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DAY THREE

Thursday, 29 October 2015

Women in Energy panelists: Gender diversity equals corporate success

ADRIENNE BLUME, *Gas Processing*

On Wednesday afternoon's inaugural Women in Energy (WIE) programme panel, Phaedra Deckart, Head of Wholesale Gas for AGL Energy Ltd., addressed the largely female audience by emphasizing the importance of gender diversity and the need to pull more women into senior leadership positions, with a target of 50% representation.

She noted that companies with more diverse leadership and stronger gender diversity are more successful. For these reasons, it is imperative that companies encourage diversity of thought, challenge discussions at the leadership level, and push for equal representation for women at the senior leadership level.

Wanted: More women engineers!

Dame Julia King, Vice Chancellor of Aston University, next addressed attendees with an opening keynote on women in energy in the UK. Not enough women in the UK are progressing to higher education levels in subjects that are prerequisites for the engineering field. She noted that this is not a universal scenario, however; for example, in Singapore, girls and boys do equally well in mathematics, in contrast to many Western countries.

The chemical engineering field has the greatest percentage of women, at 25%. However, the rest of the engineering disciplines are made up of only 15% women. Furthermore, in 2013, just 4% of the UK oil and gas workforce was made up of women. This low percentage can be explained partially by unconscious bias—the tendency for companies to recruit and hire people who are similar to the majority of the organization's personnel. In the UK, this means white, Anglo-Saxon men, King noted.

"We still have a big jump to make if we're going to get more women into our energy industries," King said. But why are more women needed in engineering fields? The answer, quite simply, is that companies with more diverse leaderships and workforces are proven to perform better.

Diverse teams are more innovative, more flexible, avoid group think and tend to engage in better decision making. However, diverse teams are also harder to manage due to higher absenteeism and staff turnover, more difficult communication and social integration, and the need to manage differences of opinion.

"The diversity and the success you get from these teams is what make them harder to manage," King acknowledged. How-

ever, it has also been proven that companies with diverse boards have better financial performance.

"Meeting diversity targets is not about putting people into jobs who aren't capable," King said, in closing. "These targets are about putting people into jobs who can competently make changes, and we must continue to do that."

Women workers help fight poverty.

Yenni Andayani, Director of Gas, New and Renewable Energy for Indonesia's PT Pertamina, shared her thoughts on women in the energy workforce, particularly as a means of mitigating poverty.

By 2035, primary global energy consumption will rise by 56%, and more than half of the world's economic growth will take place in Asia-Pacific, Andayani explained. Access to energy is integral for fighting poverty. "Energy today is not just an industrial matter any longer. It is an issue for everyone," the director said. Economic growth is linked to women in the workforce, and more women in the workforce helps to eliminate poverty. The United Nations' targets to eliminate poverty are

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DAME JULIA KING, Vice Chancellor of Aston University

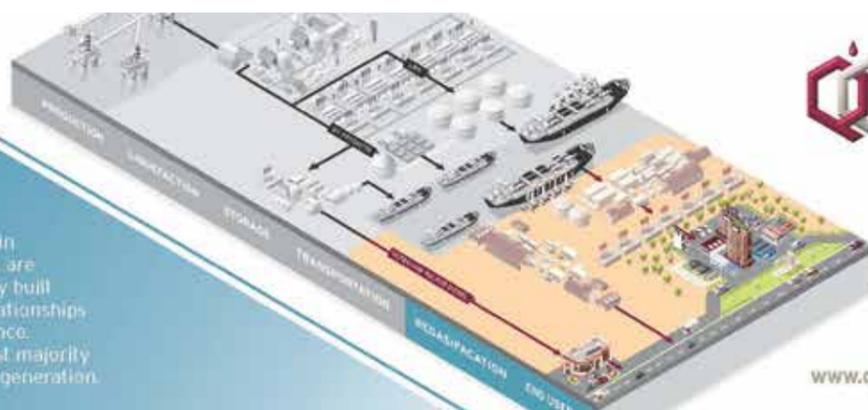


PHAEDRA DECKART, Head of Wholesale Gas for AGL Energy Ltd.

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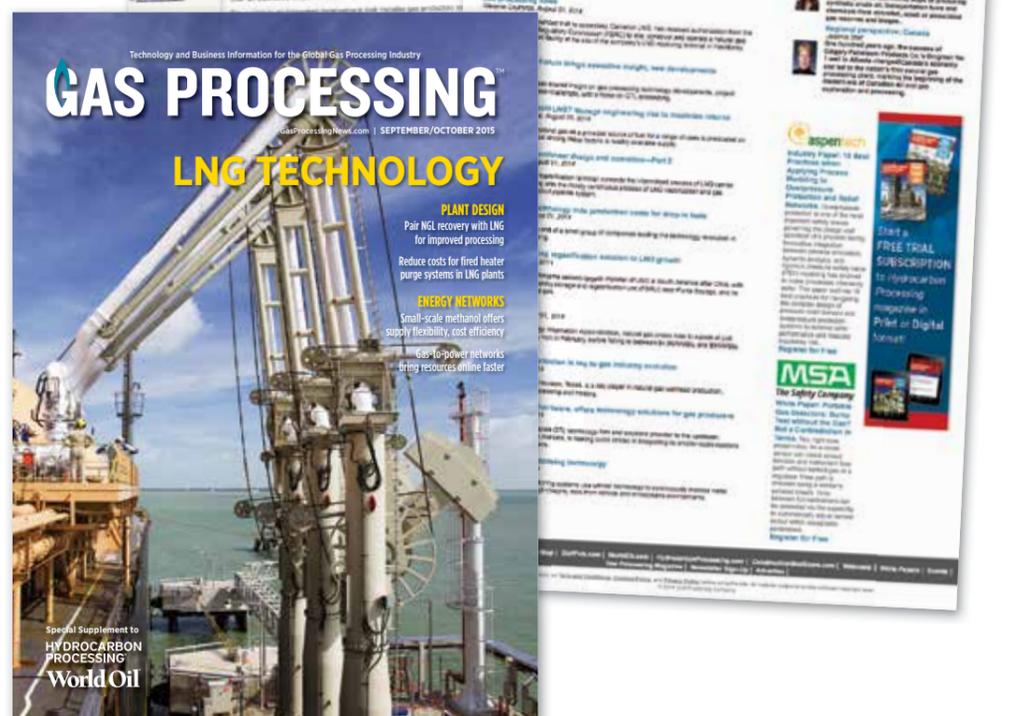
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Reform is key to China's future gas demand growth

ADRIENNE BLUME, Gas Processing

At the commercial stream on Wednesday morning, Xianfeng Ren, China Market Fundamentals Manager for BG Group, posed the question: Has the Chinese market hit a turning point?

"China has become a hot spot again, especially this year," Ms. Xianfeng stated. "There are a lot of questions about what is going on in the economic markets and in the gas markets." Between 2014 and 2015, China expects to lose about one year of demand growth. "That is going to have a significant impact on global gas demand," she said.

Economic and non-economic drivers.

Ms. Xianfeng examined China's drivers, both economic and non-economic, for gas demand growth. Economic drivers are based on the relationship between GDP growth and gas demand growth. However, if economic drivers were the only factors at work, China would still be posting double-digit demand growth, Ms. Xianfeng acknowledged. In the first half of 2015, however, growth was only 3%. The large gap comes from non-economic factors in addition to the effects of the severe economic recession, she explained.

Many economic and energy market transitions are underway in China. Rebalancing is occurring on both the demand and supply sides of the gas market, as China's gas demand structure is a mirror image of its economic structure. Approximately 60% of China's gas demand is directly related to investment and industry. "Basically, China is caught in the transition period for gas demand," Ms. Xianfeng said. "In that transition period, some sort of volatility is inevitable."

An institutional transition is also underway as the market grows. Traditionally,

the Chinese government tightly controls the gas value chain. National oil companies control upstream exploration and production, along with midstream pipelines. Meanwhile, provincial pipeline companies and local distribution companies control downstream distribution.

Gas as a commodity. Ms. Xianfeng explained that gas is becoming more like a commodity in China, rather than just a utility product. As a commodity, China's gas needs a market; it needs a stable pricing structure; and it needs more market participants and new entrants. It will be desirable to break up the value chain so that new participants can capture value from the value chain more easily. China is presently working to split up and diversify the value chain and deregulate prices.

However, Ms. Xianfeng noted that China's market reform has failed to deliver pricing flexibility, which has led to demand destruction. Over the short term, China must establish real linkages between its gas and oil prices, and it must establish bilateral trade over the medium term.

Low-carbon goals in sight. China must also use gas to facilitate its transition to a low-carbon fuel mix. China has made a commitment to reduce its carbon intensity level by at least 60% from the 2005 level by 2030. To reach its goal, the country must improve fuel efficiency and utilize a combination of solutions, including natural gas, non-fossil fuels, and energy efficiency improvements. China is aiming for a balance of 20% non-fossil fuels and 20% gas in its energy mix by 2030.

China also has the ability to utilize much more gas in its residential sector, as many rural households still rely on coal for power.

Urbanization is occurring at a slower rate than is seen in other developing economies, Ms. Xianfeng noted. The industrial sector still consumes large volumes of coal, with China's 600,000 industrial boilers burning mostly coal. Ms. Xianfeng cited 200 billion cubic meters per year (Bcmy) to 450 Bcmy of potential incremental new gas demand by 2030 from converting coal to gas in the industrial sector.

Energy reform is needed. In summary, Ms. Xianfeng noted that the recent Chinese market downturn has interrupted the country's decade-long double-digit growth trajectory, although this should not be a turning point for a "new normal." One factor that will ultimately shape China's

gas market outlook is the country's fuel-mix choices, which will require robust gas consumption growth.

The gap between what is required by the fuel mix transition and the status quo scenario can be closed if the right policy responses are taken, she said. These responses include the completion of economic transition and consolidation, the building of a more flexible pricing mechanism, the implementation of energy market reforms, the enforcement of stricter environmental regulations, and the unleashing of demand potentials from urbanization and income growth.

In closing, Ms. Xianfeng asserted, "I can summarize my entire talk in one word: reform." ■



XIANFENG REN, China Market Fundamentals Manager for BG Group

BP, CNPC TO WIDEN GLOBAL PARTNERSHIP

In an expansion of their ongoing global partnership, BP and China National Petroleum Corp. (CNPC) have entered into a framework agreement on strategic cooperation covering potential shale gas exploration and production in the Sichuan Basin, future fuel retailing ventures in China, and other international partnerships.

"The success of our Rumaila oil field project in Iraq has convinced us that there are more opportunities for cooperation between CNPC and BP," said BP CEO Bob Dudley. "This strategic partnership not only strengthens the relationship between the UK and China's largest energy companies, it also further cements the relationship between China and the UK as global business partners."

The agreement, which was signed during a UK visit by Chinese President Xi Jinping and UK Prime Minister David Cameron, is expected to add several billion dollars in future trade to BP's significant business with China.

"CNPC and BP have enjoyed a long-standing, cooperative relationship involv-

ing projects both inside and outside of China," said Wang Yilin, CNPC Chairman. "This framework agreement on strategic cooperation will further facilitate our two companies' joint efforts in exploring opportunities on a global scale, be conducive to enhancing cooperation, and take our strategic partnership to a new height."

In addition to these agreements, BP and CNPC plan to explore oil and LNG trading opportunities globally, work together on carbon emissions trading, and share knowledge regarding technology and management practices.

"BP has been committed to doing business in China for more than 40 years, and we are pleased to expand a partnership that supports the continued growth of the Chinese energy sector," said Edward Yang, BP China President.

"We expect China's energy production to rise 47%, and its consumption to grow 60%, by 2035, making it the world's largest energy importer. Through this agreement and others, BP is committed to being one of China's preferred energy partners, now and in the future." ■

Gastech

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CoTEs session preview—Expanding capacity of cryogenic plants through modular design

During one of Thursday morning's CoTEs LNG Facilities and Infrastructure seminars (11:30–11:55), Loren Pieper, VP, Processing and Treating, SNC-Lavalin/Valerus, will present a case study, "Modular approach expedites facility design for expanded capacity of cryogenic plants."

When growing market demand required the expanded capacity of two cryogenic plants in the Mid-continent area in the US, a modular approach to facilities design was used to add a new 200-MMscfd cryogenic plant and improve overall efficiency while meeting stringent environmental permit requirements. The complete turnkey project comprised full facility design and construction, commissioning and startup of the

plant, with a delivery timeline of 73 weeks, including meeting the equipment design requirements for minimum emissions in a US Environmental Protection Agency (EPA) non-attainment zone.

A review of the project shows how the modular approach saves time by allowing for parallel processes such as fabrication, permitting and logistics, and improves scheduling through simplified procurement and delivery. A repeatable manufacturing process reduces equipment costs while delivering "plug and play" capability that easily accommodates expansion needs.

Using the modular approach, full facility design and installation of the total EPC turnkey project was completed in

17 months, including civil, structural, mechanical, electrical, construction, construction management, commissioning and startup of the plant.

In addition to creating a modular facility for more efficient design and maintenance, this approach also enabled rapid modification of equipment to meet EHS Department and EPA permit requirements.

Providing capabilities that proved critical to bringing on the new assets quickly, this modular design delivered a rapid return on the capital outlays required to meet growing market demand. ■

Attend this and other informative CoTEs seminars, and visit the SNC-Lavalin team at #C145 for further discussion.



LOREN PIEPER, VP Processing and Treating, SNC-Lavalin/Valerus

CoTEs—THURSDAY 29 OCTOBER 2015

	OFFSHORE TECHNOLOGY (Exhibition Theatre A)	LNG FACILITIES AND INFRASTRUCTURE (Exhibition Theatre B)	SMALL- AND MID-SCALE LNG (Exhibition Theatre C)
Introduction 10:15–10:30	Moderator Introductory Remarks Patrick Janssens, Vice President, Global Gas Solutions, ABS		Moderator Introductory Remarks James Brown, Regional LNG and Gas Consulting Manager, DNV GL
Session 1 10:30–10:55	Developed Solutions for Offshore LNG Transfer Nicolas Duhamel, Director Business Development, Sales and Marketing for Loading Systems, FMC Technologies, Inc.	LNG Train Continuous Operations Awadh Brek Al Jaber, Vice President (Operations), Abu Dhabi Gas Liquefaction Company Ltd. (ADGAS)	Opportunities for Small-Scale LNG in APAC: Learning from the Norwegian Experience Egil Rensvik, Science and Technology Counsellor South and South East Asia, Innovation Norway
Session 2 11:00–11:25	Generic FEED of KSMR LNG FPSO Chul Gu Lee, Principal Researcher, KOGAS R&D Division	Side-Stream in Large-Scale LNG Production as Power Generation Fuel Kari Punnonen, Business Development Manager, Wärtsilä Corporation	Challenges and Opportunities in Small- and Mid-Scale LNG in South East Asia Stéphane Maillard, Business Development Manager, South East Asia, GTT
Session 3 11:30–11:55	Rethinking Offshore Power Generation: What, How and Where? Suresh Govindaraj Rao, Sales Manager, FPSO, Wärtsilä Corporation	Modular Approach Expedites Facility Design for Expanded Capacity of Cryogenic Plants Loren Pieper, Vice President, Processing and Treating, SNC-Lavalin/Valerus	Standardizing Small-Scale LNG Infrastructure for Cost Effective Deployment Derek Thomas, Director, AG&P
Session 4 12:00–12:25	FLNG Coming of Age as a Solution for Stranded Gas—A Technical and Regulatory Review Tor-Ivar Guttulsrød, Director, Global Gas Solutions, ABS	Applying Coil Wound Heat Exchanges in LNG Liquefaction Processes Christopher Butler, Manager of LNG Mechanical Engineering, Air Products and Chemicals, Inc.	Process Options for Small- and Mid-Scale LNG Mark Roberts, Technology Manager, Air Products
12:25–13:45	Break		
Moderator Recap 13:45–14:00	Moderator Recap Mark McNiel, Director, LNG Business Development, ABS		Moderator Recap Anders Mikkelsen, Business Development Leader, DNV GL Maritime Advisory
Session 5 14:00–14:25	Gas Driven Power Systems for Remote Offshore Locations James Postle, Project Manager, Yanmar Energy Systems Co. Ltd	Licence to Chill—Plant Solutions for Small- and Mid-Scale LNG George Arnett, VP Sales LNG, Chart Industries	Micro LNG Technology Solutions to Eliminate Gas Flaring James Brown, Regional LNG and Gas Consulting Manager, DNV GL
Session 6 14:30–14:55	Fast-Track Implementation of LNG FSRU Projects Don Mackay, Director—Commercial Development, Gas Solutions, BW Maritime	NGL Plant Concept with Integrated Small-Scale LNG Production Heinz Bauer, VP Technology Natural Gas Plants, Linde Engineering	Small- and Medium-Size LNG for Power Production: Case Study of Tornio LNG Terminal Kari Punnonen, Business Development Manager, Wärtsilä Corporation
Session 7 15:00–15:25	High Pressure Turret Mooring System: A Dynamic Process Overview Praveen Babu, Piping/Subsea Engineer, London Marine Consultants	A Novel LNG Technology for LNG Production John Sheffield, Consultant Instructor, PetroSkills John M. Campbell & Co.	Innovative Solutions for Small-Scale LNG Logistics and Infrastructure Saunak Rai, VP Operations and LNG Business Development, Norgas
Session 8 15:30–15:55	Effect of Cargo Tank Configuration on Sloshing Impacts for LNG-FPSO Sang Eui Lee, Postdoctoral Fellow, The Korea Ship and Offshore Research Institute (KOSORI)	Cryogenic Spill Protection: An Industry Response to a Potential Show Stopper for FLNGs Robin Wade, Chartek Segment Manager, AkzoNobel Protective Coatings	Technical and Commercial Aspects of Small-Scale LNGC and Bunkering Vessels Stephano Y. Heo, General Manager, Product Strategy, Daewoo Shipbuilding & Marine Engineering Co., Ltd. (DSME)
Closing Remarks 15:55–16:00	Moderator Closing Remarks Mark McNiel, Director, LNG Business Development, ABS		Moderator Closing Remarks Anders Mikkelsen, Business Development Leader, DNV GL Maritime Advisory
16:00–18:00	Ship-Shore Interface: What is the Other Side Doing? Mark McNiel, Director, LNG Business Development, ABS		

The Industrial Internet, data analytics set stage for more efficient pipelines

MAURICIO PALOMINO, GE Measurement & Control



FIG. 1. A near real-time view of asset conditions includes ILI and external inspection data, customer data, and maintenance and operating information.



FIG. 2. Pipeline operators that have networks exposed to geotechnical hazards can assess these external conditions against an up-to-date risk level.

Much of the US pipeline infrastructure has been in place for at least 20 years. Accordingly, operators are taking added precautions to ensure that safety remains at the forefront when transporting increased production volumes from shale formations. Pipeline companies are investing up to \$40 B/yr to expand, maintain and modernize existing infrastructure.

To make the most of these investments, operators increasingly require more robust data, advanced analytics, real-time workforce planning and accurate information to optimize the safe performance of these networks and relevant systems.

Companies need a comprehensive overview of their pipelines that provides a holistic, near real-time view of asset conditions to drive operations and maintenance decision-making (FIG. 1). This overview includes inline inspection (ILI) and external inspection data, customer data, and maintenance and operating information, such as work orders, surveys, pressures, temperatures and flowrates. Real-time external data sources, such as weather and soil information, as well as information about third-party activity above the pipeline, are also valuable to integrate. The ability to capture this information, perform analysis and create detailed reports enables better informed decisions.

Industrial Internet impact. The Industrial Internet has opened access to a new era of efficiencies, productivity and improved safety for the industrial world, including oil and gas pipelines. However, along with these advances comes a significant increase in data management challenges for pipeline operators. With the growing number of files from the digitization of a wide range of records, and the large volume of associated data, the amount of information to be processed, analyzed and used can be overwhelming.

The records vary in complexity, source and completeness, given the different types of information gathered, the age of pipeline assets, the monitoring and control equipment in use, and information technology (IT) systems. These growing challenges require the industry to develop new plans to more effectively integrate and manage data.

By combining data, analytics and visualization while taking advantage of advancements in data science and computing power, pipeline companies can improve the way they manage all operational aspects—allowing a move from reactive to predictive decision-making—and create a more optimized view of their business.

The value of data analytics to operators. For data to be valuable, companies must identify the key performance indicators that need to be improved with the shift from process monitoring to process optimization. They also must embark on the journey of collection, integration and modeling of data inputs to turn the information into decision support tools.

To address this challenge, operators need a flexible software platform that integrates

systems from multiple vendors, as well as custom operator-specific internal data sources. Systems like the Intelligent Pipeline Solution (IPS) from GE and Accenture allow for integration of geographical information, work orders and risk management, and inspection and equipment condition monitoring systems. When these data are combined with external sources, such as weather, seismic and third-party activity information, they form an open data structure that delivers a digital reference for all the assets and conditions in near real-time. For example, pipeline operators that have networks exposed to geotechnical hazards, while also experiencing high levels of past and forecast rainfall, flood conditions or potential soil movements, can assess these external conditions against an up-to-date risk level. This helps them determine an appropriate mitigation plan, potentially preventing failure before it occurs.

Developing new solutions that help operators to understand data attributes by applying analytics to data sets being integrated from multiple record systems is a top priority. Understanding data completeness and weighting factors helps companies to identify and prioritize the most relevant asset areas or systems where data cleanup or record completion is necessary. This ultimately helps pipeline companies optimize data quality efforts as a continuous improvement process, while also considering completeness as a potential factor impacting operational risk.

A better way forward. Pipeline operators are adopting new standards for maintaining pipeline integrity and improving safety.

As regulatory and public scrutiny of the industry mounts, pipeline operators must function at a higher level, predicting problems before they arise, addressing issues promptly and ultimately ensuring their pipelines' integrity. Operators struggle to make operational and maintenance decisions when equipped with inadequate or incomplete data. To make matters more complex, business processes, data and IT systems are often siloed between functional boundaries. This means that operators have to manually bridge the gap between functional areas to find the most efficient ways to deal with potential issues, manage their workforce most effectively, and allocate limited capital and resources.

The Intelligent Pipeline Solution, combines Pipeline Management, a GE software platform powered by the Predix industrial operating system, with Accenture's digital technology and systems integration capabilities. It uses asset records, existing sensor data and field capture tools to monitor oil and gas pipelines (FIG. 2) and then harvests, collates and analyzes vast quantities of data and converts it into actionable insights in near real-time, enabling operators to make proactive decisions. Pipelines remain one of the safest means to transport oil and gas, and by taking added precautions, operators are able to ensure that safety remains a top priority. ■

GAZPROM, PAVILION ENERGY SIGN 10-YEAR LNG SUPPLY DEAL

Singapore's Pavilion Energy, the LNG unit of Temasek Holdings, has signed a 10-year LNG agreement with a unit of Russian gas giant Gazprom, Pavilion CEO Seah Moon Ming said Tuesday in a keynote address at Gastech. The LNG deliveries from Gazprom are tentatively slated to commence in 2017 or 2018.

Pavilion has also signed MOUs with China's Huadian Green Energy and Japan's JERA Co. The Singapore company will supply LNG to China from 2020 and will jointly procure and invest in LNG with JERA.

"Pavilion Energy is very much focused on the long-term as we continue to build expertise and capabilities across the entire LNG business," Seah said in his address. "Pavilion Energy is focused on developing regional demand. We see this as an important step toward building a reliable and robust LNG ecosystem in Singapore, and, hopefully, for Asia."

Pavilion is also promoting the use of a benchmark Asia LNG price traded on the Singapore Exchange. The index, dubbed the "Singapore SLing" and unveiled in June, is in use by 16 LNG traders, buyers and producers. Seah expects that number to increase to 20 in the near future.

"Singapore is well-equipped to host this new and more open way of doing business in the LNG sector," Seah said. "With a clearer price benchmarking, the region will clearly benefit." ■

IGU president discusses changing role of gas in global energy

The oil and gas industry has undergone massive changes during the past three years and continues to be in flux. Hydrocarbon production supports international economies; yet, the oil and gas supply boom creates challenges for worldwide exploration and production companies.

Also, while natural gas production is more than sufficient to meet global demand, LNG imports and exports are needed to balance the markets. As a result, timely information on future energy development is critical to every executive riding the crest of this dynamic and ever-changing market.

To bring clarity to the market and direction to executives and strategic planners, the International Gas Union will present its triennial World Gas Conference in Paris during the week of June 1. As a preview to the event, *Gas Processing* talks to Jérôme Ferrier, senior vice president of corporate for Total, president of the association for Française du Gaz and president of the International Gas Union, about the energy industry's greatest opportunities and challenges, and the changing role of natural gas.

GP. Due to its global membership, the International Gas Union has a comprehensive overview of the natural gas industry. What would you say are

some of the major challenges facing the industry today?

Ferrier. These are indeed challenging times. I cannot recall a period when so much effort has been dedicated to addressing the growing (and, in many cases, unprecedented) social, economic and environmental demands on the entire energy sector.

However, I also see significant opportunities, especially for the natural gas industry. As the price of crude oil continues to plunge and budgets are squeezed across the entire energy supply chain, market dynamics dictate that the gas industry is likely to follow suit and experience similar supply/demand imbalances and the associated financial uncertainties for the foreseeable future.

Furthermore, growing public skepticism toward energy policies is making it increasingly difficult for the industry to make a case for long-term investment decisions, such as improving grid infrastructure and demand-side management to handle a wider mix of energy sources. Much of this mistrust stems from a lack of public awareness and knowledge about the environmental and economic benefits of natural gas as a fuel.

Another challenge is to encourage the industry to channel the appropriate investment into skills, expertise and research. We must ensure that the gas industry is future-proofed as best we can by providing ongoing

support and development opportunities for the industry's workforce.

More widely, existing national commitments to energy efficiency and decarbonization targets are fast approaching, and the pressure is mounting for global leaders to reach binding agreements at the 21st yearly session of the Conference of the Parties (COP 21) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 11th session of the Meeting of the Parties (CMP 11) to the 1997 Kyoto Protocol. The role of natural gas during these talks will be crucial to setting the agenda for tackling climate change.

GP. What are some of the major opportunities?

Ferrier. I think this is one of the most important questions to ask in 2015. I believe that gas can provide a major part of the solution to many of the problems already mentioned, and that 2015 represents a significant opportunity for the industry to demonstrate its considerable credentials.

In November 2014, the International Energy Agency (IEA) released its *World Energy Outlook (WEO 2014)*, which positively underlined the central role of natural gas in the energy mix. The global share of natural gas is expected to grow from 21% of the global energy mix in 2012 to 24% by 2040. France is proud to have held

the presidency of the IGU triennium since 2012, and this year's 26th World Gas Conference in Paris (WGCPARIS2015) presents the perfect opportunity to ensure that the natural gas industry takes its rightful place at the heart of discussion on global energy solutions.

France's role at the IGU is to advocate the development of natural gas, not only as

See **FERRIER**, page 13



JÉRÔME FERRIER, senior vice president of corporate, Total; president of the association for Française du Gaz; and president of the International Gas Union, Paris, France

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ABS Stand C270 in Hall 4 at Gastech

Gastech 2015

Queensland kicks off LNG exports with CSG cargo

A. BLUME, Gas Processing

The first tanker loadings of LNG from BG Group's \$20-B Queensland Curtis LNG (QCLNG) project, located on Curtis Island offshore Queensland, Australia, began on December 28 (FIG. 1). The inaugural shipment, which set sail on January 5, marked the first LNG export from Queensland and the beginning of a major expansion of the state's gas sector.

Two other LNG projects—Santos Ltd.'s Gladstone LNG (GLNG) project and Origin Energy and ConocoPhillips' Australia Pacific LNG (APLNG) terminal—are slated to begin exports in 2015. Collectively, the three LNG projects will make up approximately 8% of the world's LNG production, or around 25 metric MMtpy, by the end of 2016. Gas exports from the three projects will find homes in Chile, China, Japan, Singapore, South Korea, Malaysia and other countries.

Australia boasts a number of other liquefaction projects under development

around the country, leading market watchers to predict that Australia will eclipse No. 1 LNG exporter Qatar in 2018 if all projects under development are built. However, falling oil prices pushed down benchmark prices of LNG by more than 40% in 2014, which could negatively impact progress on LNG export projects in Australia and beyond.

The Queensland LNG facilities are designed to be operable for 30 to 50 years, meaning that they should withstand cyclical ups and downs in energy prices. Still, the project owners will likely be cautious in their spending in response to the ongoing price decline, which means that expansions of the export terminals may happen slower than previously projected.

QCLNG. The QCLNG project is unique in that it is the world's first to process coalbed methane—or coal seam gas (CSG), as it is known in Australia—into LNG for

export. Bechtel, the main contractor on the QCLNG project, as well as the Santos and Origin Energy ventures, reported that a total of 6,000 people worked to make the QCLNG project a reality. Construction began in 2010 and is anticipated to finish in the third quarter of this year with the startup of the second train, which will raise production volumes to 8 metric MMtpy.

Gas is sourced from the Surat Basin in southern Queensland; a 42-in., 540-km buried pipeline (FIG. 2) links the fields to Gladstone. The gas is then sent to the terminal on nearby Curtis Island for liquefaction, after which it is delivered by ship to buyers.

The completed terminal will include two 4-metric-MMtpy trains, two 140-Mcm storage tanks, a marine facility for worker and equipment transportation between Curtis Island and the mainland, and marine loading facilities for LNG exports. It takes around 13 hours to fill an LNG tanker; two to three LNG tankers are expected to depart from the Gladstone harbor each week.

GLNG. In July, EPC contractor Bechtel installed the first LNG production train for Santos' 7.8-metric-MMtpy Gladstone LNG facility on Curtis Island. Bechtel built GLNG's first production train in 82 modules at its construction yard in the Philippines. The second train includes 29 modules, for a total of 111 modules.

The second of the \$20-B project's two trains was completed in November 2014 (FIG. 3), although the falling price of oil forced Santos to cut \$50 MM in spending on the GLNG project as part of a \$700-MM cut to its overall operations, the company announced in December. As of that time, the project was 90% complete and still expected to begin producing first LNG—also from CSG—in the second half of 2015. The project will use ConocoPhillips' Optimized Cascade process to produce LNG.

Shareholders in the project include Santos (30%), Total (27.5%), Petronas (27.5%)

and KOGAS (15%). A new 420-km pipeline (FIG. 4) transports gas from the Fairview, Arcadia, Roma and Scotia fields located in the Bowen and Surat Basins to the GLNG terminal. The project is being held to rigid environmental standards, particularly with regard to water treatment and discharge. LNG exports will be sent to Asian markets, including Malaysia and South Korea.

APLNG. Origin Energy and ConocoPhillips' 9-metric-MMtpy Australia Pacific LNG terminal will also use CSG as feedstock. The company stated in December that falling oil prices would impact its profits, but not its ability to fund the \$20.5-B APLNG project. Origin and ConocoPhillips each own 37.5% stakes in the terminal, while Chinese state oil company Sinopec owns the remaining 25%. The project owners hope to begin exports from the APLNG terminal in the second half of 2015 (FIG. 5).

The CSG feedstock will be sourced from the Surat and Bowen Basins in central southwest Queensland and piped to the LNG terminal via a 530-km pipeline. Construction of the LNG project on Curtis Island was nearly 90% complete as of the turn of the year. The facility will also use ConocoPhillips' Optimized Cascade technology, combining two 4.5-metric-MMtpy LNG trains in one. Exports will be sent to China and Japan.

Australia's LNG future. Queensland's government expects that LNG production in 2015–2016 will spur a rise in exports that will boost the province's economic growth by 5.75%. The projected boom in LNG output may go a long way toward helping Australia overtake Qatar as the world's largest LNG exporter. However, high construction costs, falling oil prices and competition from US and African LNG projects are expected to test the mettle of Australia's planned and under-construction LNG projects, including those in Queensland. ■



FIG. 1. LNG tanker *Methane Rita Andrea* loading gas from the QCLNG terminal. Source: QGC.

GE OIL & GAS EXPANDS PACT WITH CORPUS CHRISTI LNG

GE Oil & Gas signed a \$610-million agreement with Corpus Christi Liquefaction, a subsidiary of Cheniere Energy, to provide spare parts and planned inspections, maintenance services and technical support for the gas turbines and refrigerant compressors on the first two LNG trains under construction at the Cheniere's LNG export facility in Corpus Christi, Texas.

Each train will have six gas turbines and is expected to have nominal capacity to produce up to approximately 4.5 MMtpy of LNG. Construction of GE equipment on site will start in January 2017, with LNG production scheduled to commence as early as 2018.

In addition, GE will also provide a resident technical support team at Cheniere's facility to assist with all aspects of maintenance of GE equipment. Cheniere will benefit from access to OEM parts and repairs plus technical expertise of GE field engineers and technology, all of which will ensure optimal reliability, the company says.

GE Oil & Gas and Cheniere announced a similar \$1-billion maintenance agreement for the Sabine Pass facility in December 2014. Cheniere is developing the liquefaction project in Corpus Christi with anticipated aggregate capacity of up to 22.5 MMtpy over five trains.

IEA forecasts global demand to reaccelerate and grow at an average rate of 2% through 2020, with an average annual increase of 10% projected throughout the rest of the decade. Demand for European LNG imports is projected to roughly double in that same time period. ■



FIG. 2. The final pipe segment of QCLNG's main pipeline being lowered into the ground. Source: QGC.



FIG. 4. First gas being loaded into the GLNG pipeline. Source: Santos.



FIG. 3. Aerial view of the GLNG project's two trains. Source: Santos.



FIG. 5. APLNG is on track to deliver first LNG in mid-2015. Source: Origin Energy.

Linde highlights advanced heat treatment, furnace technologies

At the recent Heat Treat 2015 show in Detroit, Michigan, Linde LLC showcased several of its advanced gas control technologies and engineering services for heat treatment furnaces. Heat Treat 2015, which is presented by the ASM Heat Treating Society, took place from October 20–22.

The technologies in Linde's showcase included:

- CARBOJET gas-injection technology. The ultra-high-speed injection of a gas or gas mixture through CARBOJET lances improves gas flows and atmosphere homogeneity without the use of circulation fans, improving production by up to 20%.
- HYDROFLEX atmosphere control system. In this technology, one or more carrier gases (nitrogen or argon) maintain the furnace pressure, while a controlled ratio of hydrogen helps prevent oxidation. This results in more reliable, oxide-free annealing with non-flammable gas mixtures containing less than 5% hydrogen
- Heat treatment engineering and laboratory services. Linde engineers can perform process audits to investigate areas for improvement. This may include analyzing furnace atmospheres, gas supply and control systems, as well as upstream and downstream processes. In addition, engineers at Linde Application Centers can develop new gas supply systems for heat treatment processes and improve the control systems of existing processes. Metallography laboratory services include material analyses, scanning electron micrography (SEM) and a variety of hardness tests.
- Safety solutions for flammable atmosphere furnaces. Linde assists customers will meeting the National Fire Protection Association (NFPA) 86 Standard for

Ovens and Furnaces. NFPA 86 describes specific requirements for nitrogen supply systems used to purge flammable atmosphere furnaces.

Linde's heat treatment services and technologies are said to improve process efficiency, productivity and quality in manufacturing metal parts for a number of processes and industries (FIG. 1). The company's heat treatment experience stretches across all common furnace types, including continuous and batch-type furnaces, as well as roller hearth, pusher, pit or rotary-retort furnaces.

Linde's expertise spans typical protective atmospheres, from pure nitrogen, pure hydrogen, nitrogen/hydrogen and nitrogen/hydrocarbon-type atmospheres, to endothermic gas, exothermic gas and monogas atmospheres. ■

Check your schedules for Linde presentations throughout the conference, and visit their team at #B65 to learn more about their latest technologies.



FIG. 1. Linde's heat treatment services and technologies are said to improve process efficiency, productivity and quality in manufacturing metal parts.

KIEWIT ENERGY, AIR PRODUCTS ANNOUNCE OFFERING FOR SMALLER-SCALE LNG PROJECTS

Kiewit Energy Company (Kiewit Energy) and Air Products have agreed to collaborate on small-scale liquefied natural gas (LNG) projects in North America to meet the growing demand for LNG production. The collaboration provides customers with a one-stop-shop and rapid response to the design, construction and commissioning of projects.

“Natural gas consumption—particularly in the transportation sector—will have a significant impact on the demand for LNG, and our customers need effective, practical ways to move gas resources to market,” said Dan Lumma, Senior Vice President for Kiewit Energy Group Inc.

The modularized design and technology offered by Kiewit Energy and Air Products can be used on projects that produce up to 500,000 gallons/day of LNG. Through a unified approach, Kiewit Energy is responsible for project management, overall engineering and design, construction and commissioning, while Air Products leads the design and supply the liquefaction equipment. This streamlined, collaborative approach helps ensure projects meet cost and schedule requirements.

“As a team, Kiewit Energy and Air Products are providing lump sum turnkey offerings that bring significant cost and time-saving benefits to customers,” said Larry Balascak, LNG commercial manager at Air Products. “With an extensive roster of successful LNG projects and experience in working together, we are well-equipped to serve customers considering smaller LNG facilities.”

Earlier this month, Kiewit Energy and Air Products entered into a formal agreement to solidify the alliance. The two companies are currently working together on an LNG export terminal and a peakshaver facility in the US. ■



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Energy Construction Forum (ECF) is a unique and timely gathering covering all phases of major expansions and new construction projects, with a focus on the challenges and solutions facing the industry today. ECF is the only event that brings together all of the key stakeholders in the rapidly growing energy projects and construction marketplace.



March 2016 | EMGasconference.com

Eastern Mediterranean Gas Conference (EMGC) will provide attendees with the knowledge and insight necessary to successfully build business operations in this burgeoning region, where an estimated 40 Tcf of recoverable natural gas reserves have been discovered.



April 4–6, 2016 | Houston, TX | OGSupplyChain.com

The inaugural O&G Supply Chain Forum will cover all sectors of the oil and gas supply chain – upstream, midstream and downstream – and the challenges and issues that are specific to each. Attendees will learn to maximize efficiencies, mine savings opportunities and reduce their environmental impact. The event will feature a one-day workshop, a high-level, two-day program, and an exhibit floor.



August 2–3, 2016 | Houston, TX | GTLTechForum.com

The fourth annual GTL Technology Forum will cover the technological and operational advancements in GTL processes that are reducing costs, driving market growth and increasing global activity.



September 13–14, 2016 | Houston, TX | GasProcessingConference.com

The second GasPro Americas will cover natural gas technologies and markets in the Americas. The two-day technology conference will focus on exploring the latest trends, opportunities and challenges in the natural gas sector.



Ichthys LNG project implements advanced separation technology

T. PERSCHKE, GEA Westfalia Separator Group

The Ichthys LNG project is a JV between INPEX, Total and the Australian subsidiaries of Tokyo Gas, Osaka Gas, Chubu Electric Power and Toho Gas. At peak operation, the project is expected to produce 8.4 MMtpy of LNG and 1.6 metric MMtpy of LPG, along with approximately 100 Mbd of condensate. Detailed engineering, procurement and construction of the Ichthys project are ongoing, and production is scheduled to commence by the end of 2016.

Among its equipment contracts, the Ichthys project recruited GEA Westfalia Separator Group to provide four separator skids to Ichthys contractors Daewoo Shipbuilding and Marine Engineering (DSME) and Fjords Processing (formerly Aker Process Systems) for processing hydrocarbons, enriched monoethylene glycol (MEG), diesel oil and drain water. DSME and Fjords Processing awarded the contracts for the centrifuge systems in 2012 and 2013, at a total order value of €45 MM.

Project management. The order required complex project management, which was undertaken by a group of GEA

experts. High requirements needed to be met with respect to special materials and over 200 specific standards for the production and delivery of the centrifuge skids—e.g., compliance with an independent verification body and the requirements for electrical equipment in hazardous areas (EEHA).

The objective of EEHA is the classification of design, selection, manufacture, installation, testing and inspection of equipment to comply with project codes, standards and specifications (particularly Australian/New Zealand standards 3000, 60079.14 and 60079.17).

With specialized team training, specific project and technical competencies were optimally expanded to adapt the equipment to the requirements of the customer. To date, approximately 100 different international documents per order needed to be checked and approved for several skids, as outlined in the following sections.

Diesel processing by OSE separators. Gas and condensate from the Ichthys field, in the Browse Basin offshore Western Australia, will undergo preliminary process-

ing offshore on the project's large, floating central processing facility (CPF), which will be permanently moored near the field.

The CPF will extract condensate and water, and remove impurities, to make the gas and some condensate suitable for transmission through the project's 889-km gas export pipeline to onshore processing facilities in Darwin. Most of the condensate will be transferred from the CPF to the nearby floating production, storage and offloading (FPSO) facility for offshore processing. The FPSO will be moored about 3.5 km from the CPF and will process and store condensate. It will periodically offload stabilized condensate to shuttle carriers for export directly to market.

Two individual skids were made and preinstalled on the FPSO to clean the diesel oil: (1) a centrifuge skid mounted on a frame with two OSE 40 separators (FIG. 1), and (2) a pump skid on a separate frame with valves, instruments and other components. The plants were completed with a control and two human-machine interface panels. The OSE separators process up to 20,000 l/hr of diesel oil in an internal operation in a nonhazardous area. The systems have already been completed, tested, approved by the customer and delivered.

Processing of drain water. Drain water collects where mineral oil is produced or where drilling for mineral oil takes place. This water is contaminated with oil and cannot be fed into the sea before the oil is appropriately removed.

In accordance with International Maritime Organization (IMO) guidelines, a purity level with a maximum oil content of 15 ppm in water must be stringently adhered to; only then can the purified water be pumped back into the ocean without polluting the environment. For this purpose, plants for deoiling drain water are equipped with an IMO-certified oil-in-water monitor. If the oil content exceeds 15 ppm, then the water automatically circulates back into the system until the oil-in-water content again meets legal requirements.

GEA supplied two process lines for drain water treatment (FIG. 2), each with a self-cleaning WSE 120 separator. Both lines were pre-mounted on a frame and connected to a common sludge tank. Prior to delivery,

the lines were internally cabled, tested and inspected in accordance with EEHA project requirements. The centrifuge skids were delivered in July 2014, after completion of all required checks by the customer.

Systems for MEG processing. The natural gas pipelines, which are located deep under the sea, are subject to extreme cold. Salt water and possible corrosion place further stress on the pipeline material. MEG is injected into the pipelines as an antifreeze and an anticorrosion agent. Various treatment processes are required to perform this function over the long term and to keep the MEG free of undesirable substances.

GEA also provided design, detailed engineering, drawings and document creation, material provision, production and testing for a total of five directly operated WSD 200 separators (FIG. 3) for capacities of up to 48,600 kg/hr per centrifuge. The main equipment—comprising filters, tanks, pumps, lube oil units and various valves—is fully piped and mounted on a frame that is designed for offshore operation and sophisticated project specifications.

Five separators for processing. Following the first order already placed, Fjords Processing requested an offer for a further application in this project. This offer concerned the dissolution of hydrocarbons from the MEG flow.

GEA offered two packages with double and triple centrifuge skids equipped with a total of five WSD 200 self-cleaning separators, pumps, tanks, valves and instruments. The equipment was completely mounted on a frame, cabled and tested. Each of the centrifuges is designed for a normal capacity of up to 50,096 kg/hr and is suitable for installation in Zone 2, but each is still provided with process-required inert gas purging.

The installation of these skids will finalize the Ichthys LNG project's mechanical separation technology needs. ■

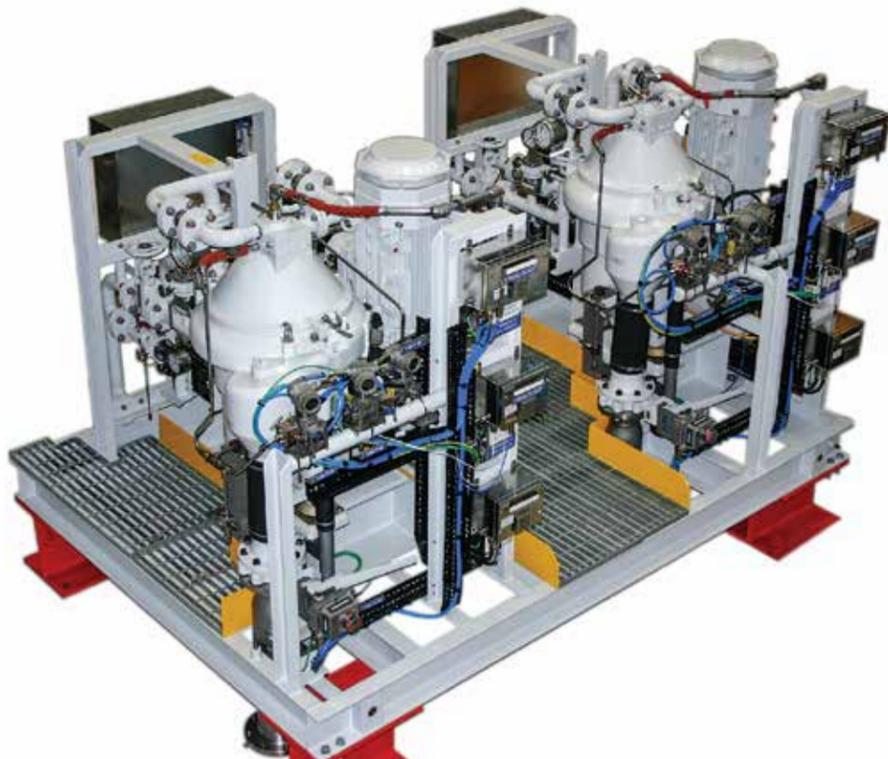


FIG. 1. Skid for processing diesel oil.



FIG. 2. Processing plant for drain water.



FIG. 3. Processing plant for MEG.



THOMAS PERSCHKE is the director for the oil and gas business line of GEA Westfalia Separator Group in Germany. Mr. Perschke has worked for GEA in various roles, including sales management, since 1999.

Heat transfer fluid chemistry for long life, high temperature

PETE FRENTZOS, Radco Industries Inc.

Heat transfer fluid (HTF) is an essential part of oil and gas processing. A typical gas processing plant consists of six to seven stages. Each stage removes an impurity or contaminant from the raw gas stream. At least three of these stages use HTF. In the production of petrochemicals from crude feedstocks, high temperature processing is especially important for greater yields and more diverse products. Re-refining also seeks higher processing temperatures to increase output.

Finding the best HTF to use for the operation of high-temperature/low-vapor pressure thermal fluid systems is challenging due to the limited chemistries available. This scenario is further complicated by the fact that fluid degradation and reduction of service life increases with rising temperatures.

The most common chemistry for higher temperatures has traditionally been a partially hydrogenated terphenyl (PHT) formulation followed by dibenzyltoluene (DBT) mixtures and other aromatics. These mixtures are typically rated up to 650°F (345°C). They are best used at lower temperatures for long life, because the degradation rate doubles every 17°F (10°C) at temperatures of over 600°F (315°C).

Even if the higher temperatures are not required, initial degradation begins far below the maximum operating temperature, and the rate of degradation gradually rises with temperature until it reaches a level that gives the fluid an unacceptable service life. That temperature is used as the maximum bulk operating temperature of the fluid.

Aromatic mixture for higher operating temperature. Radco is

now offering a methylethylated aromatic (MEAr) mixture that has a rated operating temperature of up to 700°F (370°C), with a maximum vapor pressure of approximately 1 atm. Radco sells this product under the brand name Xceltherm SST.

ASTM Standard D6743 is a test method for the thermal stability of organic HTFs. This test produces the data for comparative fluid life, offering comparison under controlled conditions (FIG. 1).

TABLE 1 offers data showing that, under controlled stress conditions, the MEAr mixture has a lower degradation rate. This is a reliable indication of the relative life of the fluids in like conditions. **Note:** Calculations and variables used in ASTM D6743 to determine the thermal stability of a heat transfer fluid are shown below.

However, the lower degradation rate is not the only essential criterion. Comparisons need to be made for viscosity, vapor pressure, cold-start temperatures and other properties. MEAr mixture characteristics meet most system requirements, and the mixture is expected to be a new chemistry in use for the foreseeable future.

ASTM D6743 calculations and variables. HTF thermal stability definitions for ASTM D6743 include:

- **Low-boiling and high-boiling components** (8.16 and 9.3): These components are the peaks and valleys on the gas chromatogram that appear before and after the normal boiling distribution of the virgin sample.
- **Decomposition products that cannot be vaporized** (8.15 and 9.6): Products that do not distill out during

short-path distillation, which have a boiling point greater than 400°C, since the distillation is under vacuum.

- **Gaseous decompositions products** (8.12 and 9.6): These products have a boiling point lower than -55°C. After heating, the sealed ampoules are placed in a -55°C acetone bath for 15 minutes. The mass of the contents are compared to the mass of the sample placed into the ampoule before heating.
- **Decomposition products remaining in the test cell** (9.7): Products remaining in the test cell are determined by comparing the values measured in section 8.2 and 8.3. A negative value means more stressed fluid drained from the ampoule than the virgin sample drained from the same ampoule prior to heating.

- **Unstressed fluid remaining in the test cell** (8.2 and 9.5): Fluid remaining in the test cell is determined by pouring a virgin sample into a clean ampoule and then draining the ampoule. The mass (grams) remaining in the ampoule is used to determine decomposition products remaining in the test cell.
- **Material remaining in the test cell after heating** (8.3 and 9.6): Determining material remaining in the test cell after heating follows the same procedure as the unstressed fluid remaining in the test cell.
- **Evaporation loss:** This loss is determined by comparing the mass of the sealed ampoule before and after heating. A value difference greater than 0.5% indicates a leak during the heating process. ■

TABLE 1. Test results of ASTM D6743 for HTF chemistries, as performed in Radco laboratory

Thermal stability results	Stressed HTF for 504 hours at 700°F (370°C)		ASTM 6743
	Methylethylated aromatic	Dibenzyltoluene mixture	Modified terphenyl
Tested in Radco laboratory*			
Low boiling decomposition	0.07%	15.1%	36.8%
High boiling decomposition	3.63%	5.91%	2.32%
Total Decomposition	3.7%	21%	39.1%

*Typical data from laboratory samples; not guaranteed for all samples



FIG. 1. The ASTM Standard D6743 test method determines the thermal stability of organic HTFs and guided Radco's R&D effort.

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LNG importers: Pricing flexibility key to market success

ADRIENNE BLUME, *Gas Processing*

At the conclusion of the first day of the Gastech conference on Tuesday, an LNG importers panel debate examined the potential impacts of lower oil and LNG prices on buyers and sellers over the next five years. The panel concluded that LNG contract pricing flexibility in an evolving and low-oil-price market will be essential to ensuring a successful balance between buyers and sellers.

The panel was moderated by **Ian Catterall**, the Head of Natural Resources Project Finance for Bank of Tokyo-Mitsubishi UFJ Ltd. The six panelists were **Shigeru Muraki**, Executive Advisor for Tokyo Gas Co. Ltd.; **Jong-Ho Lee**, Senior Executive Vice President of Korea Gas Corp. (KOGAS); **Hiroki Sato**, Vice President of the Fuel Procurement Department for JERA Co. Inc.; **Huang-Chang Lee**, Deputy CEO of the Natural Gas Business of CPC Corp., Taiwan; **Prabhat Singh**, Managing Director and CEO of Petronet LNG; and **Weiguo Shan**, Head of Gas Market Research for China National Petroleum Corp. (CNPC).

Catterall harked back to Gastech 2014, noting that presenters and attendees at the Seoul conference and exhibition likely would not have been able to forecast the oil and gas market movements of the past 18 months. “Nor would they be keen to forecast the next 18 months,” he quipped.

Catterall noted that, at the time of Gastech 2014, greater numbers of importers were seen participating in the global LNG market, and many were seeking enhanced contractual and destination flexibility,

more balanced pricing mechanisms, short-term contracts and spot pricing. The same remains true of LNG importers today. The question Catterall posed to the panel was: Has the oil price evolution since Gastech 2014 changed these outlooks—and if so, how?

LNG in a low-oil-price world.

Catterall asked KOGAS’ Lee to share his perspective on the LNG market amid the oil price drop of the past year. Lee opined that, while low gas prices might be good for buyers over the next five years, buyers may hesitate to make long-term deals due to future uncertainties, such as economic recession and the greater use of coal for power generation. However, suppliers may also hesitate to put more LNG into market and may be forced to delay or cancel some projects, Lee said.

JERA’s Sato then shared information on what the five-month-old JV of major Japanese LNG importers Tokyo Electric Power Co. Inc. and Chubu Electric Power Co. Inc. hopes to achieve. Sato noted that the collaboration between the two companies maximizes their LNG buying power. Together, the firms will increase their yearly LNG purchase volume to approximately 40 million metric tons (40 metric MMt) by the time their upstream energy and fuel procurement businesses are combined in 2016.

“The objective for JERA is to be a game-changer in the LNG market,” Sato stated. “We will look at how to mitigate the Asian LNG premium and how to increase

the liquidity of the Asian market.” JERA will be involved in all stages of the value chain, and the company will use that to maximize its portfolio, Sato said.

Evolving LNG business models.

Next, Tokyo Gas Co.’s Muraki talked about the new LNG business model emerging in the US market, which he called “very different from the integrated LNG concept.” Muraki noted that, in contrast to companies like JERA, Tokyo Gas Co. is moving away from the integrated LNG model.

Muraki also said that the emergence of new pricing mechanisms in Asia will help make natural gas the most affordable and flexible fuel in the region. Trading will increase, and an Asian LNG hub and pricing scheme will be established. Additionally, Muraki spoke to the Japanese government’s mid-2015 announcement of its desire to source 20% to 22% of its energy from nuclear power by 2030. The advisor said that this goal may not be reached due to the expected greater use of coal to fuel utility operations. Nuclear power’s contribution to Japan’s energy mix is more likely to be capped at around 15% in 2030, Muraki said.

Petronet’s Singh picked up on Muraki’s comments regarding the new LNG business model, saying, “This whole process of production has moved from major players to smaller, niche players—the more players in the picture, the more the market opens up.”

Singh also noted that “these players are willing to play the game on a shoestring budget.” Even at crude oil prices of \$49/bbl, LNG is still being produced in the US, which Singh called “a very different market” from that of Asia-Pacific. When looking at the complete value chain, it may make sense for more companies to become involved in more and smaller market segments, Singh said. “The market is maturing, and specialization is coming in.”

Singh also touched on the state of India’s gas market. The country consumes approximately 120 million cubic meters per day (MMcmd) of gas, with imports making up 40 MMcmd to 45 MMcmd of that total. Singh noted that recent lower gas prices have provided an opportunity for India to import more gas and to build more infrastructure for the import and processing of greater volumes of gas.

The China factor. CNPC’s Shan next discussed China as a key global gas market. The research head acknowledged that China’s economic “new normal” of single-digit growth in energy demand, as opposed to the double-digit growth numbers seen just a few years ago, is reshaping energy deals with China’s partners and the country’s future demand outlook.

However, he also noted that shale gas is on the threshold of commercial production in China, and that the country could mark shale gas output of more than 5 billion cubic feet (5 Bcfy) this year. CNPC and Sinopec are promoting shale gas production for the sake of energy self-sufficiency, Shan noted.

With regard to gas imports, Shan does not see competition between pipeline gas and LNG supplies in China. “If economics are good, China can accommodate both pipeline gas imports and LNG import commitments,” he said. Even if the economic new normal continues, and gas demand does not expand so quickly, China will still see substantial gas demand accumulation by 2030, Shan said.

Shan next spoke about the planned pipeline that would bring gas from Russia to China along an eastern route, according to agreements signed between the two countries last year. While the design capacity for the eastern line is 38 Bcm, capacity utilization would likely be lower than that because of China’s slowing demand, Shan said. Most of the gas would go to Northeast China, where demand is still increasing, and possibly to Shanghai.

Shan also noted that the Chinese government will seriously consider environmental protection policies in light of growing concerns over global warming, as well as how to encourage a better energy mix that includes more clean energies and cleaner-burning fossil fuels.

Lastly, CPC Corp.’s Lee rounded out the discussion with some comments on LNG pricing. He noted that today’s lower LNG prices will allow for readjustments in LNG contract pricing, which will help establish fairer prices for both buyers and sellers. “Sellers need (high enough) prices to justify their investments, and buyers need (low enough) prices to justify their gas purchases,” Lee said. “A balance is required.” ■



In Tuesday afternoon’s Importers Panel Debate, top executives discussed, “What will be the impact of lower oil and LNG prices on LNG buyers and sellers over the next five years?”

DEMAND INCREASES FOR LNG VESSELS IN MARINE SECTOR

Based in the UK, cryogenic valve manufacturer Bestobell Marine has seen a major increase in demand for its products from the US marine sector. This is largely due to the new Emissions Control Areas (ECA), which are increasing the number of dual-fuel vessels being commissioned that require cryogenic valves.

One of the first major contracts that Bestobell secured in the US marine sector was for the Harvey Gulf International Marine “Going Green” project. Five ships were designed and built as the first US-flagged vessels capable of operating exclusively on natural gas. The first of these, *Harvey Energy*, was recently launched. Bestobell Marine supplied globe and check valves for the LNGPac fuel system on the five Harvey Gulf vessels.

Duncan Gaskin, sales director at Bestobell, said, “It is very exciting to have supplied the first US-flagged vessels that will run primarily on LNG. Ship builders and owners are increasingly opting for fuel-efficient LNG, and this kind of vessel is a blueprint for the future of marine engineering,” Duncan adds. “These vessels meet the emissions standards of today and the future. They are some of the most environmentally friendly offshore vessels in the Gulf of Mexico, demonstrating Harvey Gulf’s commitment to sustainability.”

In addition, Bestobell Marine has won the contract to supply valves to two Orca Class vessels operated by Totem Ocean Trailer Express (Totem Ocean) in Alaska. These ships are undergoing conversion, as they do not currently run on LNG. When relaunched, they will be some of the most environmentally advanced ships in the US. One of the leading US marine transportation companies, TOTE Inc. is in the process of converting its existing fleet to run on natural gas as part of a commitment to the environment.

Bestobell’s cryogenic valves are designed specifically for marine applications, which include a requirement for the valves to have fire-safe properties, whereby all components must be able to withstand a minimum temperature of 925°C (as per the interim IGF code). The company has been a world leader in the manufacture of LNG cryogenic valves, with over 50 years of industrial gas experience and 15 years of successfully supplying the LNG marine market. Bestobell’s Valves are used widely on LNG carriers, FLNGs (Floating LNG Production Units) and FSRUs (Floating, Storage and Re-gasification Units). ■

To learn more about Bestobell’s technologies and meet their team, visit them at D232.

FERRIER, continued from page 7

a foundation fuel, but also as a key long-term solution for sustainable growth and a more secure energy future. I am confident that the continued responsible development of our industry can help increase energy market stability, reduce CO₂ emissions and improve quality of life wherever it is used. The opportunities, to my mind, lie in three principal areas.

First, we must tell our own story and not leave a vacuum for others to fill. One of the three major IGU Task Force activities is natural gas advocacy. We have ensured that several discussion panels at WGCPARIS2015 are dedicated to presenting updated strategies and new policies for better communication about gas. We must take the opportunity to tell our story clearly, convincingly and effectively.

Second is the urgent need to continue investment and innovation to secure the expanding role of the natural gas sector. Investment is needed in the production, transportation and distribution of gas to improve connectivity. Innovation is needed to move toward improved carbon efficiencies. Developing LNG technologies is a key part of the journey toward reducing emissions in transport and shipping.

Third is the opportunity to encourage dialogue and increased collaboration between key global organizations. In recent years, the IGU has dramatically expanded its presence and influence all over the world, with membership now representing more than 95% of the global gas market. We have also reinforced relationships with the Secretariat of the UNFCCC; the United Nations Industrial Development Organization (UNIDO); the United Nations Educational, Scientific and Cultural Organization (UNESCO); the World Bank; and the IEA.

Our growing and important work with such institutions on environmental and other aspects of energy is a clear demonstration of our industry's commitment to the proposition that the many benefits of natural gas as a fuel of today and tomorrow should be seen as complementing the move to a low-carbon future, rather than posing a threat to the development of renewable energy sources.

GP. How important, overall, is LNG transportation to the natural gas industry, and do you believe this type of gas transportation will increase or decrease during the coming decade?

Ferrier. Up until recently, LNG was a commodity designed to supplement or replace natural gas flows through pipelines. However, the growth of LNG transportation has highlighted its importance to the wider gas industry. LNG has become an important source of primary power generation and has brought gas to locations far from major gas infrastructure, expanding the global gas market's reach and the world's access to cleaner energy.

Many countries are expanding their LNG capabilities, including Australia, Canada, Mozambique, Tanzania and the US. With the added flexibility that this brings to the market, LNG is increasingly being recognized as an economic enabler for developing countries.

In a recent study, the IGU found that global liquefaction capacity will grow substantially between 2020 and 2025, with regasification capacity set to increase by

around 75%. This is a clear sign that LNG is set to grow further over the coming decade.

GP. Do you believe that most countries are concerned about the environmental impacts of developing natural gas reserves, and does IGU offer any advice regarding this issue?

Ferrier. Across the world, we are seeing an increase in concern for the environment, especially in the run-up to the UNFCCC's COP 21 summit in Paris later in 2015.

I am confident that the gas industry will play a vital role in discussions about our energy future. As the IEA's *WEO 2014* report emphasized, natural gas produces far less NO_x and SO_x compared to coal, and using it for power generation will reduce carbon emissions by 50%. This means that natural gas has an important role to play in our transition toward a lower carbon economy and as a foundation fuel for the future energy mix.

Furthermore, the IGU takes every opportunity to encourage governments across the world to work with industry to develop operational and regulatory approaches that ensure that gas resources are developed in an environmentally progressive manner. We advocate climate policies that introduce a cost of carbon that is uniform and predictable across economies, and that can drive the innovation of both low-carbon technologies and increased energy efficiency.

GP. Given the recently announced layoffs and redundancies of major natural gas exploration and production companies, as well as service and supply companies, do you believe the industry will experience another "brain drain?" What actions should the industry's leaders take to avoid losing practical expertise?

Ferrier. The so-called "brain drain" of the oil and gas sector has been well documented in the media. It is quite rightly a major concern for those in the industry and one that we take extremely seriously at the IGU.

To develop the gas resources of the world, we need a continuous supply of skilled personnel, from researchers and managers to technicians and operators. As oil prices fluctuate and jobs are threatened, it is imperative that we support those working in our industry.

To contribute to efforts around this issue, the IGU has dedicated the entire Day 4 at WGCPARIS2015 to human capital. Our strategic panel will address the vitally important topic of women in the gas industry, and another session will cover gas communication.

We are also heavily investing in our youth program, which incorporates 200 students and young professionals between the ages of 20 and 30. The program is designed by, and for, young people and comprises high-level workshops and conferences that showcase all that the gas industry has to offer their generation. We need to work together to show young people that our industry should be a major consideration at the start of any ambitious career path.

It is imperative for governments and organizations to encourage people to

enter the engineering workforce. We must make determined efforts to understand and address any educational or cultural constraints involved. This is another challenge faced by our industry, but one I am confident we are working toward solving.

GP. What are the advantages of using natural gas for energy as compared to other forms of energy, such as coal, nuclear, oil, wind and solar?

Ferrier. We have already discussed the fact that natural gas produces far less NO_x and SO_x compared to coal, and we know that it burns with 50% less carbon emissions. Natural gas is applicable to most forms of transportation, and it is seen as a good source of electricity supply for a number of economic, operational and environmental reasons.

For example, natural gas processing is a low-risk venture (technically and financially), and gas plants can be built relatively quickly, in around two years, unlike nuclear facilities, which can take much longer and carry their own long-standing and deep-rooted issues. Renewable energy production, such as wind and solar, although improving dramatically each year with technology innovation, still faces major challenges around storage, intermittency and financing.

Each energy source comes with its own set of challenges. The real heart of the matter lies not in which is better, but in how to make a smooth transition from polluting fossil fuels to clean energy while meeting

increased energy demand and seriously combating climate change.

GP. Do you have any final comments for our readers?

Ferrier. We have many opportunities to address supply and demand challenges and to advance the global efforts for sustainable development over the course of 2015. This June, the 26th World Gas Conference in Paris will bring together the largest gathering of senior oil and gas leaders and policymakers from more than 600 global organizations. The opportunity for our industry, therefore, is to restate the case for gas and outline its place as a foundation fuel. ■

Gastech

Over 9,000 professionals from the LNG and Natural Gas industry converged on the Singapore Expo on the opening day of Gastech 2015. This number is made up of conference delegates, speakers, press, exhibition representatives and visitors. The real value of Gastech is the chance to network, and this was evident at the Global Meetings Programme lounge where over 400 meetings had been arranged prior to the event by using clever match-making software. There is already record-breaking interest in Gastech 2017, which moves to Tokyo, Japan, in April 2017. Visit the Gastech sales stand C430 for more information.



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Conference Programme

COMMERCIAL STREAM

MORNING

Contracting, Pricing and Trading (Session 1)

- 9:00–9:10 **Chairperson's Welcome**
■ Luca Tonello, Head of Oil and Gas—Investment Banking Asia, Sumitomo Mitsui Banking Corporation
- 9:10–9:30 **JERA's Action for the Change of the Future Asian LNG Markets**
■ Yuji Kakimi, President, JERA Co., Inc.
- 9:35–9:55 **Flexibility, Liquidity and Price Formation; A Brief History of, and the Outlook for, LNG from a Trade-Structure Perspective**
■ Ann Collins, Vice President, LNG Supply and Optimisation, Global Energy Marketing and Shipping, BG Group
- 10:00–10:20 **Hybrid LNG Pricing: Confronting the Challenges of Hub-Linked Pricing for U.S. LNG**
■ Jason K Bennett, Partner, Deputy Department Chair, Global Projects Group, Baker Botts
- 10:25–10:45 **Market-Based LNG Pricing Using JEPX Indices in the Evolving Japanese Energy Market: Restoring the Competitiveness of LNG**
■ Akira Miyamoto, Executive Researcher, Osaka Gas Co., Ltd.
- 10:45–11:15 **Networking and Coffee Break**
- 11:15–11:35 **"2015": The Year of Living Dangerously—How Are Asian Gas Players Responding to a Low Oil Price Market?**
■ Tony Taylor, Research Director and Advisor, IHS
- 11:40–12:50 **North American Focus Panel: "New Wave North American Supply: What Works Best for Asian Buyers?"**
■ Noel Tomnay, Head Global Gas, Gas and Power Research, Wood Mackenzie
■ Shenyuan Ma, Vice President, ENN Group
■ Frederick Jones, Founder and CEO, Delfin LNG
■ Kunio Nohata, Senior Executive Officer, Tokyo Gas Co., Ltd
■ Andrew Walker, Vice President LNG Strategy, Cheniere Marketing
■ Brent Wahl, Senior Managing Director, Macquarie Bank
- 12:50–14:10 **Delegate Lunch**

AFTERNOON

Contracting, Pricing and Trading (Session 2)

- 14:10–14:20 **Chairperson's Welcome**
■ Deborah Turner, Senior Shipping Adviser, Simpson, Spence & Young
- 14:20–14:40 **Changing Dynamics in LNG Contracting Strategy—A Myth or Reality?**
■ Lennart Lutén, Manager, Galway Group
- 14:45–15:05 **An Alternative to Price Reviews?**
■ Gaston Bilder, Senior Legal Counsel, Total
- 15:10–15:30 **What First-Time LNG Buyers Want: The Challenges of Creating a New Regasified LNG Value Chain and their Impact on LNG SPA Negotiations**
■ Daniel Reinbott, Partner, Ashurst LLP
- 15:35–15:55 **How Can LNG Buyers Best Position Themselves Ahead of the Coming Supply Crunch?**
■ Paul Griffin, Partner, Allen & Overy
■ Kristian Bradshaw, Counsel, Allen & Overy
- 15:55–16:20 **Networking and Coffee Break**
- 16:25–16:45 **Know Thy Enemy!**
■ Henning Gloystein, Energy Editor, Asia, Thomson Reuters
- 16:55–17:15 **Does \$50/bbl Oil Require a New Approach to Delivering Successful Projects?**
■ Philip Loots, Adjunct Professor, Centre for Mining, Energy and Construction Law, The University of Western Australia
- 17:15–17:35 **Evolution of LNG Trading Activities, LNG Pricing and Project Development in Asia-Pacific**
■ Medan Abdullah, Managing Director, Asia Pacific, Gazprom Marketing and Trading Singapore
- 17:40–18:00 **Asia's Future LNG Pricing Challenges**
■ Hiroshi Hashimoto, Senior Analyst, Gas Group, Institute of Energy Economics, Japan
- 18:00–21:00 **The Gastech 2017 Launch Party, Hall 2, Singapore EXPO**

TECHNICAL STREAM

MORNING

Shipping

- 9:00–9:10 **Chairperson's Welcome**
■ Andrew Clifton, General Manager and Chief Operating Officer, Society of International Gas Tanker and Terminal Operators (SIGTTO)
- 9:10–9:35 **Summary of Developments in Ship to Ship LNG Transfer Safety**
■ Alasdair Barclay, Electrical, Instrumentation and Control Engineer, Shell Shipping Technology
- 9:40–10:05 **A Ship Owner's Perspective of the Technical and Operational Challenges of Delivering LNG to Pacific Markets via the Northern Sea Route and Panama Canal**
■ Suryan Wirya-Simunovic, General Manager—LNG and Offshore, Mitsui OSK Bulk Shipping (Asia Oceania) Pte. Ltd., Singapore
- 10:10–10:35 **Learning from the Past—A View of the Future of LNG Transportation at Sea**
■ Richard Boudiette, Technical Advisor, Society of International Gas Tanker and Terminal Operators (SIGTTO)
- 10:40–11:15 **Networking and Coffee Break**
- 11:15–11:40 **Develop Next-Generation LNG Carriers with Succeeding MOSS Type Cargo Tank**
■ Takumi Yoshida, Manager—Ship and Offshore Structure, Kawasaki Heavy Industries, Ltd.
- 11:45–12:10 **New Shipbuilding of KC-1 LNG Cargo Containment System**
■ Young-Kyun Kim, Principal Researcher, Korea Gas Corporation (KOGAS)
- 12:15–12:40 **Large Ethane Carriers—Providing Transport Solutions to a New Market**
■ Björn Munko, Sales Manager, TGE Marine Gas Engineering GmbH
- RESERVE PAPER: Beyond the Experience Matrix: Putting Knowledge to Work and Improving Learning in the Workplace**
■ Ray Gillett, Director and General Manager, GTT Training Ltd
- 12:50–14:10 **Delegate Lunch**

AFTERNOON

Gas as a Transport Fuel

- 14:10–14:20 **Chairperson's Welcome**
■ Mark Bell, President, Society of Gas as a Marine Fuel (SGMF)
- 14:20–14:45 **Development of LNG for Transportation in Indonesia**
■ Rudolf Doloksaribu, General Manager—LNG Sales Operation—JMG, PT Pertamina (Persero)
- 14:50–15:15 **Beyond the 'Chicken and the Egg': Are the Economics of Retrofitting Holding Back LNG Bunkering?**
■ Manon Dumontier, Natural Gas and LNG Consultant, Poten & Partners
- 15:20–15:45 **Retail Scale LNG Handbook: Leveraging Existing Knowledge on LNG Import Terminals**
■ Jonathan Lauck, Director of Engineering, ENGIE North America
- 15:50–16:25 **Networking and Coffee Break**
- 16:25–16:50 **LNG Bunkers—Delivering the Solution**
■ Angus Campbell, Managing Director,
■ Bernhard Schulte, Shipmanagement Ltd
- 16:55–17:20 **First 2-Stroke Main Engines (ME-GI) Operating on Gas—Project Implementation and Operational Experience**
■ Jürgen Harperscheidt, Project Manager, TGE Marine Gas Engineering GmbH
- 17:25–17:50 **A Successful Application of DSME Fuel Gas Supply System (HiVAR®) to the World First LNG Fuelled Containership**
■ Dong-Kyu Choi, Director, Daewoo Shipbuilding & Marine Engineering Co., Ltd. (DSME)
- RESERVE PAPER: Case Studies for Low-Speed Dual-Fuel Engine Machinery Solutions: LNG Carrier and Merchant Vessels**
■ Daniel Stroedecke, Manager Application Engineering, Winterthur Gas & Diesel
- 18:00–21:00 **The Gastech 2017 Launch Party, Hall 2, Singapore EXPO**

To see the schedule for Centres of Technical Excellence (CoTEs), please see page 5

Wireless Dräger gas detection solutions

To increase efficiency, save costs and improve safety, Dräger offers wireless area gas monitoring and wireless fixed gas detection solutions that warn and protect personnel and assets during standard plant operations and shutdowns.

When the Dräger X-zone 5500 (FIG. 1) detects gas hazards, it transmits the alarm signal to all interconnected units. Up to 25 Dräger X-zone 5500 units can be automatically interconnected to form a wireless fence line, creating safety networks that can span large areas.

The triggering unit's alarm flash lights differ from the connected X-zones. Even from a distance, it is possible to identify the hazard source because the visual and audio alarm provides a clear warning with 360° red LED lighting and a loud alarm of up to 120 dB. The Dräger X-zone 5500's 24 Ah battery provides up to 120 hours of continuous operation.

In the event of a gas alarm, the triggering device transfers the alarm to all other devices in the chain. One X-zone Com enables the forwarding of data from up to 15 devices directly to workers. The Dräger X-zone Com sends measured data and warnings via email, text or cloud to your mobile device. For wireless transfer, the X-zone Com is Bluetooth-enabled and has a GSM/GPRS module. A data logger continuously stores the measured values, ensuring that no data is lost. All measures covering evacuation and protection, the elimination of the problem and the resumption of work, can be implemented quickly, efficiently and safely.

Applications. The danger of gas leaks always exists. The Dräger X-zone 5500 and X-zone Com can be used in the following applications:

- Oil & gas—monitoring of pipelines, boreholes and repairs
- CSE monitoring of hot works, individual workspaces
- Chemical industry—shutdowns, tank cleaning.

GasSecure, GS01 wireless gas detection. Since the purchase of GasSecure in March 2015, Dräger has taken further steps to provide future-oriented technology for explosion protection in the oil and gas industry.

The Norwegian company GasSecure AS was founded in 2008 and is headquartered in Oslo. It specialises in the development of a wireless infrared system for the detection of hydrocarbons. This wireless gas measuring device offers many advantages: it greatly reduces the effort and expenditure required for technical planning and installation; features a long battery life that can last over a year; and offers seamless integration with existing wireless and wired process control systems.

GasSecure GS01 represents a totally new concept in hydrocarbon gas detection, both off- and onshore. Built into a compact stainless steel enclosure, the entire device is intrinsically safe and specially designed for hazardous areas. The GS01 uses single-beam triple-wavelength infrared (IR) technology for fast gas detection with extremely low power consumption. Due to this low power design, the small integrated battery pack enables two years of continuous operation.

The GS01 also offers life-long zero point stability so that it never needs to be calibrated in the field. Wireless communication is based on the open ISA100 Wireless standard, simplifying integration with commercially-available wireless access points. Some of the key features are:

- **True wireless, no cables:** significant cost and time savings, and installation flexibility compared to wired detector installation
- **Lifetime calibration:** no field calibrations required, reducing maintenance costs
- **Fail-safe IR detection with triple wavelength:** no false alarms, and includes heated optics
- **Hazardous area intrinsically safe design:** low power, light weight gas detector with Ex-i field replaceable battery pack.

Areas of applications. GasSecure offers wireless IR gas detection for demanding industrial applications, including gas terminals and processing plants, FPSO/FLNG vessels, storage tank farms, oil and gas production platforms, oil and gas exploration rigs, and petrochemical plants and refineries. ■

Learn more about Dräger's wireless gas detection solutions at booth #A212.



FIG. 1. Up to 25 Dräger X-zone 5500 gas detection units can be automatically interconnected to form a wireless fence line.

SPECIAL FOCUS STREAM

MORNING

Emerging Gas Markets: Developments and Investment

- 9:00–9:10 **Chairperson's Welcome**
■ François Martin, Global Head—Oil and Gas Sector, Crédit Agricole
- 9:10–9:30 **Investment in the Global Gas Business**
■ Michel Lebon, General Manager Jakarta Office, ENGIE Exploration & Production International SA
- 9:35–9:55 **Unlocking Greater Value Through Capital Structuring**
■ Katan Hirachand, Managing Director, Energy Project Finance, Société Générale
- 10:00–10:20 **The World's Largest Project Financings Have Been for the LNG Industry: Can LNG Remain a Magnet for Global Funding?**
■ Melanie Lovatt, Finance Advisor—LNG Research Reports, Poten & Partners
- 10:25–10:45 **Indonesia's First In-land LNG Receiving and Regassification Terminal**
■ Teuku Khaidir, President Director, PT Perta Arun Gas
- 10:40–11:15 **Networking and Coffee Break**
- 11:15–11:35 **LNG: A Game Changer in Pakistan's Energy Equation**
■ Rahil Pitafi, Assistant Executive Director (LNG), Pakistan
- 11:40–12:00 **Focus on Canada: Canadian LNG Development: A Challenging but Not Impossible Path**
■ Aaron Engen, Managing Director and Co-Head, Power and Energy Infrastructure, BMO Capital Markets
- 12:05–12:25 **Focus on Canada: Examining the Fundamental Requirements of Asian Buyers—Is Canada Still Considered a Supplier of Choice?**
■ Mary Hemmingsen, Partner and National Sector Leader, LNG, Power and Utilities, KPMG
- 12:30–12:50 **Eastern Canada's LNG Opportunity**
■ Honorable Michel P. Samson, Government House Leader and Minister for Energy, Government of Nova Scotia
- 12:50–14:10 **Delegate Lunch**

AFTERNOON

FLNG Innovation, with Containment and Storage

- 14:10–14:20 **Chairperson's Welcome**
■ Patrick Janssens, Vice President, Global Gas Solutions, ABS
- 14:20–14:40 **FLOATING LNG: Shell FLNG Safety from Research to Engineering**
■ Ian Jewitt, FLNG HSSE Team Lead, Shell Global Solutions
- 14:45–15:05 **Floating LNG: What Makes Nearshore Mid-Scale FLNG Solutions Attractive?**
■ Javid Talib, Vice President and FLNG Program Manager, Black & Veatch
- 15:10–15:30 **Floating LNG: FLNG Commissioning at Nearshore**
■ Dong Hyun Lee, Senior Manager, Samsung Heavy Industries
- 15:35–15:55 **Containment and Storage: LNG Bunkering—The Dawn of a New Era**
■ Irfan Choudhry, Senior Director—Energy Consulting, Galway Group
- 15:55–16:25 **Networking and Coffee Break**
- 16:25–16:45 **Containment and Storage: Onshore Mid-Scale LNG Terminal Storage Modularization**
■ Brian Raine, Principal, Arup Texas Inc.
- 16:50–17:10 **Containment and Storage: A New Solution for Middle or Small Scaled Offshore Modularized LNG Terminal**
■ Yanjian Peng, Engineer, CNOOC Gas and Power Group
- 17:15–17:35 **Containment and Storage: Mini-LNG Solutions for Indonesia: Distributed Electricity Generation Units**
■ Chairani Rachmatullah, Head of Oil and Gas Division, PT PLN Persero
- 18:00–21:00 **The Gastech 2017 Launch Party, Hall 2, Singapore EXPO**

CONFERENCE AND EXHIBITION OPENING TIMES

	Conference	Exhibition
Tuesday 27 October 2015	14:00–17:50	10:00–18:00
Wednesday 28 October 2015	09:00–18:00	10:00–19:00
Thursday 29 October 2015	09:00–18:00	10:00–18:00
Friday 30 October 2015	09:00–13:00	10:00–16:00

Global gas market expected to prosper after short-term dip

KURT ABRAHAM, Gas Processing

Examining the situation from different angles, several speakers in Wednesday's opening commercial session said that they have high hopes for the long-term global gas market, once the current oversupply and low prices are overcome. Despite the short-term hiccups, "it's an

exciting time to be part of the global LNG industry," noted moderator Roger Bounds, Global Head of LNG at Shell.

"We have more volume and more supply than ever before," continued Bounds. "New markets are opening all the time, and we're also seeing our buyers reaffirming the validity of long-term contracts. I'm very happy to speak on behalf of floating LNG and how they're beginning to find their own stride."

Referring to the keynote speech delivered on Tuesday by BG Chief Executive Officer Helge Lund, Wood Mackenzie's Noel Tomnay provided some comic relief to the crowd by saying, "When folks are quoting Winston Churchill to you, you know things are really bad." He noted that coal and carbon markets will influence potential floor prices for gas in Europe and Asia. "There is a real risk that prices in Europe over the next five years might dip below \$5/MMbtu. Coal competition in Asia in the short term is not something that we had seriously considered before, but we might have to start."

Tornay also said that there will be a new focus on the cash cost of gas supply. "Delivered cash costs of indigenous Chinese gas and US LNG appear relatively high," he explained. "In fact, US LNG cash costs to Europe might be anywhere from \$4/MMbtu to \$5/MMbtu." In yet another factor affecting the global market, Tornay said that Asian players will be more aware of the consequences of Russia's strategy for gas sales into Europe.

Looking at some additional predictions, Tornay said that the proportion of spot sales will be higher, with the concurrent growth in availability of supply and shipping. "The Asian LNG buyer will be more fragmented, with requirements for smaller volumes and more flexibility," Tornay said. "Control of supply will be more concentrated, driven by an appetite for cost reductions and portfolio growth."

In one of the more insightful comments of the session, Tornay noted that once Shell finishes its acquisition of BG Group, the transaction "will ensure that the top four suppliers in the world will have about the same share in 2020 as they do today."

Patrick Breen, Chief Executive Officer at Gas Strategies, said that the industry is "looking at a slowdown of FIDs, which was already beginning in the last six months. Forward demand projections are faltering, and people are looking at Northwest Europe to underpin FIDs."

There is an increase in liquidity and flexibility being driven by today's market conditions, added Breen. "With a 35% increase in global supply by 2020, the industry will experience a paradigm shift. There may be a shift from contract management to customer management."

Until now, there has never been an oversupply in the global LNG market, observed Breen. "There has always been latent demand to soak up the supply. Successful development of new demand (will be necessary), and it raises challenges that are now unfamiliar to many." He said that these challenges include uncertain demand; initially very low demand; incomplete infrastructure; inexperienced buyers; questionable credit; an emphasis on security of supply; challenging and unpredictable demand profiles; and short periods of need (bridge solutions).

Current conditions, explained Breen further, will require greater understanding by both buyers and sellers of how to handle the market. "For buyers, it means buying well. For sellers, it means really, really understanding the needs of buyers and knowing your place in the supply chain."

Looking at global trends that have influenced the gas market, Alaa Abu Jbara, COO, Commercial and Shipping, at Qatargas Operating Company Ltd., said four specific items have had the greatest impact. "These include slow Chinese growth, the sharp drop in oil prices, US Federal Reserve monetary policy, and emerging market challenges," noted Jbara. "Global gas demand is still expected to grow in the coming years, but at a slower rate than expected."

In the LNG sector of the overall gas market, Jbara said the market has been adjusting to several factors of its own, including global demand plateaus, emerging Middle East demand, emerging spot vs. long-term trade, and a situation of few new supply additions. In addition, "Global gas demand is being challenged by greater use of coal and renewables. However, significant new supply volumes will come from Australia and the US over the next few years."

Jbara said that the long-term outlook at Qatargas remains positive. "After all, demand continues to grow," explained Jbara. "Just look at population growth—the most recent baby is the 7-billionth person on the planet. By 2025, the Chinese economy could match that of the US." ■



ROGER BOUNDS, Global Head of LNG, Shell



NOEL TOMNAY, Head Global Gas, Gas and Power Research, Wood Mackenzie



ALAA ABU JBARA, COO, Commercial and Shipping, Qatargas Operating Company Ltd.



PATRICK BREEN, Chief Executive Officer, Gas Strategies



JONATHAN STERN, Chairman and Senior Research Fellow, Natural Gas Programme, Oxford Institute for Energy Studies

NOBLE TO DELIVER LNG TO FLOATING TERMINAL IN EGYPT

Noble Group is set to soon deliver its first million metric tons of LNG within its first year of operations in the segment. The cargoes will be sent to Egypt, which is the fastest-growing market for the fuel.

"The new slots in Egypt are the latest addition to Noble's fast-growing global LNG business, which also includes cargo deliveries to customers in the Pacific and the Atlantic Basins," the company said. "Noble has been regularly chartering

LNG vessels on the spot market this year as its deliveries continue to grow."

Egypt became an importer of LNG earlier this year, receiving four to five cargoes a month through the Höegh Galant FSRU. The African country holds supply contracts with Noble, Vitol Group, Gazprom, Trafigura Beheer, Sonatrach and BP.

Egypt's second terminal, from BW Group, is due to start next month. The

country plans to lease its third FSRU in 2016. A third import facility could be added, making Egypt one of the world's five largest importers.

Noble's LNG unit holds purchase and supply agreements until 2020 with buyers in the Middle East, Europe and Asia, including Japan. Noble's expansion into Egypt gives the company an opportunity to supply the country's burgeoning need for power.

Noble commissioned the country's first terminal at the port of Ain Sokhna and delivered the first two LNG cargoes imported by Egypt. Under its contract, Noble will supply seven cargoes for two years starting from April 2015.

Egypt has chosen an additional seven companies to provide 55 LNG cargoes from November of this year through December 2016, the oil ministry said in a statement. ■

Alaska touts its LNG project during Suppliers Panel

KURT ABRAHAM, Gas Processing

In Tuesday's Suppliers Panel session, which was dedicated to what the impact of lower commodity prices will be on the LNG market over the next five years, perhaps the most compelling story involved the proposed Alaska LNG project. Standing in for Alaska Gov. William Walker (who had to attend a special session of the state legislature), Audie Setters, the Alaska Gas Team General Manager, provided Gastech delegates with a progress update of the state's signature gas project.

"The most important thing to know is that the project has a great partnership between Alaska's three biggest producers—BP, ExxonMobil and ConocoPhillips—and a state government that badly wants this project to move forward," Setters said. "We continue to progress toward a final investment decision in 2019. If that happens, then we would have first output and transmission in 2025. We have already received preliminary Department of Energy (DOE) approval for the project to export LNG, and we don't expect any particular problems in getting environmental permits approved."

As outlined by Setters, the "foundation fields" for the project, known as AKLNG, are all on the North Slope. The primary fields will be Prudhoe Bay, which has a 27-Tcf gas cap, and Point Thomson. About 75% of the gas will come from Prudhoe Bay, while 25% will be supplied from Point Thomson. In addition, an 800-mi gas export pipeline will be constructed and will roughly follow the footprint of the oil line—the Trans-Alaska Pipeline System, down to Nikiski, Alaska. There, a three-train, 3-Bcfd, 18.5-MMty gas liquefaction plant will be built.

"Another advantage we have," Setters continued, "is that all the wells and infrastructure are already in place. So, it's much more like a brownfield project." At a proposed \$45 B to \$65 B, AKLNG will be the largest, single investment in Alaskan history. The project potentially will create between 9,000 and 15,000 jobs during the design and construction phases; plus approximately 1,000 jobs for continued operations. In addition to generating billions of dollars for the Alaskan state treasury, the project will provide access to natural gas for Alaskan citizens.

In a project update presented to Alaskan state legislators in September 2015, AKLNG said that spending on pre-FEED activities through July 2015 totalled \$243 MM. The initial design scope was 75% complete, and 2015 field work was roughly 50% complete. The project



Tuesday afternoon's Suppliers Panel Debate included **PIERRE BREBER**, Executive Vice President, Chevron; **HAMAD MUBARAK AL MUHANNADI**, Chief Executive Officer, RasGas Company Limited; **STEVE HILL**, Executive Vice President, Global Energy Marketing & Shipping, BG Group; **PHILIP OLIVIER**, Chief Executive Officer, ENGIE GLOBAL LNG; **AUDIE SETTERS**, General Manager, Alaska Gas Team.

partners have also been actively acquiring land, with about 600 acres purchased in Nikiski for the actual LNG plant site. During 3Q 2015, project coordinators were developing a 2016 work program and budget.

In other comments during the Suppliers Panel session, several participants offered perspective on the situation that the global LNG market finds itself in due to prolonged, low commodity prices. "If you go back to early 2014, spot LNG prices were close to \$20," said Pierre Breber, Executive Vice President of Gas and Midstream at Chevron. "LNG is capital-intensive, and lead times are long. Fundamentally, what Chevron is working on are the most capital-effective projects it can find."

Philip Olivier, CEO at Engie Global LNG, noted that Henry Hub prices are "still rather low, although some of the loss has been offset by hedging or efficiency gains. If you carry out more standardization, it should help to lower the product prices (and improve profits). Of course, Olivier added, one group's pain is another group's benefit. "When LNG prices are low, it should be like oxygen for the importing countries."

Olivier agreed with moderator Joseph Bevas, Managing Partner in the Tokyo office of Latham & Watkins

LLP, that there is a chance there could be a shortage soon of LNG projects reaching FID. "I would encourage companies to work to lower the cost of liquefaction. We need to have economies of scale for floating LNG."

Jumping on the technical innovation and cost reduction bandwagon, BG Group Executive V.P. Steve Hill, who oversees the firm's Global Energy Marketing & Shipping operation, said, "We don't know how far greater efficiencies can take us, but we know that we need to go down that path, an example being floating liquefaction." Hill also offered that the concept of an LNG hub is "one of the most widely discussed topics today, and the definitions of what that is are just as widely dispersed."

Adding to a theme covered by his boss, BG Group CEO Helge Lund, in Monday's keynote address, Hill offered some additional comments on China from an LNG perspective. "China's a fascinating market," Hill said. "Long term, we're very positive about China's gas demand. So far, there's only a 5% penetration, and we see room for huge growth. If LNG is the swing fuel among Chinese gas sources, it could have a huge impact on the LNG market." ■

WOMEN IN ENERGY, continued from page 1

pointing to the intersections between gender and the energy sector as key focus areas.

"We need to make it known that women in the energy sector are a crucial pillar in resolving the energy challenges in the world today," Andayani said. The reasons why so few women are at the top of the energy sector may include inadequate qualifications due to inadequate education, unconscious bias by hiring companies, and other reasons. It is also true that the industry as a whole is still trapped in the prejudices of the past, Andayani said.

As women in energy, "We have the capabilities, but we often underestimate ourselves," she explained. Andayani stressed that it is time for women to stop selling themselves short and move forward without fear.

Nurturing gender diversity in the workplace. The last speaker of the panel, Emiliana Rice-Oxley, Vice President of Exploration Malaysia for Petronas, presented a unique viewpoint on being a woman in a male-dominated role. Rice-

Oxley noted that she has been fortunate, in her roles at Petronas and Shell, to not have encountered gender discrimination, and that her experiences as a woman in a leadership role have been based solely on merit.

"A great deal of my passion and enthusiasm for my work is based on the understanding that my contribution matters," Rice-Oxley said. "Nobody told me that I couldn't do what I wanted to do because of my gender."

However, Rice-Oxley acknowledged that her experience is often not shared by other women in leadership roles, especially in the corporate world, and particularly in the energy sector. The VP credited her mother—a strong, hardworking single parent of ten children—with teaching her that she could do anything she set her mind to do.

However, wanting to succeed is not all that is required to surpass expectations. "You must believe in yourself, you must build your core competencies and you must have personal drive," Rice-Oxley asserted. This helps create a solid foundation upon which one can stand and contribute. It also

imparts confidence that will translate into other areas of life.

Within the workforce, women remain an underutilized resource, Rice-Oxley said. The goal is to create gender diversity across entire organizations, and not just in top technical roles. "Why is gender diversity important?" Rice-Oxley posited. "It's not because it's the right thing to do. It's because it's a business imperative. It is a *necessity*."

Research shows that companies benefit from the different leadership style that women bring to senior management roles, which translates into financial gains. Companies that proactively nurture gender diversity will be more profitable in the future, Rice-Oxley said.

To achieve gender diversity targets, companies must encourage programs that help women enter and stay in the workforce. Family-friendly policies, such as company-sponsored child care, flexible working hours and the ability to telecommute, are essential. Such policies will also give husbands and fathers the opportunity to play a bigger role in taking care of their families. However,

Rice-Oxley noted, "These changes will require working on perceptions, both on the individual and institutional level."

Companies that take steps to nurture diversity, to address women's needs and to promote more women in senior roles will benefit in terms of profitability and sustainability. While these initiatives may not be happening fast enough or visibly enough across the workforce as whole, Rice-Oxley urged WIE programme attendees not to be discouraged. "We can certainly take control of our own destinies," she asserted. ■



Attendees listened intently at the inaugural Women in Energy panel on women in the energy workforce.

Gastech 2015 marks 25 years of industry service for Heatric

UK-based Heatric Ltd., the pioneer of the printed circuit heat exchanger (PCHE), will be celebrating 25 years of service to the global oil and gas industry at Gastech 2015.

Visitors to the Heatric exhibition (D340) will have a rare opportunity to inspect at very close quarters the solid, diffusion-bonded core and chemically-etched flow channels of a sectioned printed circuit heat exchanger (FIG. 1). The innovative manufacturing techniques make PCHEs as much as 85% smaller and lighter than equivalent shell and tube units, and provide them with an exceptional safety record. Today, more than 2700 Heatric units are in operation in offshore and onshore fields all over the world.

“The diffusion bonding process was first developed by our founders at the University of Sydney, Australia, in 1980,” explains Business Development Director Nick Johnson. “The modern Heatric story really began 10 years later when the company was acquired by Meggitt PLC and relocated to the UK. In Australia, the gas industry was in its infancy; in Europe the ‘dash for gas’ had begun and the North Sea was booming.”

“Natural gas is set to be the fastest growing fuel source for at least the next 20 years, and Heatric PCHEs will play a key role in that growth,” says General Manager Adrian Tattersall. “For gas operators who need to

boost output from existing platforms or optimise new-build projects, our PCHEs offer an ideal solution in offshore operations: smaller footprint, higher output and better safety. For existing platforms, that means de-bottlenecking; for new platforms, a host of knock-on financial and operational benefits are unlocked by designing-in higher efficiency, safety and durability from the start.”

Heatric is dedicated exclusively to the design, development and manufacture of printed circuit heat exchangers. At the company’s Dorset, UK headquarters there is evidence of rapid expansion: the original plant was doubled in size as recently as 2011, and a completely new factory, opened in 2013, doubled capacity once more. The main site’s 15,000 m² of advanced production facilities are a single, integrated operation including one of the largest civilian radiography and pressure-testing facilities in the UK. A workforce of 100 or so in 2008 has grown to more than 400.

Heatric’s worldwide reputation for building safe, efficient and reliable heat exchangers is due, in large part, to the skill of its welder-fabricators (FIG. 2), who must work to the same inspection standards as the builders of nuclear submarines (FIG. 3). Finding talent of the right calibre has not been easy, so the company has taken to growing its own; a prestigious four-year apprenticeship programme is housed in a dedicated, fully-equipped training factory just minutes away.

Aftermarket services have been a key engine of development for Heatric. A full suite of lifecycle support services—system preparation, commissioning, on-going maintenance, specialised cleaning—helps keep customers’ PCHEs in peak condition, maximising operation up-time. A Heatric customer service technician can be onsite anywhere in the world within 72 hours.

With sales offices in Poole, Houston, Rio de Janeiro, Singapore and Sydney, as well as a network of agents across the rest of the world, Heatric now provides truly global and bespoke service wherever its customers operate and whatever heat transfer challenges they face. ■

Be sure to visit Heatric’s comprehensive booth #D340 to speak with experts from its sales, engineering and customer support operations, and to see inside one of their game-changing devices.

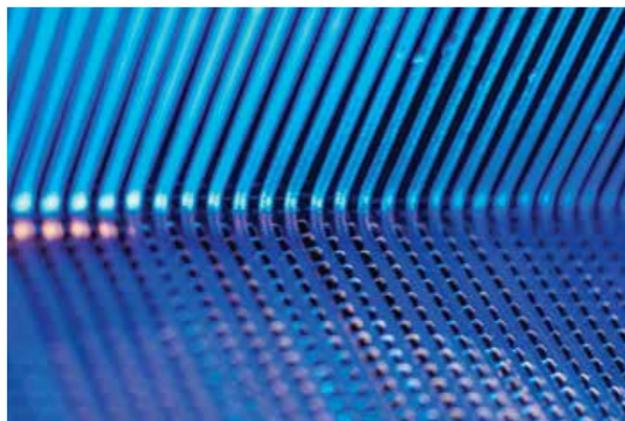


FIG. 1. Close-up of a diffusion-bonded Heatric PCHE core.



FIG. 2. Heatric PCHEs are assembled by hand to the highest inspection standards.



FIG. 3. Heatric PCHE weld seam quality.

PROTECT YOUR PEOPLE WITH NEXT-GENERATION GAS DETECTION



In a global economy, the challenges to personal safety, productivity and business continuity are magnified. Companies in a wide range of industries, where the presence of combustible and toxic gases is a way of life, must continue to evaluate their gas detection systems or suffer the consequences. Considerations involve a number of factors that can enhance safety, while streamlining installation and minimizing maintenance now and the future.

“Dealing successfully with any emergency situation requires careful planning and training,” said Tony Pickett, Scott

Safety product line manager. “All personnel need to know how to behave in an emergency, and those responsible for carrying out lifesaving tasks must be familiar with the equipment they need and know how to use it safely and effectively. This, together with working with a reputable manufacturer, will help reduce deaths and serious injury in this demanding industry.”

Fixed gas detection. Combining advanced sensor technology and simple operation, Scott Safety offers a comprehensive range of fixed and portable gas detectors, flame detectors and controllers flexible enough to handle the harshest conditions, while helping customers minimize their overall cost of ownership.

The Meridian Universal Gas Detector is an innovative, next-generation fixed gas detection solution. The Meridian single detector head supports combustible and toxic sensors. Designed for ease of use, Meridian significantly reduces upfront investment and ongoing maintenance costs.

Whether the application requires an infrared or catalytic bead sensor to detect

combustible gases, or an electrochemical or metal oxide semiconductor sensor for a toxic environment, the Meridian gas detector utilizes a single detector head to easily accept all sensor types. The specific toxic or combustible sensor is attached to the detector head, and the Meridian gas detector will automatically determine the type of gas to be detected. Installation of the sensor is a simple plug-and-play action. The Meridian platform is designed to be future proof, allowing owner-operators to take advantage of new sensing technologies from Scott Safety.

Portable gas detection. With simple, intuitive operation and automated functionality, Scott Safety’s portable gas detection solutions reduce the likelihood of user error.

The company’s PS200 is a rugged, easy-to-use portable multi-gas detector ideal for use in confined spaces and hotworks. Both lightweight and durable, the instrument monitors and displays up to four hazardous gas conditions simultaneously, using catalytic bead sensor technology for a wide

range of combustible gases and electrochemical sensors for carbon monoxide (CO), hydrogen sulfide (H₂S) and oxygen deficiencies. To ensure the highest level of personal safety (FIG. 1), the PS200 is also fitted with an optional man-down/motion sensor that activates alarms if the instrument is not moved at a preset time.

Rooted in more than 75 years of heritage and dedication to safety, Scott Safety has constantly expanded to provide safety solutions for new markets and challenges. Today, the company works with dozens of global industries, including oil and gas, general industry, petrochemical, marine, first responders, and military and civil defense, among others. With five manufacturing facilities and a customer base that spans more than 50 countries, Scott Safety has a broad, global offering of innovative safety products, with a premium portfolio of self-contained breathing apparatuses, air-purifying respirators, gas detection systems, compressors, PPE and thermal imaging products. ■

To learn more about the Scott Safety portfolio, visit their capable team at booth #A178.

Scenes from Gastech



The **GASTECH YOUNG ENGINEER FOUNDATION** is an initiative that recognizes and supports the next generation of engineers.



Select students and recent graduates listen intently to the opening session of the **GASTECH STUDENT PROGRAMME** on Wednesday.



Gastech is a great forum for promoting international discussions and interaction.



On Tuesday, **JEREH GROUP** announced a collaboration with **PRIMUS GREEN ENERGY**.



Foot traffic increased on the Gastech show floor Wednesday, as attendees visited key stands in greater numbers.



KIEWIT attracted a long, steady line of attendees with its crane game.



HYUNDAI HEAVY INDUSTRIES' uniquely shaped exhibit houses informative models of FPSOs, FLNGs and other vessels.



Delegates try out PE's interactive LNG map at **BG GROUP'S** booth (C10).



A **KUWAIT OIL COMPANY** executive makes a presentation at the firm's stand.



Networking and business were in high gear at **KBR'S** booth.



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