halliburton's business model."

The same core values—a focus on great people and a service approach to delivering value—provides Athlon and Halliburton a foundation to deliver an enhanced offering to the refining and petrochemical markets. Leading up to the acquisition of Athlon, Axcell said he knew there was a common understanding between the companies.

"Halliburton is the execution company. They manage problems by doing what they say they are going to do," said Axcell. "They think like we do but on a macro scale."

Axcell said Halliburton has also embraced Athlon, making them part of the larger corporate strategy. "Everywhere I go within Halliburton, people know who we are and how we fit into the strategy. That is a nod to us and their commitment to specialty chemicals, our applications expertise and the downstream market."

One of the most impressive attributes of Multi-Chem and Halliburton, said Axcell, is their duty to fulfill their value proposition.

"I have seen many companies craft value propositions and mission statements that just collect dust after the roll-out," he said. "For Halliburton, it is a pledge. When we tell customers, 'We deliver superior service and chemical application expertise to maximize asset value for our customers,' we mean it because we hold ourselves accountable to it."

Halliburton's upstream expertise. "Halliburton people, technologies and services enhance our offering," said David DeBlanc, who leads Athlon's business development and corporate accounts teams and is the company's chairperson for this year's AFPM Annual Meeting. "We are leveraging these resources so that we can help our customers meet their goals."

DeBlanc said Halliburton's upstream focus on drilling, evaluation, completion and production is an advantage. "We have a vast amount of experience and knowledge about the hydrocarbons, chemicals and feedstocks that enter into the downstream segment. This provides us with more information to better manage water and process challenges. We already have several projects underway that identify upstream knowledge and capabilities that can be leveraged for our downstream customers," he said, noting the use of Halliburton's digitalization and analytical expertise as a key area that is being developed to enhance Athlon's automation offering.

The automation project is building off Athlon's philosophy that automation begins with people and service, DeBlanc said. "You need a holistic approach that includes direct upstream knowledge, differentiating specialty chemicals, applications expertise and the digitalization tools and equipment that allow for effective continuous, real-time data collection, measurement and monitoring at a customer site. This drives better analytics and prediction to mitigate risk and improve performance. What we are seeing from Halliburton is a strong history of doing this in the upstream markets." ●

JEFF MILLER is Chairman of the Board of Directors, President and CEO of Halliburton, where he leads the Executive Committee. Since joining Halliburton in 1997, Mr. Miller has served in several roles, including COO, where he was responsible for developing and executing the company's operational strategy and aligning short- and long-term objectives with the Company's overall strategy.

ERIC AXCELL is Director of global downstream sales for Athlon, a Halliburton Service. Before the acquisition, Axcell held positions of VP of sales and field operations and VP of technology. Prior to Athlon Solutions, he served at Champion Technologies as Director of technical support and development for the Canadian business unit and as Section Manager of phase separation research and development for the company's global operations.

DAVID DEBLANC leads Athlon's business development and corporate account teams. Prior to this role, DeBlanc held positions of Director of business development and Gulf Coast Region Manager for Athlon Solutions. He spent the first 20 years of his career in various sales and management roles, supporting business partners along the Gulf Coast.

VALUE, continued from page 14

Digital solutions. Realizing these margins is, to a large degree, reliant upon integrated commercial business processes, as well as upon the use of digital technologies, such as SalesForce (FIG. 1). These digital technologies continue to help automate processes to accelerate cash flow cycles and to enable marketing organizations to drive greater margins through their branded and unbranded marketing channels.

Opportune is assisting several downstream clients with the adoption of digital technologies, which have already achieved significant margin improvements. Our approach is to target those commercial activities that most impact the revenue cycle and to leverage those capabilities throughout the commercial organization.

Opportune has identified several areas in the commercial supply chain area that are prime opportunities to leverage digital technologies to improve commercial performance, including:

- Streamlining deal entry for high-volume, low-complexity physical trades
- Integrating derivatives transaction processing from order to confirmation, fulfillment through allocation and broker reconciliation
- Maximizing utilization of electronic trade confirmation services
- Automating market data acquisition
- Enhancing integration with logistics partners.

Several major downstream companies have embarked upon large-scale digital transformations with anticipated capital spend tallying in the tens to hundreds of millions of dollars. While these initiatives promise significant returns, not all small-to-midsize refining organizations are prepared to double down on digital transformation projects and make investments of this magnitude. To that end, Opportune has been actively working with these refining organizations to identify more targeted opportunities to leverage digital transformation technologies. ●

MATT FLANAGAN is a Partner with Opportune LLP and leads its downstream industry sector. He has more than 25 years of experience in global refining and marketing, pipelines and transportation (liquids and gas), petrochemicals and mining, encompassing corporate strategy, operations, transportation, marketing, IT and back-office processes. Prior to Opportune, he led the M&A integration and commercial IT functions at Petroplus Marketing AG, a Swiss-based independent refining and marketing company.

ALON REFINING KROTZ SPRINGS, DUPONT CLEAN TECHNOLOGIES CONTRACT TO BOOST CLEAN FUELS PRODUCTION

DuPont Clean Technologies has been awarded the contract to supply Alon Refining Krotz Springs, a part of Delek US, with a license and engineering services for the STRATCO® alkylation technology at the refinery in Krotz Springs, Louisiana.

The 6,500-bpd STRATCO alkylation unit will enable Alon to generate low-sulfur, high-octane, low-Rvp alkylate with zero olefins, improving the quality and quantity of the refinery's gasoline pool to meet increasingly strict clean fuel standards. The STRATCO alkylation technology is a sulfuric acid catalyzed process that converts low-value olefins into high-value alkylate, a key desirable component for clean fuel, and has 90 units licensed worldwide and more than 850,000 bpd of installed capacity. ●

DATA, continued from page 15

The human element. Despite how advanced these analytics platforms have become, they still cannot suggest hypotheses, establish tests or draw conclusions. Process experts and engineers must examine the data, identify trends and advance theories of what might be happening with out-of-spec CPPs. This process expertise, combined with advanced analytics applications, can then be used to test theories and derive cause and effect.

Advanced analytics applications can be used to more effectively find correlations. Process engineers and experts are needed to identify cause and effect, advance theories and interpret conclusions to improve batch manufacturing performance. The best solution is to select the right advanced analytics application and put it into the hands of those with a deep understanding of the process. ●

Jon Peterson is the Senior VP of product and customers at Seeq. As a co-founder, he creates harmony between customer requirements and product development. Prior to Seeq, Mr. Peterson spent 21 years at OSIsoft, where he held leadership roles as VP of engineering and VP of marketing.

What does 2019 hold for the North American PET and polyester industries?

MICHAEL BERMISH, Wood Mackenzie Chemicals

As was evident in 2018, North America's polyethylene terephthalate (PET) and polyester industry is full of surprises. Will 2019 simply be a repeat of themes witnessed last year, or are new challenges ahead? Wood Mackenzie Chemicals Senior Consultant Michael Bermish discusses five key issues to observe over the next 12 months.

Regional rPET market changes. As of January 2018, China imposed an import waste ban that has effectively eliminated rPET (recycled PET)-baled bottle exports from the US to China. China has been, by far, the largest importer of rPET-baled bottles from the US, primarily from the West Coast. Significant substitute destinations are unavailable for rPET-baled bottle exports. This action by China has significantly altered the US West Coast recycling market dynamics, and this will persist through 2019 and beyond. On the East Coast, the rPET market is being impacted by a tight virgin PET resin market, which has pushed many converters and thermoformers to view the rPET market as an alternative and somewhat cheaper raw material. This will likely continue into 2019 and 2020 until additional capacity is added to the virgin PET resin market segment.

PET resin capacity constraints. PET resin capacity expansions are expected to stop this year. Impacted by delays assigned to the Federal Trade Commission (FTC) review of the Corpus Christi polymers three-way JV, the new Corpus Christi PET resin plant is not expected to come online until the second half of 2020, at the earliest. As such, the region's PET resin supply/demand balance for 2019 into 2020 is expected to remain extremely tight.

Tight PTA supply. In combination with a tight regional PET resin market, we expect North America's PTA supply/demand balance to remain tight in 2019 and into 2020 (FIG. 1). As this segment of the industry ages, unplanned outages are likely to occur, especially when plants are running at or near full capacity. We can expect to see some creative juggling of PTA capacity between North America and Europe to meet domestic PTA requirements.

Second wave of investments in North America. North America's shale gas developments have led to a significant wave of new ethane-based ethylene/polyethylene (PE)/mono ethylene glycol (MEG) export-oriented facilities coming online between 2017 and 2019. A second wave will reach final investment decision (FID) in 2019–2020, with commercial production expected in the first half of the 2020s.

Global surplus of MEG. A global MEG surplus is projected for 2019, and a significant multi-MM metric t (tonne) surplus for beyond 2020. One MM metric t of new US MEG supply is to be added by 1Q 2019, but only 27,000 metric t of demand growth is expected in 2019. The US adds another 1.6 MM metric t in 2019–2021 and a further 2 MM metric t after 2022. This is the beginning of an extended down cycle. ●

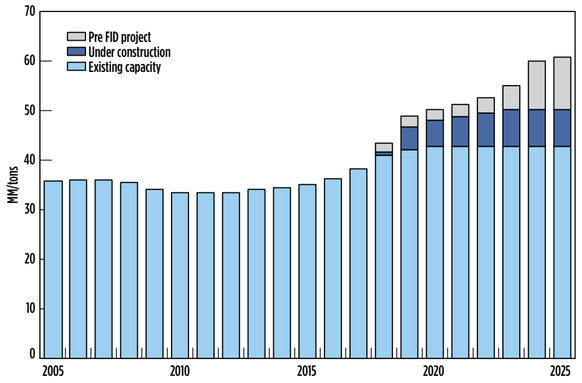


FIG. 1. North America ethylene production capacity. Source: Wood Mackenzie Chemicals.

SCENES FROM THE 2019 AFPM ANNUAL MEETING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1 During Monday morning's General Session, members of the AFPM board of directors and executive committee presented US Senator (R-Texas) **Ted Cruz** (second from right) with the AFPM Leadership Award.

2 **David Wilkins** and **Celest Horton** of Petroval SA enjoyed the relaxed atmosphere of Sunday evening's kickoff reception.

3 The capable and friendly AFPM staff made the check-in process easy and fast.

4 It's all in the follow-through! Visitors to the Pall Corporation suite on Sunday night were able to learn about the company and polish their gaming skills.

5 **Karen Barker** and **Gina Palermo** of Total Safety U.S. are excited to attend the Annual Meeting and show their support for the petrochemicals and refining industries.

6 In the registration area, where everyone could drool over it, Shell Catalysts & Technologies showcased the new McLaren 600LT. The supercar is owned by Hennessy, which endorses Shell's lubes and fuels.

7 AFPM attendees enjoyed a little gambling (with nothing at stake) at Haldor Topsoe's Casino Night hospitality suite.

8 **Diego Trujillo** (left) and **Sam Lordo** of Nalco Champion, and **Jill Langley** of Nalco Energy Services showed their enthusiasm for the upcoming technical sessions.

9 A little St. Patrick's Day cheer is infectious, as these AFPM attendees discovered Sunday night.

10 One of the best aspects of the AFPM Annual Meeting is the opportunity for different companies to share ideas and best practices. **Eric Heavin** of KBC Advanced Technologies, **Adham Sherkawy** of Bechtel and **Don Deutsch** of RMG took advantage of this at Sunday's opening reception.

11 The AFPM Annual event allows plenty of time to connect with colleagues and make new contacts.

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