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This Month’s Front Cover

Join the Conversation

Sabin outlines what really matters in balancing a company’s precious metals management: best practices in processing, sampling and analysis to maximise metals returns; environmental protection; regulatory compliance; and achieving precious metals refining transparency; utilising peripheral services that truly add value; and aligning with the new global paradigm.

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FROM A ...TO B... TO SEA.

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016 has been a turbulent year, to say the least. Historic events such as the UK’s withdrawal from the European Union, or ‘Brexit’, and the unexpected outcome of the US presidential election have rocked the political world – and the entire world for that matter – and the oil and gas industry has remained on constant tenterhooks as crude prices linger on shaky ground. However, as the year draws to a close, now is the time to look to the future.

Accordingly, the International Energy Agency (IEA) has released its World Energy Outlook 2016 (WEO-2016), reviewing the movement of global energy systems to 2040. Reassuringly, the analysis finds that the era of fossil fuels appears far from over, although government policies, as well as cost reductions across the energy sector, will enable a huge push in the renewables arena, as well as improvements in energy efficiency, over the next 25 years.

However, an energy mix makeover also brings its fair share of security risks. Concerns related to oil and gas supply remain, and are reinforced by a decline in investment levels. In the longer term, investment in oil and gas will be absolutely essential to meet demand and replace declining production, but the growth in renewables and energy efficiency will diminish the need for oil and gas imports in a number of countries. Increased LNG shipments will also change how gas security is perceived, according to the WEO-2016. Meanwhile, the changeable nature of renewables in power generation (wind and solar in particular) necessitates a specific focus on the security of electricity.

The analysis notes the growth of global oil demand until 2040, mostly due to the lack of ‘easy’ alternatives to oil in areas such as road freight, aviation and petrochemicals. But, despite this, demand from passenger vehicles is expected to decline, even as their number doubles in the next 25 years, due to marked improvements in efficiency, an increased use of biofuels and rising ownership of electric cars.

Of course, the much-celebrated Paris Agreement, a major step in the fight against global warming, takes a leading role in the outlook, but meeting these ambitious climate goals will be a tremendous challenge for both developed and developing economies – with huge pushes in the area of decarbonisation and efficiency required. According to IEA data, the implementation of current international pledges will only slow down the projected rise in energy-related carbon emissions from an average of 650 million tpy since 2000 to around 150 million tpy in 2040.

While this is an achievement to be proud of, it is far from enough – only limiting the rise in average global temperatures to 2.7°C by 2100. The mission to attain 2°C is very tough, but feasible, if policies to accelerate further low carbon technologies and energy efficiency are established effectively across all sectors, resulting in a peak in carbon emissions over the next few years, and the global economy becoming carbon neutral by the end of the century. A simple example from the WEG-2016 illustrates the scale of this challenge. In the ‘2°C scenario’, the number of electric cars would need to exceed 700 million by 2040, and displace more than 6 million bpd of oil demand – ambitions to further limit temperature gains, beyond 2°C, would require even bigger efforts.

Efficiency and emissions reduction are, of course, vital issues that must be addressed to ensure the long term health of our planet, and its residents. However, the analysis is clear in its view that fossil fuels still, undeniably, remain king. And, the fact that our industry is constantly thinking up new and innovative ways of advancing emissions reduction technologies – I had the pleasure of witnessing some of these innovations myself at the ERTC 21st Annual Meeting in Lisbon in November – is certainly a comforting notion looking forward.

I would like to take this opportunity to express my sincere gratitude to all of our authors, advertisers and readers for your continued support in 2016. On behalf of the whole Hydrocarbon Engineering team, I wish you all a very relaxing and gratifying holiday season and a happy New Year!
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North America | Operator training

A refinery in North America has commissioned and installed a high fidelity STRATCO® operator training simulator (OTS) for two sulfuric acid alkylation units. The OTS was specifically developed and fully customised by DuPont Clean Technologies over a seven month period. It encompasses the entire refinery alkylation operation from feed preparation to product storage.

An operator training simulator allows the alkylation plant operator to safely practice plant shutdowns and startups, hone responses to potential emergencies and improve troubleshooting skills in a realistic yet consequence free environment.

DuPont also offers instruction and training that leverage the OTS platform as well as STRATCO alkylation technology expertise. At the time of product delivery, DuPont included one full week of OTS-enhanced operator training for a class of 12 operators and engineers.

Vietnam | Improving refinery efficiency

Honeywell has announced that a subsidiary of PetroVietnam will use its new IIoT-based Connected Performance Services (CPS) offering to improve the performance of its manufacturing operations in Quang Ngai City, Vietnam.

Binh Son Refining and Petrochemical Co., Ltd (BSR) will use Honeywell’s CPS technology, which integrates Honeywell UOP’s deep process knowledge to improve refinery and plant performance, at its naphtha complex. CPS is part of Honeywell’s Connected Plant initiative, which leverages IIoT technologies, services and domain expertise to improve all aspects of industrial operations from supply chain efficiency to asset optimisation.

CPS gives refineries and petrochemical and gas processing plants greater visibility into their operations. Problems that reduced plant efficiency and productivity, and that persistently avoided detection, can be quickly identified and resolved using recommendations from CPS. As a result, plants can produce more and avoid unplanned shutdowns for maintenance and repair, resulting in millions of dollars per year in increased productivity.

The Netherlands | New polypropylene pilot plant

SABIC will have a new pilot plant for the development of next generation polypropylenes (PP) onstream in Sittard-Geleen, the Netherlands, by the end of March 2017. The plant, which will use gas phase polymerisation technology, will support the production at nearby full scale plants of superior materials that meet the needs of the different industries such as automotive, pipe, appliances and advanced packaging.

The pilot plant is the latest in a series of investments being made by SABIC at the Brightlands Chemelot research and development (R&D) and manufacturing campus in Sittard-Geleen. The company opened a new research facility there in May.

SABIC is taking a fast track approach to construction and installation of the pilot plant. It has contracted the work to Zeton, which has developed a skid-mounted system that accelerates implementation times and allows full design flexibility. Installation will begin in December after Zeton has built and tested the plant in Enschede before partially disassembling it into around 15 modules for delivery to Geleen.

USA | Polyethylene capacity increase

ExxonMobil is planning to add a new production unit at its Beaumont polyethylene plant that will increase capacity by 65% (650 000 tpy). Construction of the unit has begun at the plant, where current production capacity is 1 million tpy. Startup is due in 2019.

ExxonMobil is investing billions of dollars along the US Gulf Coast to help meet growing global energy demand. This will not only expand existing refining and chemical capacity, but also stimulate economic growth and create jobs — it could create more than 28 000 temporary jobs in construction and more than 1200 permanent jobs over the next few years and beyond.

The Beaumont project builds on supply advantages created by ExxonMobil’s expansion of its Mont Belvieu plastics plant in Texas, where two similar polyethylene units are being added. Combined, this multi-billion dollar investment will increase the company’s US polyethylene production by 40%, or nearly 2 million tpy, making Texas the largest polyethylene supply point for ExxonMobil.

SABIC is looking in particular to develop grades with improved stiffness/impact, flow properties and other specific secondary properties needed in different industries. SABIC plans to concentrate on the development of impact grades of polypropylene, as well as random copolymers and homopolymers. It will also carry out experiments on advanced catalysts. The plant will complement pilot plants used by SABIC at other strategic locations, and would support the strategic innovation initiatives to address continuously evolving market needs.
IN BRIEF

SAUDI ARABIA
KBR, Inc. has announced that its Saudi Arabian joint venture engineering operation, KBR-AMCDE, has signed an amendment to extend its existing General Engineering Services Plus (GES+) contract with Saudi Aramco. KBR will provide front end engineering design (FEED), detailed design, material procurement and project management services (PMIS) to support Saudi Aramco’s capital programmes in Saudi Arabia.

USA
Wood Group has been awarded a US$40 million contract by ExxonMobil Chemical to provide main automation contractor services for a grassroots polyethylene plant to be built in Beaumont, Texas. Wood Group completed the front end engineering design (FEED) for the process control systems in 2015. Zachry Group has also been chosen to support ExxonMobil’s 650 000 tpy Beaumont polyethylene expansion, which began in 4Q16. Zachry will provide constructability and execution planning, electrical and instrumentation design, and direct hire responsibilities for in-plant construction, which is scheduled to be completed in early 2019.

AUSTRALIA
BP's Kwinana refinery has selected the HR 1246 CoMo catalyst from Axens following results of pilot plant tests conducted by BP’s Refining Technology & Engineering Groups, and a subsequent tendering process. Due to its intrinsic high activity, HR 1246 will be associated with regenerated HR 626 and enable a less than 10 wppm sulfur diesel product while reducing the cost to fill. The project marks Axens’ hundredth Impulse catalyst award in ultra low sulfur diesel (ULSD) service.

FRANCE
Wärtsilä has signed a Memorandum of Understanding (MoU) with ENGIE to develop solutions and services within the small scale LNG business sector. The cooperation covers four work streams: LNG for ships, LNG distribution in islands and remote areas, LNG to power solutions, and small scale LNG and bioliquefaction.

Canada | Water treatment project

Seeking to reduce the use of water in the refining process, and as a way of minimising its environmental impact on the North Saskatchewan River, North West Redwater (NWR) Partnership has selected GE’s Water & Process Technologies for its new Sturgeon refinery in Alberta, Canada.

To minimise the use of freshwater, GE will provide efficient water treatment systems with process water from the refinery being treated and recycled multiple times. Surface water runoff from the facility will be contained in the retention ponds and used for process purposes to reduce the water withdrawal from the North Saskatchewan River. The ultrafiltration and membrane bioreactor technology allow NWR to meet its unique recycling challenges. Chemistry and onsite technical support from GE will not only ensure that the facilities’ water balance targets are met, but will also maintain the reliability of its various assets by protecting them from deposition and corrosion.

The Sturgeon refinery project is the world’s only refinery designed from the ground up to incorporate gasification and a carbon capture and storage solution while producing cleaner, high value products. NWR undertook a collaborative approach to project development and selected companies with best in class technologies, vetting them to ensure commercial competitiveness within their respective areas of expertise. NWR then partnered with the selected organisations to develop a ‘fit for purpose’ design. This unique approach eliminated costly redesign steps for a project of this nature, thus reducing project cost and improving the overall project schedule.

Russia | Benzene unit modernisation

GTC Technology has signed an agreement with PJSC NizhneNeftekhim (NKNK) to provide its GT-BTX® licensed technology for the modernisation of a benzene production facility at NKNK’s EP-600 cracker plant in Nizhnekamsk, Republic of Tatarstan, Russia. The new GT-BTX unit will process a full range C6 - C8 cut after the first stage pygas hydrotreating unit and will allow NKNK to lower the cost of producing high purity benzene, and also recover non-aromatics to be used as cracker feed. GTC will revamp the existing second stage pygas hydrotreating unit to process 30% more feed, and design a new GT-BTX unit with post-fractionation. Scope of supply includes the basic engineering package, technical services, proprietary catalyst, solvent and equipment. Startup is planned for 2017.

USA | LNG bunker facility contract

Matrix Service Company’s subsidiary, Matrix Service, has been awarded the engineering, procurement, fabrication and construction of a 2 million gal. LNG tank for the JAX LNG Bunker Facility, a new LNG liquefaction and storage facility located at Dames Point near the Port of Jacksonville. JAX LNG is a joint venture formed by Pivotal LNG, a wholly owned subsidiary of Southern Company Gas, NorthStar Midstream, LLC, a midstream transportation company backed by funds managed by Oaktree Capital Management, L.P. and Clean Marine Energy LLC. JAX LNG is the long term supplier of LNG to the world’s first LNG dual fuel container ships, the Isla Bella and Perla del Caribe, operated by TOTE Maritime Puerto Rico.

The JAX LNG facility is expected to be operational in the fourth quarter of 2017. Once completed, it will be capable of producing more than 120,000 gal./d of LNG, which will be stored in the 2 million gal. cryogenic storage tank.
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- Managing stringent sulfur limits
- Monetizing orphan streams
- Upgrading residuals

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PROCESS PLANNING AND DEVELOPMENT
LICENSED TECHNOLOGIES AND CATALYSTS
FULL-SCOPE EPFC SERVICES
PROJECT MANAGEMENT AND CONSULTING
AFTERMARKET SERVICES
OMAN
Oman Oil Company S.A.O.C. (OOC) and Kuwait Petroleum International Ltd (KPI) have signed a Memorandum of Understanding (MoU) to cooperate on the development of the Duqm Refinery and Petrochemical Complex in the Duqm Special Economic Zone (SEZ) in Oman's Al Wusta Governorate. The refinery, once completed, will have the capacity to process 230 000 bpd of crude oil that will serve both local and international markets.

ROMANIA
Black Sea Oil & Gas SRL (BSOG) has awarded, together with its co-venture partners, the contract for the front end engineering and design (FEED) of its offshore and onshore facilities for the development of the Ana and Doina Gas Discoveries on the XV Midia Shallow Block, offshore of Romania (the Midia Gas Development Project). Offshore and onshore FEED services will be provided by Xodus Group, which consist of a wellhead platform, an in-field and offshore export pipeline, an onshore pipeline, and a gas treatment plant.

SOUTH AFRICA
Sasol has completed another major capital investment in South Africa as part of its dual-regional, multi-asset hub growth strategy in Southern Africa and North America. The company unveiled the C3 Expansion Project, which enables Sasol to increase its polypropylene production capacity by 103 000 tpy from its Secunda Chemicals operations, while also realising improvements in environmental impact.

MIDDLE EAST
A Middle Eastern refinery has selected outdoor shelters using a combination of Intertec’s passive and active cooling technologies to protect its vital control systems. The environmental protection solution is being provided as part of an upgrade to the burner management systems at the core of the plant’s refining processes. High reliability PLC-based systems will provide the control and safety functions needed for management of eight separate burners.

RUSSIA | Complete integrated fuel development
Genoil, Inc. has announced the signing of a US$50 billion letter of intent (LoI) to develop oilfields and construct clean technology upgraders, refineries and pipelines in Russia. The project will incorporate Genoil’s efficient clean technology hydroconversion (GHU) process, and mark the second time that the company will have provided a complete integrated project, from the development of oilfields to the production of cleaner fuels. The scope of the project is to produce 3.5 million bpd.

Genoil’s hydroconversion process improves upon the existing data verified fixed bed hydroconversion technology, which is used worldwide. Currently, 85% of all desulphurisation is taking place worldwide via hydroconversion. Genoil’s investment into hydroconversion projects can significantly increase the desulphurisation, demetallisation and denitrification conversion rates, and increase operating efficiencies by 75%.

The parties involved will also explore linking this new project to existing pipeline networks in the region. The finance will be provided in full from Chinese banks to the Russian companies involved.

Genoil will be responsible for the design and construction of 6 million tpy of new refinery capacity in Chechnya, and will organise a large consortium of Chinese engineering and services companies to provide all the necessary support and project guarantees.

The LoI has been signed by the President of the Board of Directors of Grozneft, a former official in the administrative department of the Russian Federation.

AZERBAIJAN | Petrochemical facility modernisation
Technip has been awarded a contract for engineering, procurement, and construction (EPC) services by SOCAR for its Azerikimya plant, located in the city of Sumgait. The scope of work includes; the modernisation of the EP-300 steam cracker with construction of new cracker furnaces licensed by Technip; and the installation of a new refinery dry gas treatment unit, new ethylene and propylene storage and related utilities and offshore facilities.

In addition, the project includes the modernisation of the instrumentation and new control system. It also covers control building in order to improve the overall efficiency and safety of the plant.

Technip’s operating centre in Rome, Italy, will execute the contract, scheduled to be completed during the first half of 2019.

PAKISTAN | Refinery power plant project
MAN Diesel & Turbo and Hyundai Engineering (HEC) have completed the extension of a power plant in Pakistan for Attock Refinery Limited (ARL). The plant, located northeast of Rawalpindi, is powered by heavy fuel oil (HFO) and supplies electricity to a refinery.

Three MAN 14V32/40 gensets generate 18 MW of electrical power for the processes in the refinery. This equates to the electricity demand of approximately 30,000 households. Hyundai, as an engineering, procurement and construction (EPC) service provider, was responsible for the construction of the plant, whilst MAN took over the design and delivery of the engines and accessories, as well as the training of the operating personnel.

Rawalpindi is situated in the Punjab region, only a few kilometres southwest of the capital city, Islamabad. Together, the two cities comprise one of the country’s largest industrial centres. Also located in Rawalpindi are the headquarters of the Attock group, one of the most important businesses within the oil and gas industry in Pakistan.
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Enhancing global gas security

While the rise of the LNG market has accelerated the globalisation of natural gas, the energy security implications of this transformation have attracted much less attention. The new Global Gas Security Review from the International Energy Agency (IEA) seeks to provide more transparency into the LNG market.

There is no doubt that global gas markets are well supplied today. While this is positive for global gas security, IEA warns that LNG markets are less flexible than is commonly believed.

A growing share of LNG capacity is offline, meaning the market has less extra capacity than assumed. Between 2011 and 2016, the level of unusable export capacity has doubled, disabling about 65 billion m³ of gas, which is equal to the combined exports of Malaysia and Indonesia, the world’s third and fifth largest exporters. A period of low oil and gas prices could further worsen the situation.

However, LNG contract structures are becoming less rigid, increasing market liquidity. In 2015, about 40% of LNG contracts had fixed destination terms, down from 60% for contracts signed up to the year 2014.

While shorter term contracts are gradually becoming more common, buyers are also accepting longer contracts in exchange for increased flexibility in the final destination in order to better respond to market conditions. Flexible contractual structures are important for gas security as they enable the aggregation of gas volumes at a lower cost from various regions.

LNG’s share of the global gas market is set to increase in the coming years, with LNG supplies having grown at a faster pace than total gas consumption.

Petroleum and gasoline demand trends

Total petroleum deliveries in October moved up 3% from October 2015 to average 20.1 million bpd, and were the highest October deliveries in nine years, since 2007. For year to date, total domestic petroleum deliveries moved up 0.3% compared to the same period last year. Gasoline deliveries in October were down from the prior month, but up from the prior year, and the prior year to date. Total motor gasoline deliveries, a measure of consumer gasoline demand, moved up 0.2% from October 2015 to 9.3 million bpd. These were the lowest deliveries since April, but remained the second highest October deliveries on record.

Record natural gas storage levels

Working natural gas in storage reached a record high of 4017 billion ft³ as of 4 November, according to US Energy Information Administration (EIA) data. Inventories have been relatively high throughout the year, surpassing previous five year highs in 48 of the past 52 weeks.

Declining natural gas production and strong demand from the power sector were offset by a warmer than usual winter, which left natural gas inventories in April (the beginning of the 2016 injection season) above the previous five year maximum.

The injection season for natural gas storage typically runs from April through October, although net natural gas injections sometimes continue for several weeks during November. The previous record for natural gas storage was set at 4009 billion ft³ for the week ending 20 November 2015. This year, natural gas inventories have been relatively high in almost every natural gas storage region in EIA’s survey.
Introducing FFC Plus, the next generation of FIBER FILM® Contactor technology. Merichem Company’s advanced FIBER FILM technology with an integrated coalescer and treater pushes the boundaries of extractive technologies. With this latest advancement to Merichem’s proven technology, hydrocarbon treating rates can be increased by up to 150% through increased mercaptan extraction efficiency. The integrated coalescing and treating device offers a simple installation, reduced chemical use, and reduced service and maintenance complexity. FFC Plus truly is mercaptan treating made better.

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

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

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

Existing Merichem or other treating units can be easily retrofitted with FFC Plus, providing up to 150% additional capacity. This capacity increase will not affect the existing turndown range of Merichem units and will improve the turndown of other units. The new contactor is a direct “drop-in” replacement that can be added or switched with minimal modifications within a short shutdown period.
Strong economic growth and robust demand have made Asia Pacific an extremely attractive area for downstream operators and investors in recent years. *Hydrocarbon Engineering* reviews the recent project developments occurring within the region’s dynamic petrochemical industry.
Asia Pacific is, and will be for years to come, an area of great importance in the global oil, gas and petrochemicals market. According to the World Bank’s East Asia Pacific Economic Update, October 2016, growth in the developing East Asia and Pacific region is expected to remain resilient over the next three years. China is expected to continue its gradual transition to slower but more sustainable growth, from 6.7% this year to 6.5% in 2017 and 6.3% in 2018. Meanwhile, in the rest of developing East Asia, growth is projected to remain stable at 4.8% this year, and rise to 5% in 2017 and 5.1% in 2018. Overall, developing East Asia is expected to grow at 5.8% in 2016 and 5.7% in 2017 - 2018.

While the region still faces significant risks to growth, including sluggish movement in advanced economies, subdued prospects in most developing economies and stagnant global trade, the World Bank expects domestic demand to remain robust across much of the region, with continued low commodity prices benefiting importers and keeping inflation low across most of the region.

These indications of healthy economic growth and increasing domestic consumption have attracted substantial investment throughout the region, providing a major boost to the downstream sector.

The majority of the world’s largest refineries are situated within the Asia Pacific region, and the top five facilities in this part of the world produce some 4 million bpd of oil. Accordingly, the region also holds a wealth of petrochemical infrastructure and resources, and is receiving more and more attention from regional and global players.

In March 2016, research and consulting firm GlobalData released research showing that global petrochemicals capacity would grow considerably over the next five years, increasing from 1464 million tpy in 2015 to 1708 million tpy by 2020. Around 647 planned projects are due to come online in the next five years, driven primarily by China, the US and Iran. Asia is home to over half of all planned projects, with China responsible for 176 projects, and is set to have a total capacity of 64 million tpy by 2019.

Below, Hydrocarbon Engineering provides an overview of major contract and project announcements and updates that have come to light over the past 12 months, and will continue to enhance the region’s petrochemical sector and capabilities.

Petrochemical project round up

China

Connel Chemical Industry
In August 2016, Wison Engineering disclosed that it had been awarded an engineering, procurement and construction (EPC) contract for a 300 000 tpy methanol-to-olefins (MTO) unit that will constitute the first phase of Connel Chemical Industry Ltd’s 600 000 tpy MTO plant. The two parties also signed a licensing and process design package (PDP) contract for Wison’s proprietary olefin separation technology. The project will utilise an integrated solution that leverages UOP’s MTO®+OCP® (olefin cracking process) technology and Wison’s high recovery olefin separation technology. Wison will be responsible for the engineering, design, procurement and construction of the MTO reaction and concentration unit, the olefin separation unit, the olefin cracking unit and additional auxiliaries. The project is scheduled to be delivered in October 2017.

Dongying Qirun Chemical
In October 2016, Honeywell announced that Dongying Qirun Chemical Co., Ltd would license Honeywell UOP’s Unicracking™ technology for the production of diesel and naphtha at its refinery in Shandong Province to meet growing domestic demand for transportation fuels. UOP will also provide engineering, startup services, equipment and catalysts. Qirun Chemical is located in Dongying City in the Yellow River Delta.

Handi Sunshine Petrochemical
In August 2016, Honeywell UOP and ExxonMobil declared a technology licensing agreement with Hainan Handi Sunshine Petrochemical Co., Ltd, marking the first project in China under a joint marketing alliance for premium fuels and lubricants between the two technology providers. The integrated UOP and ExxonMobil technology platform enables Handi Sunshine to meet growing demand in China for cleaner-burning jet fuel and diesel along with high quality Group II/III base oils. UOP’s Unicracking technology and ExxonMobil’s MSDW™ catalytic tubular de-waxing technology will be installed at the Hainan facility.

Hebei Zhongjie Petrochemical
In January 2016, Hebei Zhongjie Petrochemical and Genoil, Inc. of Canada signed a contract and announced plans to establish a new company, Dora Energy Technology Company, that will construct one of the world’s most advanced heavy oil refineries, utilising Genoil’s GHU® technology. Hebei Zhongjie Petrochemical has already invested CNY25 million to date and the parties have completed a new feasibility study and the technological selection required for the refinery project. A Chinese engineering firm has also been selected. The feasibility study encompasses all economic calculations, including the capital costs, the operating costs and necessary factors, as part of the package required by the Chinese lending source. The required feedstock has been lined up and the sales of necessary contracts for finished products, sufficient to amortise the loan from the bank, will be organised.
**Hengli Petrochemical**
In February 2016, Hengli Petrochemical Co., Ltd selected Axens to supply technologies for its petrochemical project, to be located at Changxing Island in Liaoning Province. The crude to paraxylene complex, with a processing capacity of 400 000 bpd of crude, will supply high purity paraxylene to purified terephthalic acid (PTA) plants for polyethylene terephthalate (PET) application. The complex includes a final conversion refinery oriented towards the production of naphtha and an aromatic complex to maximise high purity paraxylene production. The new complex will be the largest site in the world for the production of high purity paraxylene, along with liquefied petroleum gas (LPG), gasoline and diesel fuels (meeting China’s specifications), jet fuel and base lube oils.

In March 2016, DuPont Clean Technologies announced that Hengli Petrochemical Co., based in Dalian, had awarded the company a contract to supply the alkylation and spent acid regeneration (SAR) technologies for the new grassroots refinery in the Changxing Island Harbour Industrial Zone. The contract includes the license and engineering design packages for the STRATCO® alkylation and MECS® SAR units. Installation of the new units at Hengli is currently planned for 2018, with startup anticipated in 2019. The grassroots refinery complex, with the addition of STRATCO® alkylation technology, will allow Hengli to produce a high quality alkylate product from a 100% isobutylene feed stream.

**Jiaxing Petrochemical**
In September 2016, Servomex reported that it had been selected by Jiaxing Petrochemical Co., Ltd to supply a complete analyser system for the second phase development of its purified terephthalic acid (PTA) production facility in Zhejiang Province. Four years after supplying a system for phase one of the project, Servomex will supply the plant with three Servotough Oxy 1900 oxygen and three Servotough SpectraExact 2500 toxic gas analysers. These will be integrated into a bespoke analyser house, designed and built at Servomex’s Systems Integration Facility at the company’s Asia Pacific Business Centre in Shanghai.

**Nanhai Petrochemical Complex**
In March 2016, China National Offshore Oil Corp. (CNOOC) and Shell Nanhai B.V. announced the final investment decision (FID) to expand CNOOC and Shell Petrochemical Company’s (CSPC’s) existing 50:50 joint venture in Huizhou, Guangdong Province. Subject to regulatory approvals, CNOOC and Shell have agreed that CSPC should take over CNOOC’s ongoing project to build additional chemical facilities next to CSPC’s petrochemical complex. The project comprises the construction of a new ethylene cracker and ethylene derivatives units, which will increase ethylene capacity by more than 1 million tpy. It will also include a styrene monomer and propylene oxide (SMPO) plant. Shell will apply its proprietary OMEGA, SMPO and polyols technologies to produce 150 000 tpy of ethylene oxide, 480 000 tpy of ethylene glycol and 600 000 tpy of high quality polyols.

**Ningxia Petrochemical Complex**
In May 2016, SABIC signed a project development agreement (PDA) with Shenhua Ningxia Coal Industry Group Co., Ltd (SNCG), a subsidiary of Shenhua Group Corporation Ltd, for the potential joint development of a greenfield petrochemical complex to be located in the Ningxia Hui Region. The parties would proceed with further actions to implement the project in the event of a positive FID, and subject to obtaining all necessary governmental approvals. The joint venture would benefit from its location in Ningxia and utilise locally available coal feedstocks, to be supplied by SNCG. The PDA provides a basis for the parties to conduct a joint feasibility study on the project within three years, starting from the date when the agreement became effective, and, subject to a positive outcome, to prepare and submit the materials necessary to obtain project application report (PAR) approval from the National Development and Reform Commission (NDRC).

**Shaanxi Future Energy Chemical**
In April 2016, it was reported that a facility in Yulin City would install GE’s advanced zero liquid discharge (ZLD) technology to help meet new regulations governing wastewater treatment at Chinese coal-to-chemical plants. GE’s ZLD evaporator and crystalliser system will eliminate liquid discharge of waste and enable water reuse at the Shaanxi Future Energy Chemical Co., Ltd coal-to-chemical plant in Shaanxi Province. GE’s wastewater treatment system includes a vapour recompression brine concentrator followed by a crystalliser, providing a proven and cost effective ZLD solution. The equipment is expected to be delivered in mid-2016, with commissioning in March 2017. Once operational, the HongDun wastewater treatment facility will treat wastewater at a rate of 40 m³/hr.

**Shandong Luqing Petrochemical**
In May 2016, Honeywell issued a release stating that Shandong Luqing Petrochemical Co. had accepted performance of China’s first standalone Honeywell UOP C₄ Oleflex™ process unit, producing 170 000 tpy of isobutylene. The unit, located in Shandong Province, will support the growing demand for fuel and petrochemicals in China’s industrial sector. In addition to licensing, Honeywell UOP provided the engineering design, catalysts, adsorbents, specialty equipment, staff training and technical service for the project.

**Shenhua Ningxia Project**
In March 2016, Air Products’ PRISM Membranes division in Saint Louis, Missouri, received a significant order to provide a large quantity of membrane separators to the Ningdong Energy and Chemical Industry Base in Ningxia for use as part of the Shenhua Ningxia coal-to-liquids project. The membranes will be part of a hydrogen purification and recycling operation that is expected to start up in late 2016. The membrane separators contain polymeric hollow fibres that use selective permeation under differential pressure to separate hydrogen from methane, carbon monoxide and other hydrocarbons.

**Sinopec Yangzi Petrochemical Company**
In May 2016, Honeywell announced that the first commercial installation of its UOP MaxEnE Process successfully entered production at Sinopec Yangzi Petrochemical Company’s (YPC’s) integrated refinery and petrochemical facility in Nanjing. The new technology generates substantially higher yields of the chemical components used to make plastics, and has processed more than 2.5 million t of naphtha feed since entering production, meeting all of its performance criteria. The facility is a cooperative project between the company and Sinopec to jointly commercialise the process based on Honeywell UOP’s pilot plant technology. In addition to licensing, UOP provided the basic engineering, key equipment, adsorbents and technical support for the unit.

**Yanshan Petrochemical Complex**
In July 2016, it was announced that Sinopec had chosen Veolia, through its subsidiary Veolia China, to operate the entire water...
**Latest News**

**HYDROCARBON ENGINEERING**

**SUNOCO LOGISTICS TO ACQUIRE ENERGY TRANSFER**

Sunoco Logistics Partners, L.P. (SXL) and Energy Transfer Partners, L.P. (ETP) have entered into a merger agreement providing for the acquisition of ETP by SXL in a unit for unit transaction. The transaction is expected to provide greater opportunities to more closely integrate SXL’s natural gas liquids (NGLs) business with ETP’s natural gas gathering, processing and transportation business.

**GLOBAL BIOFUEL ADDITIVES MARKET REPORT**

According to a new report by Allied Market Research, ‘World Biofuel Additives Market’, the biofuel additives market is projected to reach US$12.560 million by 2022, registering a CAGR of 15.3% from 2016 to 2022. The biofuel additives market has grown tremendously in the recent past due to an increase in acceptance and performance of first and second generation biofuels globally.

**GAZPROM’S DEVELOPMENT PROGRAMME APPROVED**

The Gazprom Management Committee has approved the Comprehensive Targeted Programme for the retrofitting, reconstruction and development of automated process control systems at the company’s facilities between 2017 and 2021. The programme will include the upgrade or replacement of outdated automation equipment in gas treatment units, compressor stations and gas processing plants.

**RISK OF SILO WORKING IN THE PROCESS INDUSTRIES**

ABB has launched a new white paper that raises concerns of an increased risk of major accident hazards due to significant levels of silo working in the process industries. Process safety performance within the high hazard industry is being threatened by the silo factor – an inability within process safety management circles to collaborate and be consistent across all departments in an organisation.

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cycle of its Yanshan Petrochemical Complex. Located 50 km from downtown Beijing, Yanshan Petrochemical is a fully owned subsidiary of Sinopec. The complex is one of the largest production bases of synthetic rubber, synthetic resin, phenol acetone and high quality refined oil products in China. It processes over 10 million t of crude oil and produces 800 000 tpy of ethylene. It can produce 94 varieties with 431 grades of petrochemical products. Veolia and Yanshan have chosen to expand the scope of their partnership to the entirety of the water cycle management. Veolia will work at optimising the water consumption within the site and increasing the water recycling rate, as well as upgrade the wastewater treatment facility and provide a comprehensive energy optimisation programme.

**India**

**GAIL (India) Limited**

In October 2016, GAIL (India) Limited successfully started its first Unipol polyethylene (PE) process line with the capacity to produce 400 000 tpy of PE. The total production capacity of GAIL’s petrochemical plant at Pata, Uttar Pradesh, is 810 000 tpy. GAIL’s flexible high density polyethylene (HDPE)-/linear low density polyethylene (LLDPE) swing plant provides access to a full range of resin applications. The new process line gives GAIL the platform to expand its PE product capabilities, providing Indian PE converters with the high quality, domestically produced resin products needed for large volume markets, as well as advanced performance applications.

**Lubrizol CPVC Plant**

In March 2016, Jacobs Engineering Group, Inc. reported that it had provided services for Lubrizol Corporation’s recently commissioned chlorinated polyvinyl chloride (CPVC) compounding plant in Dahej. The plant, which has the capacity to produce 55 000 tpy of compound, supports the growth of Lubrizol’s emerging businesses in South Asia, the Middle East and East Africa. The plant is the first major investment in India for US-based Lubrizol. Jacobs was associated with the plant’s construction, from the conceptual design phase through the basic engineering and total installed cost (TIC) estimate. It subsequently provided detailed engineering, procurement and construction management (EPCM) services for the entire project. The plant’s chlorinated polyvinyl chloride unit was mechanically completed within the targeted project schedule of 20 months.

**Japan**

**TonenGeneral Sekiyu K. K.**

In May 2016, GTC Technology announced that it had supplied advanced distillation technology for TonenGeneral Sekiyu K. K’s new mixed xylenes recovery unit. The grassroots unit is located at TonenGeneral’s refinery in Ichihara City, Chiba Prefecture, and was successfully started up in April 2016. The xylene unit has a capacity of 230 000 tpy. Unique to this design is high purity toluene, as well as high purity C9 aromatics, being produced from the same column as the xylenes. The unit uses GTC’s Dividing Wall Column (GT-DWC®) technology for high energy efficiency. This installation also uses a first of its kind design for divided wall columns (DWCs) with the overhead vapours providing the heating duty to two upstream units. GTC provided a single source responsibility for process license, basic engineering design, equipment supply and process guarantees.

**Malaysia**

**Petronas Refinery and Petrochemical Integrated Development (RAPID) Project**

In April 2016, MECS DynaWave® technology, licensed by MECS, Inc., a wholly owned subsidiary of DuPont, was chosen by international oil and gas services provider Petrofac for the installation of three custom engineered scrubbing systems for sulfur dioxide removal at a Petroliam Nasional Berhad (Petronas) site. The DynaWave units were to be delivered to the company’s Refinery and Petrochemical Integrated Development (RAPID) project refinery in Pengerang, Southern Johor, in Q4 2016 for subsequent fitting. Furthermore, in November 2016, DynaWave technology was selected for the installation of three custom-engineered scrubbing systems for sulfur dioxide removal at PRPC Refinery & Cracker Sdn Bhd, a subsidiary of Petronas. The DynaWave units are set to be delivered to the company’s RAPID project refinery before the end of the year for subsequent fitting.

In July 2016, China’s Chu Kong Petroleum Natural Gas Steel Pipe Holdings Limited and its subsidiaries (PCK) announced that the group had been awarded a price agreement to supply approximately 40 000 t of steel pipes for the RAPID project. The ambitious project will consist of a 300 000 bpd refinery and petrochemical complex, with a combined capacity of 77 million tpy of various grades of products, including differentiated and speciality chemicals products. The estimated Capex of the project is US$16 billion, while related facilities will cost around US$11 billion.

In September 2016, GE declared that, through a strategic partnership with Prime Sourcing International (PSI), a subsidiary of Petronas, it would supply 17 emergency diesel generator (EDG) packages, five transportable switch rooms and electrical balance technology for the Pengerang Integrated Complex (PIC) in Johor. The equipment will be provided by various GE businesses. Each EDG package will consist of 616 diesel engines provided by GE’s Distributed Power business, which will be coupled with the generators and electrical equipment, bound in e-houses.

Also in September, Linde Malaysia Sdn Bhd, a subsidiary of The Linde Group, announced that it had established a joint venture company with Petronas Gas Berhad (PGB) to build a state of the art industrial air gas facility that will produce gaseous oxygen and nitrogen to supply the needs of the RAPID project. Linde and Petronas’ joint venture company, Pengerang Gas Solution Sdn Bhd (PGS), also secured long term agreements for the supply of oxygen and nitrogen to the world scale refinery and petrochemical complex, which includes an ethylene oxide/ethylene glycol plant. PGS will build two large air separation units and associated gas facilities, resulting in a total investment of €150 million.

**Philippines**

**JG Summit Petrochemical Corp**

In November 2016, GTC Technology announced that it had signed an agreement with JG Summit Petrochemical Corp to provide its GT-BTX® and GT-DWC licensed technologies for an aromatics extraction unit at JG Summit’s petrochemical complex in Batangas. JG Summit currently has a capacity of approximately 210 000 tpy of pyrolysis gasoline (pygas). After the cracker expansion, capacity will increase to approximately 300 000 tpy. The combination of GT-BTX and GT-DWC will be designed to process the company’s expanded pygas capacity to produce around 170 000 tpy of...
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Transactions and acquisitions

Dorf Ketal Chemicals and Filtra Catalysts and Chemicals
In January 2016, Dorf Ketal Chemicals India Private Ltd issued a statement announcing that it had acquired Filtra Catalysts and Chemicals Ltd, also based in India. Filtra’s adsorbents and catalyst products will be combined with the Dorf Ketal product offering in downstream hydrocarbon process chemicals.

Chevron Phillips Chemical Company and INEOS Sytrol styrenes
In November 2016, Chevron Phillips Chemical Company LLC announced that it had signed an agreement with INEOS Sytrol to sell the company’s K-Resin® styrene-butadiene copolymers (SBC) business. The deal is subject to customary closing conditions and regulatory approvals. As part of the transaction, INEOS Sytrol will purchase the equity interests of K R Copolymer Co. Ltd (KRCC), which owns and operates a K-Resin SBC plant in the Yeosu Petrochemical Complex in South Korea. Certain Chevron Phillips Chemical’s proprietary K-Resin SBC intellectual property, and other Chevron Phillips Chemical assets related to the business will also be transferred.

LyondellBasell and Zylog Plastalloys
In April 2016, LyondellBasell completed the acquisition of the polypropylene (PP) compounding assets of Zylog Plastalloys Pvt. Ltd (Zylog) in India. The company entered into a definitive agreement to acquire Zylog’s PP compounding assets in November 2015. In October 2015, LyondellBasell acquired SIS Plastiblends Pvt. Ltd’s PP compounding business, which is located in Aurangabad, Maharashtra. With the acquisition of Zylog’s manufacturing operations in Sinnar, Maharashtra, and Chennai, Tamil Nadu, LyondellBasell is now the third largest producer of PP compounds in India with an annual capacity of 44,000 t (97 million lbs).

Hyundai Chemical
In January 2016, Honeywell reported that Hyundai Chemical Co. would use UOP technology to expand its petrochemicals complex in Daesan Republic, allowing it to make its own feedstock material to boost profitability. The facility will use technology as well as modular equipment from UOP to allow the plant to make mixed xylenes, a critical feedstock used by the plant to produce paraxylene. Back-integrating the facility to make its own feedstock will reduce the plant’s dependence on imports of mixed xylenes and its exposure to the volatile market for the feedstock. The plant currently uses UOP technology to produce paraxylene.

Hyundai Oilbank
In September 2016, Praxair, Inc. declared that it had signed a long term contract to supply industrial gases to Hyundai Oilbank, a producer of gasoline and propylene in South Korea, with a processing capacity of 390,000 bpd of crude oil and other feedstock. Praxair will build, own and operate four vacuum pressure swing adsorption (VPSA) plants that will supply a combined 750 tpd of oxygen to Hyundai, which is located at the Daesan Petrochemical Complex on the west coast of the Korean peninsula. The VPSAs are expected to start up in 2017.

SK Gas Corporation and Advanced Petrochemical Company
In June 2016, Clariant reported good performance of its catalysts during the successful startup of the largest propane dehydrogenation (PDH) unit in South Korea. Located in Ulsan on the southeast coast of the country, the PDH plant is a joint project between SK Gas Corporation Ltd and Advanced Petrochemical Company. The facility is designed to produce 600,000 tpy of propylene using CB&I’s Catofin® catalytic dehydrogenation technology, which is based on Clariant’s Catofin catalyst.

Taiwan

Taiwan-Japan Oxo Chemical Industries
In February 2016, Axens announced that Taiwan-Japan Oxo Chemical Industries, Inc. (TJOCI) had chosen Axens technologies and catalysts for its isonoxy alcohol (INA) production plant. On 11 February 2015, CPC, KH Neochem (KHNC) and Mega International Commercial Bank (MICB) signed an agreement setting up a joint venture for the production of high value added petrochemical products. Under this agreement, TJOCI will invest TWD13.7 billion in the construction of an INA production plant in the Kachshung area. The plant is scheduled to begin commercial operations in 2019, with its initial annual production capacity of high value added petrochemical products set at 180,000 t. This project is the largest single investment ever held by Japanese and Taiwanese companies in the petrochemical area in Taiwan. Axens will provide a whole chain of technologies including methyl tertiary butyl ether (MTBE) and Dimersol® X™ technologies to ensure octenes production utilised for the synthesis of the INA via hydroformylation.

Vietnam

PetroVietnam
In May 2015, Honeywell reported that it had signed a Memorandum of Understanding (MoU) with Vietnam Oil and Gas Group (PetroVietnam) to increase its presence in Vietnam. The MoU was signed in the presence of representatives of the US and Vietnamese governments and executives from the companies. Pursuant to the terms of the MoU, Honeywell will provide professional consulting services to PetroVietnam and its subsidiaries for future investment projects, as well support PetroVietnam in engineering design and economic and technical project feasibility studies for all of its facilities.

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“My camera lens captures the energy of the city”

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