



IN BRIEF

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GAS PROCESSORS ASSOCIATION EUROPE

SHOWCASING GENERATIONS OF OIL AND GAS PROCESSING SOLUTIONS

Napoleon is quoted to have said: "If the earth was a single state, Istanbul would be its capital." Then GPA Europe Chapter's selection of this idyllic location for its Joint Annual Conference with GCC Chapter in September 2016 is likely to build up significant interest, given the excellent opportunity to visit historical sites, admire the Byzantine architecture and sample the culture and cuisine that Istanbul offers.

In addition, the Joint GPAE/GCC Conference will also underpin some serious business in facilitation of technology in the wider sense and networking on surface facilities for oil and gas production.

As recent OPEC discussions have shown, the GCC countries - Iraq and Iran - dominate the baseload production for traditional onshore oil and gas where lifting costs per barrel are significantly lower relative to more challenging productions from deepwater, arctic, oil sands and shale etc. In current scenarios of lower demand and low prices for oil, there are greater pressures to deploy appropriate technologies for sustainable field development while driving lifting cost further down to maintain production margins.

The oil and gas fields in the Middle East countries are at various stages of their development life cycle. Some large fields even



The Blue Mosque

today are still in primary recovery mode - punching new, relatively cheap wells and producing oil and gas through two phase production separators with minimal gas handling. Where significant produced water breaks through, dehydration/desalting (D&D) skids are added as short-term solutions to continue producing to oil product specifications. Without technologies for boosting wellhead pressure, many wells are shut-in to mitigate

declining bottom-hole pressures and increasing water cuts.

Today, there is regional and worldwide experience in the application of efficient separation systems, D&D technologies, electric submersible pumps (ESP), gas lift, multi-phase pumping, multi-phase metering etc, which have

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Comprehensive coverage of the conference in Florence



Şâleymaniye the Magnificent

benefited from advancement in equipment design and reliable system engineering as a result of applying relevant learnings. There is therefore significant opportunity for sharing experience and best practice within and outside the Middle East countries.

Together with oil comes the challenges of handling produced water and associated gases, which even today are managed differently in different field locations. Disposal of produced and wash waters from D&D units is managed by retrofitting water oil separation prior to disposal.

Handling of associated gases laden with natural gas liquids (NGL), H₂S and other impurities has offered significant gas treatment and processing challenges. Some countries have well developed infrastructure and operating experience for gas handling, processing, and treatment to maximise value of NGLs from associated gases. However, there is some rich associated gas flared due to remoteness or the inability to extract value from residue sales gas and LPG products, and lack of investment in infrastructure for gas handling, processing, storage, transportation. So again, plenty of opportunity for sharing experience and best practices within and outside the Middle East region.

At the outset, a key consideration in field development is the oil recovery factor, and evaluation of secondary recovery usually returns as “no brainer” the implementation of water or gas injection from value considerations. The current deficit of indigenous sales gas in the region is increasing the pressure to minimise gas injection and makes water injection a preferred alternative, subject to field specifics.

Water injection is, however, by no means “a piece of cake” as this generally involves challenges in management of escalating levels of produced water (and fresh water) handling, treatment, flowline network and water injection pumping. To minimise environmental impact and conserve water as a natural resource, produced water treatment and re-injection to close the water loop cycle is becoming a priority.

The real challenges of escalating water breakthrough in later life have, however, been addressed by many international companies, some “producing more water than oil” from operations in Alaska, North-Sea, and GoM, and therefore have significant learnings from life-cycle management of water flood systems.

The discussions above reflect production challenges and technology considerations primarily from processing perspectives. Significant advances have also been made in intelligent field data collection, transmission and interpretation where investments are targeted for efficient field management to maximise production, increase reliability, focus maintenance efforts and enhance process safety.

With greater emphasis to preserve natural resources for future generations and field management, there is significant appetite to focus on tertiary recovery systems such as enhanced oil recovery (EOR) through use of CO₂ or N₂ injection or other. The technologies required will produce a new generation of processing facilities that:

- generate and capture large volumes of CO₂ (via pre-, post- or oxy- combustion and capture) or N₂ (via cryogenic air separation units (ASU))
- refit well completions/tubings and renew flowline networks to mitigate corrosion, in the case of CO₂
- upgrade oil and gas processing plant to separate incremental levels of breakthrough CO₂/N₂
- build infrastructure to distribute and recycle CO₂/N₂ injectant to injection wells.

In the commercial world, the value streams from incremental future oil, from injection gas substitution and in the case of CO₂, its capture and storage credits may alone not provide a strong viable basis for investment required for EOR facilities. Correctly, however, the leadership to focus on resource recovery factor (RF) has in the \$100+/bbl oil environment spawned trials for EOR schemes. The predictions of extended periods of low oil prices will challenge the industry for significant technology cost reduction to satisfy the appetite for EOR development.

It is, however, reassuring that the processing technologies required for EOR have been deployed in the US and other parts of the world since the 1970s. While there is extensive experience and know-how, the next generation of EOR facilities will need to incorporate significant advancement of processing technologies: materials for wells and surface facilities; embracing e-technologies for the management of complex systems to minimise; phase capex spend while assuring reliability and availability to maximise production and recoveries.

The Middle East region thus offers a mixture of challenging opportunities for evolution to new generation oil and gas processing facilities. In



Turkish "Pizza"

recognition, the GCC Chapter has strong National Oil Company (NOC) sponsorship and participations to networks that share learnings and best practices.

Historically, the GPA Europe Annual Conferences are popular with strong participation not only from European membership but also strong participation from the US, North Africa, SE Asia and others that will bring experience in life cycle field operations and EOR from other regions eg in North Sea, USA.

Therefore, the September 2016 Joint GPAE/GCC Conference will undoubtedly facilitate a strong meeting point beyond Istanbul's reputation of "creating its own history at the meeting point of Europe and Asia" and prove not only an idyllic venue but also a place for serious business as well.

Murtaza A Khakoo
Malaika Consultancy
 (<https://uk.linkedin.com/in/murtazakhakoo>)

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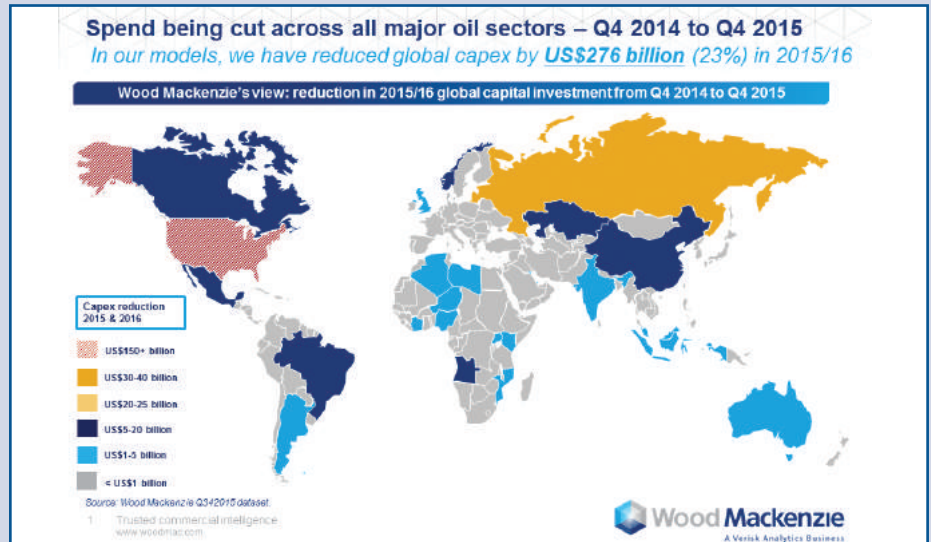
GET ON YOUR PLANE

VIEW FROM THE TOP

GPA Europe chairman, Paul Openshaw, considers a shrinking global market where face-to-face meetings are more important than ever



Paul Openshaw



Source: Wood Mackenzie

Norman Tebbit's Dad

It is 35 years since Norman Tebbit gave his "get on your bike" speech. Norman was an outspoken government minister who encouraged UK citizens to travel to find new work, as his father had done by getting on his bicycle back the 1930s.

GPAE members have always invested time in going to see customers, suppliers and colleagues to help develop and deliver Gas Processing Plant Projects but, with the recent slowdown in the industry, companies are under tremendous pressure to tighten their travel budgets.

Increasing the productivity of visits

Savings are being made by limiting the number of trips engineers take. Thanks to the

availability of Skype and advancements in video conferencing facilities, a great deal can be achieved through regular virtual meetings, once strong relationships have been established. However, I would argue that, during the early stages of building partnerships, face-to-face meetings are essential. Typically, suppliers visit their clients on five separate occasions before contracts are signed. So, with less contracts being signed this year, it is more important than ever for service providers to target the locations where they are most likely to gain business. Jumping on a plane can often be the right thing to do but it needs to be for the right meetings.

European know-how underpinning global projects

Western Europe enjoys a wealth of oil and gas

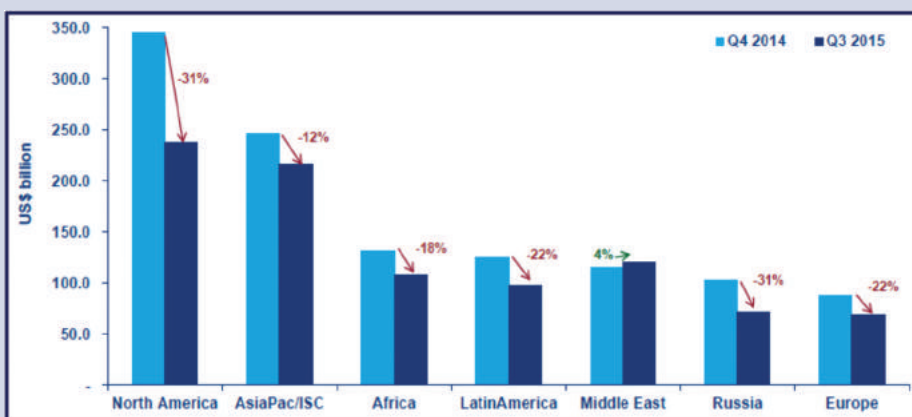
know-how but it is one of the highest cost operating areas in the world. The drop in oil prices has had a cruel impact on the region, leading to thousands of job losses. Despite the turndown, cities such as Aberdeen, London, Paris and Madrid are still recognised as centres of technical excellence for the global gas industry. European Engineering companies are looking more and more to the Middle East, Africa and Latin America for work. These are the regions that seem to be maintaining momentum with their investment plans.

Wood Mackenzie estimates that US\$ 220 billion has been cut from the global upstream capital expenditure in 2015/16 but not all geographies have been impacted equally. The Middle East appears to be bucking the trend by continuing to grow investment.

Istanbul - where East meets West

With the gas market in the Middle East becoming more and more important to GPAE members, the timing is right to take our annual conference outside Western Europe. Istanbul is an excellent location for operators and suppliers from East and West to meet. I hope you get chance to jump on a plane and join us there in September.

Paul Openshaw
 GPAE chairman



Source : Wood Mackenzie

GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 16 SEPTEMBER 2015

CONFERENCE SESSION ONE: EQUIPMENT AND MACHINERY

Moderated by Simon Crawley-Boevey, Advanced Technologies GE Oil & Gas

Due to the large number of papers offered this year for the September conference, the Programme Committee decided to extend the conference by arranging for four papers to be presented on the Wednesday afternoon. The theme for the session was "Equipment and Machinery".

ORegen™ Waste Heat Recovery Cycle: Development and Applications

The first presentation of the afternoon was presented by Andrea Burrato of GE Oil & Gas on the subject of "ORegen™ Waste Heat Recovery Cycle: Development and Applications". The presenter explained how one of the most effective approaches to increase the efficiency of energy conversion is waste heat recovery, considering the large amount of energy that is discharged into the atmosphere by simple cycle gas turbines whose efficiency in the best case is around 40 per cent. Modern plants designed for base load power generation, and equipped with gas turbines, typically employ a bottoming cycle. The standard bottoming cycle is the Rankine cycle that recovers the heat from the exhaust of the gas turbine traditionally using water/steam. The combination of the two is referred to as a combined cycle. The presentation introduced the Organic Rankine cycle, referred to by GE as the ORegen™ system for waste heat recovery from



Robert Broad - Heatric

simple cycle gas turbines, which operate at variable loads from 50 up to 100 per cent in power generation applications. The technology is particularly applicable for locations where water is absent or scarce, overcoming the limitations of the traditional water/steam Rankine cycle when applied to gas turbines. The thermodynamic configuration allows modern plants to exceed 50 per cent efficiency.

The Seven Deadly Sins of Filtration and Separations Systems in Gas Processing Units

The next paper was presented by Philip Le

Grange of Sulphur Experts (on behalf of authors David Engel Ph.D. Nexo Solutions and Michael H. Sheilan P.Eng. Sulphur Experts) on "The Seven Deadly Sins of Filtration and Separations Systems in Gas Processing Units". The presenter explained that separation systems play a fundamental role in gas processing both for reliability and as enabling devices for enhanced throughput and process stability. In many cases these systems are the only and/or last line of defence to protect the plant from unwanted and detrimental contaminants. As plants are required to process gas with more contaminants (such as certain Shale Gas feeds), these devices are increasingly being required to perform under progressively difficult conditions. The presenter's company troubleshoots and improves many of these systems at a number of worldwide plant operations, and consequently they have identified many different failure modes in these systems with various degrees of severity. These can range from incorrect design, to poor choice of physical location, to errors in instrumentation, and most critically erroneous or non-performing internals. A large set of these cases were combined and compiled into a list of the seven most common errors in filtration and separation systems when applied to gas



Speakers and Moderators in Florence

Continued on page 6



Conference in progress

processing operations. The effects of not having correct contamination control in gas processing operations often causes profound impacts in gas processing plants manifested as: solvent contamination and degradation; foaming; fouling; low reliability and low efficiency; increased maintenance and undesirable environmental emissions. All this leads directly to high operational costs and/or the inability to meet sweetening specifications.

Printed Circuit Heat Exchanger Replacing Brazed Aluminium Heat Exchanger

After a break for tea, Robert Broad of Heatric gave his presentation on *Printed Circuit Heat Exchanger Replacing Brazed Aluminium Heat Exchanger*. Brazed Aluminium Heat Exchangers are the workhorses for the cold end of gas processing. Having multi-stream capability, they operate with low temperature differences, are fabricated out of low cost

materials of construction, with high thermal conductivity over a wide operating temperature. However, they suffer from mercury attack and thermal fatigue so are prone to failing or worse depending on the mechanism. This has led several gas processing plants to investigate alternatives of which the Printed Circuit Heat Exchanger (PCHE) in stainless steel has proven to be a viable alternative. This presentation highlighted the differences between the two technologies including a cost comparison over the lifetime of the plant and ultimately demonstrated the superior integrity of design, and that higher grade of material of the PCHE leads to a more reliable and safe solution. Robert used a case study of a real life replacement to show it is a viable long-term investment.

The Newly Developed HPRC and Wet Tolerant Compressor for the Upstream Market

The first session finished with a presentation

by Stefano Falomi of GE Oil & Gas (co-authors G. Lurisci, M. Bertoneri, and A. Grimaldi, GE Oil & Gas) on *The Newly Developed HPRC and Wet Tolerant Compressor for the Upstream Market*. The presenter explained that the current pressure on cost in the gas industry calls for new technologies that can simplify and reduce the number of equipment installed as well as saving space and weight. The High Pressure Ratio Compressor (HPRC) is a technology that has been built on GE's compressor heritage enabling the machine to deliver a very high pressure ratio in one single casing. The Wet Tolerant Compressor is a technology development that makes this compressor capable of continuous operation with consistent amounts of liquid content, up to five per cent liquid volume fraction (LVF). Natural gas production and enhanced oil recovery systems are increasingly being done offshore making these new technologies very attractive both in terms of capital cost and operating cost as they result in smaller footprint, lower weight, and reduced absorbed power. The presentation illustrated the benefits of HPRC and Wet Tolerant Compressors applied to real case studies and also how the process can be re-engineered to achieve higher efficiency, greater reliability, simplification, and reduced cost.

The session chairman briefly summarised the papers presented during the afternoon and thanked the presenters. Sandy Dunlop then gave an overview of the conference agenda and ended by inviting the audience to attend the Welcome Reception in the evening. The Welcome Reception, generously sponsored by ABB Consulting, was an excellent chance to both renew old acquaintances and make introductions to new attendees.



Lively discussions prompted

GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 17 SEPTEMBER 2015

COMPANIONS TOUR

With the streets of Florence being narrow, busy and allowing no buses in the centre of town, we took the decision to take the tour company's advice and journey with our guests out of the city.

With many returning companions, it was felt that they would not mind a bus tour to Siena where they could not only hear about the history of Tuscany on the bus ride, but also socialise and catch up with old acquaintances. This meant that an hour and a half bus ride from Florence to Siena was a friendly history lesson interspersed with lively chit-chat.

Once in the mediaeval city of Siena we were passed onto the local guide who took us for a walk around the cobblestoned streets and alleys of the city telling us the history of Siena. Our main stop was at the gothic Duomo cathedral. The exterior and interior of the cathedral are decorated in pink, white and greenish-black marble in alternating stripes making for a most impressive effect. The building is filled with treasures by Pisano, Donatello and Michelangelo, but the main treasure is the Piccolomini Library containing beautiful hand-inscribed manuscripts, but one really goes to the library to see the fantastic frescoes by Pinturicchio.

A short walk from the Duomo took us down into the main heart of the city – the huge Piazza del Campo, where the Roman Forum used to be. The Campo is dominated by the Palazzo Pubblico and its tower, the Torre de Maigia. The Palazzo or Town Hall construction



Duomo Cathedral in Siena

began in 1297 to house the republican government of Siena. Its façade is concave to reflect the convex curve of the Campo. The Torre del Maigia was built between 1325 and 1344. However, the Piazza is better known, and indeed world-renowned for the Il Palio horse race, which is run twice a year. A pageant, the Coreo Storico, precedes the race where ten horses and riders – bareback and dressed in the appropriate colours representing ten of the sixteen city wards- race around a very tight track. They round the thick dirt track laid on the Campo three times and the race typically lasts only around 90 seconds! Unfortunately, there was no race that day, but we could certainly

appreciate what excitement there must be on race day.

Back on the bus and a short three kilometers ride away along a cypress bounded lane we came to the ancient Castello de Pugna, on a gentle hill in front of Siena. The property extends over 44 hectares of which 30 per cent is laid out to vineyards and three hectares dedicated to olives. The grapes are native Tuscan grapes and with a new modern winery, a fine selection of wines preserves the ancient tradition of the Tuscan territory. Our lunch of bruschetta, cold meats and cheese was interspersed with a talk about the different wines, which of course we needed to taste with each course.



Merry band of tourists

The group was so relaxed and enjoying the warm afternoon chatting together that they voted not to continue the tour to the next destination but to stay at Castello de Pugna, relaxing with the wine and visiting their shop to buy home-made goods. Eventually, however, we had to leave in order to get back to Florence in time to get ready for the Conference Dinner. The day was certainly considered an excellent adventure and a great opportunity to get back together again and still visit some beautiful countryside.

Anne Dunlop

INNOVATION



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GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 17 SEPTEMBER 2015

CONFERENCE SESSION TWO: APPLICATIONS OF GAS PROCESSING CHEMICALS



Fabrizio Pisanelli - Amine Global Services

**Moderated by Vince Atma Row,
Johnson Matthey**

A New Solvent for Acid Gas Removal - Screening Methodology and Techno-Economic Evaluation

The day began with opening remarks from the chairman of Gas Processors Association, John Mollenkopf of Mark West Energy Partners. The first paper of the morning session was presented by Nicolas Laloue of IFP Energies Nouvelles (co-authors Bruno Delfort, Aurélie Wender, Thierry Huard, Sébastien Gonnard, Julia Magne-Drisch and Julien Grandjean).

The paper addressed the challenges gas operators were facing in the removal of undesired acid gases and contaminants from sour gases. The presentation covered the new solvent that IFPEN has developed as well as

the high throughput screening methodology that was used to benchmark more than one hundred amines. The final techno-economic evaluation was performed for the selected three best candidates on three industrial case studies, which were representative of today's challenges. IFPEN claims that the new solvent offers a significant gain in selectivity compared to the traditional MDEA process and reduces OPEX and CAPEX by 15 per cent in the three cases.

Diisopropanol Amine (DIPA) Reclaiming By Means Of Electrodialysis Technology For HSAS & Formamide Removal

The next paper in the session was presented by Fabrizio Pisanelli of Amine Global Services who covered the use of electrodialysis in the removal of non-regenerable salts (HSAS). The use of reclamation technology such as

electrodialysis is becoming a consolidated and popular method of controlling heat stable amine salts (HSAS) in refinery natural gas plant Carbon Capture amine solutions. HSAS levels now play an important role in optimising the energy efficiency of amine units, are critical for the control of corrosion, and are a factor in the amount of amine lost due to foaming.

Methanol Distribution in Amine Systems and its Impact on Plant Performance

Ralph H. Weiland of Optimized Gas Treating presented the third paper of the session (co-authored by Anand Govindarajan and Nathan A. Hatcher) on how methanol distributes in amine wash systems. Methanol injection into natural gas streams is commonly used to prevent hydrate formation and icing.

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Nicolas Laloue - IFP Energies

Downstream, when the gas is scrubbed, the residual methanol enters the amine treating system. Significant amounts of methanol then enter in the acid gas fed to the sulphur unit, causing catalyst degradation, lowering sulphur recoveries and causing higher sulphur emissions. Existing simulation tools do not allow for rigorous simulation of methanol in amine systems. Optimised Gas Treating has recently introduced the ability to simulate methanol in amine systems on a mass transfer rate basis.

Ralph examined the effectiveness of a water wash stream upstream of the amine absorber. He also quantified the effect of methanol on reboiler energy usage in a typical LNG unit

The Impact of Elevated Acid Gas Recovery Temperature on Downstream Unit Operations - A Case Study

After mid-morning refreshments, we reconvened to listen to an excellent presentation from Jon Lewis of Advisian. Jon's presentation covered the design challenges in the recovery of flared gases due to feed gas compositional uncertainty. He shared a Middle Eastern flare gas recovery application case study with the audience where two approaches were investigated. The Base Case was a traditional approach using refrigeration to allow relatively cool operation of the amine systems in the acid gas recovery and SRU tail gas treating units, while the Alternative Case considered warmer operation of these systems with no refrigeration. For the Alternate Case the impact on design of unit operations downstream of acid gas recovery

was assessed with respect to product and emissions specification together with a CAPEX and OPEX assessment.

Innovative Adaptation of Ion Exclusion Chromatography (IEC) for Easy and Efficient Desalination of Mono-Ethylene Glycol (MEG)

Avinash Malhotra of Frames presented an innovative technique for desalination of the hydrate inhibitor, Mono-Ethylene Glycol (MEG) during the recovery process. The technology is based on an innovative switching scheme and multiple beds, which lead to a continuous separation of salts and MEG. A major advantage as claimed by Frames is the inherent ability of IEC to remove both monovalent and divalent dissolved salts in a single step.

An Innovative Technology for Natural Gas Sweetening by means of Cryogenic Distillation

The last paper of the morning session was presented by Stefano Langé from Politecnico di Milano and Fabio Brignoli of Tecnimont (co-authors Laura A. Pellegrini, Politecnico di Milano, Oldrich Mikus, Stamicarbon, and Barbara Picutti, Paolo Vergani, Guido Franzoni, Marco Lo Savio Tecnimont) In the paper, Fabio considered the use of cryogenic distillation for natural gas sweetening. A process based on a "dual-pressure" cryogenic distillation unit was proposed, a high-pressure column for the CO₂ bulk removal and a low-pressure column for the methane recovery, which allow a complete separation of CO₂ and H₂S from methane, whilst avoiding the CO₂ freezing.



Ralph Welland - Optimized Gas Treating



Stefano Lange - Politecnico di Milano - and Fabio Bignoli - Tecnimont



Jon Lewis - Advisian

GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 17 SEPTEMBER 2015

CONFERENCE SESSION THREE: CO₂, CARBON CAPTURE AND NGL RECOVERY

Moderated by Christian Bladanet, Technip

Carbon Dioxide Tolerant Nitrogen Rejection Reduces Cost and Emissions

After a taste of Italian dishes, and a shot of ristretto, all the delegates were up and running for an exciting afternoon, which brought us all the way through from Nitrogen removal to NGL recovery, though life extension of facilities and MEG reclaiming.

Courageously facing the challenge to open the session, Adil Farooq of Costain presented the delegates with a new process that, through modification of a proven cryogenic nitrogen rejection process, become more tolerant to CO₂. Adil's paper was co-authored by Adrian Finn, Ahmad Hosainy and Grant Johnson also of Costain.

Commercial scale Nitrogen Removal Units use a cryogenic process, which requires some pre-treatment to remove CO₂ from the feed gas to cope with cryogenic temperature. Typically, no more than 0.3 mol per cent of CO₂ should be left in the gas to avoid CO₂ freezing in the coldest part of the unit.

By a thorough analysis of the CO₂ distribution and solubility, Costain has developed a scheme that allows processing of natural gas with up to two per cent CO₂ without risk of plugging in the unit, potentially eliminating the need for an upstream CO₂ removal unit.

This is great proof that, as mature a technology is, improvements are always possible and welcome.

Extending the Operating Life of a Major Gas Terminal

Andy Hollins of ABB Consulting then gave the audience an overview of Asset Life Planning and Life Extension Studies. Andy showed us through a case study how ABB specialist consultants, using a proven methodology, has been able to determine the investment and full programme of work needed to extend the life of a gas terminal beyond its original design life. Uniquely, the ABB Consulting approach covers all aspects of age-related deterioration, from the most recognised (corrosion, mechanical damage and wear) to less obvious



Andy Hollins - ABB Consulting



Avinash Malhotra - Frames

issues such as electrical system ageing and control system obsolescence.

A significant proportion of the audience are still wondering if Andy's programme applies to engineers too, to help us coping with the increasingly longer working life!

Innovative Adaptation of Ion Exclusion Chromatography (IEC) for Easy and Efficient Desalination Of Mono-Ethylene Glycol (MEG)

After the break, where most of us were busy exchanging views on the industry, Avinash Malhotra presented the WISSET™ technology developed by Frames to reclaim MEG from salt accumulation. Avinash's presentation had the double interest of detailing the WISSET™ technology and development programme and to de-mystify (at least for some of us), the principles of gas chromatography.

Avinash very pedagogically explained to us the principles behind the Sequential Simulated Moving Bed (and it's a pity the animation presented cannot fit yet on an e-zine) and described Frames development programme, from lab test to pilot to the fabrication of a mobile test unit, available for onsite testing and demonstration, although this process is already widely used in food and pharmaceutical applications, like desalination of glycols derived from sorbitol and xylose syrups. Anyone for a drink?



Adil Farooq - Costain



John Mak - Fluor

New NGL Recovery Process Designs for Unconventional Gas Applications

Last but not least, John Mak showed us Fluor's solution to allow phase development of NGL recovery plants to match the current sluggish liquid hydrocarbons market price, and the potential for expansion to LPG and Ethane production when the market recovers. John's paper was co-authored by Sabrina Devone and Jim Shih, also of Fluor Energy and Chemicals.

John started his presentation with the comparison of a typical mechanical refrigeration dew pointing unit against Fluor Deep Dew Pointing Process. Then John explained how a shale gas plant can be developed incrementally by smartly designing and implementing in due time the export gas compressors and the turbo-expander. Finally, John showed us Fluor solutions to implement Ethane extraction in an operating gas plant, once the Ethane market recovers.

As measured by the number of keen questions raised during the afternoon, all the papers proved of high interest for all the participants.

The session was brought to a close by the chairman, Paul Openshaw, giving us all the instructions for the evening's dinner gala in Palazzo Borghese to ensure nobody would get lost in the narrow Florentine streets.

32ND ANNUAL CONFERENCE DINNER FLORENCE, 17 SEPTEMBER

FLORENCE CONFERENCE DINNER



Understated surroundings

It has become something of a tradition over the past few years for the Conference Dinner to be a surprise for the delegates and I take great pride in coming up with a new idea each year – it is challenging! For the Florence meeting, it was right that we should reflect the grandeur and artistic history of this beautiful city and so we found the Palazzo Borghese, on Via Ghibellina, hidden away down a back street in the old city and looking for all the world like a block of granite from the street. But what delights did we meet when

the delegates, after a bit of a walk from the River Arno, reached the building and were greeted by a lantern lit entrance way, and then climbed the stairs to the first level for welcome drinks. The rococo decoration of the building took many a breath away and when I arrived with the last group, I was met with comments such as “A bit understated isn’t it!”

The Palazzo Borghese was a conversion of a number of houses by the Salviati family in the 15th century but was then renovated in the



The Evening Entertainment

16th century and then by marriage passed to the Borghese family. In the early 19th century it became the home of Prince Camillo Borghese and his wife Pauline Bonaparte, sister of Napoleon. We had drinks in Pauline Borghese’s bedroom fitted with a minstrel’s gallery so she could have music all day. The delegates were able to walk around most of the reception rooms of the palace, but the highlight was when dinner was called and we moved through to the Monumental Gallery, the ballroom of the palace. Surrounded by mirrors and stunning colours, with a string quartet of mediaeval players, the effect was electrifying.

A nice dinner now we thought, and then the fun began. A jester arrived and pulled unsuspecting diners from their seats to play funny games and dance for the entertainment of the group. Few escaped and John Mollenkopf, chairman of GPA, joined in the fun and, dressed as a knight, saved a fair lady in distress!!

The excellent meal was a typically Tuscan menu, and when topped off with the entertainment, a really enjoyable evening was had by all the guests.

The real problem will be – how do I top that next year? Come along to Istanbul and find out.



Sandy joins in the fun

Sandy Dunlop

GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 18 SEPTEMBER 2015

GE OIL AND GAS SITE VISIT



On the morning of 18 September, a party of delegates visited GE Oil and Gas' Nuovo Pignone manufacturing and service facility in Florence as part of the GPA Annual conference.

Spanning 350,000 square metres, and home to almost 5,000 employees, the GE Oil and Gas Florence manufacturing facility produces technologies such as centrifugal and reciprocating compressors, steam and gas turbines, and turbo expanders. This site also boasts advanced testing facilities and a state-of-the-art repair centre. Florence is also home to the GE Oil and Gas i-Center for Monitoring and Analytics, with more than 11 million accumulated hours of monitoring to-date.

Upon arrival at the facility, the delegates were taken to a conference room and shown a short video outlining what products were produced at the facility, testing facilities and other GE locations in Italy including a large facility in Massa. This was followed by a safety briefing

after which the delegates were split into two groups and escorted on site for the tour.

The comprehensive tour of the facility included visiting various workstations, testing areas and assembly lines. The delegates visited the Centrifugal Compressor Assembly Line and the Reciprocating Compressor Assembly Line seeing different stages of centrifugal and reciprocating compressor assembly and different compressor sizes. Within this area were compressor head flanges of various sizes, some of which were extremely large. The delegates also had the opportunity to see the Impeller Line, viewing a wide range of sizes and types of impellers at different stages of manufacture.

The delegates were also shown some of the impressive testing facilities at the manufacturing site including hydraulic pressure testing facilities for equipment casing and over speed testing for impellers and rotors. The facility also has the capability to carry out full

load tests and mechanical string tests.

There was also the opportunity to see the large scale specialised bunker for high speed rotor balancing. High speed balancing ensures optimal rotor weight configuration adjustments for actual operating speed. The main features of the bunker included a vacuum chamber, AC motor and a control room with PLC control system and balancing software.

As well as this, the delegates were shown the Gas Turbines workstation, including the HSPT pulsing line. Furthermore, there was the chance to view the Steam Turbine Rotor Assembly Line and steam turbine testing facilities. The test facilities included test benches and a complete steam plant.

The visit concluded with a brief summary and refreshments, and a most informative visit was had by all, with many thanks to GE Oil and Gas.

Adil Farooq - Costain

GPA EUROPE 32ND ANNUAL CONFERENCE FLORENCE, 18 SEPTEMBER 2015

CONFERENCE SESSION 4

Moderated by Jeanine Klinkenbijn, Shell

Novel solvent technology for the removal of ionic mercury from aqueous streams of gas processing plants and refineries

Heather Whittenbury of Johnson Matthey (co-author Dr Steve Colley) gave the first presentation of the morning on the new (Puraspec) adsorbent developed for mercury removal (Hg^{2+}) from liquid water streams. The development was well received and the discussion focused on waste disposal, which remains the responsibility of the operating site. After development of the new adsorbent and laboratory testing, new opportunities are being sought for additional demonstration of this new product.

Innovative process scheme for mercury removal on water saturated natural gas

The next presentation was delivered by Clothilde Jubon from Axens (co-authored by Olivier Ducreux). A plea was made to remove mercury upstream in gas processing units to prevent mercury in the pipeline system. Optimisation is achieved in humidity control at the mercury adsorption vessel, where the selected temperature increase required was taken as five degrees. In the discussion, the temperature difference appeared generically taken, but might have optimisation options depending on the actual conditions.

Water content assessment in acid gas

Next, Alexandre Terrigeol of CECA and Christophe Coquelet, MINES Paristech, described an extensive fundamental discussion on the basics of thermodynamics, performed over the past year, including the setting up of a test facility. Actual testing was presented in high detail and feedback on the learnings in this journey was presented. The objective is to have higher water content prediction in an acid natural gas stream to replace more empirical calculation methods. The conclusion was that the new correlation, developed taking into account the specificity of the phase diagram of the ternary system $H_2O - CH_4 - CO_2$, has at least a comparable accuracy (one per cent) with SRK-CPA, and may be further enhanced. To extend the present limited application area, sponsors are looking to develop this accurate and easy to use EoS (Equation of State) forward.



Alessandro Speranza - KBC Advanced Technologies



Alexandre Terrigeol - CECA- and Christophe Coquelet - MINES Paristech



Clothilde Jubin - Axens



Andrew Laughton - DNV GL



Heather Whittenbury - Johnson Matthey

Calculation of Hydrocarbon Dew Points Using Equations of State

Andrew Laughton of DNV GL described how the GERG-2008 EoS maximum 21 components (up to C_{10}), is verified against other EoS for the calculation of hydrocarbon dew point of natural gas taking into account heavier hydrocarbons and aromatics. Improvement is required to make a better prediction of when hydrocarbon liquid may become a threat in operation. The GERG-2008 EoS is used for the ISO 20765 UK standard (parts two and three composition and hydrocarbon dew point) dealing with this extended component base. Therefore, a standard for calculations and definition of hydrocarbon dew points in the UK is now in place, and maintains accuracy.

Importance of PVT and Thermodynamic Models for Multiphase Flow Metering Applications

Alessandro Speranza (co-authors Victor Ruehle and Xiaohong Zhang, KBC Advanced Technologies, Richard Streeton and Ingve Morten Skjoldal, FMC Technologies) advised in his presentation that, in the daily activity of measuring natural gas flows, accuracy can be substantially improved by matching physical devices (Multiphase flow meters (MPFM)) and modelled calculation of the flow based on proper physical properties of the gas, and the right thermodynamic packages in a calculation model. This may have substantial economic effects to confirm the reservoir recovery. The Multiflash software in combination with the FMC technologies wet gas flow meter is an example of such a combination. The enhancement in this combination in the past few years with specific emphasis on dynamic in-situ verification for large gas flows was presented.

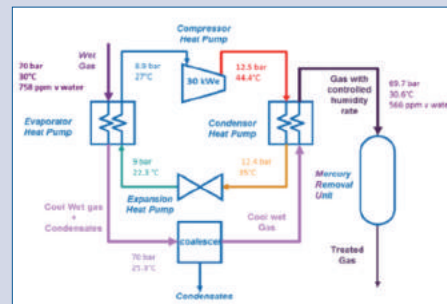


Figure 5: Scheme of thermal integration around the coalescer with water removal assisted with heat pumping

GPA EUROPE TECHNICAL CONFERENCE

LONDON, 26 NOVEMBER 2015

KNOWLEDGE SESSION

Moderated by Jason Frost, Aker Solutions

Knowledge Session on I-Design and I-Control

Wim Van Wassenhove, head of software solutions at Billington Process Technology, took up the challenge to educate the GPA on the current state of the use of computing and software technology for both design and control functions in engineering, under the auspicious title of i-design and i-control (aside: I was never really sure who the 'I' was!).

Wim has more than 25 years of direct experience with simulation software from sales, training and product development perspectives. His recent experience is developing complementary tools for existing process simulators. Being fully conversant in these tools with extensive experience in both steady state and dynamic modelling, Wim was able to inform the membership about the current usage and exciting possibilities for the future, along with examples of challenges along the way.

Wim advised that i-Design focused on steady state simulation, augmented by a variety of sizing and data collection tools intended (by the software vendors) to make the design process more integrated.



Wim Van Wassenhove - Billington Process Technology



Speakers and Moderators in London

Wim made it apparent that the potentially significant time-saving benefits envisaged by the vendors hadn't really had the uptake that one could have expected (particularly in the current lower energy price market). The challenge it seems is not in designing software that allows efficient integration, rather reconfiguring workflow and roles of individuals in the engineering teams using the software.

An example of a heat exchanger design from a simulation was presented as an example, with differing involvements of: up to three process engineers for various roles; a heat transfer specialist for ensuring optimising of design sizing; a mechanical engineer for code design and compliance; and a cost engineer to price it up. Each of these human involvements can result in an element of 'tinkering', and data consistency and communication becomes more challenging as the process reflects the organisation doing the engineering design, rather than that envisaged by the software vendor.

Whereas the technical issues with implementing a more optimised system could be overcome, the real concern, it seems, is in the psychological feeling of loss of control of the

process. The technology is there, but the will... well, let's see where it goes from here.

The second part of the knowledge session was based on i-Control, which is dominated by dynamic simulation. Wim explained that while suitable dynamic modelling software capabilities have been around for more than 20 years, they have been the domain of specialist consultancies rather than having had an overall uptake. The feeling is that there's a fear of the unknown in some quarters.

Dynamic modelling can be undertaken at different levels of detail (with appropriate assumptions) at any stage of a plant life and still contribute valuable information. As a means of holding our hands into the unknown, Wim talked us through the construction of a simple dynamic model and explained how it could be further developed and used.

Wim also suggested a few potential developments for the future; design by voice using a 'Siri' type interface and more dynamic simulation earlier in the design cycle. GPA Europe extends its thanks to Wim.

Jason Frost

GPA EUROPE TECHNICAL CONFERENCE

LONDON, 26 NOVEMBER 2015

TECHNICAL SESSION

Technical Session Moderated by Myrian Schenk, Jacobs

We had a very inspiring Technical Session at the GPA Europe Annual General Meeting/ Knowledge Session and Technical Conference. The topic 'i-Design and i-Control' was selected as a theme that represents some of today's challenges and opportunities for the industry in general and in particular for the Gas Processing Industry.

There were four papers prepared for the session and the presenters gave the audience good "food for thought" in different areas of design and control of gas processing plants:

- Dynamic Simulation
- Data Management
- Computational Fluid Dynamics
- Energy Optimisation

Managing Gas Plant Life-Cycle with Dynamic Simulation

The opening paper was presented by Julien Metayer and Mylene Le, both process engineers from the knowledge management department, process and technology division at Technip in France. The paper was entitled *Managing Gas Plant Life-Cycle with Dynamic Simulation*.

Julien set the scene, mentioning that the industry needs the development of cost effective and time saving solutions to support all the phases from conceptual studies to plant



Leonardo Pratana - Process Integration Ltd



Mylene Le and Julien Metayer - Technip

operation. He was referring to the development of cost effective dynamic simulation models that can be used over the plant life cycle: Conceptual/FEED; FEED/EPC; Construction; Operation; Feedback/Revamp (and back to conceptual).

Julien mentioned that Dynamic Simulation as a tool is a simulation model that evolves from a low fidelity to a high fidelity approach depending on the accuracy of the supplied data, depending on which block of the life cycle is involved.

Mylene showed the application and the benefits of such a computational approach in terms of process scheme selection, Design Optimisation, Control strategy and Controller pre-tuning, DCS check-out, until Operator Training Systems and up to real-time optimisation of Plant Performance

Mylene walked us through a Compressor and a Subsea/Facilities case study. The compressor case study was performed during FEED stage. The subsea and the treatment facilities units, which are usually simulated separately, were combined into an integrated model at the Construction/EPC stage.

Julien and Mylene concluded that the sooner an integrated model is built, the sooner the strategy in discussing and selecting key elements such as gas treatment process technology, type of

control, and vendor selection can be set. This modelling approach can be (and is!) cost effective and helps minimise changes that impact on the Gas Plant Process, but most importantly avoids over-costs related to rework as issues will be understood earlier.

Use of Predictive Analytics and Big Data Solutions to Drive Improved Reliability of Equipment and Process Behaviours in LNG Plants
The second paper was presented by Dr. Paul Seccombe, solutions leader, EMEA region for GE Digital. The paper was entitled Use of Predictive Analytics and Big Data Solutions to Drive Improved Reliability of Equipment in LNG Plants.

Paul introduced the audience to the definition of big data by mentioning a quote from GE chairman and CEO Jeff Immelt: "The opportunity for industrial companies is to grab the next age of productivity... so we have to turn connectivity into insights... and insights into outcomes... and that is the industrial internet ..."

We heard that 64 per cent of companies are planning or already working on a big data project but still there is a gap in understanding how to get value from the huge amount of data available. The main reason for this is, of course the 'validity' of the data: how do we know the data is true?

Paul continued to explain that the use of all available data could be used to monitor, help



A chance to meet

understand maintenance, drive energy and fuel efficiency. And then, the most interesting bit in the new era, which is virtualising operations, will lead to a workforce transformation. The big data strategy at GE is based on four points: velocity, variety, volume and veracity. How fast and which format does this set of data need? What size does the system need and how is it checked that the data is correct?

The industrial internet at GE follows four points: internet of things; intelligent machines; big data; and analytics. Dr Seccombe ended his presentation by introducing an example of the use of the big data in the turbomachinery of oil and gas plants, as they rely on the continuous operation of critical items such as compressors and gas turbines. The framework takes into account vibration, performance monitoring, combustion dynamics, process optimisation and instruments/controls for the early warning of issues with these unit operations.

The future for the industry is to develop and understand the use of such tools for improving gas-processing plants.



Mark Roberts - Apollo Offshore Engineering

Maximising Plant Design through Detailed CFD Analysis

Mark Roberts, senior engineer, presented the third paper from Apollo Offshore Engineering. The paper was entitled Maximising Plant Design through Detailed CFD Design. Mark started his presentation by mentioning Computational Fluid Dynamics (CFD) is often used as a tool for diagnosing issues within separation trains. The speed of the simulations and insight into how things operate make it an ideal tool to deal with such issues where time and money is a constraint.

However, we also heard that more increasingly these days, it is being used to deliver an optimised design prior to installation. The case study presented focused on a production sour fluid with a large amount of water gathered from four reservoirs. All vessels, HP and LP separator, de-salters, dry tanks and effluent produced water storage, and hydro-cyclones were studied.

Mark highlighted that CFD can be extremely useful in the design of these separation processes. Utilisation of this technique led to



Paul Seccombe - GE Digital

reducing capital expenditure (hydro-cyclones not needed), gave confidence in design (the internals of the vessels can be fully optimised) and also helped to support critical project decisions, based on the type of internals used.

From his experience in using CFD, Mark also highlighted that during concept or EPC, CFD cannot bring many benefits. However, during pre-FEED/FEED and Operation there are lots of advantages on using the technique as sizing, improvements on performance and understanding of the operation envelope can be enhanced.

Energy Optimisation in Natural Gas Processing Plants

The final paper was presented by Leonardo Pratana (on behalf of Xuesong Zheng, the original author, who was unable to present) from Process Integration Ltd. The paper was entitled Energy Optimisation in Natural Gas Processing Plants.

Leonardo presented i-Heat™ and i-Steam™, two software design tools for heat integration and energy optimisation of process systems. These tools have state-of-the-art process integration technologies. They are used for the design and optimisation of heat exchanger networks and utility systems.

Leonardo highlighted that i-Heat can be used from conceptual to detailed design. I-Steam is particularly used in the design of the utility system that is able to cope with different steam and power demands from the main plant, while maximising efficiency at the lowest economic cost.

Leonardo presented an example, studying the optimisation of different level steam requirements of a natural gas processing plant and exploring the interactions between this plant and the steam co-generation plant. Several steps are analysed using the tools. It was shown that by analysing heat integration in each plant (within trains) operational savings could be made, and there were more significant than the increase of capital costs.

The chairman thanked all the presenters for their excellent papers on behalf of the GPA. The presentations were fascinating, forward looking to the world of data collection and usage to assist increasing the capabilities to connect, monitor, analyse, predict and optimise the gas processing plants. How will we shape the future? The chairman expressed hope that the audience will reflect on what was heard while carrying out design, and control ...i-design, i-control....

HONORARY MEMBERSHIP FOR LONGSTANDING GPA CONTRIBUTOR JOHN SHEFFIELD

As a matter of any other business at the AGM, Paul Openshaw raised a request that the AGM formally approve the award of honorary membership to John Sheffield – a long-time and well-known member who was present at the meeting. John is an ex-chairman of GPA Europe and a hard-working member of the GPA Management Committee and more recently, the Board of GPA Europe Ltd. He is very well-known for his presentations and chairmanship at many GPA Europe conferences and is extremely well-respected across the industry as an expert in LNG operations and

design. Although now retired from M W Kellogg, he continues to offer presentation, insight and support to the industry and not least the initiative for training young professionals. The AGM unanimously endorsed the proposal and John expressed his surprise at being so recognised and thanked the members for the unexpected honour.

Paul also took the opportunity to present Adrian Finn of Costain his award for Best Paper 2014. Adrian's paper was given at the 31st Annual Conference in Madrid.



Honorary member – John Sheffield

GPAE CHAIRMAN'S ANNUAL REPORT 2015

Ladies and Gentlemen, friends and colleagues

Thank you for taking the time to join us for the 2015 Annual General Meeting of GPA Europe Ltd.

2015 has been an extremely tough year for our industry. The dash for gas in the USA, previously spurred on by major capital investment in the development of shale plays, came to an abrupt halt. Sanctions in Russia; OPEC's stance on crude pricing; political instability in some countries and economic uncertainty in others have forced oil and gas companies to take drastic action. Most of the GPA members I have spoken to over the past few months have stories to tell about projects being cancelled, studies being put on hold and jobs being cut. So, apologies for a rather somber start to my annual report. I promise I will get more upbeat later in my report. Let me take you through the highs and lows of the GPA 2015 calendar in chronological order:

The potential impact of low oil prices was raised and discussed at our January GPA Europe Management Committee meeting. Operating companies as well as suppliers reported a tightening of their company



AGM in session

budgets. Travel authorisations were to be restricted and there would be less money available for training and conferences. It was good for our Programme and Management Committee members to gain an appreciation of the way things were heading but, by January, the GPAE annual budget had already been set so all we felt we could really do was to acknowledge the industry downturn, build an awareness into our planning and execution of our four main events and to continue to monitor the situation.

In February we held our inaugural Young Professional Training Day – a collaboration with the University of Manchester. The event was hailed as a great success. More than one hundred students and young professionals from eight countries enjoyed a strong mix of academic and industrial papers. Based on the feedback we received we decided to hold a second event back in Manchester in February 2016. We had a fresh set of papers lined up but we will stay close to what was seen to be a winning formula. We intend to make this a



Adrain Finn receives Best Paper 2014 Award

regular event in our GPA calendar. Further ahead we are hoping to take the day out of the UK, possibly into France in 2017. We would really like to keep this as a free conference to GPA members and students.

In April we were in Hamburg for our spring conference. Our theme was gas treatment and liquefaction processes for natural gas. A strong set of technical presentations were supplemented by an extremely useful knowledge session covering the basics of gas treatment, presented by Joelle Castel from Technip.

As we moved into summer, Committee members were starting to get concerned over a question that had been raised around VAT. Each year we would seek advice, which appeared to be getting less reassuring. A small team was tasked with gaining clarity. That's when the sleepless nights started. VAT is an extremely complex subject, one where getting definitive yes and no answers from financial advisors is extremely difficult. To cut a very long story short I am now pleased to confirm that GPA Europe Ltd is not liable for VAT and there is no need for us to be VAT registered. I am extremely grateful to those who worked through the comprehensive review that was carried out. Malcolm Harrison deserves special mention as someone who wrestled this thorny issue down to the ground.

Back to the conferences

September took us to the wonderful City of Florence. Sandy and Anne came up trumps again with a spectacular and enjoyable conference banquet. I am sure everyone who was there will remember the evening's entertainment for a long time – in fact several delegates became the evening's

entertainment, which included a cameo appearance, adorned in full medieval costume, by GPA Chairman John Mollenkopf. Upon his return to the USA, John sent through an email to Sandy and me:

"Thank you for the wonderful time in Florence. I enjoyed the conference and the activities immensely and was impressed by your organisation."

So praise from the man at the top and another successful conference. However, the number of attendees was not as high as we had hoped to attract. During one of the coffee breaks in Florence, one of the delegates posed an interesting question. He asked me whether there was a direct correlation between attendances at our conference and the price of oil. Well, in terms of attendees I am pleased to report we have weathered the storm so far. The total number of delegates across our four events this year has been around 400, which compares favourably with previous years. If you asked other conference organisers how they have fared in 2015 I think most would say that attendances have dropped dramatically.

So what makes the GPA different? The key is to maintain the now expected high levels of technical quality at our conferences. The other big difference is that we are a non-profit making organisation so we can offer excellent value for money. GPA Europe is run by our membership for our membership. We set the conference fees at a level where we recover the costs of holding the events, targeting a small surplus. So what has tended to happen over the years is the small surpluses have accumulated and our reserves have grown.

Now, you will hear from Martin shortly that trend has reversed over the past two years. Our 2014 accounts show a deficit.

This change in our financial situation is due, in part, to a couple of very conscious decisions. Rather than letting our reserves continue to grow we agreed to re-invest in the future of our organisation and the industry we serve. We set up the young professionals training day as a free event for delegates and agreed to use GPAE funds to fund the event. Furthermore, we decided to drop one of our annual technical conferences. For some time we had debated whether we were trying to cram too many conferences into our calendar. The feeling was that quality is far more important than quantity and, with members struggling to justify the time and money we thought holding just two fee-paying events rather than three would be the right thing to do. So, it is not surprising that we find ourselves with more money going out than in the past. The question is whether our revised schedule of events is sustainable? Can we keep the February young professional event and November's London meeting going as free events? I feel we can. This is how I see 2016 turning out:

We have already set the pricing for our Paris conference at reasonable levels and have been conservative with our estimates for attendance. We are planning to take a similar robust approach to budgeting of our annual conference in September. This will be a joint event with the Gulf Chapter. This is a real opportunity for some upside. If we can maintain the number of European-based attendees we saw in Florence and we can add a further 50 delegates from the Middle East we will exceed our budgeted income. I am extremely excited about Istanbul. At next year's AGM I am expecting to report on another year of successful conferences and an increase in our reserves.

Before I close, I would like to express my sincere thanks to the directors, management committee and programme committee who give their time generously to GPA Europe Ltd. Then of course there is Sandy and Anne Dunlop who turn what we aim for in reality. I am delighted to report Sandy will be with us for another two years. As ever, Sandy has been thinking ahead; helping with his own succession planning. We have laid out a timetable to identify and appoint his replacement. So if you feel you could be the next Sandy Dunlop please contact Steve O'Donnell who will be leading the recruitment process to appoint the next GPA administrator.

To all members of GPA Europe, thank you for your support in 2015 and all the best for 2016.

FORTHCOMING EVENTS

SPRING CONFERENCE

20 - 22 April, 2016
Marriott Rive-Gauche Hotel,
Paris, France

- Making Natural Gas the Sustainable Fuel of the Future
- 1½ days of conference - 15 papers
- Conference Dinner

ANNUAL CONFERENCE

21 - 23 September, 2016
Wyndham Grand, Kalamis Marina,
Istanbul, Turkey

- Joint Conference between GPA Europe and GPA Gulf Chapter
- 1½ days of conference
- Conference Dinner
- Companions Tour
- Associated Training Session provided by Petroskills

AGM & TECHNICAL MEETING

24 November 2016
London, UK

- Knowledge Session - Production Water Handling
- Technical Meeting - Water handling in Gas Wells and Production Plants

YOUNG PROFESSIONAL TRAINING DAY,

March 2017
Paris, France

May 2017

Spring Meeting, Milan, Italy

September 2017

Annual Meeting, Budapest, Hungary

November 2017,

AGM & Technical Meeting, London, UK

CORPORATE MEMBERS

This listing of current Corporate Members represents the status as at 26 June 2015.

PREMIER

Air Liquide Global E&C
AMEC Foster Wheeler Energy Ltd
Amines & Plasticizers Ltd
Atlas Copco Energas GmbH
BASF SE
Bechtel Ltd.
BG Group
BP Exploration Operating Co.
Compressor Controls Corporation
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Orlen Upstream

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P S Analytical
Paqell bv
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Penspen Ltd.
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