

An optimistic era for the fuels and petrochemical industries

CHET THOMPSON, President, American Fuel & Petrochemical Manufacturers



Welcome to the 2017 AFPM Annual Meeting! We are excited to be back in San Antonio, a great city that always makes us feel welcome. A lot has changed since we were last here in 2015, undoubtedly the most notable being a new president, a new cabinet and a new Congress.

We are optimistic that our new government will usher in a new era for the fuels and petrochemical industries—one that promotes our growth and recognizes the many benefits our industries and products provide not only to the US, but to the world.

President Trump signaled that change was upon us within hours of being inaugurated when he posted his *America First Energy Plan*. The plan boldly calls on the US to leverage its resources to become an energy superpower. It demonstrates that the current administration understands the benefits that oil and natural gas bring to our nation by way of lower energy costs, more jobs, increased wages, enhanced national security and an improved infrastructure. The plan also indicates that a strong energy sector and responsible environmental stewardship are not mutually exclusive.

Just a few days later, President Trump delivered on campaign pledges to clear the way for critical infrastructure projects and to reduce regulatory burdens on US manufacturing. First, the president issued an executive order to expand en-

ergy infrastructure by allowing the Keystone XL and Dakota Access oil pipelines to advance. He then presented another order that will dramatically pare back federal regulations by requiring agencies to cut two existing regulations for every new rule introduced. We are optimistic that this is only the beginning, and that more reform is on the way.

This administration is right to address policies that promote the growth of our industries. The refining and petrochemical industries are essential to the world, and will remain so for years to come. Data from the Energy Information Agency (EIA) shows that through the middle of the 21st century, petroleum products will continue to supply more than one third of US energy demand, and more than 40% of global energy demand.

US refining capacity has expanded to more than 18 MMbpd, an increase of more than 10% since 2000. US demand for gasoline has grown since 2015, and is expected to top 144 Bgal in 2017. Diesel demand is anticipated to remain strong, as well.

As a result of our country's newfound resource abundance and the energy industry's ingenuity, we have become a net exporter of refined petroleum products and a major supplier of diesel fuel, gasoline, jet fuel and propane—as well as intermediates and feedstocks—to world markets. As our energy consumption diversifies, the US supply of petroleum products to the global market will increase to meet world demand. US petrochemical exports are also expected to grow, increasing by 60% to 2020.

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Secure sensitive data on connected IoT devices

WARREN KURISU and FELIX BAUM, Mentor Graphics

The functionality of connected IoT devices is rapidly increasing and, accordingly, the value of the stored information—and the information accessible through these devices—is also on the rise. Most devices in use today are connected to at least one type of IoT network or service.

When addressing the security of an embedded connected device, the “surface area” vulnerable to attacks must be considered. The area of attack varies from device to device; generally, the more sophisticated the device, the greater the area of attack. It is also important to understand that most threats target data not for the sake of data, but for the ability to manipulate that data. Finally, it is critical to design and develop a device that is both robust and secure by layering various secure capabilities.

An example of manipulating data might be an attack on an algorithm that affects the operation of the very system it depends on for operation. When it comes to protecting data, developers must be aware of the three critical stages: data at rest, data in use and data in transit.

Data at rest defines any data, including executable code. Considerations include: Where is the bootable data stored? Are anti-tampering methods used to inform the device if it is being tampered with, and is a mechanism in place to prevent it from booting into a vulnerable state? Have executables been encrypted, or could anyone who gains access remove EEPROM, dump the memory or attempt to reverse-engineer the application?

Data in use refers to a device that is operating normally, with data that is

being generated and processed. Have obfuscation methodologies been used for sensitive data? Is the device executing in a validated state? Has a chain of trust been established?

Data in transit describes data entering or leaving a device. A good design should address: How is data being protected if it is hijacked? Are encryptions or tunneling protocols in place? Have firewalls been deployed, and what are the strategies for denial-of-service attacks?

Creating layers of security. When it comes to protecting layers within an IoT device, you might hear “defense in depth” or “layered security.” Regardless of the terminology, it equates to creating layers of security that can defend against attacks or, at the very least, delay the attack from penetrat-



FIG. 1. TrustZone® technology allows developers to designate functions within a SoC as “secure world” or “normal world.”

ing subsequent layers. The layered security model often includes rules governing access and usage of a device; a (literally) physical barrier such as a fence, guard or locked door; securing the connectivity to the outside world; protecting the system from malicious applications; and ensuring the integrity of used or stored data.

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WELCOME, continued from page 1

This trajectory has occurred despite the stifling regulatory environment that the prior administration imposed on US manufacturers. Under an *America First Energy Plan* that encourages domestic energy production and downstream manufacturing, our growth can be even stronger, ensuring our ability to provide consumers with affordable and reliable fuels and petrochemicals for decades to come.

None of these changes are guaranteed, of course. Indeed, our critics remain (in force), and we expect them to be better funded and more vocal than ever, particularly at the state and local levels. We must work harder than ever to seize opportunities to change the narrative about our industries and products, to ensure that consumers understand the value that our products provide, and to adopt policies that en-

able the fuels and petrochemical industries to thrive well into the future.

You will hear more about the benefits our industries bring to our nation and to the world in the days ahead, from industry leader Greg Garland of Phillips 66; author Peter Zeihan, who will present his geopolitical overview of the world and the role of energy; and filmmaker Mark Mathis, who will speak about public misperceptions of the essential nature of oil and natural gas.

In addition, more than 70 technical and management papers will be presented in breakout sessions that address legislative, regulatory and

strategic issues; supply and demand projections; and proven practices in operations, safety, reliability and refining technologies. Finally, the Annual Luncheon features NFL great Peyton Manning. You don't need to be an Indianapolis Colts or Denver Broncos fan to know who he is, or to appreciate his talent, dedication and hard work. I'm looking forward to hearing from him on Tuesday.

We hope you enjoy the next several days, and gain valuable knowledge to bring back to your team and community. Thank you for coming, and for your continued support of AFPM. •

SCHEDULE OF SESSIONS AND SPECIAL EVENTS

SUNDAY, MARCH 19, 2017

9 a.m.–7:30 p.m. Registration
5:30–7:30 p.m. Opening reception

MONDAY, MARCH 20, 2017

7 a.m.–5 p.m. Registration
7:30–9 a.m. Government relations breakfast*
*Open to registered member attendees only
Networking breakfast*
*Open to registered member attendees only

9–11:30 a.m. General session featuring:
Mark Mathis, filmmaker: *Fractured and SpOILed*
How can we have a rational discussion about the most important thing in our lives—energy—when virtually every word, term and phrase used in describing energy production and consumption is wrong? Journalist turned filmmaker, Mark Mathis, explains why common terms such as, "Fossil fuel," "Alternative energy," "Clean energy," "Mother nature," and "Fracking" are highly misleading. These incorrect terms deceive the public about the essential nature of oil, gas, coal and nuclear power, and cause people to believe in expensive, dangerous illusions. In addition to explaining why common energy terms are inaccurate, Mr. Mathis proposes a better way of thinking and talking about the fuels that power our lives.

Peter Zeihan, author, *The Accidental Superpower*
Using his 12 years of intelligence experience, Peter Zeihan will present a Geopolitical Overview of the World as Related to Energy. Mr. Zeihan is a geopolitical strategist who specializes in global energy, demographic and security. He analyzes the realities of geography and populations to deepen the understanding of how global politics impact markets and economic trends.

12–2 p.m. Women in Industry Luncheon*
AFPM's first-ever Women in Industry Luncheon will feature a speaker who will discuss the vital role of women within the industry.
*Open to registered women attendees only. Tickets required.

2–5 p.m. Breakout sessions: Management, Alkylation, Crude Oil/Resid, Fuel Regulations, Margin Improvement

TUESDAY, MARCH 21, 2017

7 a.m.–12 p.m. Registration
7:30–9 a.m. Industry Leadership Breakfast featuring:
Greg C. Garland, Chairman and CEO, Phillips 66
Mr. Garland will share his insights from more than 30 years of industry experience in technical and executive leadership positions within the oil, natural gas and chemicals industries.

9–11:30 a.m. Breakout sessions: Reliability, Hydrocracking, Distillation, FCC, Plant Automation/Cybersecurity, Process Safety

12–2 p.m. Annual Luncheon featuring*:
Peyton Manning, legendary NFL quarterback
Peyton Manning has earned his place among the greatest quarterbacks in NFL history. As a leader in nearly every statistical passing category, Mr. Manning is the NFL's only five-time Most Valuable Player, 14-time Pro Bowl selection, and the first starting quarterback in NFL history to win a Super Bowl with two different teams.
*Open to registered member attendees only

2–4:30 p.m. Breakout sessions: Environmental, Hydrocracking II, Refinery Operations, FCC II, Gasoline

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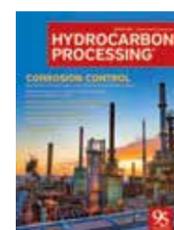
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Comply with environmental regulations and detect PRD malfunctions

MARCIO DONNANGELO and MARCOS PELUSO, Emerson Automation Solutions

Global fugitive emissions regulations are increasingly stringent, including carbon emissions and rigorous monitoring of pressure relief devices (PRDs). A cost-effective and reliable PRD monitoring system can meet regulations and provide a strong ROI while improving efficiency and safety, and cutting operating costs.

PRDs include pressure relief valves, pressure safety valves or rupture disks. They activate when pressure approaches the maximum allowable working pressure of the vessel or process component. Ideally, hazardous materials being relieved by a PRD should be routed to an enclosed recovery system to be treated and properly disposed of, or neutralized through combustion in a flare system. However, some PRDs release process fluid directly into the environment, potentially creating explosive and toxic emergencies.

In addition to potential environmental and safety concerns, process upsets causing overpressures can negatively affect production, uptime and profitability. A PRD is sometimes the only noticeable indicator of process upsets, so the sooner a PRD event can be detected, the sooner operators can respond to the root cause problem.

Often, when the process pressure returns to normal, the PRD does not completely close. Even a small leakage (0.1% from the PRV flow area) can cause significant financial losses (TABLE 1), as well as emissions violations that result in expensive fines and even required shutdowns.

Regulations. Regulatory requirements for refineries, petrochemical plants and other industries are similar worldwide, with the main difference being the tolerated amounts for each type of

pollutant released. The rules can be generalized by three simple requirements: provide an indication and location for a PRD event through electronic monitoring; measure, record and report the time and duration of the PRD event; and notify the operator so corrective action can be taken.

Monitoring PRDs. Historically, PRDs have been difficult to monitor because they are simple mechanical devices with no connection to automation or monitoring systems. Monitoring methods have included manual inspection for telltale signs, or the indication of a leak or release by a larger-than-normal flare.

Process instrumentation is also used to observe pressure peaks and valleys, temperature downstream and flow in the discharge header. Plants may monitor PRDs by observing process pressure, but when the pressure is close to the operating limit, the peaks and valleys make it difficult to determine when the PRD is actually opened or closed (FIG. 1).

Such measurements are susceptible to false positives and inaccuracies, and do not provide insight into the health and status of individual PRDs. Measuring flow in the discharge header does not show which PRDs were activated. Observing changes in the flare flame is also inaccurate and does not show which unit and which PRD caused the release.

In theory, PRD activation should occur only in exceptional circumstances. However, in practice, activation occurs more often due to small leaks when the PRD does not reseal fully. This may be an indication of other problems, such as PRD issues, plant operating practices or equipment specifications.

A reliable, effective and economic way to monitor PRDs is *WirelessHART* acoustic transmitters. Process fluid flowing through valves and orifices generates acoustic waves in a wide and complex range of frequencies and magnitudes. Acoustic transmitters detect ultrasound acoustic waves in the pipe wall, as well as its temperature. These small, wireless, lightweight and non-intrusive devices can be easily clamped onto an exhaust pipe (FIG. 2).

Using acoustic transmitters, PRD operating conditions can be determined:

- A noise level increase indicates that the PRD has been activated.
- The noise level returns to the previous level, indicating that the PRD is no longer discharging.
- A noise level returning to a level above the previous level indicates leakage due to the valve not closing completely. This may be caused by the deposition of particles or scale between the disc and its seat, or due to mechanical misalignment.
- A continuous noise level change indicates that the valve may be simmering or chattering.
- Temperature changes may be used as an additional indication to validate a release.

Acoustic *WirelessHART* transmitters should be installed downstream of a PRD, and as close as possible to the valve. PRDs are usually installed with shutoff and bypass valves for maintenance and special operating conditions. Bypass valves may be inadvertently left open or not closed completely, causing unexpected flow to the recovery system. A wireless acoustic transmitter monitors not only discharges or leakages of the relief valve, but also flow through the bypass valve.

Rupture disc monitoring. Some types of rupture discs are equipped with a burst detector that generates a discrete signal indicating disc rupture. Rupture discs use a relatively thin membrane that may have pinholes created by pitting corrosion, and process fluids can leak through the pinholes. The burst detectors are not activated unless the disc ruptures, so leakage can go undetected.

Rupture discs also can be monitored with a wireless acoustic transmitter, which can detect when the disc ruptures and the duration of the discharge (as it does for relief valves), as well as often detect even small leaks caused by pinholes.

The rupture disk does not need to be replaced immediately after bursting, as the *WirelessHART* acoustic transmitter still monitors pressure releases. This allows maintenance personnel to replace or maintain the equipment at the most convenient time without having to slow or shut down the process.

PRD monitoring is necessary for regulatory compliance. It also mitigates the risk of expensive fines (and potential process unit or plant shutdowns) and provides awareness when a PRD is leaking, prompting immediate action. *WirelessHART* acoustic transmitters are an effective, reliable and economic way to be compliant and mitigate losses to the flare. •

TABLE 1. Petrochemical 0.1% leakage loss costs examples

Gas type	Cost/metric ton	Process pressure, psig	Leakage losses, \$/yr
Ethylene	\$1,044	250 at 212°F	740,000
Ammonia	\$500	250 at -28°F	335,000
Steam	\$22	250 at 400°F	7,800

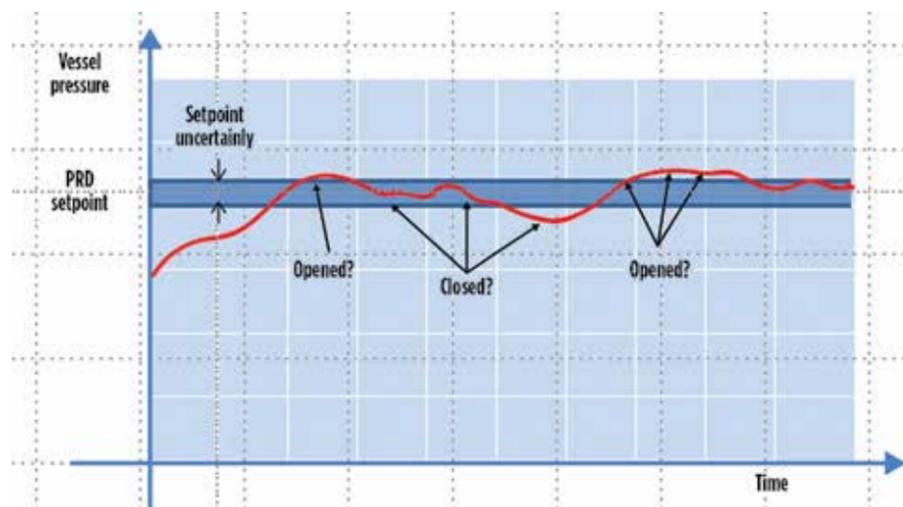


FIG. 1. Using process instrumentation to observe pressure variations and predict PRD operation can produce inconclusive results.

AFPM ANNOUNCES NEW APPOINTMENTS

Robert McArver has joined AFPM as Vice President of petrochemicals, and Don Thoren has been promoted to Vice President of state and local outreach.

Both Dr. McArver and Mr. Thoren bring a wealth of in-depth industry experience to their new roles. Dr. McArver most recently served as VP of policy and government relations for the Association of Home Appliance Manufacturers, and also worked for Celanese Corp. as VP of global public affairs. Mr. Thoren joined AFPM in 2016 as the Director of state and local outreach, and previously held leadership roles at the American Chemistry Council and the Altria Group, where he focused on outreach, political mobilization and state government affairs.



AFPM congratulates Dr. Robert McArver (left) and Don Thoren (right) on their new appointments.



FIG. 2. A *WirelessHART* acoustic transmitter clamped to a pipe.



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Sunday, March 19: 7:30pm – 9:30pm

8:15pm – 8:30pm: International Maritime Organization 2020 strict sulfur emissions regulation: The time to get ready is now.

The US refiner is ideally suited to take advantage of the ruling. Find out how KBC can assist you to maximize the profit potential from your plant.

Monday, March 20: 12:00pm – 2:00pm & 6:00pm – 10:00pm

12:00pm – 2:00pm: Complimentary lunch, drinks and informal networking with the KBC team.

7:15pm – 7:30pm: Operational Excellence: Create a production focused, competitive advantage for your business

KBC's OpX model focuses on value delivery through increased margins and optimized capital employed to deliver sustainable competitive advantage.

8:00pm – 8:15pm: A second pair of eyes on process performance with the KBC Co-Pilot Program™

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Precision-tuned stacked catalyst systems

JAMES ESTEBAN, Criterion Catalysts & Technologies

Criterion Catalysts & Technologies' applications extend beyond a targeted loading approach to provide complete solutions, performance optimization and enhanced profitability. From its stacked catalyst systems in the mid-1980s to the company's targeted loading methods using its CENTERA™ products, Criterion is a significant presence in the fluid catalytic cracking pretreat (FCCPT)/gasoil hydrotreating and distillate, or ultra-low-sulfur diesel (ULSD) markets.

The strategic application of NiMo/CoMo catalysts in targeted reactor loading improves overall catalyst system hydrogenation. This increased performance enables deep hydrodenitrogenation (HDN) and aromatics saturation for enhanced hydrodesulfurization (HDS) performance, as

well as maximum hydrogen (H₂) uptake for the highest overall yields.

Criterion's testing and commercial experience with various feedstocks has demonstrated that a NiMo/CoMo stacked design results in performance that exceeds either 100% NiMo or 100% CoMo catalyst designs, in many cases. Applying NiMo catalyst in the upper part of the reactor to reduce nitrogen (N₂) and polynuclear aromatic (PNA) levels tends to "unlock" direct HDS reaction paths in the lower part of the reactor. Those direct-path HDS reactions consume less H₂ and result in boiling point shift and volume swell without significant light naphtha yields.

FCCPT stacked solutions. Feed pretreatment for FCCUs offers significant performance advantages, includ-

ing overall increases in conversion, improved yield selectivity, FCC products that meet clean fuels specifications and reduced catalyst usage. Criterion continues to develop and apply new advanced catalysts and solutions for FCCPT applications. CENTERA catalysts have demonstrated market leading hydrogenation performance and HDS and HDN activity. Use of these products alone provides solid hydrotreating performance, but a key feature of the portfolio of products is its synergistic behavior when applied in stacked systems.

The saturation of aromatics enables improved product upgrade for increased FCC yields, while also increasing the rate of deep desulfurization via direct desulfurization routes. Additionally, the high hydrogenation activity enables increased HDN, improving both FCC feed quality and hydrotreater performance as N₂ inhibits sulfur removal from feed streams in hydrotreating. The hydrogenation of FCC feed streams is necessary for deep desulfurization, particularly when operating at higher sulfur conversion targets for Tier 3 FCC gasoline production. Thus, many refiners have included the application of high-severity FCCPT operation in their strategies for Tier 3 fuels production, since FCC gasoline is a major blend component for typical refinery product gasoline streams.

A case study illustrates the performance achieved by a refiner operating an FCCPT unit to produce a Tier 3 quality gasoline blend component, increase conversion in the FCCPT unit and improve FCCU conversion and yields. This unit is operating with CENTERA technology in

a stacked catalyst system at custom operating targets for maximum performance. TABLES 1 and 2 highlight the performance benefits achieved post application of Criterion's CENTERA technology vs. a competitive catalyst system. An increase in FCCPT conversion and FCC performance with improved yields can be observed, while the catalyst system in use remains on target to provide an extended lifecycle.

The use of stacked catalyst systems also improves unit stability and cycle longevity. The application of high-performance catalysts offers expanded catalyst lifecycles by reducing the operating temperatures required to meet product specifications at start-of-run, as well as the deactivation rate as the cycle progresses. In general, hydroprocessing catalysts suffer from deactivation due to two primary mechanisms: the poisoning of active sites due to feed contaminants, such as metals; and the formation of coke on the surface of the catalyst, inhibiting access to the active sites.

Criterion's FCCPT portfolio includes performance guard products to protect from poisons, and advanced substrate geometry and pore structure to enable high tolerance to feed poisons, permitting maximum available active volume. In combination with stacking solutions, CENTERA technology results in long-term catalyst system stability with respect to deactivation as a function of coking. The application of specific catalyst layers throughout the reactor permits the use of an ideal catalyst in targeted temperature zones, which reduces the coking potential of regions of the reactor that are susceptible to aromatics equilibrium limitations and the formation of coke.

Criterion's experience in targeted stacked catalyst systems enables the production of high-quality ULSD blend streams produced directly from FCCPT units, both in mild hydrocracking operations and distillate co-processing applications. The continued performance gains realized by a customer over the course of multiple FCCPT unit cycles highlights the advantages of Criterion's latest-generation products that provide increased ULSD blendstock volume from access to heavier product fractions.

ULSD/distillate custom stacked solutions. In the upper section of a distillate hydrotreater, HDS reactions are relatively catalyst independent, occur rapidly and may advance up to 80% completion. In the upper and mid-section of the reactor, it is critical to lower the N₂ level and saturate PNAs, "unlocking" the performance of the balance of the catalyst system.

With NiMo catalyst, N₂ is effectively reduced over an optimized portion of the reactor volume (FIG. 1). While that N₂ level effectively inhibits aro-

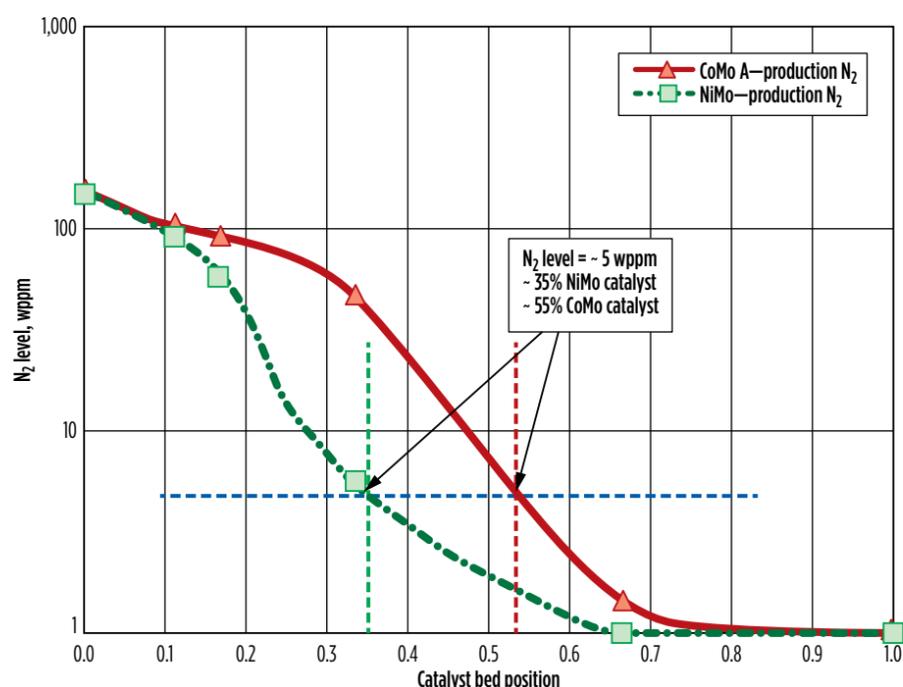


FIG. 1. N₂ profile in stacked bed.

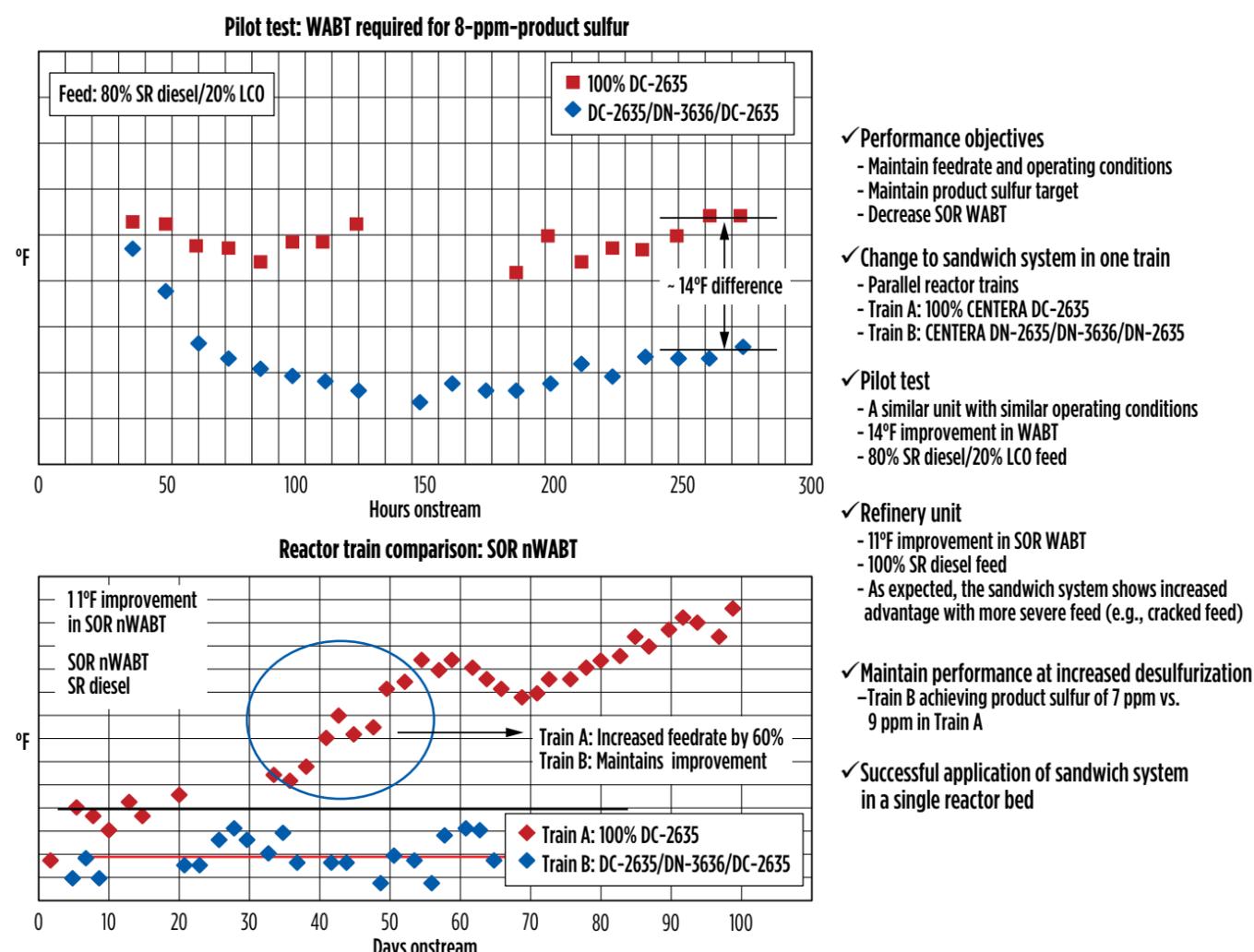


FIG. 2. CENTERA sandwich utilized by a US refiner. SOR activity of sandwich DC-2635/DN-3636/DC-2635 vs. 100% DC-2635.

▶ See CRITERION, page 12



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Resourcing the world



Operational excellence: Create a production-focused, competitive advantage

Operational excellence is the “program du jour,” but what does it really mean? For some, operational excellence is executing business processes accurately and consistently. For others, the focus is on process safety management, risk management and mitigation. Operational excellence also could be considered as an extension of asset management to increase reliability of operations.

Marketplace results show that operational excellence is seen as transforming the way CEOs drive their corporate agenda to create sustainable and competitive advantages for their business, resulting in lower CAPEX and enabling them to invest in more growth opportunities. Companies with demonstrated and sustained operational excellence programs that serve the leadership agenda are rewarded with higher returns on capital employed (FIG. 1).

KBC believes that the leadership agenda in oil and gas companies should be aligned to focus on six key areas:

1. In today’s market environment, **Growth and profitability** take first priority to provide a compelling case for investment, given the industry’s capital intensity.
2. **Disruptive technology** is changing and challenging the economics of the hydrocarbon industry, with a key focus on organizational productivity.
3. The correct **governance** structure must be in place to support timely, data-backed decisions, and ensure that resulting actions are implemented.
4. The nature of the industry will always require considerable focus on **risk and policy**, which can change a company’s value in a single incident or regulatory action.
5. Demographics in advanced economies are creating **leadership and succession** issues at the frontline where senior operators and craft skills are leaving the job pool, resulting in a loss of experience and bandwidth to train replacement hires.
6. Lastly, the **business capability** to execute the business functions in a volatile and uncertain marketplace (with a constant focus on cost containment) requires new approaches to training and the automation of low-value-add tasks.

Chevron and Exxon view operational excellence as a journey, and both companies claim that they have not yet achieved true excellence. Their leadership sees operational excellence as a means to transform their way of doing business, and they have ingrained it into their respective cultures.

Large programs fail due to unrealistic timelines, poorly defined performance goals, misunderstood organizational capability, initiative fatigue and lack of leadership stamina. An operational excellence program should focus on specific tangible goals and evolve over time.

The following prerequisites are recommended before embarking on the operational excellence journey.

Program governance. Use a top-down/bottom-up approach to understand the gap from the present state to the

future state. The use of benchmarking and stakeholder promises can establish top-down strategic goal setting. Applying lean techniques to value streams and process mapping at the frontline will identify key process steps that require redesign or application of specific technology solutions to ensure consistency, accuracy in execution and higher levels of productivity. KBC recommends establishing a results delivery team with the authority to drive change, and defining the program with time-bound expectations and leadership accountability.

Organizational DNA. Understand the organizational philosophy, capability and capacity constraints that may impact the rate of change acceptance. To achieve your objectives, the organization’s DNA must be changed. Changing the DNA of living organisms requires long evolutionary cycles, and the same is true of a corporate organization. Creating alignment in the leadership team, and speaking with one voice, will drive the new way of working.

Ensuring results. Design actionable and measurable solutions to meet strategic objectives, and align all initiatives to deliver on these objectives. More importantly, eliminate activities that are out of alignment. Chasing moving benchmarks creates chaos and a feeling that the goal is unachievable. Use easily identifiable, transparent change and key performance indicators that are supported by critical path program stage-gate performance reviews.

Program execution. Transformational programs can take three to five years to achieve results. Review the timelines for the industry leaders that began their operational excellence journeys in 2008 after the Baker Report from the fallout of the BP Texas City refinery explosion. Most process breakdowns occur at functional interfaces, so create cross-functional teams with prioritized objectives to accomplish goals.

KBC value proposition. KBC recommends establishing a results delivery team with the authority to drive change, and defining the program with time-bound expectations and leadership accountability. KBC’s OpX model (FIG. 2) is designed to deliver value by linking operational optimization levers to return on capital employed (ROCE) drivers. It focuses on value delivery through increased margins, optimized capital employed, and maintaining the license to operate. This is enabled by a production-centered workforce that is supported with the necessary leadership, governance and capability that, in turn, delivers a sustainable competitive advantage.

To discuss how KBC can support your successful journey toward operational excellence, please visit our hospitality suite Sunday and Monday evenings in the MRC, suite 3529. ●

ENTERPRISE PRODUCTS SELECTS HONEYWELL UOP TECHNOLOGY FOR PETROCHEMICAL PLANT

Houston-based Enterprise Products Operating LLC has chosen Honeywell UOP’s C4 Oleflex™ technology to produce 425 Mmt (thousand metric tons per year) of isobutylene, which is used to make high-octane fuel and high-performance synthetic rubbers and acrylics. In addition to technology licensing, Honeywell UOP will provide basic engineering design, control systems, catalysts and adsorbents for the Mont Belvieu, Texas plant. Honeywell UOP also will provide a modular continuous catalyst regeneration unit.

Enterprise, a subsidiary of Enterprise Products Partners LP, provides midstream energy services to producers and consumers of crude oil, petrochemicals, natural gas, natural gas liquids (NGLs) and refined products in the US and internationally.

Honeywell UOP’s C4 Oleflex technology uses catalytic dehydrogenation to convert isobutane into isobutylene. Its low energy consumption, low emissions and fully recyclable, platinum-alumina-based catalyst system minimizes its impact on the environment, while the process design maximizes operating flexibility, on-stream factor and reliability.

The Honeywell UOP CCR section is a critical part of the Oleflex unit and will be delivered to Enterprise as modular equipment. ●

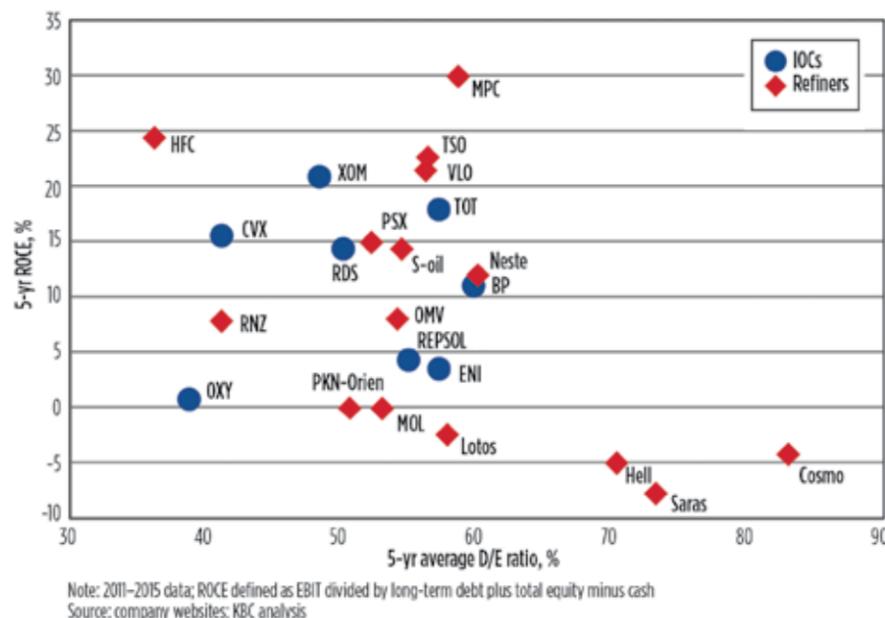


FIG. 1. Companies with demonstrated and sustained OpX programs.

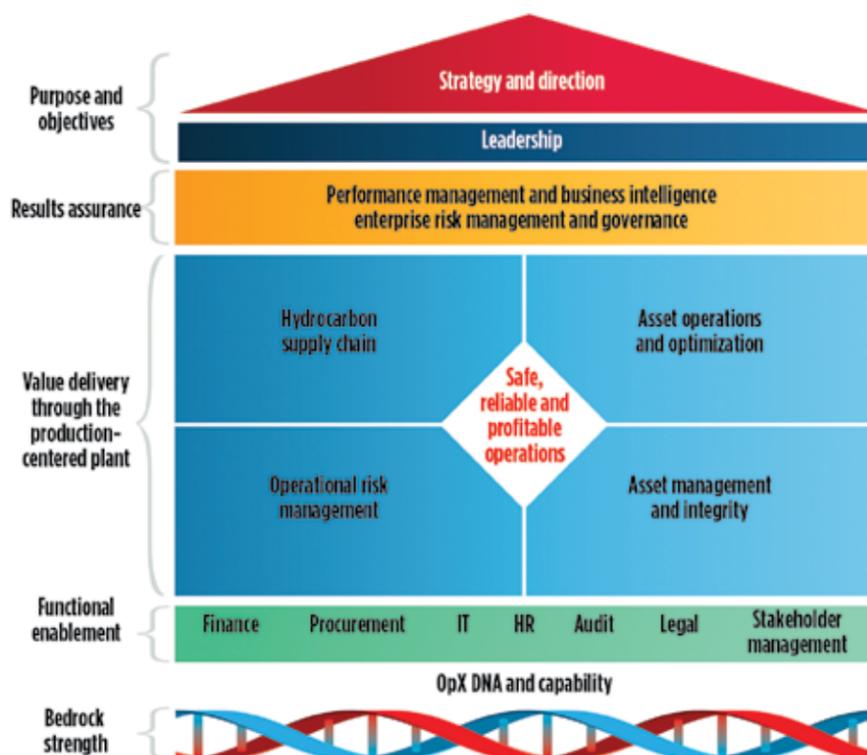


FIG. 2. KBC's Operational Excellence (OpX) model.

Technology, tools no substitute for skilled craft workforce

BOB FRAWLEY, Stork, a Fluor Co.

Technology and tools are a valuable part of today's turnaround and maintenance market, improving the industry's ability to effectively plan, schedule and track high-volume, complex projects. Jobsites are becoming essentially paperless; material requests and verifications have been reduced from days down to minutes.

However, no matter how advanced these tools become, they are all designed to support and assist a project's foundation—the people. Turnarounds and maintenance projects will always require the right resources, applied to the right tasks, in the right sequence to effectively execute the work.

In today's competitive market, companies must effectively staff projects with the right mix of skilled craft professionals (FIG. 1). Developing and maintaining this workforce is crucial to ensuring that the refining and petrochemical industries continue to safely and efficiently execute operations. Training and planning can ensure that our workforce is in a position to succeed, and that we will have a strong pipeline of skilled craft personnel.

To encourage and support individuals in pursuing craft careers, Fluor

recently opened a US Gulf Coast (USGC) craft training center in Pasadena, Texas. The center offers pre-employment, tuition-free, entry-level training in the electrical, instrumentation, millwright and pipefitting disciplines, as well as advanced welder training. The 12-week courses are taught by certified instructors with extensive industry experience, and encompass classroom and hands-on training. Trainees graduate with industry-recognized credentials in the NCCER core curriculum, as well as NCCER Level 1 and 2 certifications in their chosen trade.

Upon graduation, trainees are under no obligation to work for Fluor, and have the opportunity to apply their skills where they choose. Combined with onsite training, Fluor trained nearly 2,000 craft personnel in the US in 2016.

With skilled craft professionals available to support maintenance and turnarounds, proper planning and key supervision place those resources in a position to succeed. Tools such as advanced work packaging can substantially improve productivity through early planning and the correct sequencing of activities. By breaking

down scopes of work, managers have the ability to understand the specific skill sets required to staff projects accordingly. This improves onsite productivity, reduces safety risk exposures, and improves cost and schedule certainty by improving time on tools to maximize the work centered on a person's skill set.

Craft teams are freed to influence and shape project execution planning. Assigning core craft resources during early planning phases of an event or activity improves the

constructability of the designs and plans, and ultimately, productivity in the field. Such an execution approach also creates consistency and continuity throughout each phase by enabling site familiarity and understanding before work begins.

Regardless of the advancements in tools and technology, our industry remains a people business. With the appropriate development and commitment, the industry can ensure that it has the skilled workforce to support future projects. ●



FIG. 1. Industry-led craft training is developing the next generation of skilled craft professionals.



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Understanding Catalytic Solutions for Increasing Middle Distillate Yields
Paper AM-17-38

Brian Watkins – ART
Chuck Olsen – ART

ART Commercialization of New 5th Generation ISODEWAXING Catalyst
Paper AM-17-67

Kenny Peinado – ART

Prediction: Fog computing, IT/OT convergence to lead 2017 IoT trends

SCOTT ALLEN, FreeWave Technologies

Top industry experts from FreeWave Technologies Inc. have revealed the company's second annual list of Industrial IoT (IIoT) predictions. The five IIoT predictions for 2017 cover a range of topics including the rise of interoperability, business challenges stemming from IT/OT convergence, programmability at the edge, wireless networking standards for smart cities, enhanced cybersecurity rollouts and IoT talent recruitment opportunities (FIG. 1).

The 2017 Prediction Series is a high-level examination of the IIoT landscape from technological and business perspectives. The IIoT is transforming the connected ecosystem of geographically dispersed businesses and will be critical for IT

innovation and product development. Organizations leveraging the IIoT as a strategy must also evaluate and act upon the growing skills-gap, as industries shift toward a more digital-centric workforce.

FreeWave's 2017 predictions in descending order:

#5: A public utility closure will occur in 2017. The maturation of interoperability standards and evolution of remote data collection technologies are forcing critical infrastructure and utility organizations to adapt at a new pace. With an aging infrastructure and a high percentage of the workforce nearing retirement, existing management will struggle to match the resources needed to build a com-

prehensive, integrated portfolio of applications that must work together to support the organization's goals.

#4: Millions of smart IoT devices will be deployed into networks that use the 802.11 ah (HaLow) protocol, which will become the IIoT standard. The 802.11 ah (HaLow) wireless networking protocol will overpower Bluetooth for critical infrastructure applications such as traffic management, public safety, energy efficiency and public infrastructure design. As urban areas continue to expand, the need for high bandwidth solutions will become more important.

#3: Recruitment of IoT talent will remain a challenge, incentivizing the funding of secondary education programs to nurture the future digital-centric workforce. The biggest challenge facing IoT talent recruitment is the skills gap—not enough applicants are qualified to take on new digital-centric, IT roles. IT/OT convergence further complicates the issue. Operational transformation impacts everyone, particularly those on the operations side that deal with legacy systems.

#2: IIoT app development programs will outpace consumer IoT app development programs within three years. Third-party IIoT application development at the edge (i.e., fog computing) will alter the use of big data and predictive analytics. The ability to filter specific data directly at the source means that there will be less of a need to collect all data for broad analysis. The demand for more apps at the edge and coinciding apps on the IT side, coupled with big opportunities for app developers, will drive the shift from consumer to IIoT apps.

#1: Emerging technologies will lead to the strongest security rollouts. As a decentralized network architecture that brings computing power closer to where data is generated and acted upon, fog computing enables analysis, control and automation closer to the "things" in the IIoT. Because fog computing reduces the amount of data being sent to the cloud, cybersecurity will be enhanced by reducing the threat and attack surfaces of IIoT networks. In industries where even milliseconds are vital, certain processes will move away from the cloud and closer to the edge. •



FIG. 1. The IIoT is transforming the connected ecosystem of geographically dispersed businesses and will be critical for IT innovation and product development.

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To all AFPM attendees, we welcome you to San Antonio! Enjoy the colorful, vibrant Alamo City, which has been Zachry's home base for 65 years.

Be sure to stop by our AFPM hospitality suite in the Travis meeting room to hear more about our enhanced capabilities and our exciting acquisition of Ambitech Engineering, a global provider of engineering, design, project management, procurement and construction management services.



www.zachrygroup.com

ACQUISITIONS AND COLLABORATIONS

ZACHRY GROUP ACQUIRES AMBITECH ENGINEERING CORP.

Chicago-based Ambitech Engineering Corp., a global, full-service provider of engineering, design, project management, procurement and construction management services, has been acquired by Zachry Group.

With 750 employees in multiple locations across the US, as well as in India, the Philippines and the Middle East, Ambitech serves the refining, petrochemicals, food and beverage, pharmaceuticals and biotechnology, and consumer products industries.

Zachry Group specializes in turn-key construction, engineering, maintenance, turnaround and fabrication services in the power, energy, chemicals, manufacturing and industrial sectors. It operates 35 offices with more than 22,000 employees working in more than 400 locations across North America.

The addition of the Ambitech team enhances Zachry Group's ability to provide high-quality, full-service support to customers through Zachry's principal business lines, including engineering, construction, maintenance, turnarounds and specialty services across North America.

ATHLON SOLUTIONS, EVONIK INDUSTRIES PARTNER TO BOOST PETROCHEMICAL CAPABILITIES

An agreement with Evonik Industries complements Athlon Solutions' water and process treating capabilities with a globally proven product line and technical support network.

Under the agreement, Athlon Solutions becomes the distributor of Evonik's products and provides customers in the US, Canada and Mexico with day-to-day account management, service (including engineering and technical support) and reporting. Evonik provides its specialty chemicals and backs up Athlon Solutions with technical support.

ROCKWELL AUTOMATION TEAMS WITH INDUSTRIAL SECURITY COMPANY CLAROTY

Known industrial security weaknesses are increasingly turning into actual attacks, causing global producers to search for more robust solutions to protect operations. To meet this need, Claroty and Rockwell Automation will work together to combine their security products and services into future, packaged security offerings.

Rockwell Automation selected Claroty for the company's anomaly-detection software purpose built for industrial network security. The software creates a detailed inventory of an end-user's industrial network assets, monitors traffic between those assets and analyzes communications at their deepest level. Detected anomalies are reported to plant and security personnel with actionable insights to enable efficient investigation, response and recovery.

A key characteristic of the Claroty software is its ability to explore the deepest level of industrial network protocols without adversely impacting the system, enabling the detection of even the smallest anomalies while protecting complex and sensitive industrial networks. Traditional IT security software often uses active queries and requires a footprint on the network, which can ultimately disrupt operations; the Claroty platform uses a passive-monitoring approach to safely inspect traffic without risk of disruption.

Additionally, Claroty has joined the Rockwell Automation Partner-Network Encompass program, which offers global manufacturers access to a collaborative network of companies mutually focused on developing, implementing and supporting best-in-breed solutions to achieve plant-wide optimization, improve machine performance and meet sustainability objectives. ●

IOT DEVICES, continued from page 1

ARM® TrustZone® technology implemented in a system-on-chip (SoC) can be leveraged to address the network, application and data aspects of the layered security model. This architecture solution can segregate a hardware subset of the full SoC by defining processors, peripherals, memory addresses and even areas of L2 cache to run as "secure" or "non-secure" hardware. TrustZone technology has the ability to dynamically expose the full SoC to secure software, or to expose a subset of that SoC to normal software (FIG. 1).

TrustZone ensures that a non-secure (normal world) processor can access only non-secure resources and receive only non-secure interrupts; e.g., a normal world hardware subset might include the UART, Ethernet and USB interface, but exclude controller area network (CAN) access. Unlike the subset in which normal world software runs, software within the secure world has complete access to all SoC hardware, meaning resources associated with both secure and normal worlds.

Connected IoT devices are becoming more functionally rich; not only in capabilities, but in the data they generate and transmit. It is incumbent upon software developers to design each device with security as a paramount concern. With ARM's TrustZone technology, developers can provide a robust and secure base for SoC designs that meet the demands of our ever-expanding IoT world. ●

POLE POSITION

ANNOUNCING



Criterion announces the newest catalyst generation in performance... our scientists have used our R&D expertise to secure the pole position to launch the CENTERA GT™ high performance catalyst! We continue to innovate to increase performance and quality, and CENTERA GT takes another leap forward. This next generation, along with the SENTRY™, ASCENT™ and ZEOLYST™ catalysts, will help refiners keep on winning. Our advanced portfolio of products protects and performs, adding value with customized solutions for the complex needs of refineries.

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- Hydrotreating:** Performance in quality meeting strict fuel standards and maximizing advantaged feeds
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OXYCHEM, MEXICHEM ANNOUNCE JV ETHYLENE CRACKER STARTUP

Ingleside Ethylene LLC, the 50/50 JV between Occidental Chemical Corp. (OxyChem), a subsidiary of Occidental Petroleum Corp. and Mexichem, S.A.B. de C.V., has begun operations of its ethylene cracker at OxyChem's Ingleside, Texas complex. The ethylene cracker is presently in a production stabilization phase.

The cracker, which will be operated by OxyChem, has the capacity to produce 550 Mcmy (thousand cubic meters per year) of ethylene, and provide OxyChem with an ongoing source of ethylene for manufacturing vinyl chloride monomer (VCM), which Mexichem will use to produce polyvinyl chloride (PVC resin) and PVC piping systems. The companies have a 20-year supply agreement.

The project also includes a pipeline and storage facility at Markham, Texas. Total investment in the project was approximately \$1.5 B, and the facility will provide 150 permanent jobs. In December 2013, Ingleside Ethylene LLC awarded CB&I the engineering and construction contract to build the cracker. Construction began in 2Q 2014. ●

CRITERION, continued from page 6

matics saturation (and H₂ consumption), it allows direct desulfurization reactions to occur more effectively on CoMo catalyst in the lower section of the reactor. The arrangement of NiMo and CoMo catalyst layers is highly dependent on several factors, including feed and operating severity, and a high level of experience is required to optimize catalyst designs. This is in

sharp contrast to performance offered by tri-metallic catalysts, which do not achieve the same synergistic performance benefits, but rather require the promotion from Ni on a CoMo catalyst to simply perform higher-level HDS.

A US refiner achieved benefits operating two identical reactor trains in parallel, one with an all-CoMo catalyst system and the other with a "sandwich" system (FIG. 2). While the unit's relatively low H₂ partial pressure might drive the general misconception that an application of NiMo catalyst is inappropriate for this particular ULSD unit, that is not the case. In fact, the inclusion of a layer of NiMo catalyst offers this unit an activity advantage that, in turn, translates to improved cycle life for this limited unit. Furthermore, the commercial performance measured from the unit data confirmed that the pilot plant testing performed in advance of the application provided a tailored solution that ultimately yielded an 11°F SOR activity advantage.

Criterion Catalysts & Technologies remains a clear industry expert for all-inclusive hydroprocessing solutions, harnessing the power of targeted stacked solutions for optimum performance in hydroprocessing applications.

To visit with the Criterion team and learn more about their product portfolio, visit their hospitality suite Monday evening in the second-floor Atrium, MRC. ●

TABLE 1. Benefits achieved post application of Criterion's advanced CENTERA technology vs. a competitive catalyst system

FCCPT unit	Competitive typical	Criterion Tier 3 mode
Operating mode	HDS	Arosat
TLP volume gain, lv% of feed	Base	1.25
Product sulfur, ppmw	1,000	300
Product N ₂ , ppmw	500	100
API gain, °	Base	1.2
Distillate conversion, wt% of feed	Base	4.1

TABLE 2. Benefits achieved post application of Criterion's advanced CENTERA technology vs. a competitive catalyst system

FCC unit	Competitive typical	Criterion Tier 3 mode
Combined feed sulfur, ppmw	1,200	570
Combined feed N ₂ , ppmw	360	160
Combined feed API, °	Base	0.7
Riser top, °F	Base	-20
Conversion, %	Base	0.5
Gasoline sulfur, ppmw	46	10
Gasoline octane, R+M/2	Base	Base
Dry gas, wt% of feed	Base	-0.51
TLP volume gain, lv% of feed	Base	3.9
Gasoline, lv% of feed	Base	3.66
LCO, lv% of feed	Base	0.27
Slurry make, lv% of feed	Base	-0.35

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DWC converts two-column application into single column

MANISH BHARGAVA and ROOMI KALITA, GTC Technology

Dividing wall columns (DWCs) offer a fresh perspective on traditional distillation techniques, as well as approximately 10%–30% savings in energy and capital costs. The technology provides highly customizable and flexible solutions for grassroots columns and for revamping existing columns.

One such solution is shown in FIG. 1 and FIG. 2. A conventional two-column naphtha separation sequence is replaced with a single naphtha splitter retrofitted using DWC technology. The second column in the sequence is

removed and will be repurposed. The column has been operational since January 2017.

The original design consists of two naphtha splitter columns in sequence, Naphtha Splitter-1 (N-1) and Naphtha Splitter-2 (N-2). The first column separates the feed into the naphtha splitter overhead, naphtha splitter side draw and naphtha splitter bottoms. The side draw is routed to the second column, where a heart cut naphtha stream is obtained. The bottom product is heavy naphtha.

The two columns consume a significant amount of utilities for reboiling duties (TABLE 1). The main objectives are to lower the energy consumption of the separation and to make the second column available for use in a different operation.

By revamping N-1 with DWC technology, the high-quality heart cut naphtha stream is removed directly from the first column as the side cut product. A dividing wall is installed in the center

of the larger diameter section, segregating the column into two independently operating separation zones.

The feed enters one side of the wall and is prefractionated. The middle boiling components are recovered as the side cut product. Intermixing between the two streams is avoided due to the presence of the wall, which separates the feed from the side cut. As

► See **GTC TECHNOLOGY**, page 16

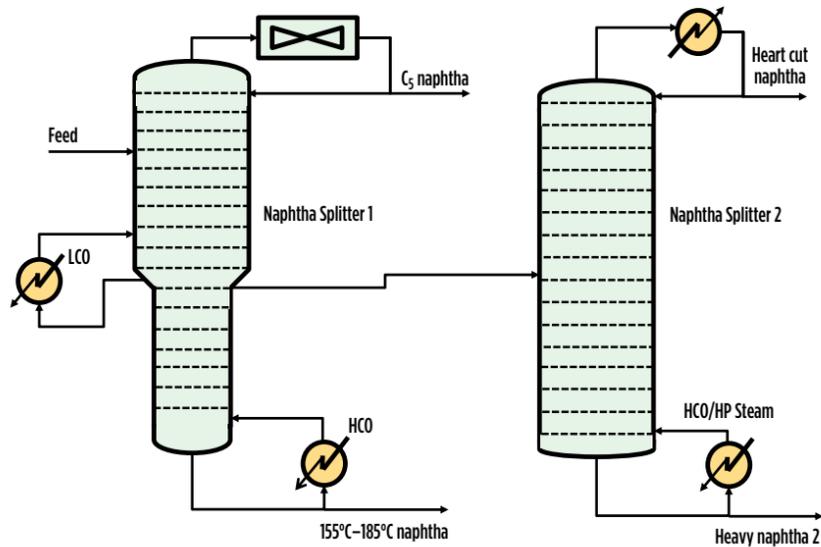


FIG. 1. The original design of the two columns.

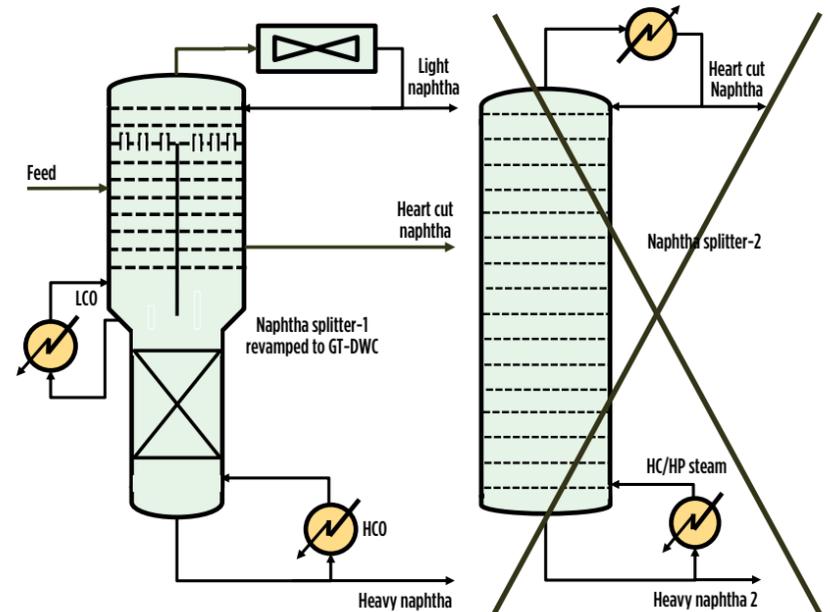


FIG. 2. The Naphtha Splitter-1 column after the revamp to DWC technology.

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PERFORMANCE PROGRAMS

Scheduling with advanced rundown blending

RUBEN RAMIREZ, AspenTech

Today's refinery schedulers require agility and advanced tools to optimize rapidly and frequently in the face of multiple objectives: turning downstream scheduling into a strategic advantage in support of company objectives to maximize margins; meeting market and regulatory requirements; and outperforming competitors. Feedstock costs, stricter product specifications, more fluid supply contracts and variable operating targets introduce the risk of off-spec products, ineffi-

cient production and margin impacts. As changing markets increase the pace of operations, refinery schedulers must produce optimal schedules that are operationally sound, feasible and economically optimized.

Many refinery scheduler teams utilize a portfolio of complex spreadsheets, but these often create organizational issues and fall short in accurate property calculations, inventory visualization, and overall collaboration and integration with other sched-

ulers. As blend complexity increases and additional constraints are introduced (e.g., component tankage limitations), spreadsheets and time constraints often force the preparation of feasible schedules and recipes with no time or capability for optimization. In such circumstances, responsiveness becomes paramount and further highlights the need for a powerful and reliable blend scheduling automation tool to handle these complex challenges and reduce any re-blends and product quality giveaways.

Advanced rundown blending software tools are key in successfully addressing these challenges within daily time constraints. Conventional blend scheduling is complicated by the absence of intermediate tankage. When additional degrees of freedom are introduced, such as multiple destinations for a rundown(s) or a slop tank(s), the potential number of feasible solutions increases and advanced decision support technology is absolutely essential.

When using multiple spreadsheets to juggle competing constraints, a scheduler will often miss the most profitable schedule, and transparency to management is missing. A compelling need exists for a fast and transparent tool to not only ascertain these solutions, but deliver an operationally and economically optimal schedule.

Move into the high-performance scheduling world. An event-based, multi-period and multi-blend modeling system is now available that generates optimal blending schedules for short- and long-term campaigns. This approach generates and solves non-linear blending problems that span a user-defined time period, taking into account correlations, tank constraints, discrete volumes, recipe constraints, and all relevant events, such as blends, timing and sequencing of rundown blends, product shipments, intermediate receipts and tank-to-tank transfers.

With today's advanced event-based, multi-period and multi-blend modeling software systems, users can address a number of rundown blending scenarios: blends using a hot rundown stream, blends using a hot rundown stream with multiple, fractional dispositions and blends utilizing a hot rundown stream with an available slop tank. Each scenario can be modeled and solved in parallel within this improved modeling system approach. With the system's flexible modeling capabilities, schedulers can simulate and optimize any complex refinery blending challenges, meeting time and production schedules (FIG. 1).

The rundown challenge. In refinery blending, rundown blending consists of taking a unit stream directly into finished product tanks—that is, blends with recipes that use components without intermediate tankage between the process unit and blender. Agile refiners are employing this method due to a short supply of space onsite to build additional intermediate units and finished product tanks; the cost and delay of CAPEX involved in building and maintaining new tanks; and the inventory cost penalty for having finished products in storage, as a refiner does not benefit from storing finished product onsite. Best practices maximize throughput and keep products moving to raise margins.

Adapting to a changing market. The refining market is ever-evolving due to continuously changing market trends. Entering data into a spreadsheet is often limited to time-based scheduling. With growing environmental regulations, product specifications, and the lack of intermediate units and finished product tanks, refiner interest in the rundown blending method is increasing. Today's advanced tools enable schedulers to use rundown components continuously, while respecting tank inventories and constraints, to generate a refinery-wide blend schedule on a single database. As a result, refiners have a competitive advantage to help maximize margins from available component streams, while meeting all market and regulatory requirements. ●

These rundown blends pose operational challenges to schedulers who are rapidly addressing flowing rundowns and discrete product blends. Questions that arise include:

1. What product grade should be blended?
2. When should it be blended?
3. What is the optimal recipe?
4. Where will the rundown be directed?



FIG. 1. Advanced, event-based, multi-period and multi-blend modeling software systems can address a number of rundown blending scenarios.

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AFPM APPLAUDS CONFIRMATION OF ADMINISTRATOR PRUITT

Upon the confirmation of Scott Pruitt as the EPA's Administrator, AFPM President Chet Thompson stated, "We congratulate Administrator Pruitt on his confirmation as the next Administrator of the EPA. His experience and leadership skills will be an asset to the EPA and the country. We are confident that Administrator Pruitt understands that environmental protection, economic growth and energy security are not mutually exclusive, but rather require reasonable balancing. Under his leadership, we can realize the president's *America First Energy Plan*, which embraces our country's potential to be an energy superpower while simultaneously protecting the environment." ●

Cost-effective wireless remote tank level monitoring

SCOTT KELLER, SignalFire Wireless Telemetry

When a chemical plant sought to add level and temperature monitoring to a set of tanks on the edge of its property, the initial proposition was to run a HART cable from the control room to the tank site, and then branch out to each tank and wire in the level and temperature sensors. The wire length would be more than several thousand feet between the two points and to wire sensors to each tank.

It was determined that the cost and time associated with this wiring effort was prohibitive. Trenching and running conduit added to the cost of expensive wire. The proposed budget for this upgrade was close to \$100,000 for the connection costs alone.

Taking a more cost-effective route, the chemical plant decided to use a wireless link. Multidrop HART

wireless nodes (FIG. 1) were installed on the top of each tank and connected locally to the sensors associated with each tank. **Note:** Nodes serve as the wireless, long-distance communication link in the remote monitoring and control of assets such as tank levels. The nodes extract and then transmit data from sensors via a wireless mesh network to a Gateway, where data is available via a Modbus RTU or TCP interface.

The total cost of the equipment and installation was a small fraction of the cost of running cable alone, and the startup time totaled a few hours as opposed to weeks. Additionally, because it was found to be easy to add additional wireless measurement points, other monitoring points can be easily added to the network. ●



FIG. 1. To provide wireless tank level monitoring, the SignalFire Remote Sensing System uses low-cost, medium-range C1D1-certified nodes that interface with sensors to provide robust, reliable wireless mesh data transmission in rugged outdoor environments.

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Simulation-driven engineering

JOSEPH MCMULLEN, Schneider Electric

The typical process design paradigm is for one person to have access to a given simulation at any given time. This inherently limits the process design workflow that requires several people to work on the same simulation, sometimes in different areas, creating delays and potential issues in ensuring that the final simulation incorporates feedback and changes from various departments. Engineers require simulation software that promotes collaboration and streamlines the process engineering workflow.

This has led to a new paradigm in the front-end engineering design (FEED) process. Schneider Electric is calling this new paradigm, “simulation-driven engineering,” which uses the actual process simulation as the repository for all design information,

and utilizes the collaboration capability to enable multiple engineering departments to work on their part of the simulation when needed.

The typical FEED process follows the plant lifecycle in FIG. 1. The problem is that each major step in the plant lifecycle uses a separate modeling tool (e.g., the conceptual design and basic engineering phases use a steady-state simulator). Detailed engineering and startup commissioning typically utilize a dynamic simulator. Finally, once the plant is up and running, real-time optimization software would be used for the operations maintenance phase before utilizing steady-state and dynamic simulation tools to debottleneck/revamp the process, as needed. This requires multiple tools, all requiring different training.

SimSci SimCentral. Now, a new and better way to think about the FEED process is available. The new paradigm uses one simulation platform, SimSci SimCentral, as a single common point (FIG. 2) for the entire FEED process. With SimCentral, the “Process” mode performs heat and material balances for equipment sizing; the “Fluid Flow” mode performs steady-state network analysis and equipment rating; and the “Dynamics” mode performs transient analysis. The SimCentral platform will soon include Operator Training, Control System Checkout and Optimization, but it already greatly reduces the amount of software tools needed.

Running a business comes down to the bottom line—profitability. SimCentral allows a simplified and streamlined FEED process, reducing the various engineering tools required and their related learning curves, as well as efficiently leveraging global engineering resources with enhanced collaboration. It is time to embrace “simulation-driven design” to leverage those engineering resources, regardless of where they are.

Simulation tools used by process engineers trace their origins to legacy architectures, operating systems and user interfaces. Global competition, pricing pressures and energy alternatives are driving the need for a new approach. The next generation of workers also expects modern, scalable and easy-to-use solutions with technology that they now take for granted—high-speed Internet access, mobile devices, touch screens and virtual reality.

SimCentral is the first commercially available platform designed to take advantage of developing web-based and cloud technologies, while delivering a modern user experience that will allow your workforce to be more productive, creative and inspired.

- **SimCentral provides unified lifecycle engineering.**

SimCentral is the first industrial simulation platform developed from the ground up to support steady-state, fluid flow and dynamic modeling in one environment for unified lifecycle support, effectively reducing the overall learning curve for the engineering department by consolidating numerous tools.

- **SimCentral allows agile process development.** SimCentral changes the engineering workflow by promoting collaboration, allowing users to work concurrently on the same model, across departments, regional time zones and between engineering, procurement and construction (EPC) companies. SimCentral includes a model writing environment that allows the simulation of custom and proprietary processes.
- **SimCentral entices the next generation.** SimCentral embraces modern software architecture and interfaces to exceed the expectations of users to accelerate adoption, usage and time-to-value.

The recent release of SimCentral focuses on utilities modeling for steam systems, cooling water systems and flare networks. Users can streamline process utility design, better collaborate for process improvement and ease modeling complexity to cut costs, while delivering a user experience that empowers and appeals to engineers entering the workforce. SimCentral is constantly improving and expanding its capabilities with new features coming every few months, with Process Design and Upstream Production releases coming later this year.

Join Schneider Electric’s team on Monday evening in the Bonham room (MRW). ●



FIG. 1. A typical plant lifecycle.

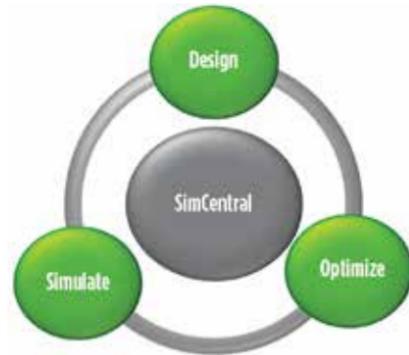


FIG. 2. Simulation-driven engineering with SimCentral.

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GTC TECHNOLOGY, continued from page 13

a result, a better quality of heart cut naphtha is obtained.

The application of the DWC concept to N-1 provides the following benefits:

- Heating duty is reduced by approximately 25%
- Heart cut naphtha is obtained in the N-1 column
- N-2 is idled and available for reuse in a different service
- No equipment modifications are needed outside the column.

The DWC technology derives most of its basic fundamentals from conventional distillation methods, but it provides operational flexibility and can be tailored to meet the refiner’s specifications and needs, be it improved product quality, lowered utility consumption or decreased capital costs.

See the conference program to find and attend GTC Technology presentations. ●

TABLE 1. Performance of N-1 and N-2 before and after revamp

Items	Units	Original configuration, Naphtha Splitters 1 & 2	Revamp of N-1 to GT-DWC
Feedrate	TPH	308	308
Total heating duty	MMkcal/hr	38	28
Heart cut naphtha			
Flowrate	TPH	165	165
D86 IBP-FBP	°C	110.6–170	110.0–170.0

MARRIOTT RIVERCENTER FLOOR PLAN



HOSPITALITY SUITES

To find the exact room number of a hospitality suite, please refer to the daily event board in the lobby of the hotel, or the information wall located in the AFPM registration area, Marriott Rivercenter Meeting Room 1-4. To contact the hotel desk, dial 210-223-1000 (Marriott Rivercenter) and 210-224-4555 (Marriott Riverwalk).

Note: The hospitality suites this year are spread across two hotels. In the listings, MRC indicates the Marriott Rivercenter, and MRW signifies the Marriott Riverwalk.

- Advanced Refining Technologies—Sun., Mon Presidential Suite TBA, MRC
- Albemarle—Mon River Terrace, MRW
- Ambitech Engineering Corporation—Mon Suite TBA, MRC
- Athlon Solutions—Mon Salon E, MRW
- Axens North America Inc.—Mon Bowie, MRW
- BASF Corporation—Mon Salon C, MRW
- CB&I—Sun., Mon Salon A & B, MRW
- Chevron Lummus Global—Sun., Mon Suite TBA, MRC
- Criterion Catalysts & Technologies L.P.—Mon 2nd Floor Atrium, MRC
- DuPont Clean Technologies—Sun., Mon Suite TBA, MRC
- Emerson Automation Solutions—Sun Suite TBA, MRC
- Haldor Topsoe Inc.—Sun., Mon Suite TBA, MRC
- Honeywell Process Solutions—Mon Suite TBA, MRC
- Honeywell UOP—Mon Suite TBA, MRC
- KBC Advanced Technologies Inc.—Sun., Mon Suite TBA, MRC
- KBR—Sun., Mon Salon D, MRW
- Linde Engineering North America Inc.—Mon Presidential Suite TBA, MRC
- Merichem Co.—Mon Salon F, MRW
- Sabin Metal Corporation—Sun., Mon Suite TBA, MRC
- Schneider Electric—Mon Bonham, MRW
- TechnipFMC Process Technology—Sun., Mon Suite TBA, MRC
- Wood Mackenzie—Mon Conference Room 16, MRC
- W.R. Grace & Co.—Sun., Mon Presidential Suite TBA, MRC

BY INVITATION ONLY

- Advanced Refining Technologies Sazo Banquet Room, MRC
- Air Liquide Suite TBA, MRC
- Buckeye Partners L.P Valero Room, MRW
- Colonial Pipeline Co Suite TBA, MRC
- W.R. Grace & Co Sazo Banquet Room, MRC
- Kinder Morgan Terminals Milam Room, MRW
- S&P Global Platts Riverview Room, MRW
- Vopak Americas Suite TBA, MRC

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Deep in the heart of Texas

Welcome to San Antonio! The city's independent spirit and varied culture make it an ideal gateway to the region's scenic beauty, restful retreats and historic legacy. First settled as a colony of Spain, the city has grown up as a territory of Mexico, part of the independent Republic of Texas, and finally a key city in the greatest of the United States (well, that's what we Texans think).

The Old World charm of San Antonio is represented everywhere you look. The influence of Spanish, Mexican and German cultures, among others, is apparent in culturally significant art, museums, architecture, cuisine and music. Even some of the street signs are written in three languages. With such a variety of attractions, it is little wonder why San Antonio is the most popular tourist destination in Texas.

The Texas Hill Country. Settled by Germans and Eastern Europeans, the Hill Country has a culture all its own. Storybook farms and ranches dot the countryside, and you may still hear long-time residents speaking German in Fredericksburg, Boerne and New Braunfels. You'll also find quaint B&Bs, antique shops on old-fashioned main streets and celebrations with roots in the Old World, like Wurstfest (a sausage festival) and Weihnachten (a Christmas festival). Floating down cool rivers, strolling quaint main streets in search of unique bargains, playing a round at one of many championship-quality golf courses, or hiking and biking through rolling, scenic terrain are all within driving distance. Outside of Boerne, the Cascade Caverns offer a

68° break from the Texas heat, including a 100-ft. underground waterfall.

The Missions and the Alamo. In the 18th century, Franciscan priests from Spain established five Catholic missions along the San Antonio River, primarily to extend Spain's dominion northward from Mexico, but also to convert and educate the native population. Today, the five missions (San Antonio de Valero, Mission San José, Mission Concepción, Mission San Juan and Mission Espada) represent the largest concentration of Spanish colonial missions in North America, and they have been nominated for World Heritage status.

The Alamo (Mission San Antonio de Valero) was founded in 1718 as the first mission in San Antonio, serving as a way station between east Texas and Mexico. In 1836, decades after the mission had closed, the Alamo was the site of one of the most notorious battles in American history, becoming an inspirational symbol for liberty during the Texas Revolution. For 13 days, 150 "Texians" died defending the Alamo against more than 1,000 of Mexican General Santa Anna's troops, including state folk heroes William Travis, Jim Bowie and Davy Crockett. The Alamo is open daily, and the most accurate depiction of the Battle of the Alamo can be seen at the IMAX movie theater.

Attractions. The [San Antonio Zoo](#) is one of the largest in the nation, housing over 3,500 animals. Take the Zoo Train for a relaxing tour of the grounds and

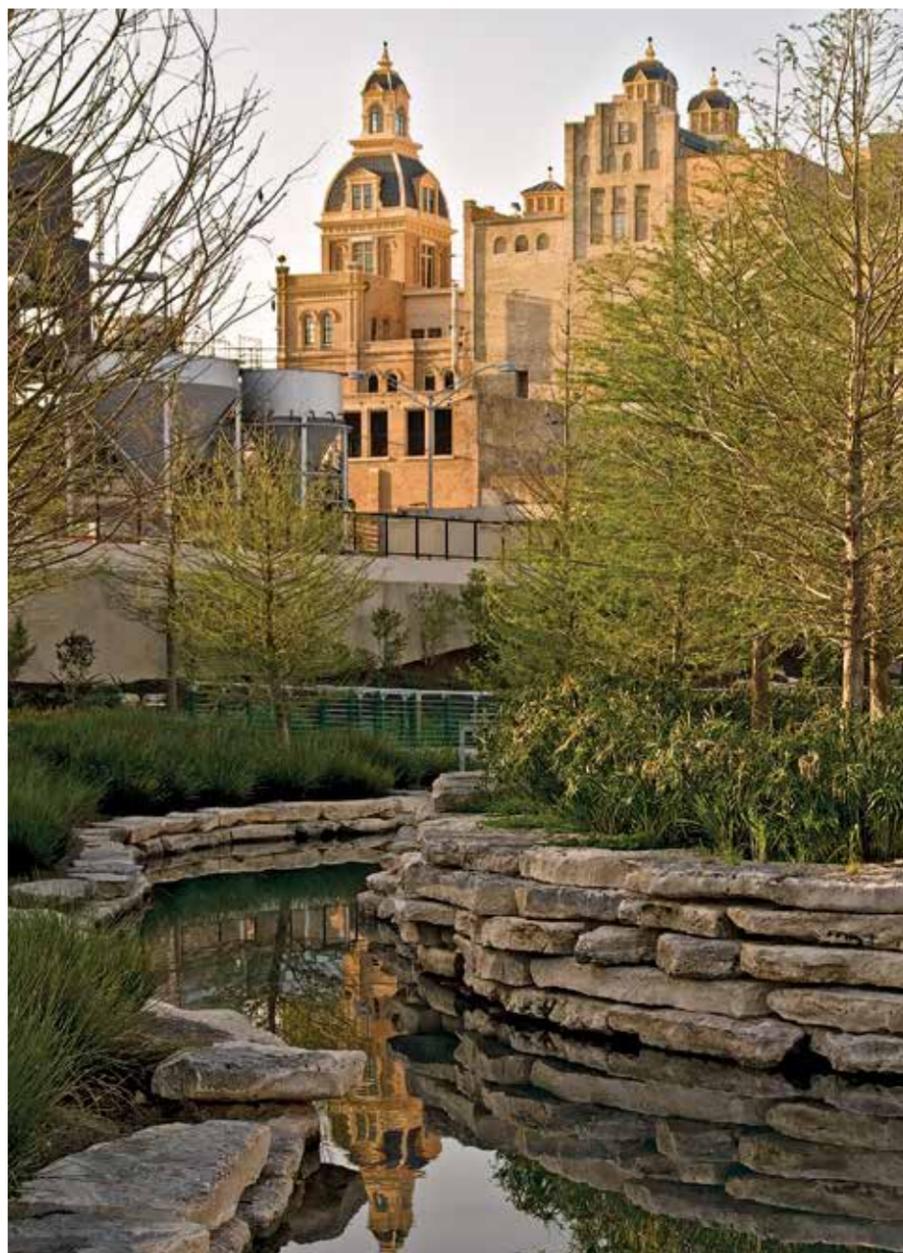
nearly a dozen naturalistic exhibits. Marine life shows and displays, adventure camps, exciting rides and one of the coolest water parks anywhere await you at [SeaWorld San Antonio](#). Sample one of over 100 rides, including the only "floorless" roller coaster in the southwest, at [San Antonio's Six Flags Fiesta Texas](#). Since it was opened during the 1968 World's Fair, the 15-acre [HemisFair Park](#) has remained one of the city's top draws, anchored by the 750-ft. Tower of the Americas. Hit a two-for-one special under one roof: the [Plaza Wax Museum](#) and [Ripley's Believe It or Not! Museum](#) are fun for visitors of all ages. Shop at [Market Square](#), known as the largest Mexican market north of the Rio Grande, and find unique local and imported pieces of art, pottery, jewelry and textiles. Visit the lavish homes of the historic [King William District](#); immerse yourself in local art at the [McNay Art Museum](#); shop in the [Traders Village](#); cruise throughout town on a Segue; get your "cultured cowboy" on at the [Briscoe Western Art Museum](#); experience the [Natural Bridge Wildlife Ranch](#); stroll through the [Botanical Gardens](#); and visit [La Villita](#), one of the original neighborhoods in old San Antonio, to see the artisan studios, shops and restaurants. Are you getting the drift? The list goes on and on.

The River Walk. No visit to Texas is complete without strolling or riding a boat along the San Antonio River Walk, a verdant oasis of cypress-lined paved paths, arched stone bridges and lush landscapes. Steps away from

the MRC and MRW hotels, it gently winds through the city center, providing millions of visitors each year with easy access to the city's cultural hot spots, authentic restaurants, local shops, nightclubs and historic sites. Visitors and locals dine aboard river cruisers while the sounds of mariachis echo from above. This is the river that originally inspired the settlement of San Antonio, and it still flourishes today as the city's center.

Dining. Perhaps nowhere is the city's diverse culture more evident than in its cuisine. San Antonio's culinary palette and cooking styles reflect the heritage and innovation of European and Mexican influence. The variety of options, including the famed Tex-Mex with its aromas of spices and fresh cilantro, are unmatched in the state and accompanied perfectly by local wines, beers and tequilas. Many of our acclaimed chefs who studied elsewhere bring their world-class training back to our culinary landscape. And the barbeque? This is Texas, partner. Enough said.

Music flourishes here: country-western, mariachis, rock, blues and folk can be heard throughout the city. Art comes alive in outdoor murals, gardens, parks and sculptures. The confluence of cultures is everywhere and in everything, especially the open, friendly faces of the people who call San Antonio home. Our city has deep roots in its past, but we are forever mindful of its future. Thank you for visiting San Antonio, and we hope you enjoy it as much as we do. ●



What's missing in this picture?



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Process Safety Conference
May 17-18, New Orleans, LA

Reliability & Maintenance Conference
May 23-26, New Orleans, LA

Operations & Process Technology Summit
(Formerly Q&A and Technology Forum)
October 2-4, Austin, TX

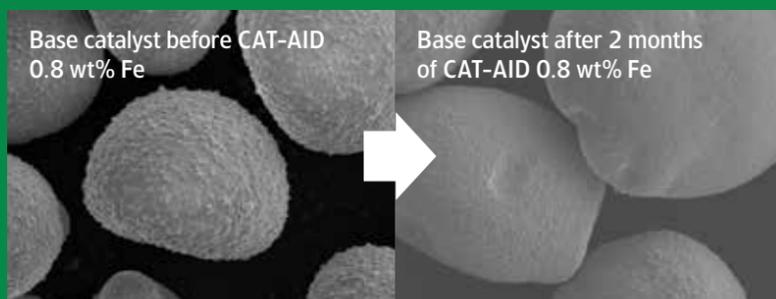
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