American Fuel & Petrochemical Manufacturers

2016 Q&A and Technology Forum

AFPM

Conference Daily Published by
HYDROCARBON PROCESSING®

DAY ONE | #QA16
Sunday/Monday | September 25/26, 2016

Advancing and overcoming new market challenges

CHET THOMPSON, President, American Fuel & Petrochemical Manufacturers

Welcome to the AFPM Q&A and Technology Forum, and welcome to Baltimore. This year's theme is ***Refocus, Reimage, Reassure,*** so there is no more appropriate place to meet than Baltimore, a city whose history has run a similar course.

Founded in 1729, Baltimore was once a major manufacturing center and the second-leading port of entry for immigrants to the US. However, with the decline in manufacturing, the city has had to refocus and reinvent itself into what is now a growing service-oriented economy.

Like Baltimore, the refining and petrochemical industries know what it means to adapt to new challenges. Today, we are facing one of our largest challenges yet: a growing movement to demonize our industries in the name of climate change. Sadly, the leaders of this movement will not face the truth—oil and natural gas are the fuels that created and maintain the modern world. They have lifted billions out of poverty, and have advanced prosperity for more than 100 years. They allow for lifestyles that are healthier and more enriched, and provide the feedstocks that go into making most modern medicines, technologies and practically all goods we use in our everyday lives.

Food, clothes, medicines and medical devices, cell phones, computers, automobiles, jets, ships, the buildings in which we work and the homes in which we live could not be produced without oil and natural gas. While solar, wind and biofuels hold some promise for the future, none of the necessities I have listed could be produced or significantly fueled by these alternative energy sources, now or in the foreseeable future.

Today's oil and gas industries are not the fossil fuels industry of the past. Through your ingenuity and industriousness, well-known developments and increasingly advanced technologies installed at our facilities and refineries have made the air cleaner than it has been in more than 50 years.

These environmental improvements are achieved through the investment of billions of dollars in research and technology. Clearly, the work that you do is instrumental in advancing our industries, which is why this conference is so important.

This year's program was developed to focus on the issues that you have identified as critical to your operations. The Q&A sessions and the complementary Principles and Practices sessions address a wide range of critical subjects that affect your operations, and highlight the importance of developing and training future industry leaders.

Back by popular demand, and necessity, is our Cybersecurity Day. This issue continues to pose significant challenges to industries, governments and individuals. Cybersecurity is a critical component of protecting refineries and petrochemical facilities, and several standards, technologies, controls, strategies and processes to manage cyber threats have been developed. The Cybersecurity Day will tackle many issues, from legal risks to identifying risks to your control systems.

► See **PRESIDENT'S WELCOME,** page 3

INSIDE THIS ISSUE

Sam Lordo to receive Lifetime Service Award

Each year, the Peter G. Andrews Lifetime Service Award honors members who have made long-lasting contributions to the value and vitality of the AFPM Q&A and Technology Forum. Recipients have served in many capacities and had significant influence on the event's quality, emphasizing the importance of sharing knowledge in making continuous improvements.

The 2016 recipient is Sam Lordo, who has accumulated 39 years of experience in the refining and petrochemical industries with Exxon Chemical, Nalco/Exxon Energy Chemicals and Nalco Champion. He has been a longtime AFPM member and advocate, serving in numerous capacities, including on the 2002 AFPM Q&A Panel and the AFPM Screening Committee.

Mr. Lordo serves as marketing director for Nalco Champion, North America, where he directs, coordinates and supports marketing and technology activities with major refinery sites worldwide. He is involved with desalting, antifoulant and corrosion control technical and technology developments, and has authored several papers on corrosion control, desalting and crude oil management. In addition to his longtime participation with AFPM, Mr. Lordo has been a member of the National Association of Corrosion Engineers (NACE) for 20 years, and remains active in the Crude Oil Quality Association (COQA) as an associate board member.

"It is a great honor to receive this recognition," Mr. Lordo says. "I have spent many years working in and for the industry through a number of direct and indirect pathways. AFPM was one of the first industry organization events I attended, and it is definitely one of the first that I got actively involved with.

"At the AFPM Q&A and the Annual Meetings, it is always great to see and visit with all of my old friends and colleagues, as well as meet new friends. AFPM is more than a technical social organization: I truly believe that through our interactions, AFPM members expand our knowledge of the industry and the opportunities ahead. I use these meetings as a chance to learn and stay up-to-date through the networking opportunities."

Mr. Lordo believes that the refining and petrochemical industries have shown great resiliency and adaptability to the challenges that geology, governmental and environmental regulations and a challenging global economy have presented.

"Just look at what we have persevered through since 2008. With the advent and application of the technologies that help produce light tight oils, we moved from the doom and gloom of final oil to having to throttle back production to match demand," he says. "Even with the stress of low oil prices, the industry continues to adapt with new technology."

Echoing the sentiments of many industry professionals, Mr. Lordo marvels not only at how far technology has come recently, but also the potential effects that new technologies will have on taking refineries to the next level of production efficiencies.

SAM LORDO, Marketing Director for Nalco Champion, North America

"I see one of the biggest opportunities in predictive modeling that is being developed using key crude oil qualities. Both computational power and innovative data mining will bring big changes," he says.

► See **SERVICE AWARD,** page 3

Advanced Refining Technologies

Drawing upon the expertise of Chevron and Grace, Advanced Refining Technologies® (ART) is the leader in hydroprocessing catalysts with more than 50 years of combined experience perfecting best-in-class solutions.

ART is the preferred provider of hydroprocessing catalyst solutions:

- #1 in Hydrocracking
- #1 in Fixed Bed Resid
- #1 in Ebullating Bed Resid

artcatalysts.com

Visit ART and Grace at Booths 36 & 37

GRACE

Talent | Technology | Trust™

The **talent** to partner with industry-leading customers on breakthrough solutions...

The **technology** to deliver improvement in productivity and profitability...

And **trust**, developed over decades of service to the world's leading refiners.

It's all on display at AFPM events, where we deliver unique insights on industry trends and what works.

- **AFPM Annual Meeting:** Technical presentation by Doc Kirchgessner with Patrick Salemo of PES
- **AFPM Cat Cracker:** Q&A with Grace's Ann Benoit; technical presentations by Gary Cheng, Kent Turner, and Dennis Kowalczyk
- **AFPM Q&A/Technology Forum:** Informational exhibit and one-on-one dialogue with technical experts

Request presentations and technical papers, and learn more about how Grace can put talent, technology, and trust to work for you: **grace.com/AFPMevents**.

grace.com

AFPM

2016 Q&A AND TECHNOLOGY FORUM

Published by *Hydrocarbon Processing* as three daily editions, September 25/26, September 27 and as an electronic edition on September 28. If you wish to submit a press release, please contact the editor via email at Mike.Rhodes@GulfPub.com.

Publisher
Catherine Watkins

AFPM Contacts
Diana Cronan
Rebecca Adler

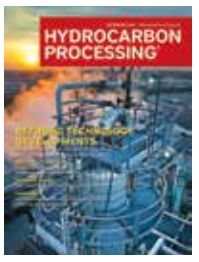
Editor
Mike Rhodes

Contributing Editors
Kyle Kornegay
Lee Nichols

Production Manager
Angela Bathe Dietrich

Hydrocarbon Processing
2 Greenway Plaza, Suite 1020
Houston, TX 77252-77046
713-529-4301

HYDROCARBON PROCESSING®
www.HydrocarbonProcessing.com



SERVICE AWARD, continued from page 1

Throughout the last 30 years of his career, and during his work with Nalco Champion, he has been involved with process troubleshooting and assisting refiners to improve reliability and profitability, often through mostly unconventional methods.

"If I had to identify the greatest challenge that I have seen the industry grapple with," Mr. Lordo says, "it would be the dramatic changes in crude quality and how to best process those crudes in the face of the changing political and regulatory climate."

Some of his short-term goals include continuing his involvement with the Advance Downstream University, an internal training program that Nalco Champion has developed for new college graduates. He will also support and promote the Emerging Leaders Series that AFPM has allowed Steve Perry and others to foster. "I find it rewarding and satisfying to see the growth and development of the next generation of industry contributors. This is vital for the future of AFPM and the industry as a whole."

Mr. Lordo described his plans for a busy event. "In addition to attending as many of the sessions as possible, I will be assisting in the crude/vacuum/coking Q&A session and moderating the associated open forum session, which is a new dimension that promotes increased audience discussion. Steve Perry and I will co-chair the Emerging Leaders P&P session, and I will visit some of the hospitality suites looking for new ideas."

As always, he will be promoting the benefits of AFPM membership. "I do it because of the people I have been privileged to work with over the years. I must thank Nalco Champion and my family for all their support that has allowed me to participate in AFPM over the years," he says. "Being recognized by my AFPM peers is one of the greatest professional highlights of my career." ●

SCHEDULE OF SESSIONS AND SPECIAL EVENTS

SUNDAY, SEPT. 25, 2016

3–6:30 p.m.	Registration and badge pickup
5–5:30 p.m.	Emerging Leaders networking event
5:30–6:30 p.m.	Q&A kickoff networking event

MONDAY, SEPT. 26, 2016

7 a.m.–6:30 p.m.	Registration
8–8:55 a.m.	**General session** • Presentation of the Lifetime Service Award: Sam Lordo, Nalco Champion • Keynote address: Jim Mahoney, Koch Industries
9 a.m.–12 p.m.	**Plant Automation: Alarm Management** • Q&A Session: Stephen Apple, Schneider-Electric; Missy Jones, Honeywell Process Solutions • Alarm Philosophy Document: Randy Conley, Total Petrochemicals & Refining USA Inc.; Missy Jones, Honeywell Process Solutions • Alarm Management—Seven Steps in 30 Minutes: Bill Hollifield, PAS Inc. • Alarm Management and Cultural Change: Dan Butler, Sinclair Wyoming Refining Co.
9 a.m.–12 p.m.	**Principles & Practices: Emerging Leaders Town Hall Meeting, Q&A: Gasoline Processes** Panelists: Eddie Habibi, Plant Automation Services Inc.; Steve Philoon, UOP LLC–A Honeywell Company; Matthew Hutchinson, Axens North America; Ken Rhodes, Marathon Petroleum Corp.; James Kleiss, Valero Energy Corp.
10–10:15 a.m.	Coffee Break
12–2 p.m.	Lunch in Exhibit Hall
2–3:30 p.m.	**Plant Automation: Supply Chain and Optimization** • Opportunity Crudes—Processing Heavy Crude Oils: Bill Cates, Hunt Refining Co. • A Novel Approach to Intermediate Stream Pricing for Real-Time Optimization: Steve Treiber, Manufacturing Technology Network • Establishing the Resilient Supply Chain Optimization Process: Jose Sentmanat, LyondellBasell Industries
2–5:15 p.m.	**Principles & Practices: Gasoline Processes** • Solutions for Producing Higher Octane Gasoline: Marina Minin, UOP LLC—A Honeywell Company • Discussion: What Is the Industry Doing to Get Ready for Tier 3?: Kevin Proops, Koch Industries Inc. • Gasoline Blending Strategies: Darren York and Eric Heavin, KBC Advanced Technologies Inc. • Better Plants Program: Robert Bruce Lung, DOE **Q&A: Hydroprocessing** Panelists: Subhasis Bhattacharya, Chevron Lummus Global LLC; Patrick Gripka, Criterion Catalysts & Technologies; Andrew Layton, KBC Advanced Technologies Inc.; Jeffrey Mueller, Marathon Petroleum Corp.; Chad Perrott, ExxonMobil Chemical Company; Joseph Rydberg, CITGO Petroleum Corp.
3:30–3:45 p.m.	Refreshment break
3:45–5:15 p.m.	**Plant Automation: Software Applications** • Eliminating Difficult to Control Processes with Procedural Automation: Darwin Logerot, ProSys Inc. • The Cloud is Here for Smart Manufacturing: Pete Sharpe, Emerson Process Management; Larry Megan, Praxair Inc. • Big Data Analytics Applied to Real-World Control Systems—From Instruments to Advanced Controls: George Buckbee, Metso
5:15–6:30 p.m.	Reception in Exhibit Hall

PRESIDENT'S WELCOME, continued from page 1

Plant Automation sessions will focus on alarm philosophy and management to help keep your facilities operating successfully and producing products. We will also have conversations on supply chain and optimization. Gasoline processing, including exploring solutions for producing higher-octane gases, is an increasingly important topic as the Obama administration, and possibly the next administration, looks to increase fuel efficiency standards. Every session addresses the fundamentals of good operations and the foundational principles for technologies that are commonly used.

This forum is created each year to give everyone the opportunity to listen and share information. Through your participation, we continue to work together to make our industries among the safest and most innovative in the country. I hope the program and your fellow conference attendees provide new perspectives and information to take back and utilize in your operations.

In addition to participating in this year's event, I hope you have an opportunity while you are here to appreciate some of the city's great offerings, including its rich history, the scenic harbor and, of course, the famous Maryland crabs.

Thank you for joining us here in Baltimore, and thank you for supporting AFPM. ●

2016 AFPM Q&A AND TECHNOLOGY FORUM PANELIST BIOS

Rainer Bass, HollyFrontier, is a senior economic and planning engineer in Dallas, Texas. He is responsible for strategic capital project development at all of the company's locations, as well as strategy around specific threats and opportunities affecting commercial operations. Mr. Bass holds a BS degree in chemical engineering from Kansas State University and has been with HollyFrontier for nine years at various locations.

Zach Bezon, United Refining, is a process engineer based in Warren, Pennsylvania. He assists in the advancement and improvement of the refinery's processing facilities, including the implementation of heat exchangers, distillation towers, vessels, pumps, tanks and new piping solutions. Mr. Bezon holds a BS degree in chemical engineering from the University at Buffalo and has five years of experience in the oil refining industry.

Subhasis Bhattacharya, Chevron Lummus Global, is a Richmond, California-based consulting engineer in hydroprocessing and downstream technology. He has 27 years of industry experience and has worked extensively in process design, plant commissioning, technical services and technology development. Mr. Bhattacharya has presented several papers on distillate and residue hydrocracking, catalytic dewaxing and hydrofinishing technologies at national and international conferences. He is the author of the chapter on lubricant base oil hydroprocessing in the latest edition of the *Handbook of Petroleum Refining Processes,* and has three patents. He earned an MS degree in chemical engineering from the Indian Institute of Technology in Kanpur, India.

Luis Bougrat, UOP LLC—A Honeywell Company, is a fluid catalytic cracking (FCC) technology specialist within the company's technology services department. His responsibilities include direct customer support, troubleshooting and knowledge transfer for operating units, revamps and grassroots projects around the world. He has been involved in the refining industry for eight years and has held various technical roles within the FCC, treating and renewables communities. These roles and responsibilities stretched across the R&D, regional services, field operating services and technology services departments within UOP. Mr. Bougrat holds a BS degree in chemical engineering from the Rose-Hulman Institute of Technology in Terre Haute, Indiana.

Patrick Gripka, Criterion Catalysts & Technologies, serves as the company's regional technical manager for the Americas, and is responsible for ensuring technical support quality. He has been with Criterion for 20 years, and has focused on providing technical support to Criterion's customers with estimates, design bases, startups, unit monitoring, troubleshooting and value creation opportunities. Mr. Gripka holds BS and MS degrees in chemical engineering from the Missouri University of Science and Technology (formerly known as the University of Missouri–Rolla), and has 30 years of experience in the industry.

Matthew Hutchinson, Axens, has 14 years of refining and chemical plant experience in various technical and operations positions, primarily in reforming—continuous catalyst regeneration (CCR) and fixed-bed—and FCC. He began his career in 1998 in Sunoco's Engineering Associates program. In 2012, he joined Axens North America as a senior process engineer leading various process designs for Prime-G+ and Prime-D technologies, as well as multiple other process studies. He became technology manager for reforming in 2014. Mr. Hutchinson graduated from Cornell University with a BS degree in chemical engineering.

James Kleiss, Valero, is a director based in San Antonio, Texas. He is responsible for strategic planning for all the Valero refineries in the US Gulf Coast (USGC), including capital project development and economic evaluation of projects and business strategies. He has experience in refineries on the USGC as well as the US West Coast (USWC), Canada and Europe. Mr. Kleiss has recently been involved in strategy development around processing light tight oil and low-cost natural gas liquids (NGLs). He earned a BS degree from Oklahoma State University and has 29 years of refining industry experience.

Andrew Layton, KBC Advanced Technologies, is a principal consultant with 44 years in the refining industry in all regions of the world, as well as in R&D and engineering and design offices. His experience includes refinery technical, supervisory and operations positions, major project startup leadership, and regional technology leads for reforming and hydroprocessing. He is involved in numerous reliability and profit studies, and also provides a wide range of capabilities that includes frequent turnaround and startup technical support to several global refiners.

Ram Mallik, Fluor, is a director of process technology and engineering based in Sugar Land, Texas. He is responsible for process design and engineering, and the technical support of refinery projects, and has 40 years of experience in the hydrocarbon processing industry. Mr. Mallik has specialized in the design and construction of numerous commercial delayed coking units, working as a technology manager/process manager in the Lummus technology division, the Bechtel coker technology group, and as a process director at Fluor. He is a Fluor delayed coking technology subject matter expert (SME) and has experience in refineries in North America, Europe, Aruba, the Middle East and India. Mr. Mallik holds a BTech degree (Honors) in chemical engineering from Andhra University in Visakhapatnam, India, and a post graduate diploma in refining from the Indian Institute of Petroleum in Dehradun, India.

Jeffrey Mueller, Marathon Petroleum

Phillip Niccum, KP Engineering, is senior vice president of process engineering. With 35 years of engineering and management experience, Mr. Niccum has been granted 15 US patents and authored dozens of publications for major industry conferences and trade journals. Prior to joining KPE, he served as a senior refinery process engineering manager at KBR, as well as chief technology engineer and director of FCC technology at KBR, where he spent the last 26 years of his career. Mr. Niccum began his engineering career with Texaco, where he performed technical service and design work on Texaco FCC units. He earned a BS degree in chemical engineering from California State Polytechnic University.

Chad Perrot, ExxonMobil Chemical

Steven Philoon, UOP LLC—A Honeywell Company, is a principal platforming technology specialist. His current responsibilities include providing direct support to a set of globally distributed customers, participating in technology development projects and bringing commercial perspectives to those efforts, contributing to engineering review meetings for new units and revamps, and conducting onsite troubleshooting and unit performance assessments. During his 35 years with UOP, Mr. Philoon has held positions in R&D, technical service, information technology and engineering services. He earned a BS degree in chemical engineering from the University of Wisconsin–Madison.

Ken Rhodes, Marathon Petroleum, is a reformer and aromatics technologist based in Russell, Kentucky. He is the subject matter expert for CCRs and petrochemical process units for Marathon's seven refineries. He has held various positions in operations and technical service for CCRs, sulfolane and cumene units, as well as other refinery processes. Mr. Rhodes holds a BS degree in chemical engineering from the West Virginia Institute of Technology, and has 25 years of refinery experience.

Joseph Rydberg, CITGO Petroleum, has over 15 years of experience in the refining industry. He is a process technologist at the Lemont Refinery in Lockport, Indiana, where he is responsible for technical support for daily refinery operations and project process development. His experience is primarily in hydroprocessing technical support, optimization and troubleshooting. Mr. Rydberg holds a BS degree in chemical engineering from the University of Illinois at Champaign-Urbana.

Pete Sharpe, Emerson Process Management, is the director of industry solutions development, and has 37 years of experience in the process control industry in both technical and management roles, specializing in automation in refineries and petrochemical plants. He is responsible for managing the engineering and development of Emerson's industry-specific solutions, including advanced control, optimization, reliability and energy management technologies. Mr. Sharpe has been Emerson's representative on

the Smart Manufacturing Leadership Coalition (SMLC) since its inception. He has also been instrumental on the platform committee, working with Praxair and the SMLC team to establish real-time communications between plant systems and cloud-based applications. He holds a BS degree in chemical engineering from the University of Colorado, and an MBA degree from the University of Houston.

Maji Shyama, Essar Oil, heads the operations function of the company's refinery in Jamnagar, India. He is responsible for operations of refinery process units, utilities and associated facilities. He has experience in some of the major Indian refineries and the Mombasa Refinery in Kenya. Mr. Shyama holds a chemical engineering degree from Jadavpur University and has 33 years of experience in operations, process and health, safety and environment (HSE) functions, including process safety.

Jay Steiner, MERRICK & Company, is a senior process engineer for the company based in Greenwood Village, Colorado, and serves as the technical leader for the process engineering team. His duties include management of team resources, proposal review and development, process design and technology evaluation. He has 15 years of petroleum refinery experience, with 12 years at the Phillips 66 Billings, Montana refinery, including five years as the crude/vacuum unit engineer. Mr. Steiner holds a BS degree in chemical engineering from Montana State University-Bozeman.

Eric Thraen, Flint Hills Resources, is the system technical lead at the Pine Bend, Minnesota refinery. He is responsible for process technical support of refinery operations and capital projects, and his 35 years of experience in the refining industry includes process engineering, operations and capital projects in the areas of FCC, alkylation, crude/vacuum distillation, delayed coking and gasoline blending. Mr. Thraen has provided engineering and operations support on large grassroots construction and major revamps in these areas. He earned a BS degree in chemical engineering from the University of Michigan.

Lee Wells, LyondellBasell, is the SME engineer responsible for the FCCU at the company's Houston refinery. In this capacity, he leads the process design work for turnaround projects, mentors the FCCU operation support engineers and assists in process optimization. Since joining LyondellBasell 23 years ago, he has supported the FCCU as a process engineer and an engineering team lead. He also served for six years as the refinery's energy coordinator. Mr. Wells began his career at Citgo in Lake Charles, Louisiana, supporting the FCCUs and alky unit, among others, and serving in positions in economics and production planning. His career continued at Amoco in Texas City, Texas, where he did project work, supported the alky units and performed PSV studies. He has 32 years of experience in the refining industry, and holds a BS degree in chemical engineering from Texas A&M University.

Bruce Wright, Baker Hughes, works as a senior engineer in the industrial technology group in Sugar Land, Texas, specializing in applications within the hydrocarbon process industry. He has 38 years of industry experience and is involved in the technical support and troubleshooting of refinery fouling problems, and foam control. Mr. Wright has experience in product development and environment, health and safety (EHS) compliance. He is an inventor or co-inventor on eight US patents and has published 11 technical papers. Mr. Wright earned a BS degree in chemical engineering from the Rensselaer Polytechnic Institute in Troy, New York, and holds an MBA degree from the University of Houston. He is a registered professional engineer in the state of Texas, and is a member of the American Institute of Chemical Engineers.

George Yaluris, Albemarle, manages the Americas FCC technical services team for the solutions business unit. He has two decades of FCC experience, providing technical support for the application of FCC catalysts, commercializing new catalysts, developing novel FCC catalyst and additive technologies, and researching the chemistry of catalytic cracking processes. Dr. Yaluris holds a diploma in chemical engineering from the Aristotelian University of Thessaloniki in Greece, and a PhD in chemical engineering from the University of Wisconsin–Madison. He is a co-inventor on 16 patents and has published more than 25 papers.

Improve crude diet flexibility and increase profits

Crude diet flexibility is one of a refinery's primary means of improving profitability. The ability to process discounted crudes, from light shale oil to heavy Canadian crudes, opens up a window of opportunity for refiners. However, it also comes with an array of challenges and risks. With so many unknown factors about crude oil makeup and characteristics, uncertainty in processing is higher than ever.

Poor desalting efficiency, uncontrollable emulsions and other desalting challenges are common when processing lower-priced opportunity crude oils, and will further impact downstream operations such as heat exchanger fouling and wastewater plant upsets. A comprehensive Crude Oil Management approach, shown in FIG. 1, helps refiners minimize risk by proactively gaining insight into crude blend processing challenges, combining technical expertise with technological innovations to provide the best possible feedstock preparation and desalting performance.

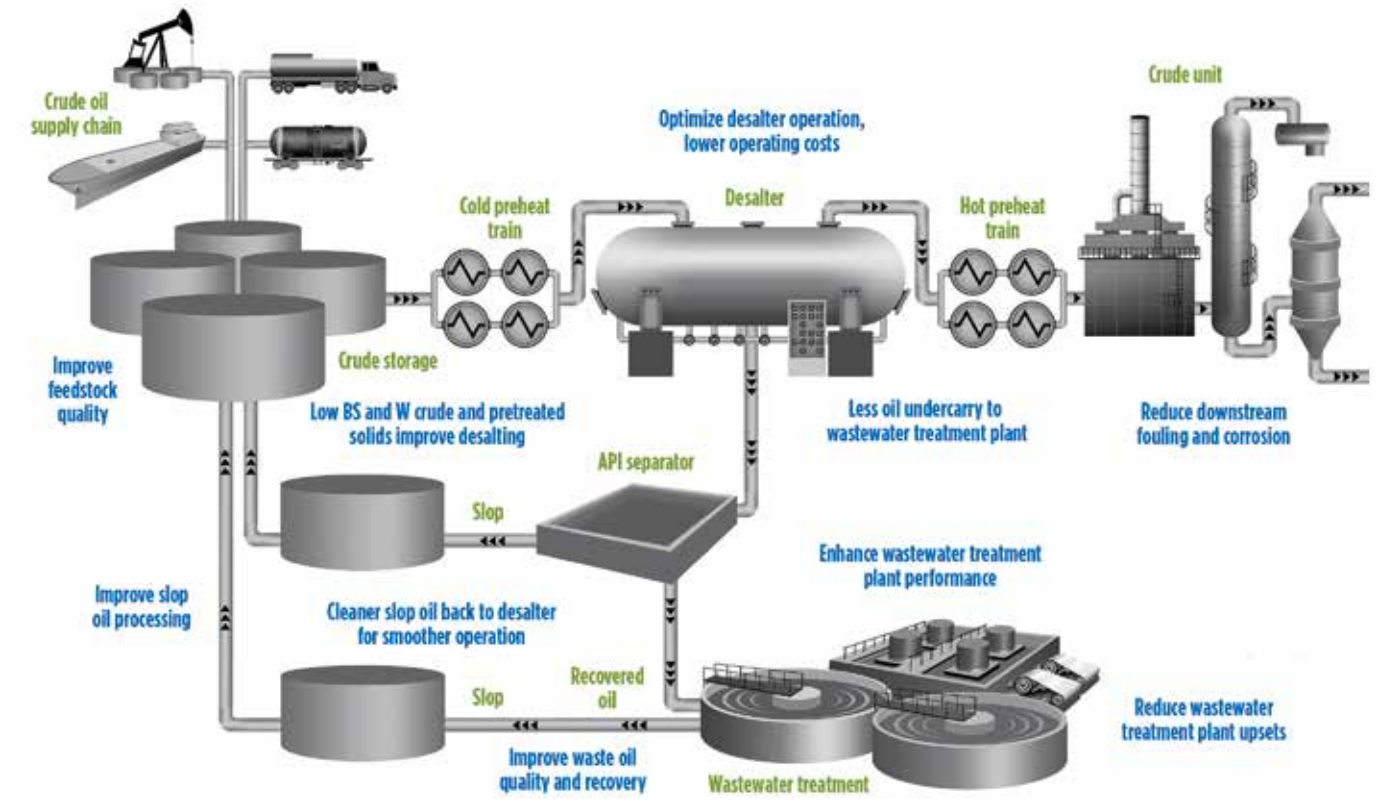


FIG. 1. Baker Hughes' Crude Oil Management approach comprises an extensive portfolio of chemical treatments, modeling platforms and mechanical service programs to ensure reliable and profitable refinery operations.

Assessing operational impact. Baker Hughes takes a holistic approach to desalting, beginning with a comprehensive risk assessment to understand how a crude blend may impact refinery operations, including:

- Recognizing upstream recovery operations and how previous chemical treatments might affect downstream processing
- Evaluating how crude is received—whether by truck, rail, pipeline or ship—to gain perspective on storage, handling and blending activities before it reaches the crude unit
- Understanding how refinery equipment and processes are configured
- Identifying and addressing potential processing limitations that may arise from different crude blends.

Case history. A US Gulf Coast refiner was processing heavy, high-solids opportunity crudes that were negatively impacting key performance indicators

▶ See BAKER HUGHES, page 10

FFC PLUS™

Advanced FIBER FILM Contactor Technology

Reduce Costs Improve Efficiencies

Hydrocarbon Treating Made Better

Introducing FFC Plus, the next generation of FIBER FILM® Contactor technology. Merichem Company's advanced FIBER FILM technology with an integrated coalescer and treater pushes the boundaries of extractive technologies. With this latest advancement to Merichem's proven technology, hydrocarbon treating rates can be increased by up to 150% through increased mercaptan extraction efficiency. The integrated coalescing and treating device offers a simple installation, reduced chemical use, and reduced service and maintenance complexity. FFC Plus truly is mercaptan treating made better.

Improved Treating Rates

The FFC Plus technology from Merichem delivers increased capacity and more efficient sulfur extraction treating of hydrocarbons. This technology enables higher through-put within smaller equipment and better turndown at no additional cost. Process changes and upsets are also handled more effectively without affecting product quality.

Reduced Carryover

Merichem's advanced FIBER FILM technology provides enhanced coalescing of both liquid phases that improves separation efficiency and reduces contaminant carryover. These features protect downstream equipment and catalysts.

Reduced Plot Space

The higher capacity and efficiency of FFC Plus translates into reduced equipment sizes and plot space. This reduces project capital and lowers plant operating costs.

Existing Merichem or other treating units can be easily retrofitted with FFC Plus, providing up to 150% additional capacity. This capacity increase will not affect the existing turndown range of Merichem units and will improve the turndown of other units. The new contactor is a direct "drop-in" replacement that can be added or switched with minimal modifications within a short shutdown period.

Fugitive emissions testing of pressure relief valves

D. EMILE TEZZO, DR. AMR GADO and **CALVIN DENG,** Pentair Valves & Controls

Fugitive emissions, the unintended release of gases or vapors from pressurized plant components, are a key concern for regulators and operators of oil and gas, chemical and petrochemical plants. Fugitive emissions can be hazardous, contribute to atmospheric pollution, and can represent an economic loss for the plant. Since the number of potential leak sources at large industrial facilities are numerous and difficult to identify, controlling fugitive emissions is vital.

FIG. 1. The Anderson Greenwood Series 400 pilot-operated modulating PRV by Pentair was part of an intensive fugitive emissions testing program.

Valves present a challenging possible source of fugitive emissions. In particular, the bolted and threaded components and features that constitute pressure relief valve (PRV) designs suffer the same fate. Unlike manual valves, PRVs are not designed with packing (or stuffing boxes) to minimize or control emissions. Additionally, an industry-wide standard for testing PRVs for fugitive emissions has yet to be established and adopted.

Pentair Valves & Controls teamed with a leading oil and gas producer and a third-party testing laboratory to conduct an innovative fugitive emissions testing program for its PRVs. The company's Anderson Greenwood pilot-operated PRVs (**FIG. 1**), the Crosby direct spring-operated PRVs and OMNI portable thermal relief valves were subjected to the test program.

Testing criteria. The testing criteria were formulated by the joint experience of the oil and gas producer and Pentair as the valve manufacturer, and designed to meet the most stringent requirements of the global oil and gas industry. The valves were subjected to pressures up to 6,000 psig. Depending on the rating of the valve, the temperature was cycled from ambient temperature down to –320°F, up to 1,000°F, and then back down to ambient temperature. Helium gas was selected as the pressurizing test medium, as helium is the smallest atom and therefore the hardest to contain and prevent leakage.

After pressurizing each valve, all potential leak paths (e.g., gaskets, flanges, fittings, etc.) were checked multiple times during the temperature cycle and after the valve was cooled back to ambient temperature. Leakage was checked using a calibrated mass spectrometer leak detector and a "sniffing" probe with a sensitivity of at least 1.0×10^{-10} Pa-m^3/sec. The valves were considered Class A if the leak was below 1.78×10^{-9} Pa-m^3/sec for every millimeter of gasket length, and the valves where the leak was below 1.78×10^{-8} Pa-m^3/sec for every millimeter of gasket length were considered Class B. Both classes are acceptable, with Class A reserved for the most severe applications, e.g., lethal service. Leakage in excess of the Class B limit is considered a failure.

Valve performance in such a test program depends on several factors. During design, leak paths must be minimized and attention should be given to sealing mechanisms and components, including surface finishes, gasket materials and areas, O-ring compression and bolt torques. The manufacturing workmanship and assembly inspection must ensure that all parts are constructed to specification and properly assembled.

Results and benefits. The independent laboratory testing showed that all Pentair tested valves successfully passed the strict fugitive emissions containment requirements while withstanding high pressure and both high- and low-temperature applications. Maintaining low emissions allows the valve to be safely used in applications with harmful fluids, including volatile organic compounds (VOC), and flammable, lethal and greenhouse gases.

Limiting harmful emissions is the driving force behind several regulations, such as the US Environmental Protection Agency's (EPA) Clean Air Act in North America, and the TA Luft regulation in Europe. The benefits to oil and gas, fuel, chemical and petrochemical producers in utilizing PRVs that are proven to reduce fugitive emissions are numerous:

- **Safety.** Limits direct personnel exposure to harmful products
- **Economic.** Saves more of the process fluids and assures shareholders that production processes are conducted efficiently
- **Environmental.** Minimizes the greenhouse effect and curtails global warming
- **Legal.** Avoids fines from local and federal regulators.

These new tests provide an industry benchmark for the continued development and promotion of process and standards improvements to control the amount of released emissions. To address this global issue, embracing new fugitive emissions testing standards can help make significant strides for cleaner processes. ●

LYONDELLBASELL TO ADD HDPE PLANT IN TEXAS

LyondellBasell has selected its La Porte, Texas, manufacturing complex as the site for a new 550-Mtpy high-density polyethylene (HDPE) plant. The plant will be the first commercial plant to employ LyondellBasell's new proprietary Hyperzone PE technology. Construction is scheduled to begin in early 2017, with startup planned for 2019.

Located on the south shore of the Houston Ship Channel, LyondellBasell's La Porte complex spans 540 acres and produces ethylene, propylene, linear low-density polyethylene (LLDPE) and low-density polyethylene (LDPE). The La Porte complex is also the primary location for LyondellBasell's acetyls business, with an integrated chain of manufacturing units producing methanol, acetic acid and vinyl acetate monomer (VAM).

HDPE resins produced using LyondellBasell's new proprietary Hyperzone PE technology will exhibit enhanced properties, such as improved stress crack resistance and balance between stiffness and impact strength. In certain applications, Hyperzone PE resins may allow customers to use less PE resin per unit produced, resulting in improved resource efficiency and savings.

The Hyperzone PE project is part of LyondellBasell's ongoing growth plan. Recently, the company completed work on ethylene expansion projects at the La Porte and Channelview sites in Texas. A third ethylene expansion project is currently underway in Corpus Christi, Texas. Additionally, development of a world scale propylene oxide and tertiary butyl alcohol (PO/TBA) plant at the company's Channelview site is progressing. ●

How will we produce tomorrow's propylene?

BART DE GRAAF and **MARTIN EVANS,** Johnson Matthey Process Technologies

High crude oil prices formed a dark cloud over the refinery landscape until late 2014, promising large profits for alternative propylene manufacturing technologies, whether the feedstocks derived from coal, natural gas or agricultural crops.

At the same time, the US shale gas boom provided steam crackers with a new and cheap feed source: natural gas plant liquids (NGPL). This feed is high in ethane and LPG. Both of these developments led to lighter feeds being run in US steam crackers. Product selectivities from these light feeds are heavily shifted toward ethylene, and this caused a decrease in propylene, butadiene and benzene supply. While the fluid catalytic cracking (FCC) process has made up much of the shortfall, alternative routes for propylene production, such as propane dehydrogenation (PDH) and methanol-to-olefins (MTO), shown in **FIG. 1,** have been actively considered by many companies. For example, Flint Hills Resources' PetroLogistics Houston PDH plant produces propylene directly, rather than as a small byproduct of cracking for ethylene or gasoline (**FIG. 2**).

To break even, these technologies typically require crude oil prices that exceed $40/bbl–$50/bbl. In northeast Asia, FCC remains the cheapest propylene source, even at $60/bbl (**FIG. 3**).

Economic drivers have shifted significantly since November 2014, when Saudi Arabia decided to change strategy and compete for market share rather than support high oil prices, causing crude oil prices to fall dramatically. In late 2015, the US Congress voted to overturn a 40-year ban on the export of oil, and this opportunity was immediately seized by several companies. Sunoco began exports of Marcellus Shale ethane via the Marcus Hook terminal, and the first ethane exports from Houston were scheduled for early August 2016. Although it is still in its early stages, the sale of NGPL outside the US is expected to result in higher prices for these liquids.

While these pricing changes were taking place, worldwide propylene demand has fallen due to slower than expected economic growth in China. Europe and the US have failed to counter this decreased demand. By the end of 2015, production rates of existing MTO units in China were being reduced, and the commissioning of several MTO projects have been postponed or delayed. Indeed, utilization forecasts of available MTO/methanol-to-propylene (MTP) capacity show over 50% of available capacity remaining unused in 2016, with four out of five MTP plants idled due to negative margins. The forecasted plant utilization remains close to 50% out to 2018.

Following the startup of the Dow PDH project, it is expected that only one of the 12 announced PDH propylene projects (the facility under construction by Enterprise Products in Mont Belvieu, Texas) will actually come online.

Increasing FCC yield. Approximately 55% of all propylene is derived from steam cracking, with FCC accounting for 35% of propylene supply. This leaves just 10% of supply from alternative sources. In the average FCCU, approximately 5% by weight of FCC feed is converted into propylene. However, this number can be substantially higher depending on the feed, catalyst, unit design and operating strategy.

Most major process licensors now offer FCC or FCC-like technologies that obtain maximum propylene production through a combination of catalyst changes, operating conditions and hardware design. Novel technologies include changes in reactor orientation (upflow vs. downflow reactors), contact time, contact temperature, multiple risers, etc.

Most FCCUs are capable of increasing propylene yield by 1 wt%–2 wt% without hardware changes. While this is a fairly insignificant increase in a single unit, if many units adopted this operating strategy, it would have a pronounced effect on propylene supply. Such a change is achievable by using ZSM-5 additives with little or no investment.

Varied reasons exist for adopting such a strategy. The imminent introduction of Tier 3 gasoline specifications will mandate a substantial reduction in gasoline sulfur levels, requiring the use of treatment techniques. This legislation is being phased in over several years through the use of built-up credits, so the effects will be gradual.

Many refiners are opting for either FCC feed pretreatment or post-treatment of gasoline, both of which have a negative effect on gasoline octane. The most common method of compensating for octane loss is the use of ZSM-5 additives: the octane number of the gasoline leaving the FCCU is directly increased, as is the production of butylenes, which are a primary feed for alkylation units.

The evolving role of FCC in fuel supply. A further incentive for ZSM-5 use is expected in 2025, when new fuel efficiency standards for cars will require 54.5 mi/gal. This standard is anticipated to reduce oil consumption by 2 MMbpd. As gasoline is the prime FCC product, a large effect on FCC throughput and operation will be seen.

It is unlikely that this fuel efficiency goal will be achieved with today's gasoline quality. Higher efficiency engines will require large (possibly even "step out") increases in gasoline octane, altering the role of FCC in fuel supply. ZSM-5 additives are part of the solution to the 2025 octane puzzle, and process licensors will undoubtedly play an important role by changing operating strategy, hardware and reactor design.

The FCCU offers noteworthy potential for increasing propylene supply without requiring investments of $500 MM or more. While experts expect "on purpose" propylene production to grow in the coming decades, the FCCU will continue to play a prominent role in this market, achieving higher octane, low-sulfur gasoline, and bridging the shortfall in propylene with some help from ZSM-5 additives.

For more information on Johnson Matthey's products and services, visit the team at booths 40 and 41, or stop by their hospitality suite. •

Product selectivities of the lighter feeds being run in US steam crackers are heavily shifted toward ethylene, and this has caused a decrease in propylene, butadiene and benzene supply. While the FCC process has made up much of the shortfall, alternative routes for propylene production are being actively considered.

FIG. 2. Flint Hills Resources' PetroLogistics Houston PDH plant is strategically located on the Houston Ship Channel and has direct or indirect access to approximately half of US propylene consumption. The facility produces propylene directly, rather than as a small byproduct of cracking for ethylene or gasoline, and has an annual capacity of 1.45 Blb. Source: plasticsengineeringblog.com.

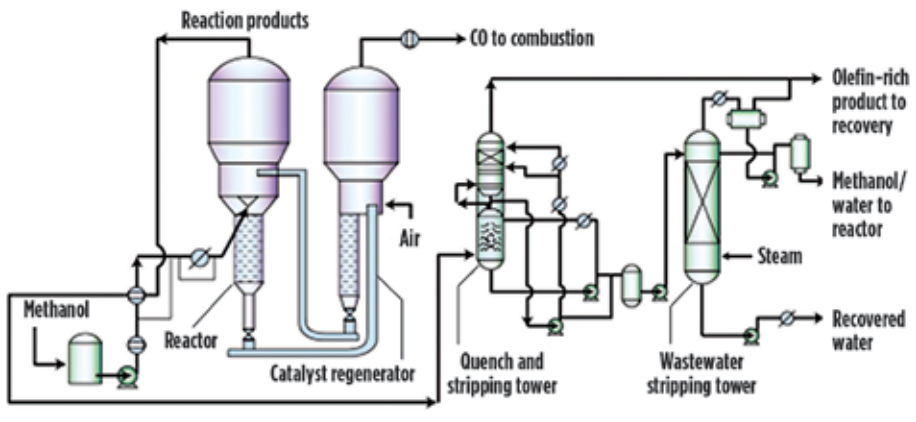


FIG. 1. An MTO process flowsheet. Source: Chemengline.com.

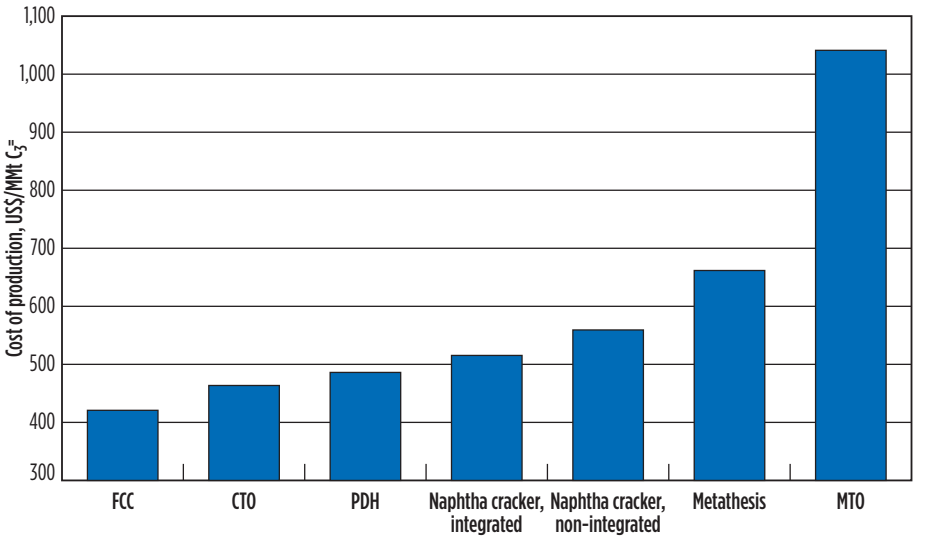


FIG. 3. 2015 NE Asian propylene cost comparison at $60/bbl.

Got Jet?

DAN TORCHIA and **NEIL HOWARD,** Advanced Refining Technologies

When Advanced Refining Technologies (ART) acquired exclusive rights to sell the ICR line of hydrocracking catalysts from Chevron Lummus Global (CLG), its activity in global hydrocracking catalyst sales, R&D and product commercialization increased.

At that time, one of ART's newest customers was starting up a load of hydrocracking catalyst in North America. The single-stage recycle design unit had been operating with a competitor's catalyst system and was using a VGO/AGO-blend feed. Operating objectives included maximizing unit operating cycle with higher endpoint feed and selectivity toward jet, and minimizing LPG and light gas yield.

For the unit's first operating cycle, the proposed catalysts were two of ART's newest, ICR 183 and ICR 214.

ICR 183. A high-activity catalyst designed to maximize jet yield at the expense of light gas production, resulting in maximum C_5+ liquid yields, ICR 183 exhibits low deactivation rate, even while operating at high conversions. The catalyst also provides high-nitrogen tolerance in case of increased nitrogen slip from the hydrotreating section. An advanced metals deposition method during manufacture results in uniform dispersion over the entire catalyst surface, improved hydrogenation activity, optimal product properties, higher organic nitrogen tolerance and added stability.

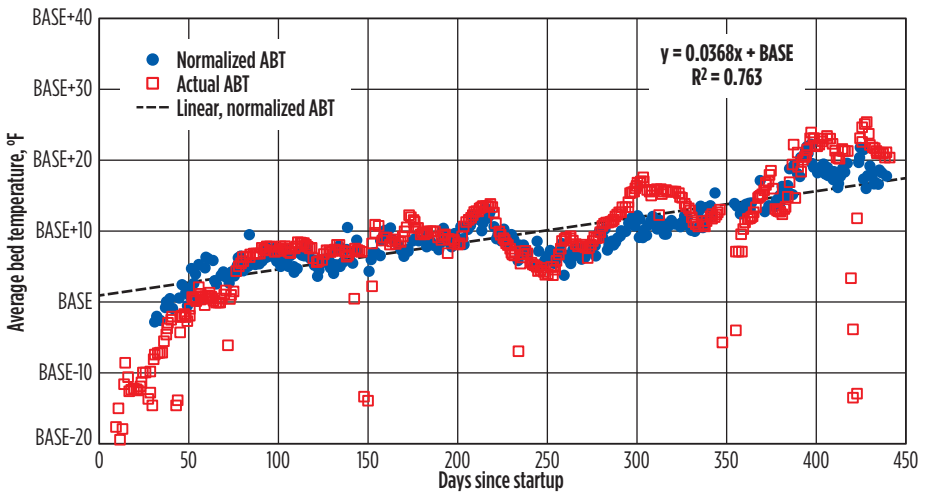


FIG. 1. The ART catalyst system is yielding improved performance over previous systems, including a low ABT deactivation rate.

ICR 214. As a component of this catalyst system, ICR 214 offers an activity advantage over ICR 183, while giving up only a modest yield of jet to light and heavy naphtha. Similar to ICR 183, ICR 214 yields very little light gas, maximizing liquid products. The customer pilot plant testing confirmed that the jet selectivity is only slightly less for ICR 214 compared to ICR 183.

Testing results. The proposed ART catalyst system and several catalyst vendors were tested at a third-party laboratory to show side-by-side performance comparisons in activity, selectivity and product quality at conditions similar to the customer's commercial operating conditions. ART was selected based on this testing and its technical support package and commercial offering.

The catalyst is meeting all expectations, and the cracking catalyst-normalized average bed temperature (ABT) is yielding a low deactivation rate. The improved performance of the ART catalyst system over previous catalyst systems is shown in **FIG. 1.**

The improved start-of-run activity and catalyst stability have enabled the customer to increase the feed endpoint fully 50°F higher than the previous two cycles, with a significantly lower feed API gravity.

Despite the higher feed endpoint and lower feed API gravity, conversion has been maintained at 97 vol% without compromising the overall operation. The same conversion would appear to indicate the same severity in these three most recent cycles. Upon closer inspection, as a result of a higher average feed rate and fixed recycle oil rate, the conversion per pass is significantly higher than the previous two cycles. This increased severity is somewhat understated, since, with the higher endpoint and lower API gravity feed, the cycle has less product range material in the feed than the previous two cycles, resulting in a higher net conversion.

The customer has utilized the improved performance of the ICR 214/ICR 183 catalyst system to their advantage in processing higher feed rates and heavier feed, at increased operating severity. However, the jet yield at 400 days was the same as the previous two cycles. Improved performance is also evident in the total C_5+ liquid yield, which is stable and compares favorably despite the increased operational severity.

Repeated selection and improved performance. The customer invited catalyst suppliers to bid for the next reload using a higher endpoint and lower API gravity feed. Third-party testing was again conducted to explore all options. ART proposed the same catalysts with an optimized stacked loading containing a higher ratio of ICR 214 to ICR 183 compared to the current loading, increasing cracking catalyst system activity and positioning the unit for a longer cycle length. Based on rigorous testing against several competing suppliers, and confidence in ART's ongoing technical service, ART was again chosen to supply the next load.

The customer experienced an improvement in unit profitability by enabling the processing of more feed, and more difficult feed, without compromise.

For more info, visit Advanced Refining Technologies at booth 37. ●

BAKER HUGHES, continued from page 6

(KPIs) at the desalter and the wastewater treatment plant. A small amount (as little as 13%) of heavy Canadian crude was included in the feedstock blend, but a consistent solids-stabilized emulsion was observed throughout the desalter, resulting in brine oil and grease > 5,000 ppm. Cleaning the brine through mudwashing proved unsuccessful due to improper oil-water separation in the desalter. During mudwashes, the large, oily emulsion band was being agitated out of the bottom of the vessel.

High amounts of solids were intermittently carried over with the emulsion, contributing to downstream heat exchanger and furnace fouling. With limited control over desalter performance and the resulting reliability challenges, the discounted Canadian crude was removed from the feed.

Baker Hughes was brought in to discuss potential options and perform a full system survey and the requested testing. The team recommended the implementation of a crude pretreatment program with its XERIC 7021 heavy oil demulsifier, and a primary demulsifier at the desalter.

Crude pretreatment allows for maximum oil-demulsifier residence time and mixing, increasing water coalescence and emulsion resolution at the desalter. It was decided that all existing adjunct chemistries, such as stabilizers and wash-water polymers, could be discontinued. Within 24 hr of startup, a significant improvement in brine quality and a reduction in the emulsion layer were noticed. Following implementation of the pretreatment program with the heavy oil demulsifier, the brine oil and grease content reduced to 200 ppm, while the amount of processed high-solids Canadian crude had increased to > 35%.

After Baker Hughes implemented its program, the refiner was able to process as much as 50% heavy Canadian crude and achieve all desalter KPIs. The crude pretreatment program delivered improvements that enabled the refiner to achieve an additional $325,500/day profit. For more information, visit bakerhughes.com/COM. ●

You deserve SatisfACTION

If raising the alky feed and distillate from your FCC unit is a top priority, you've come to the right place.

That's because with its continuing record of success, Albemarle's ACTION is the ***only*** commercially proven FCC catalyst to maximize distillate, butylenes, and octane with minimal gasoline loss. Utilizing its unique zeolite and matrix technologies, ACTION has been successful cracking all types of feeds, from tight oil to heavy resid. Your success is too important to risk with unproven alternatives.

Achieve satisfaction and success with the undisputed leader...demand ACTION.

For more information on **Albemarle ACTION catalyst** or our exceptional portfolio of products and services**,** call **(281) 480-4747** or visit **www.albemarle.com**

ALBEMARLE®

REFINING SOLUTIONS

Manufacturers rely on big data analytics to navigate tough conditions

A recent survey of manufacturing executives indicates that many respondents (67%) are pressing ahead with plans to invest in data analytics even as they pare back spending in other areas to combat tough business conditions.

How are executives justifying these expenditures? Many say that they view data analytics—a key component of the Industrial Internet of Things (IIoT)—as a viable solution to a cycle of problems that lead to downtime and lost revenue.

More than 200 North American manufacturing executives took part in the survey, titled "Data's Big Impact on Manufacturing: A Study of Executive Opinions." The survey was jointly conducted by Honeywell Process Solutions (HPS) and KRC Research Inc., from May 23 to June 8, 2016.

"Executives need to keep their businesses running smoothly and safely, and they are banking on IIoT technologies to help navigate challenges, even during cash-strapped times," said Andrew Hird, vice president and general manager of HPS Digital Transformation. "For more than 40 years, Honeywell has provided leading automation technologies that help manufacturers meet those goals. The IIoT by Honeywell is the next step in that evolution."

Among other key findings of the survey:

- Some companies are feeling pressure to continue working under the threats of unscheduled downtime and equipment breakdowns, which are viewed as the most detrimental to maximizing revenue.
- The majority of companies say they are already investing in data analytics technology.
- More than a quarter said they do not plan to invest in data analytics in the next year—of that group, not understanding the benefits of data analytics and inadequate resources are among the most-cited reasons for this lack of investment.

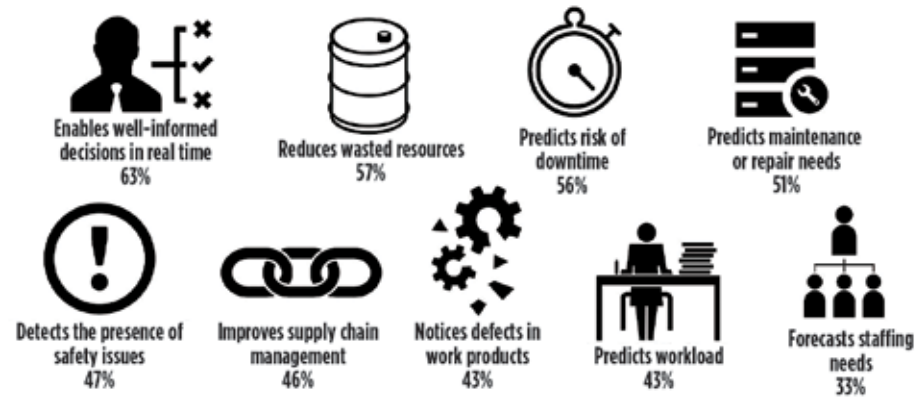


FIG. 1. Most manufacturers that responded to the survey had favorable views of the benefits of data analytics. Courtesy of Honeywell and KRC Research.

The vicious cycle of downtime. Unscheduled downtime was ranked as the top threat to maximizing revenue, but 42% of respondents admitted to operating equipment harder than they should. When asked how often their companies experienced a list of issues in recent years, 71% of respondents said they experienced equipment breakdowns at least occasionally, while 64% said the same for unscheduled downtime.

"Running plant equipment harder than appropriate presents a host of issues, ranging from equipment breakdowns to potential safety incidents," Mr. Hird said. "Those issues inevitably lead to more downtime, which leads back to lost revenue. It is easy to see how many companies feel that they are caught in a vicious cycle. Predictive analytics achieved through an effective IIoT by Honeywell solution can help companies break out of that cycle."

Of the surveyed executives, 40% ranked unscheduled downtime as the biggest threat to maximizing revenue. Other threats included:

- Supply chain management issues (39%)
- Inadequate staffing (37%)
- Off-spec products (36%)
- Equipment breakdowns (32%).

Data analytics as a viable solution. For manufacturers, data analytics is a key component of successful IIoT implementation (FIG. 1). Most respondents had favorable views of the benefits of data analytics as a solution, and they agreed that big data analytics can reduce the occurences of:

- Equipment breakdowns (70%)
- Unscheduled downtime (68%)
- Unscheduled maintenance (64%)
- Supply chain management issues (60%).

Respondents believe that data can enable well-informed decisions in real time (63%), limit waste (57%) and predict the risk of downtime (56%).

"It is easy to put that puzzle together. These executives correctly believe that data analytics can help them combat the biggest threat they see to business: unscheduled downtime," Mr. Hird said. "This is why they think that it makes sense to continue investing."

Additionally, more than two-thirds of respondents (68%) said they are currently investing in data analytics, 50% said they believe their companies are right on track in their use of data analytics, and 15% said that they believe their companies are ahead of the curve as it relates to data analytics usage.

Not everyone is sold. While the majority of respondents said that they are already investing and/or planning to increase their investments in data analytics in the coming year, 32% said they are not presently investing in data analytics. Meanwhile, 33% said that their companies are not planning to invest in data analytics in the next 12 months, or are unaware of any plans to do so.

Of those who have no plans to invest:

- 61% believe that their organizations already have systems in place to ensure safety, yield and success
- 45% said that their companies have seen some growth without data analytics
- 42% said that they do not fully understand the benefits of big data
- 35% believe that people are overstating the benefits of big data.

Approximately 63% of respondents who said that they have no investment plans indicated that they just do not have the resources to appropriately do so, while 39% said that they do not have the right personnel to make the most of data analytics.

"For some companies, hurdles remain before the IIoT can be fully adopted," explained Mr. Hird. "Some do not believe that they need it, while others say that they lack the resources to do it correctly. The good news is that the IIoT is something that does not require a wholesale change. It can be phased and scaled depending on an individual company's circumstances. This is precisely why Honeywell says that the IIoT represents an evolution, not a revolution."

To speak to a member of the HPS team, visit booth 17 or the Essex B suite on Sunday, Monday and Tuesday nights. To connect with representatives of Honeywell UOP, visit booth 16 or the Essex A suite on Sunday, Monday and Tuesday nights. ●

Good morning, Baltimore!

Baltimore welcomes you to one of the most historically significant cities in the country. More than a century after Captain John Smith (yes, *that* Captain John Smith) first sailed into the uppermost Chesapeake Bay, the city of Baltimore was founded in July 1729. As the port is one of the best naturally protected harbors in the world, it became the nation's second-largest point of entry for immigrants.

Baltimore grew swiftly in the 18th century as a granary for sugar-producing Caribbean colonies and a major trade hub for goods such as tobacco. The first US Post Office system was inaugurated in 1774, and Lexington Market, founded in 1782, continues to be known as one of the oldest continuously operating public markets in the US. The city played an important role in the American Revolution, joining the fight against British taxes and refusing British trade. The Second Continental Congress met in the Henry Fite House from December 1776 to February 1777, effectively making the city the capital of the US during this period.

The city's role in the War of 1812 is perhaps the most famous period in its history. After burning Washington, D.C., the British turned their attention to what they called "a nest of pirates," attacking the staunchly anti-British city in the Battle of Baltimore. While viewing the failed British assault on Fort McHenry (FIG. 1) from a British ship, Francis Scott Key penned the poem, "Defense of Fort McHenry" that would later become our national anthem, "The Star-Spangled Banner."

Baltimore was the first US city to light its streets with hydrogen gas, and the construction of the Baltimore and Ohio (B&O) railroad made the city a major shipping and manufacturing center to Midwest markets.

Attractions. There is so much to see in Baltimore (FIG. 2), including the first **architectural monument** in honor of George Washington; the **Baltimore Basilica,** the first church constructed in the US following the adoption of the new Constitution; the **Baltimore World Trade Center,** which is the world's tallest equilateral, five-sided building; **boat tours** throughout the historic harbor; **Johns Hopkins University and Medical Center,** one of the largest and most-respected hospital and research complexes in the world; the **Pimlico Race Course,** the site of the second leg of the Triple Crown of thoroughbred racing, the Preakness Stakes; **Harborplace,** a modern urban retail and restaurant complex; **the National Aquarium;** several world-class museums; and the ships, shops and restaurants of the **Inner Harbor,** to name just a few.

FIG. 1. The defense of Fort McHenry inspired the US national anthem.

The city also boasts the most public monuments per capita in the US, and more than 65,000 properties, or roughly one in three buildings, are listed on the National Register.

Cuisine. From crab to cocktails, our city offers something to please every palette. We are particularly proud of our Chesapeake seafood—lobster, rockfish, scallops, mussels, clams, shrimp and crab (FIG. 3). Try our cured and smoked pork, meats and salmon; coddies (small fried cakes of cod and potatoes topped with mustard and a saltine); and pit beef (grilled and served on a Kaiser roll with horseradish).

Be sure to get out into the city for inventive libations, lively entertainment and great local music. We welcome you to Baltimore! •

FIG. 3. Be ready to crack open some of Maryland's most famous foods.

FIG. 2. A beautiful Baltimore evening. Image courtesy of the Baltimore Sun.

ALBEMARLE REINFORCES HYDROPROCESSING COMMITMENT

Albemarle is reinforcing its business strategy in hydrotreating and becoming even more focused on technology development and catalyst performance.

With recent volatility in oil prices, the refining industry's biggest challenge is to maximize the profitability of unit operations. The company is positioned to optimize its customers' hydroprocessing unit operations. By not being tied to any specific license agreements, Albemarle's unique STARS portfolio and Nebula bulk catalyst can maximize profitability for refiners.

Nebula is Albemarle's bulk metal catalyst technology, developed jointly by Albemarle and ExxonMobil. It is the highest activity hydrotreating catalyst available for many hydroprocessing applications and offers at least twice the activity of traditional catalysts, leading to increased HDS, HDN and HDA activity. Nebula is ideal as a drop-in solution in existing HPC units utilizing Albemarle's STAX technology.

Today, more than 60 refineries are employing Nebula with over 130 successful unit cycles. In a proprietary STAX combination with STARS catalyst, the Nebula catalyst unleashes performance and boosts profit margins of both hydrocrackers and distillate hydrotreating units around the globe.

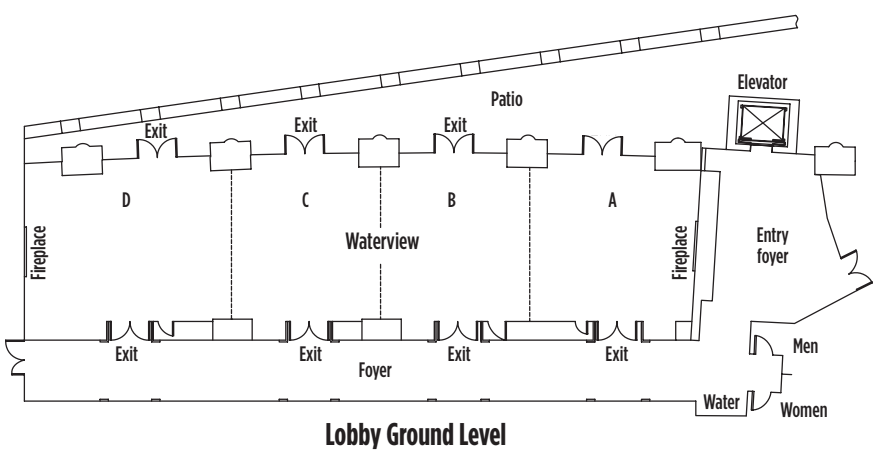
Albemarle's STARS hydrotreating catalyst product line was recently expanded to three new grades: KF 870 STARS for hydrocracking pretreat applications; KF 880 STARS for medium- to high-pressure middle distillate hydrotreaters; and KF 780 STARS, the newest all-around catalyst for low-pressure hydrotreating applications.

KF 780 is a high-activity desulfurization catalyst with an extremely high metals efficiency. This step-out feature was achieved via improved metals dispersion and tailored distribution of active sites coupled with better pore accessibility. The KF 780 is applicable as both a standalone catalyst and in various STAX configurations, utilizing Albemarle's reactor loading technology.

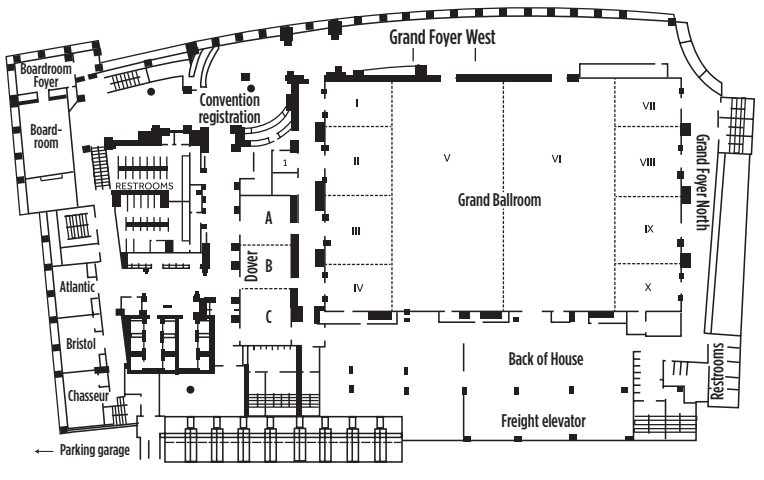
To reinforce this business strategy, Albemarle is ending its alliance with Honeywell UOP. The company is committed to working with its customers to maximize unit operations, while also completing projects initiated under the Honeywell UOP alliance.

To learn more, speak with the Albemarle team at booth 15, or visit their hospitality suite on Monday night in Dover A. •

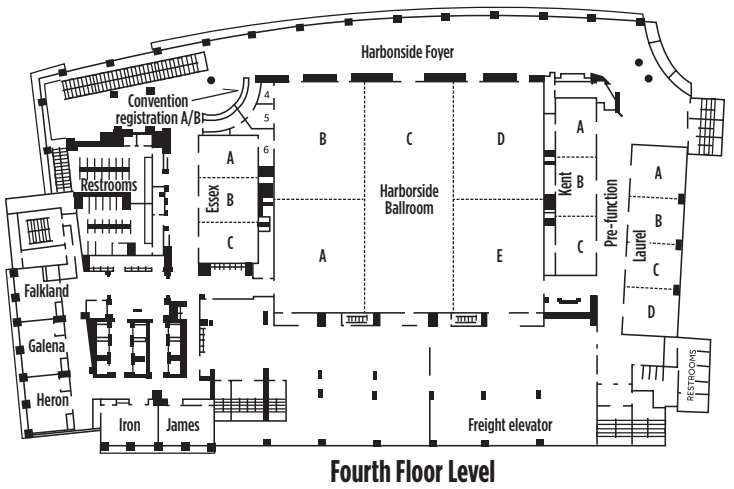
MEETING ROOMS MAP



Lobby Ground Level



Third Floor Level



Fourth Floor Level

HOSPITALITY SUITES

COMPANY	LOCATION	DAY
Albemarle Corporation	Dover A	Monday
Athlon Solutions	Grand Ballroom 3	Monday
Axens North America Inc.	Dover B & C	Monday
BASF Corporation	TBD	Tuesday
CB&I	Grand Ballroom 4	Monday
Criterion Catalysts & Technologies LP	Laurel C & D	Monday
Dow Oil, Gas and Mining	TBD	Monday
DuPont Clean Technologies	Grand Ballroom 1	Monday
Emerson Process Management	TBD	Sunday, Monday
Haldor Topsoe Inc.	Grand Ballroom 7 & 8	Monday, Tuesday
Honeywell Process Solutions	Essex B	Sunday, Monday, Tuesday
Honeywell UOP	Essex A	Sunday, Monday, Tuesday
Johnson Matthey Process Technologies	Raven	Sunday, Monday, Tuesday
Norton Engineering Consultants Inc.	Grand Ballroom 10	Sunday, Monday
Solenis	Essex C	Sunday
Technip Stone & Webster Process Technology	Grand Ballroom 9	Monday

LIST OF EXHIBITORS

Exhibitor information is provided solely for the use of attendees to search for products and services offered by exhibiting companies. Use of this information for solicitation purposes of any kind, by anyone other than a registered attendee, is strictly prohibited.

WE'RE SAVING A SEAT FOR YOU!

2017 AFPM MEETINGS

AFPM

Annual Meeting
March 19-21, San Antonio, TX

International Petrochemical Conference
March 26-28, San Antonio, TX

International Base Oils &
Waxes Conference
March 27, San Antonio, TX

Security Conference
April 24-26, San Antonio, TX

Labor Relations /
Human Resources Conference
April 27-28, San Antonio, TX

National Occupational &
Process Safety Conference
May 16-17, New Orleans, LA

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

Q&A and Technology Forum
October 2-4, Austin, TX

Environmental Conference
October 15-17, Denver, CO

afpm.org

2017 AFPM

Identifying FCCU operational and mechanical issues at an early stage leads to greater efficiency and higher profitability.

Tracerco has performed hundreds of FCCU studies worldwide to help diagnose operational problems and efficiently plan unit turnaround needs. Tracerco's advanced scanning and tracer technologies are used to measure the velocity, distribution and residence time of the catalyst or vapor phase through any part of the system. This includes testing to determine the efficiency in the riser, termination devices efficiency, and diagnose potential issues with cyclones or distribution devices. Each project is performed online and customized to provide the information needed to optimize or troubleshoot your specific process.

Enabling you to make the right decision.

Tracerco

Providing Insight Onsite

Online diagnostics to optimize performance for all major components of FCC units.

UK Tel +44 (0)1642 375500 Fax +44 (0)1642 370704
US Tel +1 281 291 7769 Fax +1 281 291 7709

www.jmprotech.com **www.tracerco.com**

JM
Johnson Matthey
Process Technologies