

Bridging the gap between pre-innovation and post-innovation

MIKE RHODES, *Hydrocarbon Processing*

At Monday morning's General Session, keynote speaker Bill O'Connor challenged an attentive audience to change their perspectives of innovation—or what he called a “baloney buzzword”—and adopt “real innovation.”

“Everyone talks about innovation, but nobody does anything about it,” he said. “The prevalent question is, ‘How can we actually create a culture of innovation, and then achieve it?’ We need to stop thinking of innovation as a mindset, goal or activity, but instead view it as a thing that leads to the establishment of something new in the world.”

Through extensive research, Mr. O'Connor has identified five main techniques that are tested and proven to be applicable to fostering innovation. He stressed that these can be done for an individual's career, when leading a team, for an organization or even for the industry as a whole.



As an Innovation Strategist for Autodesk Inc., **Bill O'Connor** has worked with some of the largest and most innovative companies in the world.

- 1. Create an innovation environment:** A map (or “helicopter view”) of the overall landscape.
- 2. Set targets:** Every large organization should have eight to 12 innovation targets. “If you are a CEO and you say that you have 47 innovation targets, I don't believe you,” he said. “If you have two, I wonder what you are doing. Eight to 12 is the sweet spot where real success can be achieved.”
- 3. Generate the widest range of ideas:** Mr. O'Connor recommended breaking away from the idea that something cannot be done, citing an established set of questions that challenge the status quo and explore how to go beyond it.
- 4. Prioritize:** “Most organizations are fairly bad about prioritization. How do you prioritize new ideas?” he asked. “This is difficult. Innovation is an art, not a science.”
- 5. Make a project:** This is achieved organically. “While the map may originate at the executive level, anyone in the organization can initiate and undertake the project,” Mr. O'Connor said. “This is taking innovation and putting it into action.”

Within some organizations, new ideas are rejected outright. Mr. O'Connor rejects that notion, and commented that one of the things that makes Silicon Valley so innovative is that their response to an idea that might be way out of the box is, “That's crazy. Let's try it.”

“Ideas are the currency of the age. Everyone is trying to make everything so technological and automatic. Innovation, creativity and imagination are part of our natural makeup,” he concluded. “If you are not choosing to innovate, you are choosing to not innovate.” ●

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When and how companies should invest in cyber security

ASHLEY SMITH, *Hydrocarbon Processing*

When it comes to cyber security, companies are still trying to evaluate what is needed and what is a waste of time and resources. Jerald Dawkins, CEO and founder of True Digital Security Inc., discussed the factors that should be considered when making decisions on a cyber security program during a Monday morning session.

When looking back at the evolution of the Internet, particularly from a security standpoint, it might appear to be nothing more than a succession of one hack after another, Dr. Dawkins said.

“In a way, a hacker is not necessarily a bad thing,” Dr. Dawkins said. “You can use technology for good and you can use technology for bad, and a hacker is really just somebody that can take technology and use it in new and innovative ways.”

The one aspect of the Internet that has not changed since it was first invented, Dr. Dawkins explained, is email. When looking at the security challenges presented by email, potential hackers are still utilizing phishing campaigns and spam messages.

“Why do those things exist?” Dr. Dawkins asked. “They exist because we made some really poor choices back in the day, and we did not anticipate the evolution of potential problems that could exist today.”

Because of the choices made in the infancy of the Internet, security problems were created that must now be solved. Security products and technologies have seemingly become a cycle of continually adding the latest “innovation” on top of previous applications.

“We keep introducing more and more functions and complexities to protect something that was not necessarily engineered or designed to handle the threats we face today,” he stressed. “That is the real challenge.”

When it comes to innovation in the cyber security sector, Dr. Dawkins explained that companies are looking at how to use components and capabilities that they already have at their disposal to deliver improved security.

“The security sector is a little crazy,” Dr. Dawkins said. “From the standpoint of the complexity of technologies, businesses must contend with infrastructure, networking, business applications, human-machine interfaces (HMIs), the Industrial Internet of



Jerald Dawkins, CEO and founder of True Digital Security Inc., discusses how to use risk assessment when implementing cyber security safeguards.

▶ See **CYBER SECURITY**, page 7

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Exploring the next-generation platform for simulation

ASHLEY SMITH, *Hydrocarbon Processing*

During the mid-morning session of Operational Planning, Control and Automation Technologies (OPCAT), Larry Balcom of Schneider Electric Software LLC spoke about a next-generation platform for simulation, how to use the platform to optimize simulations and how to integrate it without forcing operators to be taskmasters.

“Simulation has been around for a while,” Mr. Balcom said. “Its growth has mirrored the growth of computers. One of the first applications of the initial mainframes was simulation applications, which are difficult to do correctly.”

The industry has been consistently trying to create a user-friendly sys-

tem—a way of utilizing the technology to give users the information. Mr. Balcom explained that this has been challenging. With the advent of the personal computer, a new generation of simulations tools were created.

“These tools were still application-centric,” Mr. Balcom said. “These particular computer software packages perform specific functions, and they require a significant amount of data. Engineers that can feed that kind of data into a system and move the data between different pieces of software are also vital for successful utilization.”

While this method was a vast improvement on the original technol-

ogy, Mr. Balcom said, it still does not ensure that the tool will work for engineers. Looking at those applications, the industry began to develop ways to improve the efficiency and the efficacy of simulation in the engineering pool flow. IT has also been pushing for a more integrated system.

“IT has been pushing us as an industry to utilize similar platforms,” Mr. Balcom said. “They also want us to utilize the cloud to lower the bur-

den that is imposed on them to get the software working.”

It is not just individual companies that need to utilize the platform, Mr. Balcom explained. Multiple companies must be able to use it and share information with each other to improve.

“We need to grow as an industry and create tools that bring people into the simulation technology,” Mr.

► See **SIMULATION**, page 8



Larry Balcom of Schneider Electric Software LLC discussed the newest features of a next-generation platform during Monday morning's OPCAT session.

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SCHEDULE OF SESSIONS AND SPECIAL EVENTS

TUESDAY, OCTOBER 3, 2017

| | |
|--------------------|---|
| 7 a.m.–5 p.m. | Registration |
| 8–10 a.m. | Concurrent Sessions: <ul style="list-style-type: none"> • Cybersecurity • Operational Planning, Control and Automation Technologies • Principles & Practices—Hydroprocessing • Q&A and Discussion Session—Crude/Vacuum Distillation and Coking |
| 10–10:15 a.m. | Coffee Break |
| 10:15 a.m.–12 p.m. | Concurrent Sessions cont. |
| 12–2 p.m. | Lunch in Exhibit Hall |
| 2–3:30 p.m. | Concurrent Sessions: <ul style="list-style-type: none"> • Cybersecurity • Operational Planning, Control and Automation Technologies • Principles & Practices—Crude/Vacuum Distillation and Coking • Q&A Session—FCC |
| 3:30–3:45 p.m. | Refreshment Break |
| 3:45–5:15 p.m. | Concurrent Sessions cont. |
| 5:30–6:30 p.m. | Women in Refining Networking Event Reception open to registered women only. |

WEDNESDAY, OCTOBER 4, 2017

| | |
|----------------|---|
| 7:30–10 a.m. | Registration |
| 8–9:30 am | Concurrent Sessions: <ul style="list-style-type: none"> • Cybersecurity • Principles & Practices—FCC • Principles & Practices—Fostering Profitability |
| 9:30–9:45 a.m. | Coffee Break |
| 9:45–11 a.m. | Concurrent Sessions cont. |



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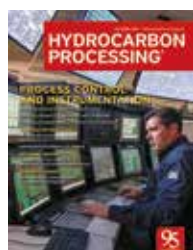
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The rising global demand for low-sulfur fuel

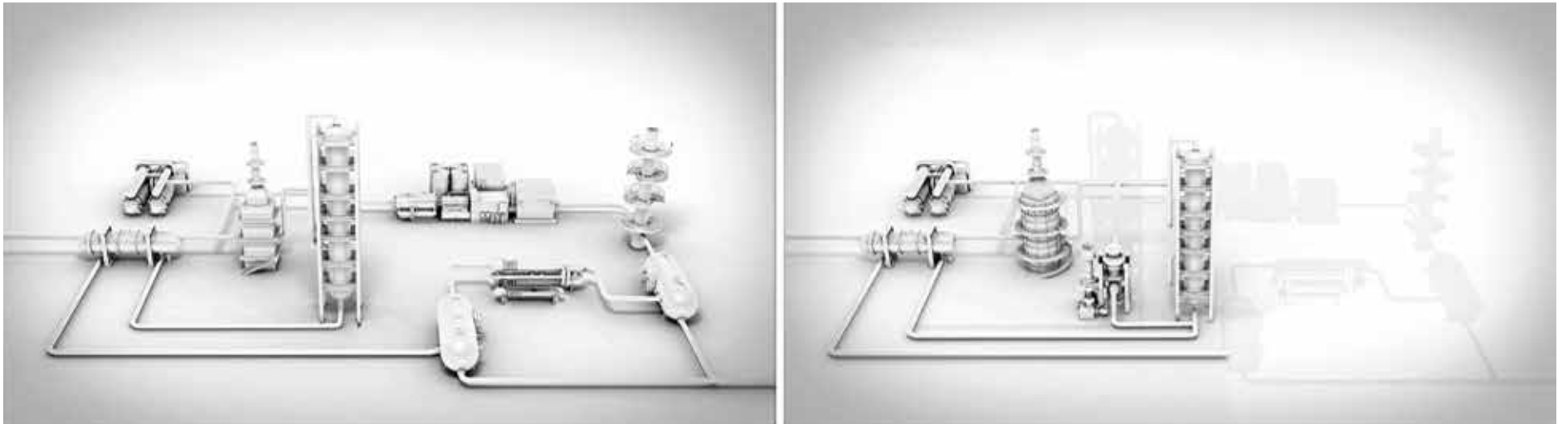


FIG. 1. Conventional trickle bed (left) vs. IsoTherming equipment configurations (right).

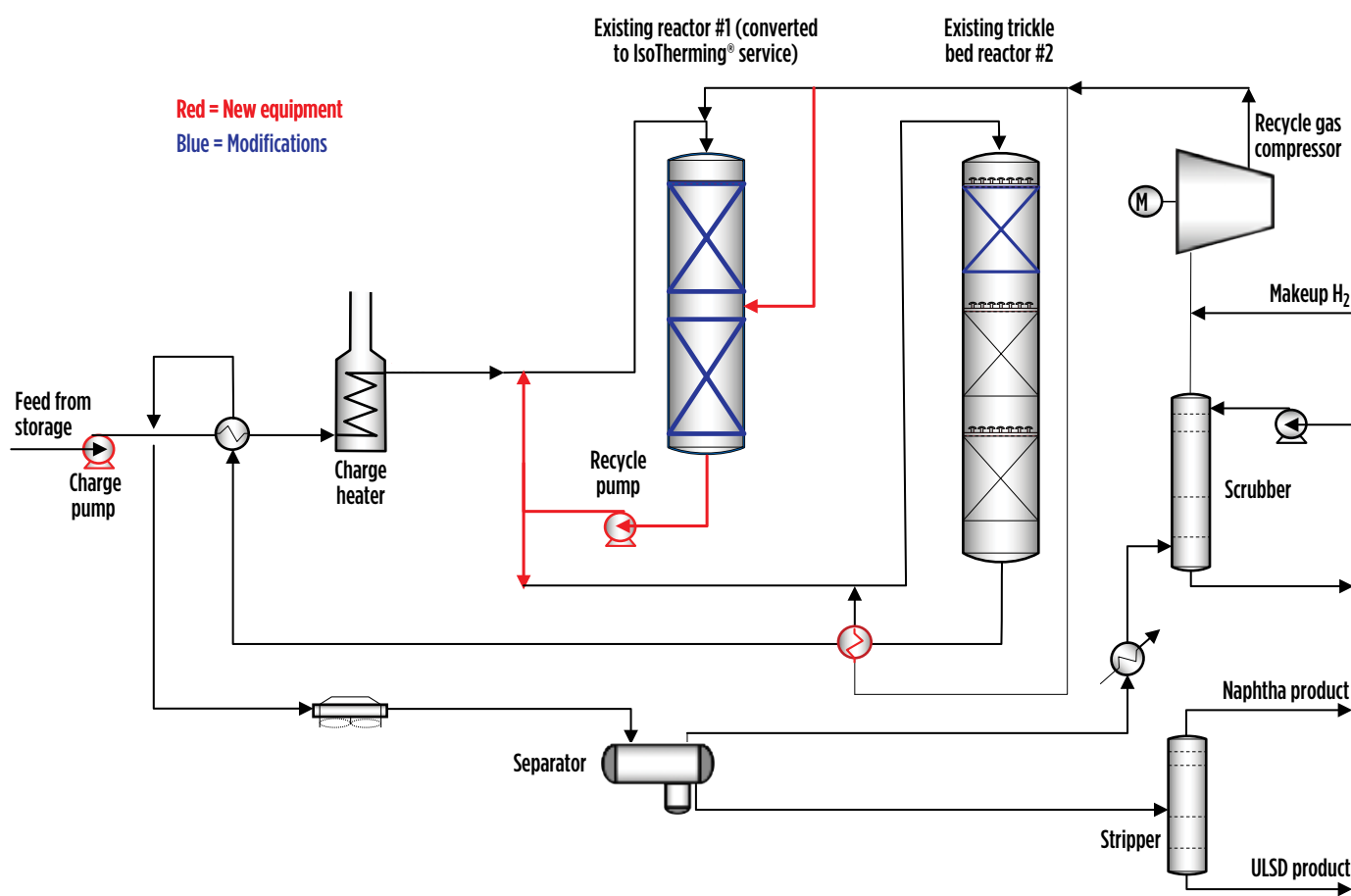


FIG. 2. Process configuration for a revamp utilizing an IsoTherming reactor as a pretreatment unit.

Increasing global demand for cleaner-burning transportation fuel is driving refiners to look for ways to increase low-sulfur diesel production capacity. DuPont's IsoTherming® technology is a disruptive innovation in hydroprocessing that is challenging the norms associated with conventional trickle bed technology.

The core of IsoTherming technology is its ability to provide the hydrogen (H₂) necessary for chemical reactions using a saturated liquid stream, rather than a recycle gas stream. All of the H₂ needed for the chemical reactions is dissolved in a single liquid phase.

Conventional two-phase trickle bed technology requires significant capital, is more complicated to design and operate, and has significant issues with catalyst fouling. IsoTherming technology has a number of unique and commercially proven advantages compared to trickle bed technology.

Increased catalyst performance and improved yields. A trickle bed reactor depends on near-perfect feedstock distribution throughout the catalyst bed to maximize reaction efficiency and to avoid overheating and coking.

With an IsoTherming liquid-full reactor, the catalyst is completely wetted, drawing the heat of reaction away from the catalyst surface and eliminating local hot spots that would otherwise promote coking and catalyst deactivation. Several commercially operating IsoTherming VGO hydrotreating units have experienced catalyst life in excess of four years, achieving lower catalyst deactivation rates than trickle bed reactors. Uniform liquid flow throughout the catalyst bed results in a uniform radial temperature profile and acts as a heat sink for exothermic chemical reactions. This results in a lower temperature rise across the IsoTherming reactor and minimizes light ends generation.

Reduced operating expenses and capital cost savings. IsoTherming technology's unique approach for H₂ delivery eliminates the need for a recycle gas compressor (and associated high-pressure equipment). FIG. 1 shows a visual comparison of the equipment differences between IsoTherming and conventional trickle bed technology. IsoTherming units have noticeably less equipment and smaller plot space

requirements, resulting in significant reductions in operating expenses and capital cost savings.

Electricity usage is lower due to the use of a lower-power reactor recycle pump, rather than a higher-power recycle gas compressor. The direct heat transfer resulting from the recycle of hot reactor product to the inlet of the reactor reduces the required fired heater duty needed to achieve the target reactor temperature. IsoTherming technology has been shown to have 40%–60% utility savings, and capital cost savings of more than 30% compared to trickle bed technology in evaluated units.

Robustness, reliability and safety.

IsoTherming is an inherently safer hydroprocessing technology, and has been commercially shown to require significantly less time to recover from process upsets than trickle bed technology, and without any loss of catalyst activity. The elimination of the recycle gas compressor and associated treating equipment also removes a large amount of high-pressure equipment from the system, resulting in a significant reduction in overall unit H₂ inventory. Since the H₂ content

IsoTherming technology has a number of unique and commercially proven advantages compared to trickle bed technology, including less equipment and smaller plot space, leading to an estimated 40%–60% utility savings and a capital cost savings of more than 30%.

in liquid full catalyst beds is limited by solubility, any potential of reactor runaway is eliminated.

Debottlenecking and revamp applications. The most significant capital cost advantages for IsoTherming technology occur with debottlenecks and revamps of existing hydroprocessing units. Utilizing an IsoTherming reactor as a pretreatment unit when revamping an existing hydrotreating asset can be done at a fraction of the cost of competing trickle bed technologies. FIG. 2 illustrates a flowsheet for this type of revamp configuration.

The IsoTherming reactor can either be a new vessel or a revamp of an existing vessel. IsoTherming pretreat reactors carry out most of the easier reactions and have the majority of H₂ consumption, leaving less work for the existing conventional reactor (which now operates in a polishing mode). This results in unloading of the existing recycle gas compressor by operating the existing trickle bed reactor with a much lower gas-to-oil ratio, as well as reduced catalyst deactivation due to coking in the trickle bed reactor. A wide range of IsoTherming solutions are available that satisfy multiple customer needs, ranging from minimizing capital cost to maximizing reuse of existing equipment.

DuPont licenses the IsoTherming technology and offers products and services that support its customers through the life of the unit. With 24 units licensed worldwide, IsoTherming is an innovative and commercially proven technology that is changing the way refiners look at hydroprocessing.

To find out more about IsoTherming technology and to meet the DuPont team, join them Tuesday evening in their hospitality suite in Room 503, or in the exhibition hall at booth #24. ●

What has happened to the industry's talent pool?

MEHDI ADIB, SNC-Lavalin Oil & Gas

Sometime around 2007, the rapid development of shale drilling for natural gas and oil production began a new boom in US petrochemical development. The demand for expertise in engineering, project and construction management grew very rapidly, resulting in the importation of personnel resources from outside the US. To understand why, we need to take a step back and examine the industry's recent history with a broad lens.

For years, the US and Europe were dependent on the availability of imported cheap oil to feed the growth of petrochemical and refinery industries. This growth also resulted in demand for well-paying jobs across the large spectrum of functions needed to execute these projects. Opportunities abounded for talent to advance their careers by joining the petrochemical industry.

Additionally, the need for new products based on available cheap energy resulted in advanced research and development by major chemical companies like Monsanto, DSM, DuPont, Union Carbide, Eastman Kodak, Bayer, ICI, and many others.

Since the 1990s, oil has no longer been considered a cheap and plentiful source of energy, and this has contributed to the downturn of petrochemical expansion in the US and Europe. The growth of the petrochemical industry was pushed to areas with available cheap feedstock, such as the Middle East.

In the US and Europe, young talent that previously might have been attracted to engineering and construction specialties have begun to choose financial and high-tech industries. Chemical engineering was no longer considered a guarantee for long-term occupation, but digital technology companies—"high-tech" startups with new ideas and financial organizations that fund these new-

comers—were attracting talent with long-term success, salary growth, signing bonuses and attractive benefit packages.

Meanwhile, industrial companies began outsourcing technical services to other countries, mainly India, and importing construction labor from Latin America. European and Asian engineering and construction contractors that had built their experience on projects in the Middle East and Southeast Asia began to set up shops in the US to benefit from new opportunities and the growing market for their expertise.

The cyclical nature of our energy industry has contributed to the shortage of qualified and experienced engineers and other required resources for the development and construction of the petrochemical industry in the US and Europe. Industry professionals have retired or are taking their knowledge and expertise to other industries, and the next generation of young talent are not stepping in to replace them in the numbers we have seen in the past. The importation of resources from outside the US and Europe have changed the landscape of our industry's workforce. ●



MEHDI ADIB is Vice President of Downstream for SNC-Lavalin Oil & Gas. He is responsible for overseeing all downstream

activities for the company, including refining, chemicals, petrochemicals and syngas, fertilizers, utilities and related infrastructure. Mr. Adib has worked in the refinery, petrochemical and related infrastructure industries markets globally, supporting the development and implementation of major projects in the US, Canada, Brazil, France, Saudi Arabia, Kuwait, Abu Dhabi, Russia, Singapore and Malaysia. He has more than 45 years of experience in project management and EPC industry experience.

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AFPM FEATURED EVENT: 2ND ANNUAL WOMEN IN REFINING NETWORKING EVENT

The 2nd Annual Women in Refining Networking event will be held on Tuesday evening, October 3 from 5–6:30 p.m. Our inaugural event held during the 2016 Summit was a rousing success, and we are sure that we will build on that momentum this year.

This event allows women to meet and network with other women in the industry (both from operating companies and service providers), and to gain from each other's experiences. The evening will begin with a brief keynote speaker, followed by a lively discussion on the book, "Lean In" by Sheryl Sandberg (e.g., "What did you like or dislike about this book?").

This will be followed by our signature attraction, "Speed networking," which enables attendees to meet and reconnect with new and old friends. The event will feature an open bar and light finger food, and will finish in time for everyone to meet their dinner engagements. We look forward to seeing you tonight. ●

Driving the right decisions at the right time

SATISH BALIGA and JAVIER VAZQUEZ-ESPARRAGOZA, KBR Technology

Maintaining critical equipment at peak levels of efficiency, availability and reliability are the goals of every plant manager in the manufacturing industry. Reducing unplanned downtime and increasing asset utilization represent the largest opportunities for reducing operational expenditure (OPEX). The ability to quickly track and diagnose operational issues that impact equipment performance is a prerequisite for achieving these goals.

KBR InSite® is a cloud-based technology service that utilizes operational insight for early detection of incipient problems that could lead to the degradation of process and equipment performance. As shown in FIG. 1, at the heart of the service is an operations and technology expert dedicated to diagnosing these problems, determining probable root

causes and recommending corrective actions that can either prevent failure or enable quick resolution.

InSite analytics. InSite uses a combination of state-of-the-art data visualization tools and advanced mathematical algorithms to fully leverage the in-depth knowledge of KBR's process technology subject matter experts (SMEs) to unlock the value of the collected data and develop a visual "digital fingerprint" of the plant.

Utilizing near-real-time operational data and a collection of process and key performance indicator (KPI) dashboards, InSite creates a cloud-hosted "virtual plant" that can be securely monitored by a select group of experts and plant operators. Smart, proactive, escalating alerts act as early warning notifications of impending

abnormal or sub-optimal process deviations, and drill-down features allow the rapid visual identification and interpretation of potential problem sources.

Proprietary mathematical methods and first-principle-based simulation models provide the necessary framework to conduct in-depth analysis and predict the health of process equipment, often through simple extrapolation from the present estimated state. Offline, what-if scenario studies are utilized by SMEs to identify further opportunities for production increase or energy reduction, and to drive plant operations toward the upper limits of thermodynamic efficiency.

InSite utilizes a highly collaborative work process anchored around industry-accepted best practices to provide a continuous improvement and diagnostic service that reflects a paradigm shift from a conventional reactive form to a more proactive form. This helps prevent incipient issues from progressing into serious operational problems that could negatively impact plant uptime. As illustrated in FIG. 2, the InSite work process consists of continuously detecting abnormal operations, providing proactive diagnostics and recommendations to address problems, and then taking timely preventive or corrective actions to improve uptime and overall plant productivity.

Functional highlights (FIG. 3) include:

- Performance improvement service for process plants that delivers continuous operational and economic benefits through monitoring and analysis of plant operations and KPIs around critical equipment in the plant.
- Expert advisory in the form of detailed diagnostics and predictive analytics is layered on a monitoring and diagnostics portal that allows KPIs from different plants to be historized and visualized from a centralized location on the Cloud, and analyzed by globally located process and operations experts using advanced big data tools, proprietary models and engineering calculations.
- The basis for a proactive and collaborative work process that leverages the use of standardized

reports, best practice guidelines, live KPI trends and advanced simulation models to predict and mimic plant behavior.

InSite value proposition and benefits. Operating plants are often too resource constrained to manually inspect and interpret process and equipment data at a frequency required to meet reliability goals. A three-dimensional approach for achieving efficiency improvements and operational excellence involves simultaneously driving plant operations toward cost minimization, risk mitigation and extended equipment uptime.

Potential benefits include:

- Continuous visibility into the plant's present and historical operating profile provides a predictive assessment of asset performance and uncovers opportunities for sustained efficiency gains.
- Early detection of equipment problems allows proactive maintenance service at relatively low cost before future degradation leads to unplanned shutdowns and expensive repairs.
- Replacing reactive maintenance with proactive maintenance improves reliability and uptime, lowers overall equipment lifecycle costs and contributes significantly to productivity benefits.
- Plant operators can leverage the domain knowledge of process technology experts to make informed decisions and achieve operational excellence.
- Analyzing process history with mathematical models that are tuned to shadow and validate plant operations helps identify true operational constraints and provides insight for optimizing plant operations.
- Automatic generation of plant operations reports summarizing production, energy, emissions and equipment performance promote informed, long-term operation and business decisions.

For information on KBR's suite of process automation technologies, visit the KBR tabletop #39 in the exhibition area. ●

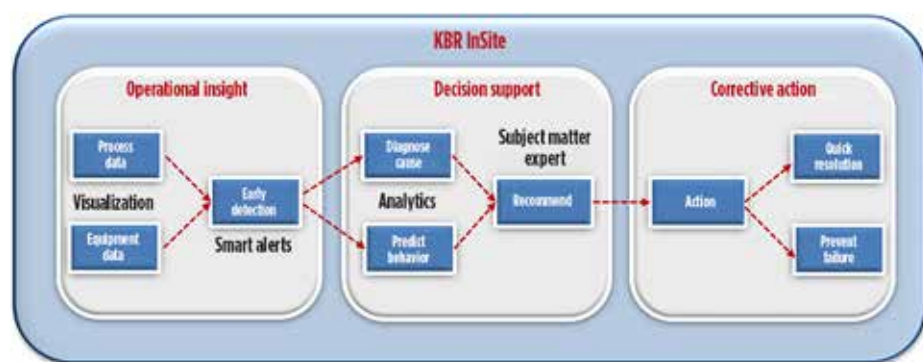


FIG. 1. The heart of KBR's Cloud-based technology service is an operations and technology expert.

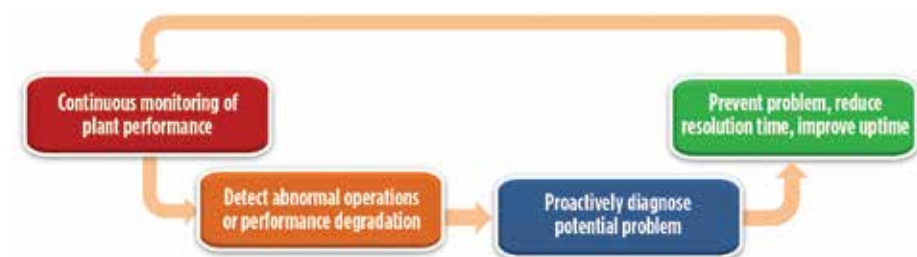


FIG. 2. Proactive monitoring will identify and diagnose abnormal plant operations preventing degradation of equipment performance.



FIG. 3. KBR's InSite provides data visualization, analysis and reporting, as well as expert advisory services.

US OIL EXPORTS TO MEET 5% OF NON-US GLOBAL DEMAND BY 2022

Crude oil exports from the US will increase to meet 5% of global demand by 2022, as refiners seek more low-sulfur crude to meet stricter rules for cleaner fuels, according to Enterprise Partners LP.

US oil exports may rise to 4 MMbpd by 2022, a four-fold jump from this year. During that same period, global oil demand (excluding the US) may rise to as much as 73 MMbpd, up from the present 65 MMbpd.

Demand for light, low-sulfur, or sweet, crude is set to rise, as countries push refiners to pro-

duce cleaner fuels, as highlighted by the International Maritime Organization's (IMO) new rules to cut the sulfur content in the fuel used in large container ships, or bunker fuel, by 2020.

US crude oil production has spiked following the higher output of low-sulfur crude from shale formations since the late-2000s, causing a glut in domestic crude supplies. US refiners, however, are geared toward processing denser oil with a higher sulfur content.

Enterprise presently exports around 100 Mbpd of crude oil from the US Gulf Coast.

To ramp up exports, the company plans to increase the loading rates at the Enterprise Houston Midland terminal by the first quarter of 2018, and is looking at stabilizing the quality of Domestic Sweet crude (DSW) exports from its Seaway terminal.

More US oil exports are also expected, as most US refiners will not change their configurations to accommodate domestic light, sweet crude oil.

The change in the bunker fuel specifications will also boost US export demand, Enterprise said. ●

Things (IIoT), etc. This is all very complicated, and organizational responsibilities can cross multiple boundaries.”

Dr. Dawkins said that the most popular question he hears from businesses is how to navigate the sea of complexity with new vendors and with the new technologies that are consistently being released. One of the biggest challenges is determining what is real and what is not when it comes to new security technologies and stories that may be spread in the media about cyber security.

“Ultimately, from a company’s standpoint, the question is what to invest in,” Dr. Dawkins said.

Many organizations face a lack of resources, and some do not even have an IT department. They want to be secure, but many companies have found that they are forced to outsource their security.

“If the budget is limited, or not there at all,” he said, “the problem becomes determining a company’s risk and really defining a return on investment (ROI) for security spending.”

Another question companies have is when to adopt new technologies. For example, if a new artificial intelligence technology is released, the CEO or executive team might wonder why that technology has not been adopted yet.

“I do not think that there a definitive answer in this area of early adoption,” Dr. Dawkins said. “The only real answer comes down to thinking through problems and then trying to

figure out the best move that you can. It really comes down to maintaining continuous improvement.”

If the correct cyber security is not implemented, based on the needs of the company, a security program can actually become a detriment and a waste of time, money and resources.

“We spend a lot,” Dr. Dawkins said. “We think we are doing the right things, but sometimes simply addressing the challenges of security can hurt us. Believe it or not, there are organizations where cyber security is hindering the business from moving and growing. Sometimes these companies are spending money and trying to increase coverage without any sort of tangible ROI.”

What these issues highlight is how cyber security usually cannot be outsourced, Dr. Dawkins said, and companies must learn to manage and solve these issues from within.

“We have to continue to innovate and do research in the realm of how to handle risk,” Dr. Dawkins said. “The main methodology to accomplish this is through risk assessment, and identifying and dissecting threats. Security is not solely an IT problem, it is a business problem.”

Dr. Dawkins has experience in regulatory compliance, technical risk assessments, penetration testing, web application vulnerability analysis and secure coding. He has authored several publications and often presents at national and international conferences. ●

MATRIX GLOBAL PLANS US SWEET CRUDE STORAGE CONTRACT AMID EXPORT GROWTH

Matrix Global Holdings is planning an oil storage futures contract for low-sulfur crude oil that will enable companies to build up supplies for export cargoes, as Asia looks for more crude imports from the US.

The contract will give holders access to low-sulfur, or sweet, crude oil storage space at the Clovelly, Louisiana terminal operated the Louisiana Offshore Oil Port (LOOP).

Matrix currently hosts a monthly auction for crude storage at the LOOP, and it offers a high-sulfur, or sour, crude oil storage futures contract through the CME Group with delivery at the Offshore Port.

The LOOP is the only US Gulf Coast port that can handle very large crude carriers (VLCC), which are capable of transporting up to 2 MMbbl of oil. The facility will begin exporting crude in early 2018.

Shippers using the LOOP to export would need to accumulate cargoes of between 1 MMbbl and 2 MMbbl before loading. The storage contract allows shippers to build up their supply.

US crude exports, which hover around 1 MMbpd, are anticipated to rise amid growing production from shale oil basins, which typically produce sweet crude.

Matrix Global is also investing in a facility with 6.2 MMbbl of storage at Cushing, Oklahoma, to take advantage of upcoming Canadian crude supplies that will be delivered by the Keystone XL pipeline. Cushing is the delivery point for the US West Texas Intermediate (WTI) crude futures contract.

Matrix is also seeking storage partners outside of the US to launch storage futures contracts and has sights on Asian countries like Singapore, Malaysia and South Korea.

TOTAL EXPECTS PORT ARTHUR, TEXAS REFINERY OUTPUT TO RETURN SOON

Total SA expects production soon from its 225,500-bpd Port Arthur, Texas refinery, which has been shut since an Aug. 30 power outage during Tropical Storm Harvey, a company spokeswoman said last week.

Gulf Coast market sources said the company was proceeding carefully bringing units up to operating temperatures and beginning to circulate feed. None of the units is producing product.

A planned overhaul of the 78-Mbpd, gasoline-producing fluidic catalytic cracking unit (FCCU) and 5-Mbpd alkylation unit began last week and is continuing as planned, according got a Reuters report.

The overhaul is planned to last up to two months, and most of the units not involved in the turnaround are preparing to restart. ●

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Improving distillation column performance

WALLY BAKER, Emerson Automation Solutions

Refineries contain numerous processes where mixed products must be separated via fractional distillation. One common denominator is the use of a distillation column where the actual separation takes place. Mixed vapors are typically introduced at the

bottom and travel up, while reflux liquid flows down. The heavier products eventually go out the bottom, while lighter products go out the top. Some intermediate products may be extracted in the middle.

Different components separate

as they move in opposite directions through the tower, where packing or trays provide desirable temperature profiles and the required two-phase interaction to coax the lighter products out of the mixture. With effective recirculation and internal flows, there can be an enormous amount of surface area for vapor and liquid to interact, encouraging separation to produce a high degree of purity for all resulting streams. Unfortunately, challenges exist, and columns can become a bottleneck for a unit due to flooding.

Column flooding. The primary problem in a distillation or stripping process is column flooding where the amount of liquid is too great, impairing free flow in both directions. When a solid layer of liquid forms in the bottom or in a tray, vapor must bubble through it. Some bubbling is normal, but if the liquid is deep enough, separation largely stops. Such a formation can potentially lead to the column filling with frothy liquid, which can be sent out the top without proper separation.

The automation system controlling the distillation column must modulate process parameters including feedrate, column pressure, reboiler heat duty, reflux ratio, various temperatures, etc. In many cases, however, not all desired measurements are available to optimize these controls, although it is possible to add instrumentation to identify key challenges. This can be done by adding strategic pressure measurements to detect when a layer of liquid is forming. A differential pressure reading measuring the

difference above and below the trays or packing section can indicate when liquid has begun to fill the section, as well as measuring the depth of any liquid accumulations.

Other advantages can be achieved while using a pressure transmitter for this application. The pressure transmitter measures the differential pressure very rapidly, often as fast as 20 times per second, but the analog 4-20 mA signal is usually sampled by the control system at much slower rates, often once per second or slower. It becomes more challenging to infer an actual process change from what may simply be high-frequency noise, so developing problems can be easily overlooked.

Some pressure transmitters can calculate this statistical process information and report changes to the automation system digitally, spotting a meaningful change against the background clutter. When enough data has been collected from these specific DP instruments over periods of effective operation, a change in the standard deviation of the pressure can be reported and tracked as an initial indicator of incipient flooding (FIG. 1). When identified early, corrective measures can be taken before more serious problems develop.

If the problem is left unchecked, liquid will continue to collect in the column until a rise in temperature confirms the problem, at which point it has become a much larger issue that could have been avoided. By adding the visibility provided by temperature and differential pressure points, improved control can be achieved. ●

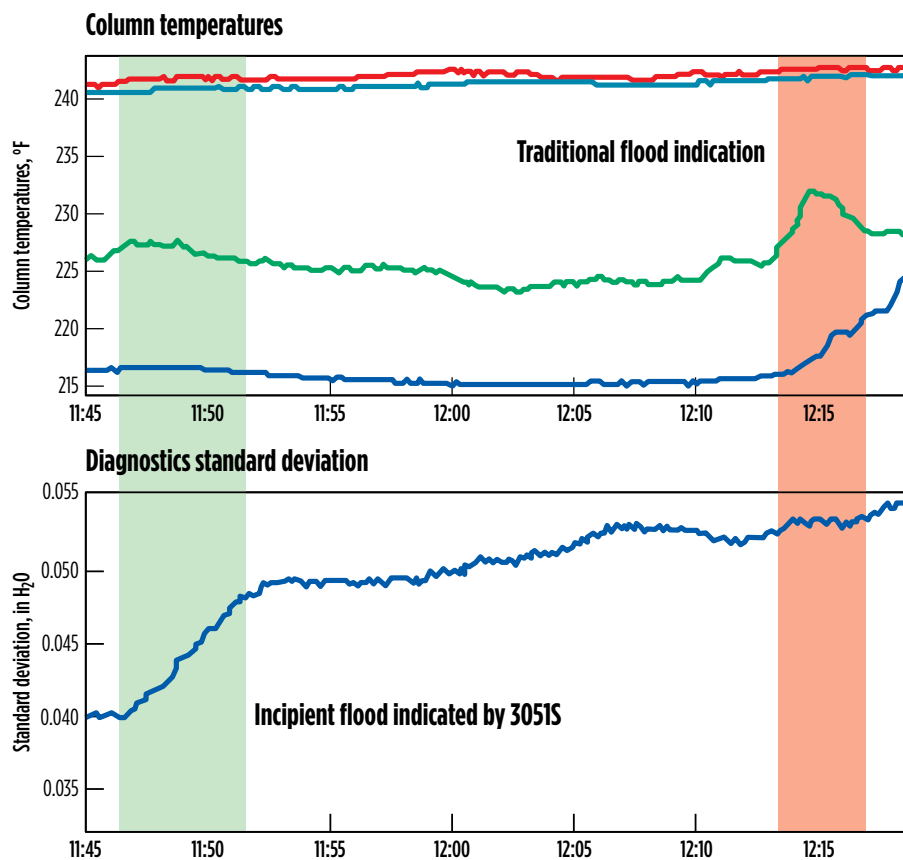


FIG. 1. A change in the standard deviation of the pressure can be identified, reported and tracked as an initial indicator of incipient flooding.

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SIMULATION, continued from page 3

Balcom said. “We must draw them in and make them want to utilize it.” Mr. Balcom explained that to create a simulation package, it has to be viewed from a completely different direction.

“We are not asking what our CPU can do,” Mr. Balcom said. “We are not saying that this is the software we have, and we can migrate this. We have cleared the table.”

In the development of the next-generation platform, industry experts were brought in to create a tool that met the needs of the users, Mr. Balcom explained, and not the other way around. When creating the platform, the needs of certain jobs and how they interact in a workflow were the priority. Each feature was put in with the knowledge of how a user will utilize it in their daily work.

“The was a complete re-engineering of our thinking in creating a tool that is people-centric, rather than computer-centric,” Mr. Balcom said.

The integration of simulation software throughout the engineering workflow is driven by engineering efficiency and accuracy. The new integrated platform now allows for the adoption of new work processes, supporting all phases of the plant lifecycle and reducing simulation effort.

The modern platform also leverages modern IT developments and allows for faster calculation speed, enabling parallel computing. It is built with the cloud in mind. The integration also enables collaboration and adoption of new work processes, allowing real-time changes.

The platform features expanded problem-solving, enables new simulation and allows the leverage of third-party applications.

A library of process utilities, transient flow and processes are available standard on the next-generation platform as well as simulation in the cloud, which features virtual machine-based cloud solutions for training and valuations. The cloud also provides added security by offering a separation of accounts, 24/7 help with any problems that might arise and an open field on how a user would use the platform.

“This is one tool, with one learning curve and built-in collaboration,” Mr. Balcom said.

Mr. Balcom has more than 25 years of experience in manufacturing support, control system design and integration, technology development, reactor design and pilot plant development for the specialty chemicals industries. ●

Bridging the gap between strategy and optimal asset execution

MATTHEW POPOVACKI, T.A. Cook Consultants Inc.

While organizations hope to consistently align all departments, they do not always fully understand the path, approach and level of effort that it takes. Decision-makers must stop differentiating strategic planning as long term, and planning and execution as short term. Multiple (and sometimes conflicting) corporate goals for different functional areas will not align naturally. Even if all major elements are in place, processes cannot integrate on their own.

An enhancement approach must also be strategic. Focusing only on fixing the worst performing process(es) is not enough to attain an asset's overall performance potential. Only strategies that take into account the exertion required to diminish the spaces between multiple functional areas will be capable of ensuring true integration and/or optimal asset performance.

Connecting multiple function areas.

These common challenges typically lead organizations to focus their attention on addressing major gaps within individual functional areas. Unfortunately, this methodology does not correct gaps that might still exist between multiple function areas. Im-

proving performance within an individual functional area will help the efficiency within the management of an asset, but it is insufficient to maximize the performance of the overall asset. As illustrated in FIG. 1, elements that drive and achieve optimal asset performance should fit together to thrive.

Aligning departments is paramount, particularly during turnaround events. These maintenance overhaul projects provide a valuable opportu-

nity to conduct mandatory system improvements offline. To remain competitive, management must formulate a shutdown, turnaround and outage (STO) strategy to help reduce the event's complexity, costs and downtime while enhancing overall production output. To adequately support and execute an STO strategy, the following elements for all of the relevant functional areas must be established during implementation:

1. Long-term event schedule.

A long-term event (five years) Level 2 schedule outlining the regulatory requirements for train outages, turnarounds and shutdowns must be created, and should include the timing of event execution and the timing for packages to be completed for upcoming events (typically

▶ See **PERFORMANCE**, page 12

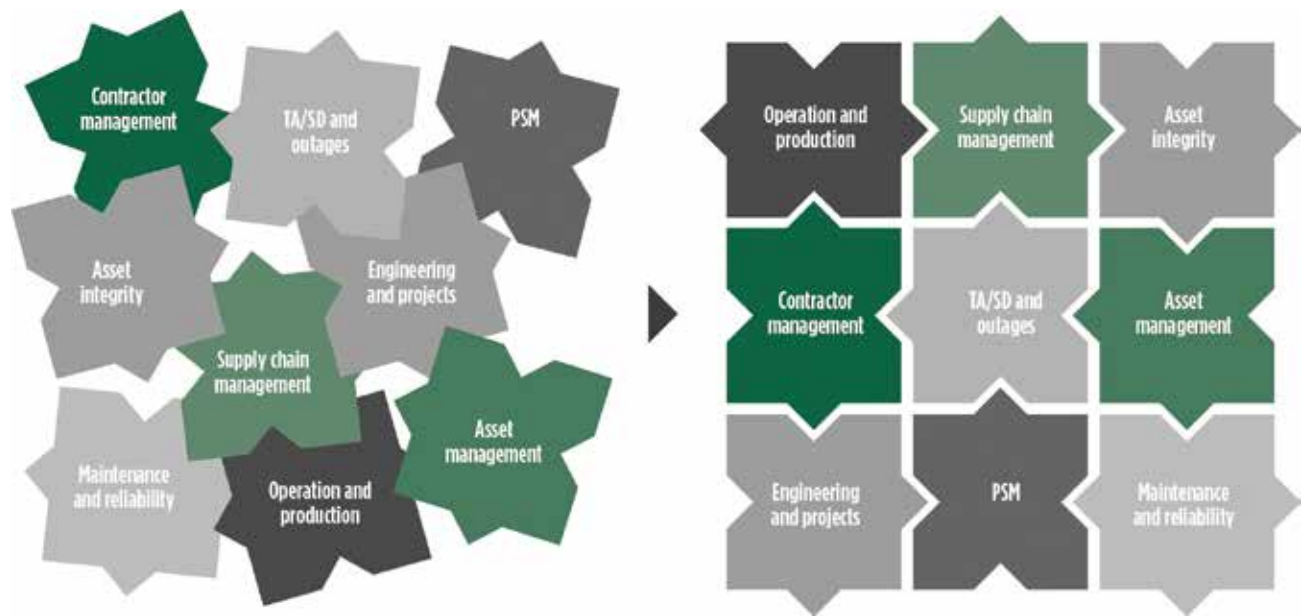


FIG. 1. Aligning departments is paramount to achieve optimal asset performance, particularly during turnaround events.

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A stitch in time saves nine

JEFFREY A. ZURLO, SUEZ—Water Technologies & Solutions

While the well-known proverb, “A stitch in time saves nine,” is older than the hydrocarbon processing industry (HPI), the foundational meaning that timely action is valuable still holds true today. SUEZ—Water Technologies & Solutions applauds AFPM for selecting innovation as the theme for this year’s Summit. The ability to react quickly can improve efficiency, save energy and avoid potential operational issues. Innovations and technological advancements are helping the industry shorten the time between the start of an adverse situation and the ac-

tions taken to correct it, and even to predict it before it happens.

The last 10 to 15 years have witnessed more significant, innovative changes in the industry than the previous five decades. Advancements such as significantly reduced tight oil production costs, the export of domestically produced hydrocarbons, wireless communication meshes and the emerging adoption of the Industrial Internet of Things (IIoT) are transforming the face of domestic hydrocarbon production and refining. These are truly exciting times for our industry.

As a major solutions provider to the hydrocarbon process industry, SUEZ—Water Technologies & Solutions remains committed to advancing technology development. The application of new tools allows teams to respond more quickly, and enables improved decision-making to determine the best corrective actions. Innovation has created additional onstream sensors to continuously monitor system performance and treatment levels, developed new methods to measure properties previously hidden, and allowed big data analytics to predict and prevent potential problems. Automated alarming allows for near-instantaneous responses to changing conditions.

Traditional methods for measuring, recognizing and responding to corrosion events have resulted in inconsistent performance results across systems. Beginning about 10 years ago, the continuous measurement of system corrosion rates has been coupled with onstream sensors and closed-loop chemical injection control to improve response to corrosion events. More recently, dynamic measurement of salting potential and safe operating windows have further improved corrosion rates. FIG. 1 shows three separate, 60-day periods on the same system where corrosion exceeded the target: the blue area represents continuous corrosion measurement, but manual control; the orange area shows the value of closed-loop control of the chemical treatment and automated alarming of corrosion rates; and the gray area indicates further improvement from dynamic system salting calculations. Although these are specific examples from one system over time, they are representative of general improvements seen across multiple systems in reducing the time to correct and lower corrosion peaks. Additionally (but not shown), the frequency of corrosion events is improved as new technology is ap-

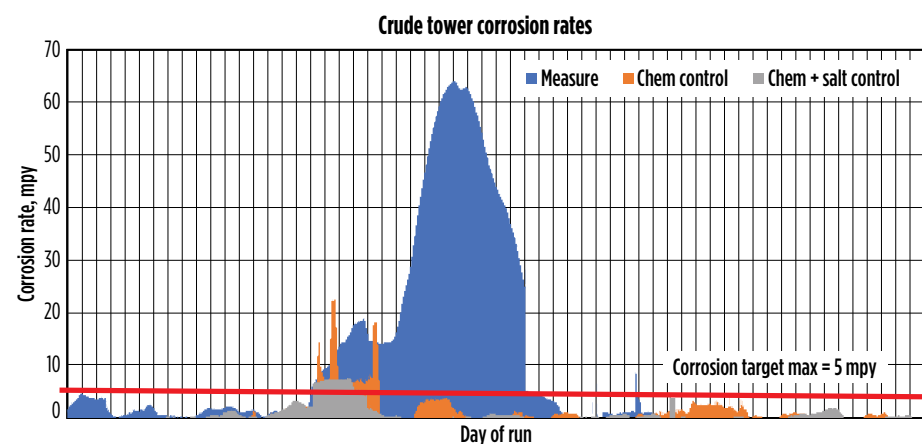


FIG. 1. For three separate, 60-day periods on the same system where corrosion exceeded the target, the blue area represents continuous corrosion measurement, but manual control; the orange area shows the value of closed-loop control of the chemical treatment and automated alarming of corrosion rates; and the gray area indicates further improvement from dynamic system salting calculations.

Utilizing innovation to reduce corrosion. One example of adopting innovation to improve system performance is reducing corrosion in the crude tower overhead system, which can be complex to control. Acidic, salt-induced and velocity-assisted are the three main corrosion mechanisms. Corrosion can be driven by multiple factors, including chemistry, contaminant level and type, operating conditions and mechanical factors.

Despite the associated difficulties, the factors that lead to corrosion have traditionally been measured and controlled on a relatively infrequent ba-

► See **INNOVATION**, page 12



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SAVE THE DATE

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WHERE:
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Catalyst handling: Best practices to obtain optimum catalyst performance

In today's competitive environment, the performance of every asset is essential. The design and implementation of the most effective catalyst handling and loading solution must be executed with the same rigor as the development and selection of the catalyst. As soon as a catalyst is manufactured and packaged, it enters the realm of catalyst handling activities until it is loaded into the reactor, activated and processing the desired feed streams.

Catalysts manufactured by Criterion Catalyst and Technologies and its affiliates (FIG. 1) meet highly specialized performance specifications and rigorous quality standards, as defined by our ISO certification and QA/QC processes. Ensuring that a carefully and expertly designed solution reaches its full potential in your reactor requires proper catalyst storage, handling and loading.

Best practices to protect investment and achieve maximum value. Catalysts are transported to the refinery in drums or bags per proper regulations, and special care should be taken to ensure catalyst packages are not damaged and to minimize container exposure to the elements (snow, rain, sun, etc.). The safety data sheet and

any safe handling guidelines provided with the catalyst shipment should be reviewed and followed to ensure proper storage and handling until the reactor is ready to be loaded. Key storage considerations include:

- An enclosed warehouse equipped with a sprinkler system
- Away from high traffic areas
- No UV exposure
- No combustible flammables nearby
- No roof leaks.

Product sampling after delivery can be misleading, as a sample taken from the top or just below the surface of a container is most likely to not yield a representative sample. The best source of product quality is to review the certificate of analysis.

Preparing the reactor for loading.

Hiring a qualified loading contractor is a critical step in ensuring a good catalyst load. Qualified and competent loading contractors stay up to date with new technologies and established industry standards, and take responsibility for all aspects of the catalyst work.

Several critical aspects of the unloading of the previous catalyst load cannot be overlooked. It is critical that reactor internal components be

inspected for damage that must be repaired, and that the reactor is "clean" prior to loading of the fresh catalyst.

During loading, each bed of the reactor should be inspected to ensure that the:

- Bottom basket and seals are installed properly
- Catalyst support grid seals are properly installed at all locations (at the support beam, along the wall, between the tray panels)
- Reactor internals are installed properly and are clean
- All internal trays are installed using a ceramic fiber gasket, including inspecting areas where thermowells penetrate the tray sections and around the outer diameter of the reactor; and that all gaps are filled
- Distributor and quench tray sections are level within the manufacturer's specifications.

A significant loading issue occurs infrequently (< 5% of catalyst loadings), but *potentially* significant issues occur more frequently. The quality of the loading contractor and onsite refinery supervision dictate whether a potential issue will be noticed, corrected and prevented, or if it will be missed and become a significant issue that impacts the subsequent cycle.

For complex loads, highly experienced Criterion loading support consultants (specialists) provide additional assurance that catalyst is loaded as correctly as possible. A unit support engineer may be inexperienced in the nuances of catalyst loading, and Criterion specialists have provided expert consultation in numerous catalyst loadings, handling issues that may not be readily apparent and providing guidance to ensure a better catalyst load. Good working relationships with many of the loading contractors facilitates efficient and high-quality catalyst loadings. Having a catalyst supplier that provides these services is a clear advantage in achieving the desired performance objectives of the hydroprocessing unit. ●



FIG. 1. The Criterion technology solutions family.

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plied—out-of-control events occur less often, even under similar operating conditions.

A second example (FIG. 2) illustrates the benefits of using new, on-the-spot measurement of crude oil blends in the refinery tank farm to predict blending compatibility and fouling potential of the crude oils. This information can be used for several purposes; in this case, it helps determine the correct compatibility aids and fouling control strategies to reduce crude unit preheat fouling. Despite the refinery moving to a crude diet with worse fouling and compatibility profiles, the ability to rapidly determine issues and respond prior to processing the challenging crude oil slates resulted in a reduction in system fouling of 96%, due to the proper application of a crude stabilizer (CS) and antifoulant (AF) treatment program. This is further evidenced when this refinery was

cleaning six preheat bundles during the operating run of the crude unit; with the new protocols, no bundles required cleaning between maintenance turnarounds. Nearly \$6 MM/year in net energy, maintenance and throughput savings were realized over the last operating run.

Innovation advancements are taking place throughout refinery processes, and the discussed examples are only small illustrations of what is being developed and applied. From recognizing crude quality to utility efficiencies, to asset protection and providing 24/7 assurance of system performance, technology advancements will continue to change the face of the refining industry for the better. To find out more about how technology can help your refinery, please attend the sessions at the conference and visit the SUEZ—Water Technologies & Solutions professionals at booth #30 in the exhibition hall. ●

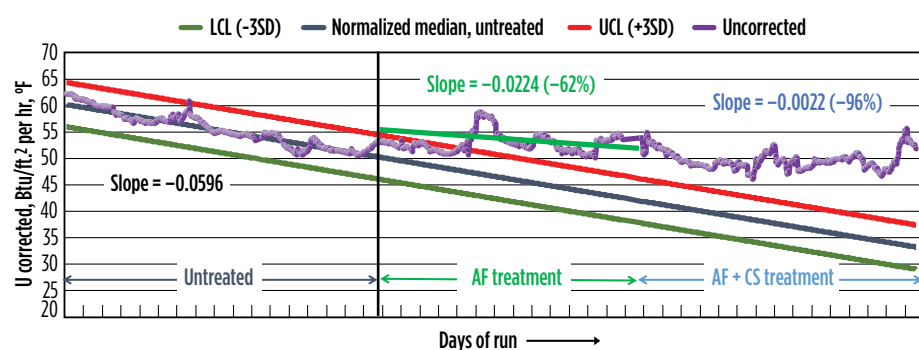


FIG. 2. The benefits of using new, on-the-spot measurement of crude oil blends in the refinery tank farm to predict blending compatibility and fouling potential of the crude oils.

one year prior). It is essential that the five-year plan support corporate production goals and revenue forecasts.

2. **Milestone plan.** A detailed milestone plan includes best-practice milestone due dates and deliverables that account for all activities from inception, front-end loading, execution and post events.
3. **Milestone description.** A description of milestones outlines the purpose, personnel accountable, deliverables, tools and templates available for completion.
4. **Milestone task breakdown.** The individual tasks required of each functional area to complete agreed-upon deliverables must be outlined. The breakdown should include a description of the task, an outline of who is responsible, accountable, consulted and informed (RACI) for each task, and the time requirement for each task.
5. **Integrated resource requirements.** A comprehensive outline of the required resources should be calculated monthly by functional area in real time, and the gaps for facilitating a successful long-term STO strategy must be determined.
6. **Management control reporting system (MCRS).** Best practice key performance

indicators (KPIs) and meeting structures must be communicated, variances to plan should be identified, and action plans should be driven to stimulate performance and address variances.

Takeaways. To maximize profitability in a global, competitive environment, organizations are expected to consistently deliver on production demands while maintaining optimal asset performance. Successful strategies do not execute themselves, and to deliver on their strategies, organizations must increase visibility across multiple functional areas and effectively integrate their processes. A more holistic, tactical and structured approach that is focused heavily on integrated planning should be adopted, so that the large gaps typically found between long-term strategic visions and actual performance can be minimized.

Incorporating a structured approach, such as an STO strategy, allows organizations to engage all functional area processes and eliminate silos between departments. This enables companies to take advantage of the synergies within different functional areas and to deliver on strategies that will represent a more profitable and optimal performance of assets in the long term. Leveraging an STO strategy will ensure that the “sum of the parts is greater than the whole,” and that real sustainability can be achieved. ●



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Advanced data analytics: Simplified and applied to condition monitoring

PETER VERDERAME, SANJAY MEHTA and WILL HANLON, Air Products

The advent of digital control systems, data historians and additional sensor monitoring are creating ever-increasing amounts of data that are interconnected through the Industrial Internet of Things (IIoT).

Sorting through the data produced by these highly integrated, multiple-feedback processes requires a new type of platform to extract actionable insights at the process and equipment level. Identifying this need, Air Products' Computational Modeling Center developed ProcessMD™, a web-based, predictive-monitoring and fault-diagnostic platform that uses advanced analytics in the form of state-of-the-art statistical multivariate techniques to de-noise process signals. ProcessMD captures the correlation among plant and equipment signals and transforms huge plant datasets into concise information and predictive indicators, providing engineers with foresight and insight into asset performance in ways not previously possible. Rather than being monitored by broad, fixed-alarm points, the process undergoes an ongoing "health check" through multivariate algorithms that, in turn, help to identify equipment deterioration and process upsets well ahead of traditional sensors (FIG. 1).

ProcessMD continuously monitors process operations in real time, and a summary dashboard allows for the rapid visual evaluation of equipment/process health for various assets. When an issue is recognized, the engineer can quickly deep-drill to the specific equipment/process of interest and then leverage the multivariate techniques to identify a root cause. ProcessMD has proven its worth at 44 hydrogen (H₂) steam methane reforming (SMR) units, more than 200 air separation plants, 278 standard product plants and thousands of individual machines across the fleet.

Primary analysis functions. The primary functions of ProcessMD revolve around analysis at two levels: process condition monitoring and equipment condition monitoring. Process condition monitoring seeks to capture the "heartbeat" of the process by isolating external influences from internal process levers. Based on these process levers, data-driven models track and rationalize the variability in key process indicators (KPIs) and then identify clear, actionable steps to restore stable operations.

Similarly, equipment condition monitoring develops empirical models that track the health and functionality of a piece of equipment at specified levels of granularity. These models can be applied to both fixed and rotating equipment to monitor bearing temperatures, machine vibration levels, etc., through adaptive control limits. Both systems utilize a proactive alert system that sends push notifications to the appropriate parties, allowing them time to plan and take preventive actions for the process or for specific pieces of equipment.

In an SMR, it is important to maintain the efficiency and reliability of the forced draft fan to ensure sufficient airflow for combustion, which provides the necessary heat to drive the reforming reaction. At an Air Products site, ProcessMD proactively identified that the motor winding temperatures associated with the forced draft fan were deviating from their adaptive control limits. Reliability engineers received an automated alert and notified the site maintenance team, which performed an online inspection that revealed that dirty air filters were causing a lack of cooling airflow. The filters were replaced, improving the associated motor winding temperatures and preventing an overheating of the motor components and any associated collateral damage, such as an unplanned SMR shutdown.

In another example of process condition monitoring generating value, the interacting conditions that led to hydrogen production limitation at an SMR site were identified. As with most highly integrated, complex manufacturing processes, multiple contributing factors lead to a deviated KPI. ProcessMD ascertained that a combination of both heat exchanger fouling and increased pressure drop on a downstream process unit affected the plant's ability to meet expected production rates. After maintenance was performed on the respective units, maximum production was restored.

With so much data and so many measurements to track in most manufacturing facilities, problems can go undetected until they cause a critical failure, which is costly to both operating companies and their customers. Through advanced data analytics, these enormous datasets can be transformed into concise representations of the process and identify outlying conditions. For Air Products, Pro-

cessMD is that asset doctor—diagnosing process issues and unlocking value from data.

As the world's leading hydrogen supplier, Air Products owns and operates numerous SMRs and the world's largest H₂ distribution network. The energy-intensive reforming process requires efficient operation and maximum onstream reliability. ProcessMD provides both in the form of predictive analytics and optimal operation, resulting in multimillion-

dollar annual cost avoidance and productivity benefits.

Be sure to attend Air Products' presentation in "The Bards of Hydroprocessing" principles and practices session Wednesday morning at 8 a.m. The discussion will include how SMR efficiency is producing more H₂ for a given amount of natural gas, improving efficiency and profits.

To learn more about Air Products' ProcessMD, visit the team at booth #8 in the exhibition hall. ●

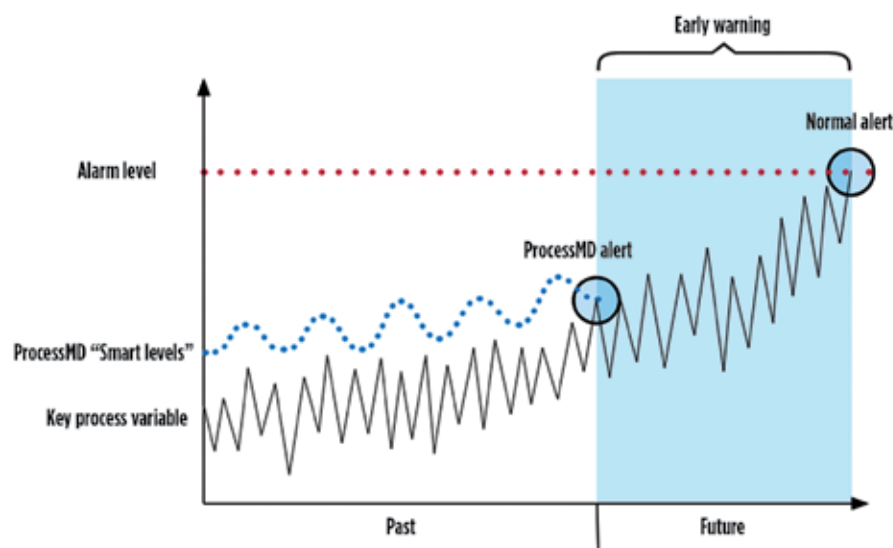


FIG. 1. Data and predictive analytics at production facilities can reduce operating costs while improving asset safety, reliability and efficiency.

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UPCOMING AFPM GATHERING

Environmental Conference

October 15–17, 2017 / Denver, Colorado

The AFPM Environmental Conference focuses on regulatory and policy issues at the plant level. Hosted at the Grand Hyatt Denver, the conference will consist of both technical presentations as well as Q&A sessions. The program will address the impacts of environmental regulations on refineries and petrochemical plants and provide facility compliance mechanisms.

SCENES FROM THE 2017 AFPM SUMMIT



- 1 The capable and friendly AFPM staff welcomed this year's attendees.
- 2 AFPM attendees had the opportunity to pose for professional portraits Sunday night.
- 3 **Warren Letzsch** from Technip USA points to his image as part of the Summit's 70th Anniversary display. As an important part of AFPM's legacy, he first attended the event in 1970, and sat on his first panel in 1973.
- 4 Guest **Alyssa Taley**, **Joe Musumeci** of Ascent Engineering, **Teresa Brod** from Criterion Catalysts and **Sharon Watkins** of Monroe Energy stopped to share their excitement for another great conference.
- 5 Reconnecting with friends and colleagues is always one of the highlights of the Summit Kick-off Networking Event, which was sponsored this year by Crystaphase.
- 6 The team from **Technip** welcomed visitors Sunday night with a football-themed suite.
- 7 A 1920s flapper welcomed guests to The **DuPont** Speakeasy on Sunday evening.
- 8 **Honeywell UOP's** hospitality suite showcased the company's technologies and enthralled visitors with a virtual reality experience.
- 9 Monday morning's Q&A Session: Gasoline Processes featured technical data and explanations from an expert panel that included (from left to right) **Geoff Dublin** from Axens North America, **Bryan Kinderman** from Clariant, **Alexander Sabitov** from Phillips 66, **Kyle Sharon** from Valero and **Patrick Sugg** from UOP.

POWERING AHEAD IN 2018



AFPM 2018 Meetings

Annual Meeting

March 11 – 13
New Orleans Hilton
New Orleans, LA

International Petrochemical Conference

March 25 – 27
Grand Hyatt
San Antonio, TX

International Base Oils and Waxes Conference

March 25 – 27
Grand Hyatt
San Antonio, TX

Security Conference

April 23 – 25
Omni Royal Orleans
New Orleans, LA

Labor Relations/ Human Resources Conference

April 26, 27
Omni Royal Orleans
New Orleans, LA

National Occupational & Process Safety Conference

May 15, 16
Grand Hyatt
San Antonio, TX

Reliability & Maintenance Conference

May 22 – 25
Henry B. Gonzalez Convention Center
San Antonio, TX

Cat Cracker Seminar

August 21, 22
Royal Sonesta
Houston, TX

Operations & Process Technology Summit

October 1 – 3
Atlanta Marriott Marquis
Atlanta, GA

Environmental Conference

October 14 – 16
Marriott Rivercenter
San Antonio, TX



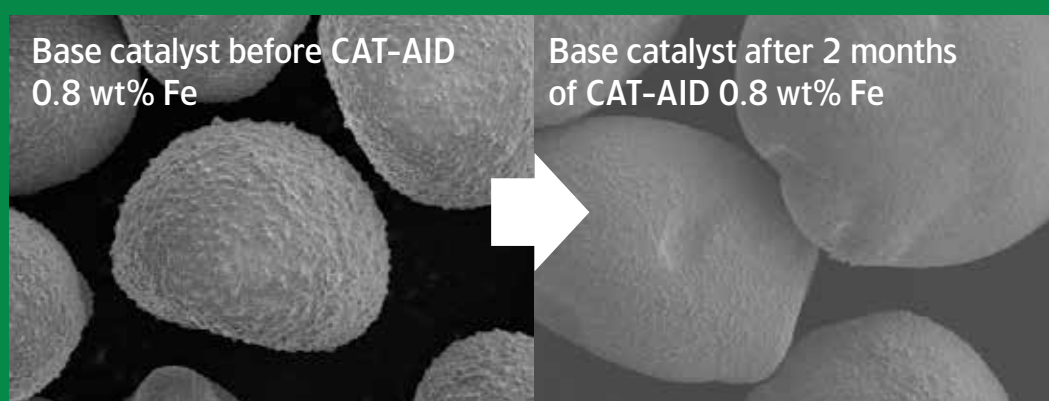
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