



IN BRIEF

ISSUE 6 SEPTEMBER 2014

GAS PROCESSORS ASSOCIATION EUROPE

A BETTER VIEW

Paul Stockwell, managing director, IMA, together with co-authors Diane Broomhall and Brian Strugnell of GL Noble Denton, described the testing of a prototype liquid detection system in a paper presented last year in Edinburgh. In his article below, Paul provides the latest update on the project.

Last September, I gave a presentation to the 30th GPA Conference about a project commissioned by National Grid (NG) and DNV GL for IMA to develop a system to provide an alarm when contamination events occur at gas entry points to the National Transmission System (NTS). Since then, testing has continued and we have made considerable progress with a number of developments evolving both inside and outside the scope of the original NG project.

Early in the project DNV GL modelled vapour pressures which indicated that some of the potential contaminants have a low vapour phase, and would be difficult to detect with gas phase analysers. Also, take-off points for gas phase analysers are specifically designed to avoid liquids that may be on the pipe wall, and measurement of gases that are already at saturation with respect to water vapour or hydrocarbon would be unable to quantify the amount of condensate in the pipeline.

The "LineGate" system will provide alarms and information on the detection, severity and identity of the liquid contamination event. This will help operators to have a better understanding of their process conditions. The



Figure 1. Prototype LineGate on test at DNV GL facility at Spadeadam. Note: The long vertical section simulates the distance to a buried pipeline

system is designed for installation on export lines and custody transfer points, and will alarm on the detection of liquid or aerosols in the pipeline. It determines the severity of the event and uses a spectroscopy system to identify the liquid present.

The device has been designed to integrate into existing infrastructure as easily as possible, both in terms of mechanical hook-up and the ease with which the data can be transmitted and used. The system consists of a sight glass mounted behind a double block and bleed (DBB) valve that allows optical systems, including a spectrometer, to view the floor of the main pipeline. It is important that any window is out of the main flow so as not to be contaminated by liquids in the gas stream, therefore the measurement system does not protrude into the pipeline. This also enables pigging to take place. A prototype under test at DNV GL facilities is shown in Figure 1.

The intention is to provide Modbus alarms for liquid onset, severity and identity.

Discussions with various parties in the oil & gas industry have led to the development of a second product. The "LineVu" system will provide a live video stream of activity within the pipeline to provide vital information to enable improvements in operating efficiency and process safety. (A design prototype is shown in Figure 2 overleaf.) Being able to see

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3 VIEW FROM THE TOP

GPA chairman Keith Thomas on attracting young talent into the gas processing industry



4-11 SPRING TECHNICAL CONFERENCE

The highlights from the technical conference in Paris, March 2014



12-15 GPA EUROPE MAY CONFERENCE

Summary of the main activity at the May conference in Leiden, May 2014

the product will help engineers diagnose process problems, and give a better understanding of process conditions. It is intended to stream the information securely over the clients' network and provide viewing access via a desktop browser, tablet or smartphone, either locally or at remote locations. Overlaying the video with relevant process data e.g. flow rate, pressure, temperature etc. will give a fuller picture of process conditions, and will be beneficial for process engineers in both upstream and downstream applications. With the safety measures we are building into the system (patent applied), we are able to achieve a high functional safety level.

Flow Tests

Flow tests at atmospheric pressure have shown that when low level liquids are introduced into a fast gas flow, the flow regime is very different from a liquid flow caused by gravity. A large majority of liquid hits the pipe wall as soon as it is introduced, and then slowly moves down the pipe, due to a combination of friction with gas flow and gravity.

In a 3" diameter pipe, low liquid flows tend to form a full annular flow: a liquid film is formed around the inner circumference of the pipe wall. With most liquids in full annular flow, the depth of film is still deeper at the pipe floor.

Repeating the tests in an 8" diameter pipe, and using the same velocity of gas and liquid flow,

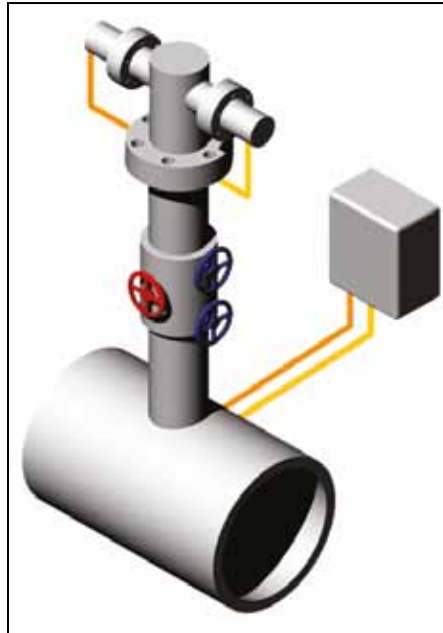


Figure 2. LineVu system installed on top of a pipeline

the liquid flows to the pipe floor and a stable state occurs at the bottom of the pipe, with a liquid stream slowly moving through the pipe. Figure 3 shows still shots from a LineVu test video looking vertically down into an 8" horizontal pipe.

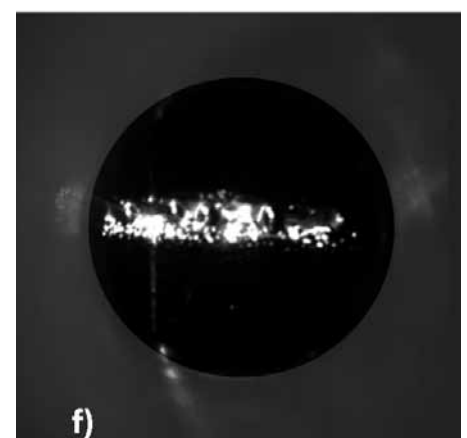
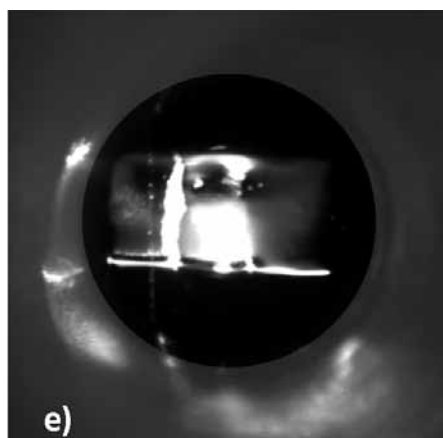
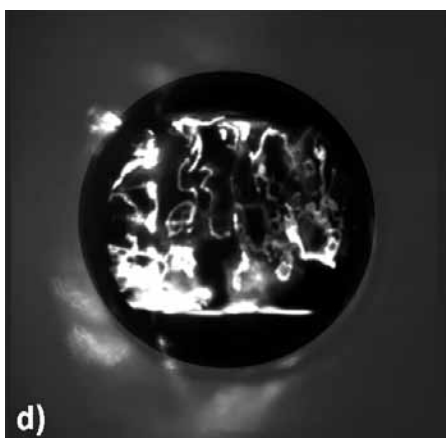
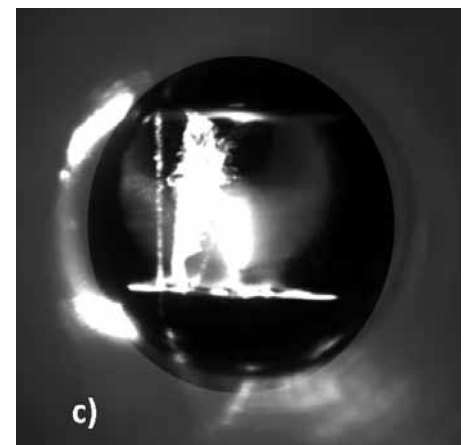
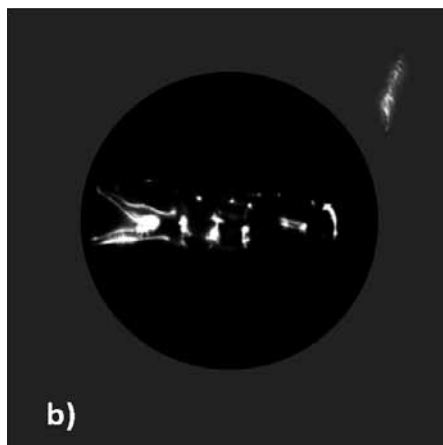
The stages of the liquid flow are: a) prior to a flow being established at the point of measurement, droplets of liquid are picked up from the main flow and thrown forward. These

droplets accumulate and merge until the main flow arrives (b). At (c) a steady state flow regime exists that moves relatively slowly. It increases in width as the liquid flow rate increases up to around 70 ml/min (depending on density and viscosity of the liquid) when "slugged" flow starts (d). With slugged flow, waves of liquid move along the pipe. When the introduction of liquid stops, the width of the liquid stream gradually decreases (e) over a period of several hours, until the stream becomes discontinuous and small drops of liquid move slowly along the pipe floor (f). The nature of the flows lends them to be illustrated more easily on video, and videos of tests can be found on our website at www.ima.co.uk

Testing is continuing to make sure that the liquid quantity and identity can be determined accurately. If you would like to be kept informed of progress or for more information please email info@ima.co.uk or contact us on +44 (0)1943 878877.

Figure 3 (below). Views down the vertical section to the 8" diameter pipeline below. Gas flow rate 11.5 m/sec.

- a) Liquid drops are thrown forward ahead of main liquid flow.
- b) Start of main liquid flow.
- c) Stable liquid flow at 60 ml/min.
- d) Slugged flow starts at around 80 ml/min.
- e) Oil injection stops and liquid level drops slowly.
- f) After several hours liquid level drops further to form slow moving drops



ATTRACTING THE TALENT OF TOMORROW INTO OUR GREAT INDUSTRY

By Keith Thomas, Chairman, GPA Europe

VIEW FROM THE TOP

At the end of my last *View from the Top* column, I raised the issue of there being enough qualified and experienced people in the industry to drive its innovation forward. For my final View from the Top I would like to explore this in more detail. My premise, for those of you who did not read the previous column, was that commercial necessity and technical innovation were now functioning almost in parallel and that technical innovation was no longer driving new commercial models. That rather at best these new commercial requirements were driving the direction and pace of innovation. This is in itself fine, however, there needs to be industrial structure and depth of knowledge for this to be possible.

The industrial structure has, over the last 20 years, definitely changed. Whereas there were a number of significant majors operating who drove research in development at the end of the last century, this profile has since changed and this function is now more widely spread or even outsourced. So what are actually the drivers for innovation? As I said in the last article, commercial needs are certainly a prime driver, and they have if anything become more intensive in the last 20 years. Another driver is the ever increasing need to improve the industry's environmental footprint. As well as these drivers however, there needs to be creativity, ingenuity and experience to make things work. And this is where I see the main problems arising. Chemical Engineers in particular have a reputation for versatility which has meant that a not insignificant number of them have wandered into other areas, many direct from university, in particular into the finance world where their skill base is greatly prized. This has meant that in the last years fewer younger engineers have entered into the gas industry and remained there. Also as the majors have downsized, companies where it was possible to get a very broad grounding at the beginning of a career have recruited less and less. Young engineers have instead been forced to join more specialized companies which, although they may also be

able to provide excellent training for their young staff, do not have the depth and breadth of activities to offer such a wide education in all that the gas industry has to offer.

So here the dilemma begins to become apparent. Just at a time when the drive for innovation becomes ever greater, the resource to make it happen becomes scarcer. In many ways the industry is in itself responsible for this. Most people I have met who work in the gas industry would not want to work anywhere else. It is a very lively international technical and commercial environment. However its image to the outside world, particularly those who are about to start on a career, is perhaps less rosy. We are still stuck with the negative images of fossil fuels, fracking, harsh locations offshore or in deserts. You name it, the industry somehow has it. But if you look at these in more detail: Yes Gas is a fossil fuel, but probably the one that causes least harm and is most flexible; Fracking (or unconventional gas as I would rather call it) is indeed pushing the boundaries anew and may not be appropriate everywhere. But there is no doubt it has a role to play in the energy mix in the world to come and the more we progress with it the better its environmental impact is likely to be. And as for the harsh and exotic locations, ultimately I think I have enjoyed them more than being stuck at my desk.

The consequence of all this seems to me to be that if we want the industry to progress, we need to make sure that we get the best people into it, and we pass on that which the industry has built up in terms of Know How over the last years to the next generation. Consequently I whole heartedly support the new initiative that the GPA is taking in Europe to step out and engage potential engineers in universities before they have made career decisions and through our Young Professionals Initiative to try and make clear to them that a career in Gas Processing actually has a great deal to offer. But this of course is only part of the picture. The entire gas processing



Keith Thomas

community will inevitably have to work closer together to make sure that the remarkable level of progress that has been achieved in the last few decades carries forward, and gas continues to play a significant role as a source of fuel and feedstock. This is not a forgone conclusion. The disparate levels of demand in Asia, the US and Europe have led to significant price differences in each market and in some cases to gas even being marginalized by coal. So here the GPA still has a role to play as a source of information, a forum for debate and interaction, and perhaps more significantly as a place where members of the gas community at varying stages of their career, can meet and network as equals so that the experience of the past can be passed on to those who will need it for the future. But ultimately this all depends on our members, the employers, stepping up to the plate and supporting the GPA and its events so they themselves can profit from what is available. Let us hope that in a world of ever smaller budgets and ever more time pressure we are wise enough to recognize this.

GPA EUROPE SPRING TECHNICAL CONFERENCE PARIS, 12–14 MARCH 2014

MORNING SESSION 13 MARCH: OFFSHORE GAS FACILITIES AND THEIR OPERATION

Moderated by Lorraine Fitzwater,
Petrofac Engineering Ltd

The conference was opened by the
GPA Europe Chairman, Keith Thomas,
welcoming some 86 delegates from 12
countries.



Peter Carolan

FSRU Toscana - a history in the making

Peter Carolan, Managing Director of OLT Offshore LNG Toscana, opened the morning session with his paper describing the development of FSRU Toscana. The "Floating Storage Regasification Unit" is permanently moored at a water depth of 120m, 12 nautical miles from the Tuscany Coast, Italy. It is completely self-contained and is connected to the national gas grid through a 36.5 km pipeline.



FSRU Toscana

The offshore location was chosen, in comparison to 6 onshore locations along the Italian coast, as it would have zero environmental and safety impact on coastal cities and have minimum visual impact from the coastline. The location near Livorno provided all necessary marine support services from the Port of Livorno and a strategic entry point into the Italian grid with most consumers in Northern Italy.

The LNG carrier, 'Golar Frost', was converted to the FSRU by adding an external turret as a single point mooring to allow the unit to weathervane and huge bilge keels for stability during severe storms. Facilities added included Regasification module, nitrogen generation (for Wobbe No. correction), LNG loading arms (for largest offshore motion capability) and high capacity transfer pumps.

The FSRU is designed for flexibility of supply, LNG carriers from 65,000m³ to 155,000m³, and export, 450t/h (max) to standby (zero sendout mode - being available for sendout at 48 hrs notice). Additionally, there is a keep-cool sendout mode of 10t/hr, allowing instantaneous ramp-up for periods of peak gas demand.

The FSRU has now been onstream since December 2013. However, Peter explained that the path to this had been a tortuous one - from conceptualisation in 2002, followed by permit to proceed being granted in 2006, after the EIA was eventually approved. After this, there was identification of a suitable LNG Carrier, 2 years for FEED before EPCIC project started in 2008.

The Operations and Maintenance responsibilities are contracted to a 3rd Party, ECOS Srl. Safety and security rules (imposed by the Maritime authority) are paramount and with the expertise

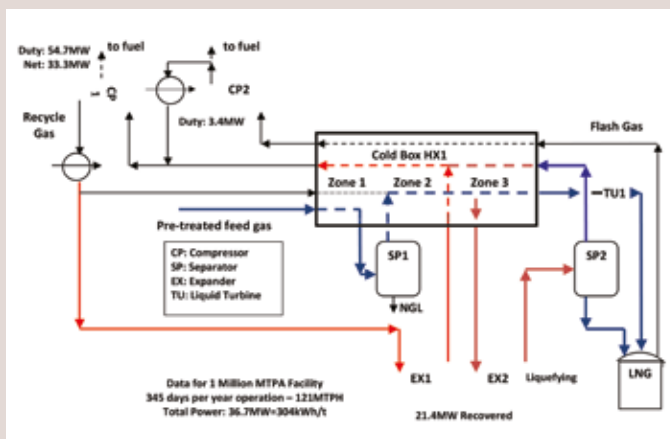


Bill Howe

of the LNG marine industry, the design and operation of the permanently moored terminal provide a new benchmark for the floating LNG industry. Additionally, the environmental rules are more rigorous than any onshore Regasification or fossil-fuel burning plant. The environmental monitoring programme is carried out every 3 months.

ZR-LNG™ Dual Expander Cycle Liquefaction Technology applied to FLNG

Staying with the offshore LNG theme, Bill Howe, CEO of Gasconsult Ltd, presented their patented dual methane expander refrigeration configuration - ZR-LNG™ (zero refrigerant LNG). In this scheme, the natural gas feed is used as the refrigerant, instead of nitrogen or mixed refrigerant.



ZR-LNG™ Process schematic

For floating LNG, there is a preference with operators to eliminate the higher molecular weight hydrocarbons required for mixed refrigerant process because of the fire/explosion risk. However, the power consumption for nitrogen cycles is typically 30-60% higher than for mixed refrigerant. Thus against this background, the need to reduce the power demand for an expander based process whilst retaining the simplicity of the nitrogen cycle, led to the development of the ZR-LNG™ process.



Richard Tomlins

The liquefaction unit net drive shaft power achieved is close to 300kWh/tonne of LNG at 20°C process cooled temperature, only marginally below base load processes. This is achieved with no feed gas pre-cooling and without the need for a nitrogen system or liquid refrigerant storage. The simplicity of the system achieves a significant reduction in capital cost and frees up deck space on FLNG facilities.



MOPU Ocean Legend

Bill Howe presented the results of several studies on a 1 Million TPA train comparing the ZR-LNG™ process with Dual N2 Expander and generic SMR processes, to illustrate the flexibility to variation in gas composition and ambient temperatures. An FLNG Case Study for a 5 train plant was developed to allow comparison of efficiency and CAPEX/NPV for the three processes. Once a driver power is chosen (in this case PGT25+G4), the higher process efficiency of the ZR-LNG™ process, will result in higher LNG production and hence give improved project financial returns.

The ZR-LNG™ process is a simpler, lower capital cost, reduced schedule and more energy efficient process than either the Dual N2 Expander or generic SMR processes in the mid-scale range up to 2 million TPA. This, coupled with the increased safety and reduced plot space, make it a candidate for FLNG. The technology is also suitable for expansions at existing LNG facilities looking for low cost, small footprint and short schedule.

Change of Service of a MOPU

The third presentation of the session was given by Richard Tomlins of Petrofac describing the conversion of an existing mobile offshore production unit (MOPU) for use in Peninsular Malaysia license area PM304. Following completion of sub-surface appraisal in early 2011, Petrofac embarked on a fast track development to have the MOPU on location by

end of 2012 ready for drilling. It was recognised that to achieve this schedule a complete new conversion was almost impossible.

The production unit sourced had previously operated in Australia with a similar duty in terms of oil and gas flows at similar pressures (new total production is 15,000 BOPD oil and 13 MMSCFD gas). This was converted to accommodate a new water injection system (20,000 BWPD) and an increase in well slots from 8 to 28.

Because of the time schedule and cost constraints, maximum reuse of existing equipment was required. The compression system proved the most challenging. Whilst a lower gas capacity was required, the existing compressors had insufficient head for the duty because of the lower molecular weight gas. Working with the Well engineers to determine the minimum gas lift duty and the original compressor supplier (Solar), it was possible to restage each of the compressors with new impellers. CO₂ and corrosion was a further challenge and resulted in a number of equipment modifications.

Key in this conversion was that overall topsides weight was limited due to tow out stability requirements and in place stability. To manage the space and weight constraints, a 3D model of the facility was developed using laser survey technology. By minimising weight change, the weight management was done by difference. The deeper water location required new 8m leg extensions (80 te each). This leg extension was one of the major engineering challenges

– to stay within the weight stability envelope and maintain the VCG (Vertical Centre of Gravity) limits on tow out.

Other challenges addressed during the design included the change of standards between the original design in 1998 and the refit in 2010, and increasing the POB from 35 to 50 to allow for the increased facilities and regional working practices.

Performance-based Design of Flare System

The next presentation was given by Michèle Normand and Laurent Paris of Technip.

Michèle opened with a comparison of the new design rules from API STD 521 (5th/6th edition) based on a Performance-based approach with the older version of API RP 521 (4th edition). The older Recommended Practice was based on a defined depressuring time of 15 minutes down to 6.9 barg (or half design pressure, whichever is lower). The Performance-based Approach is less prescriptive with the goal being to maintain the integrity of the pressurised vessels as long as the acceptance criteria for rupture is achieved. There is however no explicit criteria for “acceptable rupture” defined. Michèle further discussed other guidelines, such as those from Scandpower that do provide “Acceptable rupture” and “Unacceptable rupture” criteria.

Laurent continued with a description of Technip’s methodology for design of the Emergency Depressuring system that can be applied to all locations. By evaluating the “time required for safe escape” and the “time when untenable conditions prevent escape”, the required blowdown time and hence blowdown capacity can be optimised. A reasonable margin must be allowed between the times to allow for assumptions within the modelling approach.

The survival time for a vessel, i.e. time to shell rupture, is estimated by considering the increasing shell temperature and hence the decreasing Yield stress and UTS as a function of time together with the remaining inventory pressure. The inventory pressure is determined by dynamic simulation of the vessel considering initial inventory, liquid level, heat input from fire (dependent on type of fire) and proposed

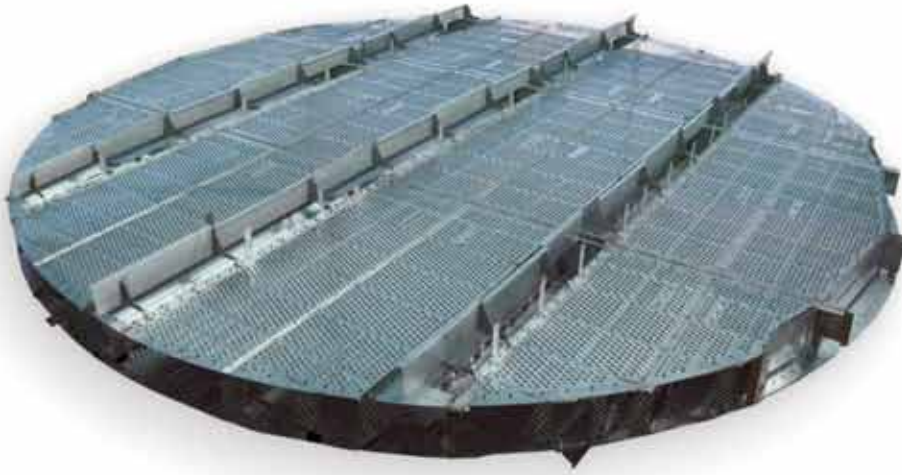


Michèle Normand



Laurent Paris

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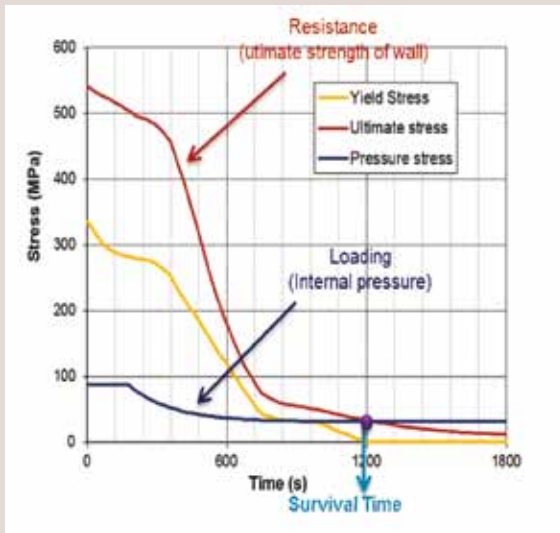
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Example of shell rupture assessment based on mechanical stresses

depressuring rate. The escape time includes detection time as well as actual time to escape and should also consider injured personnel.

This was a very interesting and thought provoking paper on new approaches to flare system design, promoting a better understanding of multiple variables on a safe design.

Benchmarking Oil & Gas Production Performance against the Industry - Where can Improvements be made?

The final paper of the morning was delivered by Mark Rogers of DNV-GL who explained how Production Optimisation using RAM Modelling could be used through the full-life-cycle of the facility. During Concept, high level availability comparisons together with CAPEX can be used to differentiate between options. During FEED, a detailed availability analysis can identify production critical items and design changes that may increase availability. During Detailed

Design, further detailed availability analysis can incorporate operational strategies and logistics and will confirm that the plant availability target specifications can be met.

Once an asset is operating, both industry standard and live asset availability modelling can be performed. DNV-GL has undertaken RAM modelling on existing aging offshore assets using the OPTAGON software package since 2008. By developing asset specific and industry standard models, performance comparisons can be made and improvement plans developed. Each update, generally carried out every 6 months incorporates asset specific equipment reliability data, well profiles and planned shutdowns

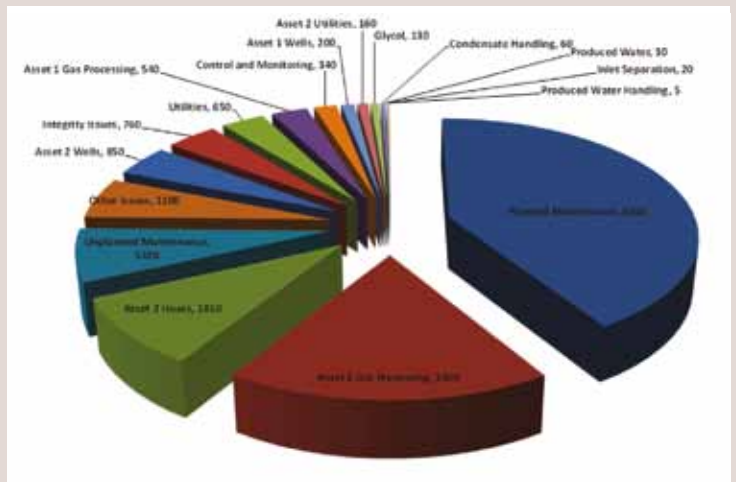
and provides a 12 month forecast for the asset. For each update, the asset specific forecast includes P10 and P90 production values, a production exceedance curve and loss production wheel.

By comparing the production performance from the asset specific model against the previous 12 month performance and the industry standard model, production



Mark Rogers

improvement plans can be made and monitored for an aging asset. This ability to benchmark performance enables informed decisions to be made with respect to where investment should be targeted and the likely financial benefit.



Loss Production Wheel (in MMscf of Gas) by System



Conference gets under way

GPA EUROPE SPRING TECHNICAL CONFERENCE PARIS, 12–14 MARCH 2014

AFTERNOON SESSION 13 MARCH

Moderated by Alexandre Terrigeol,
CECA

Offshore MEG Regeneration and Reclamation Units - lessons learned from their design and operation

The first presentation of the afternoon session was given by Simon Crawley-Boevey of Cameron. It was a very useful overview of Cameron's experience with the recovery of MEG that is injected as a hydrate inhibitor in deep water gas wellheads. Simon pedagogically explained the principles of Regeneration units and the pitfalls to be avoided, especially burping and fouling of the column packing. He then detailed the improvements proposed by Cameron, from the exchanger to the reboiler and column design. Simon covered the problem of the accumulation of dissolved salts and how to remove them in Reclamation units. Here again he explained the development of Cameron's PureMEG process that is able to handle both monovalent and divalent salts.

Novel Small-Footprint Mechanical Gas Drying

Professor J.J.H. Brouwers of the Eindhoven University of Technology presented a new dispersed liquid removal device, the Rotational Particle Separator (RPS). The RPS is a small, low energy consumer device that removes all droplets over 1 μm . After reminding the audience of the principles of inertial and centrifugal-based separation techniques, Pr. Brouwers detailed the characteristics of the RPS. The RPS offers the separation performance of a fiber-bed demister (0.5 μm) in a much smaller volume, and is able to catch much finer droplets than a cyclone. An operating pilot, installed since summer 2013 at Enexis b.v. in the Netherlands, was shown. It currently handles 2 MMscf/day, and a new 14 MMscf/day RPS will soon be implemented.

Improved Internal Implementation For Amine Absorbers For Offshore Applications

Denis Chrétien, from Total, described how Total, in collaboration with Prosernat, has developed a new amine absorber configuration for F-LNG that would prevent uneven liquid distribution (due to sea motion) without using excessive height within the column. The principle of high hydraulic leg is part of the proposed solution, but the space all around the leg is no longer lost as it is now filled with packing. In order to feed each packed section, the amine flow-rate has to



Simon Crawley-Boevey



Denis Chrétien



Prof Bert Brouwers



Paul Sturdy

be split in two halves. A preliminary sizing has shown that the new configuration enables a significant reduction in weight and volume of the absorption column, a significant advantage in floating applications.

The Use Of On-Line Scanning, Tracer And Chemical Technology To Diagnose Operating Problems In Offshore Gas Installations

The last presentation of the day was by Paul Sturdy of Tracerco. Paul gave the audience a comprehensive view of the state of the art in non-intrusive diagnostics using gamma-ray radiation. After a brief description of the principles, the presentation was essentially made of many practical examples that very well illustrated all the offered possibilities (including the

use of tracers), from liquid level measurement to column scanning, deposit detection in pipes, flow rate measurement, leak detection, residence time determination, etc. It demonstrated the usefulness of non-intrusive diagnostic techniques as regards troubleshooting, shutdown planning and more generally process efficiency improvement.



Paris speakers and moderators

GPA EUROPE SPRING TECHNICAL CONFERENCE

PARIS, 14 MARCH 2014

KNOWLEDGE SESSION: THE EUROPEAN GAS SUPPLY AND PROCESSING BUSINESS

PRESENTED BY
JOHN M. CAMPBELL PETROSKILLS

John A Sheffield

D John Morgan

Peter Wlaschitz

Alexander Kreft

John A. Sheffield and D John Morgan, both from John M. Campbell Petroskills, and Peter Wlaschitz and Alexander Kreft from OMV proposed a large overview of gas and LNG import in Europe, describing the sources of supply and the technical aspects of the gas treatment plants, pipe networks and LNG terminals.

Europe strongly depends on gas import for the needs of its industry as well as for residential and commercial uses. The import is performed either by pipelines or by LNG carriers after liquefaction in the producing countries. Some gas is produced in Europe itself (such as in North Sea) but most of it has to be imported, for example from Russia. This massive importation of gas required the construction of large infrastructures to route the gas by pipelines from Russia or Algeria through a large pipe network or LNG terminals for the reception of oversea liquefied natural gas (LNG). Terminals for pipe gas or LNG terminals are dedicated to the processing of the gas to match the specifications of the different national grids.

The knowledge session was organized in four sessions. In a general introduction, John A. Sheffield proposed a high level overview to gas supply in Europe. In a second session, John Morgan described the different gas terminals' architectures and processes to upgrade the pipe gas (either directly from the gas field or from the transport pipes) to the national grids specifications. This was followed by a living and practical example of a gas plant given by Peter Wlaschitz from the Aderklaa plant in Austria. The fourth session was dedicated to the LNG terminals by John A. Sheffield before John Morgan gave the final words and conclusions.

The introduction started with a reminder of the main orders of magnitude of the world gas industry: the location of the main reserves

(unfortunately out of Europe); and the comparative productions of oil, gas, coal and nuclear as well as renewable in the world. This highlighted the relative decline of oil and the growth of gas while other energy sources remain relatively constant in proportion. Focusing on Europe, it disclosed a map showing the impressive infrastructures of pipelines from Russia and Algeria and the evolution of the declining reserves in Europe. The main suppliers to Europe are Russia, the North Sea, Algeria and Azerbaijan for pipe gas and Qatar, Trinidad and Nigeria for LNG.

Following the stream of gas, we find at the end of the road the end users classified in "residential & commercial" and "industrial" according to their profiles of consumption. The first group is highly seasonal with a low loading factor while the other is the contrary. Power generation is a specific topic where gas, favoured by environmental aspects, is growing while oil is declining. For the future, even if they grow rapidly, it is not believed that renewable sources will replace fossil fuels in the short term.

The second session, by John Morgan, was far more technical. Gas from the pipes or from the fields is not necessarily on spec and needs some processing before feeding to the grid. The main impurities to remove are acid gases (CO₂ & H₂S), the heavies and the water. Different processes were reviewed which, depending on the initial gas and the grid specifications, are selected and implemented in the gas plants. Amine systems remove the



John A. Sheffield

acid gases while water removal can be performed by a large variety of processes: molecular sieves for deep water removal; and TEG and MEG for more moderate specifications. NGL recovery helps to achieve the required HHV specification while offering valuable by-products with LPGs and condensates after fractionation. These processes can be combined in a large number of plant architectures resulting in various block diagrams and PFDs. This presentation, although deeply technical, was additionally attractive thanks to some exercises such as finding the location of the gas terminals in northern Europe.

The presentation of the Aderklaa plant in Austria by Alexander Kreft from OMV gave a good example of a gas treatment plant. The gas supplied to the plant does not meet the national grid specifications and needs to be treated.

The first phase of the plant was built in 1961 including reception facilities, an Acid Gas Removal plant (AGR) for CO₂ and H₂S treatment, drying on a TEG unit, and dew pointing. Sulphur recovery based on a Claus unit (Scott process) with upstream H₂S

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smart engineering for extreme environments

enrichment enables the production of elementary sulphur.

A second phase of the plant includes reception facilities, AGR, drying with molecular sieves, and NGL recovery with turbo-expander expansion and a fractionation unit for the production of LPGs.

Hence with both phases, the Aderklaa plant contains almost all the possible treatments previously mentioned by John Morgan and provided an excellent illustration of the preceding session.

Despite the treatment of H₂S well known for its toxicity and the production of highly flammable LPGs, the Alderklaa plant did not witness any casualties or incidents since the start-up in 1961.

This third session finished with some statistics of the gas supply in Austria underlining, if necessary, the strong dependence on Russian gas.

Gas is supplied in Europe not only by pipeline but also from LNG which, liquefied overseas, is transported from the producing countries to Europe by LNG carriers. The fourth session, presented by John A. Sheffield, gave an overview of the LNG terminals from their technical aspects as well as their integration in the grid.

From an engineering point of view, the main challenges are the gas specifications, the fact that the treated liquid is at bubble point and the large amount of cryogenic pipes.



Peter Wlaschitz

Gas arriving from the liquefaction plant is produced according to certain characteristics which do not necessarily meet the requirements of the distribution network. In particular, the High Heating Value (HHV) and the Wobbe index which are specifications related to the quality of the combustion may be different from the grid gas quality.

The gas arrives at its bubble point in the LNG carrier and its treatment is difficult since the gas is always subject to flashing with associated damage to the equipment.

The operation strongly depends on the demand from the downstream network which is highly fluctuating leading to the need of highly flexible plants. Furthermore, different



Alexander Kreft

shippers may supply the LNG terminal with different gas qualities which are not necessarily compatible one with each other. In addition, the terminal may be operated by a different operator than that of the grid, which adds an additional interface in the production. All these reasons explain why the LNG terminals, despite their apparent simplicity, prove difficult in engineering and operation.

The final words came from John Sheffield. Gas is promised a good future in Europe despite the competition of other energy sources such as coal and renewables which are destined for rapid growth but will not be able to cover the needs of energy in Europe. John also highlighted the need for supply diversification.

GPA EUROPE 2013 AWARDS

The Programme Committee of the GPA Europe has selected Adam Jones from Costain as the winner of the 2013 Aungier Award for his paper, jointly authored with Grant Johnson, which was delivered at the 30th Annual Convention in Edinburgh, entitled "A New Process for Improved LNG Production Efficiency". Adam discussed the implications on LNG plant efficiency by the maximum pressure limitation need to conventionally remove heavy hydrocarbons from the gas which might otherwise solidify at processing temperatures. He then went on to discuss a novel approach developed by Costain which removes this maximum pressure limitation and thus allows liquefaction to be improved.

It is expected that Adam will be presented with his award at the 2014 Annual Conference in Madrid in September.

The GPA Europe is keen to encourage other Younger Professionals to offer papers for presentation and, to this end, the Aungier Award, worth £ 1000 is hoped to provide encouragement.

For the 2013 Best Paper award, the Programme Committee selected the paper by David Futter of E.On entitled "Condition Monitoring to Support Production in the Power Industry" presented at the November 2013 AGM and Technical Meeting in London. David's paper described the condition monitoring processes used in the electrical

power industry to optimise the maintenance of major machinery. The committee felt this was a well-presented and useful insight into how other industries manage the maintenance of critical equipment and offered some new ideas for people to consider. David will be invited to accept his award at the 2014 AGM and Technical Meeting in London in November.

In order to have papers selected as Best Paper available for offer to the GPA Annual Convention in USA, GPA Europe now intends to select the Best Paper for 2013 from those presented at Conference between March 2014 and November 2014 and annually on this basis thereafter.

GPA EUROPE MAY CONFERENCE

LEIDEN, 15 MAY 2014

MORNING SESSION

Moderated by John Young, Twister

It was a pleasure to welcome the GPA Europe to Leiden for its 2014 Technical Meeting. Leiden represents the intellectual centre of The Netherlands, being the home of its oldest university founded in 1575. The GPA's challenge to its speakers was to deliver papers living up to that reputation. The Technical Conference was entitled 'Gas Exploitation to Markets' and the audience was treated to a morning session which certainly broadened our perspective.



Stefan Rovers

Shell Prelude FLNG Design

Stefan Rovers of Shell Global Solutions presented Shell Prelude FLNG Design giving the audience an update on Shell's Prelude Floating LNG. What came across was the time frame to realise the project, as well as its enormity and the technical challenges being faced to bring the asset to market. Nevertheless the project was presented as proven technology being used in an innovative way. Recognising the risks associated with implementing such a project in a high cyclone environment -clearly a high degree of analysis has been performed to mitigate the risks.

Modular GTL: Transformational Gas Solution for the Upstream Industry

Shravan Joshi of Compact GTL presented Modular GTL: Transformational Gas Solution for the Upstream Industry, giving the audience a history and current status of their GTL technology, including a review of their new award for the first commercially deployed small scale GTL plant in Khazakhstan. Shravan's paper gave an understanding of Compact GTL's

operation including the demonstration plant in Brazil and their training centre in the UK. We also understood their view on GTL potential in North America and Russia/CIS and their vision on modular design to bring cost effective syncrude to the marketplace. Industry partnership was a key message in building their solutions



Leiden lunch



Shravan Joshi

SBM Offshore - Twin Hull FLNG Concept

Kristof Bryon of SBM Offshore presented SBM Offshore - Twin Hull FLNG Concept a novel concept to reuse existing Moss type LNG carrier hulls in an FLNG application. In addition to the configuration analysis developed in partnership



Kristof Bryon

with Linde Engineering, SBM presented the sea keeping test that had been carried out at SBM's site at Marin and the fire/blast desk top analysis to mitigate process safety risk. The next steps will be to progress to project specific FEED.



Paul Garlick

Coal Bed Methane - Unconventional Gas Becomes an Optimised Solution

Paul Garlick of Fluor presented Coal Bed Methane - Unconventional Gas Becomes an Optimised Solution giving an engineering contractor's perspective on the characteristics and extraction of coal seam methane and an approach utilising Monte Carlo analysis to optimise the gas gathering system and central processing facility designs. It was amazing to think that despite low flows, relatively complex extraction methodology, and uncertainties due to the unknown properties of the coal seam, this still provides an economic route to energy production.

GPA EUROPE MAY CONFERENCE

LEIDEN, 15 MAY 2014

AFTERNOON SESSION

Moderated by Gijs van Lammeren O&GBISS BVBA

Due to the cancellation of the last paper of the afternoon session, the organising committee decided to reschedule the final morning session paper to the start of the afternoon, allowing some extra question time in the morning.



Dr Martijn Oversteegen

Pressure assisted Stripping for the production of LNG

The first paper presented by Dr Martijn Oversteegen from Procede Gas Treating BV, discussed a different approach to solvent stripping in a classic amine solvent CO₂ removal system, as applied in LNG plants. Through the use of their in-house developed Procede process simulator they developed the Pressure Assisted Stripping (PAS) process. Several cases were presented and received quite some attention as it was demonstrated that the stripping ratio is predominantly in the bottom of the stripper and stays rather constant over the rest of the column, reducing the need the tall columns. This can then be extended to using a cascade of small strippers, operating at different pressures. Through this the overall water evaporation is reduced, and therefore the primary energy used in the cycle of evaporation and condensation of the stripping water. The savings in energy can go up to 26% in bringing the natural gas – specially if high in CO₂ or H₂S – to the required LNG specification.

Refrigeration and boil off compressor system considerations for NGL products export facilities.

Paul Openshaw, Business Development Manager at ENERFLEX (and incidentally the Deputy Chair of GPA Europe) confronted us with a change in paradigm on the NGL market: the United States have become an exporter of NGL products (ethane, propane, propylene, butanes...) from previously being a net importer. This means the transformation of the import terminal into an export terminal. The paper discussed compression and refrigeration equipment considerations for these facilities.

The presentation addressed the typical components of such an export facility and started by discussing the three different types of carriers available for transporting NGL:



Paul Openshaw

pressurised; semi-pressurised; and fully refrigerated, the last type being able to carry 8 to 10 times more gas than the other two.

Typically the gas received is warm and stored at medium to high pressure, which for the export needs to be converted to a low pressure, low temperature product suitable for loading the

Continued overleaf



Speakers and moderators



Dinner guests



ship. Besides the refrigeration system, often clean-up systems are needed such as contaminant removal and dehydration systems to reduce the water content below 1 ppmw. The refrigeration can be either a direct or open system or an indirect or closed systems. These were discussed for ethane, propane and butane products.

Finally specific equipment issues were discussed: vessels; heat exchangers; isolation valves and compressors. Also the need for a modular approach was highlighted in order to save space, in particular for the ship mounted equipment.



Prof Bert Brouwers

Gas to Liquids by condensed rotational separation

Bert Brouwers, Professor at Eindhoven University and owner of the Rominco group, explained how classic thermodynamics can be applied in a novel way, opening avenues for new processes for bulk separation of acid gases. The process described in the paper is called CRS or Condensed Rotational Separation, where droplet partial condensation is induced by fast temperature and pressure reduction (Joule-Thomson valve or expander), and a mixture of vapor and micron droplets in equilibrium is obtained. This mixture is then sent tangentially into an RPS, causing a swirling motion and droplets are separated due to centrifugal forces. The remainder enters the rotating element (containing an assembly of axially oriented channels), where particles coalesce and form films, which are forced out of the channels due to gravitational and shear forces.

A few applications were then discussed:

- Post combustion CO₂ capture from a chilled flue gas
- Natural gas upgrading, which will reduce the smaller amine plant's energy consumption significantly

Several devices were presented and a small demonstration unit was shown.



Marco Betting

Ten years of Twister operation

Marco Betting, Head of Technology at Twister BV began by explaining the functioning of Twister Supersonic Gas Separators, which is based on condensation of water through quick expansion of gas, typically resulting in a pressure and temperature drop of 70 bar and 60°C respectively, after which the droplets are separated through cyclonic forces. This compact, static unit eliminates the need for more complex

dehydration units such as glycol dryers. These features have been put to advantage in offshore projects.

For example, the B-11 field offshore Malaysia started up in 2003 and has been in continuous operation since that time. Therefore, a great deal of experience has been obtained and clear tangible value was provided to the operators.

The arguments leading to the choice of Twister above glycol dehydration were:

- Safety: Twister is a closed system, without H₂S emissions
- Operations: Normally unattended operation
- Economics: Lowest CAPEX and lowest lifecycle cost; no glycol inventory + 25% topside weight saving
- Simplicity: No glycol regeneration and associated operations
- Availability: Guaranteed uptime of 98%
- Flow assurance: Protection of 65 km of CS pipeline – no free water.

Since then Twister technology has been applied in the upstream industry for gas dehydration and dewpoint control in many applications. Future developments include CO₂ separation, subsea dew pointing and flare gas reduction.



Dinner at Oud Poelgeest



An avid InBrief reader

GPA EUROPE MAY CONFERENCE

LEIDEN, 16 MAY 2014

KNOWLEDGE SESSION: ENGINEERING DESIGN MANAGEMENT

Moderated by Nick Amott, Fluor

Friday morning, bright and early, the conference attendees gathered for the Knowledge session. The session Chairman welcomed everyone, expressing publicly his pleasure in seeing a truly mixed gathering of young and not so young participants. Based on the attendance of YPs, the future of the industry is in good hands. Privately, he was also pleased (and surprised) that so many had made the session after the wonderful meal in the charming setting of the Oud Poelgeest restaurant, given that as is often the custom, some of the younger attendees continued the evening in the beautiful old town of Leiden.

We warmly welcomed Hervé Baron who works for Le Gaz Integral and also provides training courses in Project and Engineering Management under the auspices of IFP Training. He is the author of "The Oil & Gas Engineering Guide" (Editions Technip). Hervé started the meeting, immediately engaging the audience with his presentation style as he walked the room, inviting questions and checking for understanding. The audience warmly responded,

setting the scene for a very interactive session of training in Engineering Management. Hervé broke the sessions down into four parts starting with a review of the Engineering work process, particularly looking at the roles of engineers, project phases and interfaces. This was followed by Project Execution, reviewing execution approaches, critical paths and concurrent working as well as the consequences of fast track schedules. We then spent time looking at the required engineering actions to meet the schedule and finished off looking at the control and measurement of engineering activity.

Hervé has provided an excellent set of slides if you were not able to make the meeting, which are available on the GPAE website as well as contact details, he is very keen to offer his experience and much information is available via his website/blog. However, for the chairman, the highlight (of which there were many) was the grounding of many issues with clearly understandable illustrations. For example, the construction critical path for getting foundations in the ground which must be done before other construction begins, but relies on



Hervé Baron

equipment weight/load/foundation designs, which relies on vendor information, which relies on vendor design, preceded by the procurement process, which relies on mechanical engineering design and in the first instance process design – you get the picture! Working through this tortuous process with photos and illustrations, brought the message home clearly.

GPAEurope would like to sincerely thank Hervé for the time and energy he put into the training session and commend the presentation material to you.

Nick Amott

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FORTHCOMING EVENTS

2014 CONFERENCES

Offers of presentations are welcomed for all meetings. Contact Administration Office for further details.

ANNUAL CONFERENCE

17-19 September 2014, Hesperia Hotel, Madrid

- Young Professional Training
- 15 high quality presentations
- Conference Dinner at Bernabéu Stadium
- Companions Tour to Toledo
- Golf Tournament
- Conference now open for booking

AGM & TECHNICAL MEETING

27 November, Hilton Paddington Hotel, London

- Theme - "Wells and Reservoirs"
- Morning Knowledge Session
- Networking Lunch
- Annual General Meeting
- Four high quality presentations
- Free post meeting drinks reception
- Call for Papers open - Closes 8 August 2014

2015 CONFERENCES

YOUNG PROFESSIONAL TRAINING DAY

February, 2015, University of Manchester

- Four key topics areas
- Academic and Industrial experiences
- Learn the latest state-of-the art and practical industry experiences
- Free to Young Professionals of member companies
- Call for Papers will be opened in late July 2014

SPRING CONFERENCE

22-24 April 2015, Le Meridien Hotel, Hamburg

- Theme - "LNG and Gas Treatment"
- Knowledge Session
- 15 Presentations
- Conference Dinner
- Call for Papers will open in November 2014

ANNUAL CONFERENCE

16-18 September, 2015, Hilton Metropole Hotel, Florence

- Knowledge Session
- 15 high quality presentations
- Conference Dinner
- Companions Tour
- Golf Tournament
- Call for Papers will open early 2015

CORPORATE MEMBERS

This listing of current Corporate Members represents the status as at the end of 2012. In addition there were 280 active individual members

Premier Member Companies

Aker Process Systems
Amines & Plasticizers Ltd
Atlas Copco Energas GmbH
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Bechtel Ltd.
BG Group
BP Exploration Operating Co.
Compressor Controls Corporation
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