



In Brief...

GAS PROCESSORS ASSOCIATION EUROPE

Vol 24 Issue 2

August 2008

GPAE 25th ANNIVERSARY

GPA Europe celebrates its 25th Anniversary in style with the annual conference in Paris in September. In a departure from the normal programme and to celebrate and challenge us in the 21st Century, we have invited four of our Industry leaders to make keynote speeches at the conference. These will be forward looking, addressing the challenges of the next 25 years.

David Wells, Vice President, Global LNG Supply; Shell; “In the coming decades, the world must meet

the challenge of producing more energy for a growing world population, while addressing greenhouse gas emissions. Within this context, demand for natural gas as the cleanest fossil fuel is growing and we are seeing an increasingly dynamic market, in which liquefied natural gas (LNG) is playing an important role. We are seeing greater interactions between the, until now, largely independent markets in the Atlantic and Pacific basins. An element of trading liquidity is emerging but so are increasing questions on how to strengthen long-term supply security given increased demand.”

Halfdan Knudsen, Senior Vice

President, Process and Processing Technology; StatoilHydro; “Qualification and implementation of new technology has historically been an enabler for StatoilHydro to develop the petroleum resources in the challenging environment of the Norwegian Continental Shelf (NCS). We will; through

continuous focus on R&D, technology qualification and efficient project execution; develop tools and

methodologies to explore and produce from even more challenging areas.”

Xavier Preel, Corporate VP Strategy & Business Intelligence; Total;

“Gas availability will depend more and

more on our ability to master high technological skills for producing and transport as well as commercial and business skills.”

David Simmonds, Chief Operating Officer; BG Nigeria Dave's presentation will look at

how the Gas Industry has grown over the last 25 years, and identify some opportunities for the Industry as it moves forward for the next 25 years. He will look at gas reserves, gas markets, Industry

business models and project delivery to see how, despite the challenges and the complexity of the gas value chain, these have combined to add to the remarkable growth of the Industry. Examples from the portfolio of the BG Group will be used to demonstrate each part of the success story.



25 YEARS

A MILESTONE REACHED

It was twenty-five years ago that a group of visionary gas process engineers founded GPA Europe and in their wisdom they decided to hold their very first GPA meeting in Paris. Hence the choice to return to Paris to celebrate our 25th anniversary with our annual conference.

The conference committee has succeeded in putting an excellent programme together, covering a wide range of topics addressing safety, upstream and downstream gas processing and commercial aspects.

The main focus of this conference is to look into the future of gas processing. Prior to the more technical part of the conference, keynote speakers from Total, StatoilHydro, Shell Gas & Power and BG Exploration & Production will share with us their companies' view on the future of the gas business.

I have also been active for about 25 years in the gas processing business and have experienced the developments in gas processing first hand. Over the past 25 years I was largely involved in LNG and saw a rapid maturing of this business. For quite some time I worked on the interface between LNG plants and the upstream gas production, which showed a shift from traditionally offshore processing through wet trunk line transport to onshore processing. I was furthermore



Ed Bras - GPA Europe Chairman

privileged to be part of the significant progress that has been made in the field of Gas To Liquids (GTL) processing. Recently I have had a brief encounter with sour gas processing including the capture of Carbon Dioxide.

Challenges for the future lie in many areas of gas processing; some that spring to mind are:

- arctic gas processing
- accessing stranded gas
- sour gas processing
- energy efficiency including Green House Gas Management.

There will be many more development areas, as the speakers in the conference will reveal.

As our regular attendees know, we

have been running knowledge sessions prior to our conferences for some time now and these have been very successful.

For this conference we have selected a very "hot" topic: 'Global warming and climate change'; not only widely discussed in society and politics, but also with strong links to gas processing. We all seem to agree that we ought to do something to reduce global warming by reducing the emissions of GHG's and gas processors have developed the technical means to achieve this. However the gas business hasn't found ways yet to make the next step by implementing CO₂ capture on a large scale.

Closer to home, the future of the GPAE is looking bright, with growing membership and increasing attendance at our events. This doesn't mean that we as an organisation should be complacent. We are aware that changes in the gas-processing world most likely reflect on the needs of our members.

Organising 4 annual events, which allow face-to-face engagements between fellow gas processors, will of course remain our principal focus. We are continuously looking to improve our events so that we can attract even more gas processors. Also we are actively reaching out to younger engineers, as they are the future. In this respect we do welcome your suggestions so that we can serve our members and the gas processing industry even better in the next 25 years.

I hope to see many of you at our conference in Paris to celebrate the 25th anniversary with us.

Ed Bras (Chairman)
e-mail: ed.bras@shell.com



LNG Unloading Arms. For the report of the site visit to Isle of Grain see page 13. Photo courtesy of National Grid



Readers are invited to provide full Chem. Eng. analysis of the process illustrated here complete with Heat, Material and, if possible, Salt Balance. A full safety assessment is not required, but desirable!!

Spring Conference, Amsterdam, Holland

Morning Session

The first paper, *An Overview of Gas Processing*, was presented by John Sheffield of John M Campbell & Company. John began by describing the contaminants in natural gas from the well and indicating how these contaminants varied for different sources throughout the world. Sales gas specifications for different markets in the world were outlined showing the various different specifications.

The three main requirements for processing natural gas from the well are:

- To achieve the specification for pipeline, for LNG or for feedstock for petrochemicals
- To remove components which cause problems during transport or processing such as corrosion or blockage
- To remove components which have a higher value as feedstock or higher heating value than required as components to meet the pipeline gas specification.

John's overview covered many of the processes presented in papers which followed throughout the day and the knowledge session the following day, including:

- Condensate removal using slug catchers
- Carbon dioxide and sulphur compound removal in acid gas removal units such as amine systems
- Acid gas treatment in Claus SRU's and tail gas recovery units to produce sulphur for sale or disposal
- Dehydration to meet dewpoint specifications, using basic cooling with chemical injection to avoid hydrate formation, using TEG wash and drying with solid bed dessicants



John Sheffield

- Mercury removal on solid absorbents to prevent attack and damage to downstream aluminium equipment
- NGL and ethane extraction for sale and chemical feedstock

The second paper, *Managing Uncertainties in Reservoir Fluids in the Design of Gas Processing Facilities*, was presented by Soufyane Teffahi of BP Exploration. He began by explaining that the communication of reservoir fluid properties from the subsurface to surface teams is an important activity in field development, and the links between the teams must be strong. These properties are very important in reservoir simulations and surface facilities simulations during design and operation. The paper focused on fluid uncertainties caused by characterisation problems. The importance of acquisition of



Soufyane Teffahi

representative fluid samples, quality control of PVT measurements and development of an accurate equation of state model was stressed.

Gases and condensates contain hydrocarbons with molecules from C1 to C100+. For most reservoir simulation packages using a large number of components is not possible, or could involve time consuming and costly computational efforts. Some surface simulation packages also have this limitation. This makes it necessary to group many components at the heavy ends into pseudo-components. It was stated that access to good experimental analyses of the C7+ fraction is key to the generation of pseudo-components which allow adequate modelling.

An example using three different levels of complexity of pseudo-component sets used in reservoir simulation software showed the danger of using too few pseudo-components. When the different levels were used in a process simulator, the wide differences in fluid properties generated by the simplest level would have a large effect on the design and operation of the gas plant equipment. The importance of minimising reservoir fluid uncertainties during all phases of the project, from evaluation for approval, selection of the optimum process schemes and detailed equipment design was outlined. Soufyane described how underestimating the Condensate Gas Ratio can cause bottlenecks in almost all areas of the plant. The amounts and types of acid gas in the field can have serious consequences in AGRU design and operation and in equipment metallurgy.

Uncertainties in predicting reservoir fluid properties in gas condensate fields cannot be fully eliminated, making it



There are some lighter moments

Spring Conference, Amsterdam, Holland

vital to understand how they affect the design of the processing equipment and how best to mitigate them. Various means of designing the process equipment with flexibility to cater for the uncertainties concluded a good insight to the problems experienced in the development and operation of gas condensate fields:

- Oversizing equipment to cater for changes in fluid volumes
- Allowing tie in points in the plant from the start to allow addition of more equipment if required
- Choose technology that is more amenable to composition variations and that can be relatively easily upgraded
- Phase development to better understand reservoir fluid properties.

The third paper, *Glycol Reclaimer*, was presented by K. Dave Diba of COMART S.p.A, co-authors M Guglieminetti and S. Sciavo. He described the causes of degradation of glycols used for dehydration in TEG absorption units, and MEG used for hydrate prevention by injection, which leads to the need for replacement or reclaiming of the glycol solution. The time between the need for reclaiming can vary from as little as one month, up to a year or more depending on the severity of the service. The main contaminants were identified as organic and inorganic acids; iron carbonates and sulphides; decomposition products from glycol and heat stable salts; coke formed from heavy hydrocarbons in glycol emulsion; oil, condensate and lube oil in glycol emulsion; dissolved aromatic hydrocarbons; salts and total solids from entrained water and condensate. They cause severe equipment fouling,



Listening intently



Dave Diba

foaming in the system causing glycol losses and reduction in processing capacity. Understanding the chemical and physical properties of the contaminants is key to reclaiming technology.

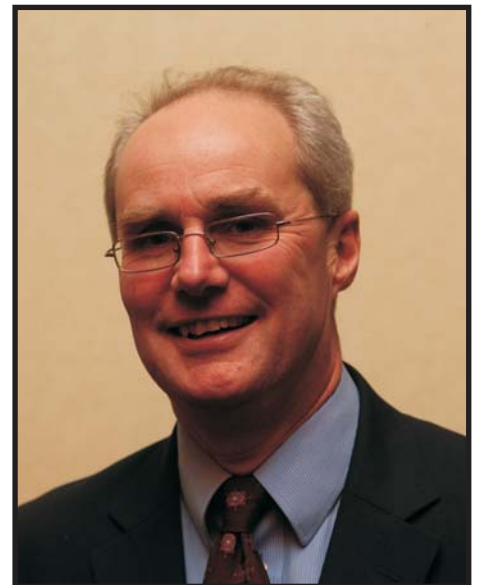
The two methods for reclaiming are; high energy cost electro-dialysis and vacuum distillation. COMART technology uses the latter route and this is the basis of the paper. Three operations are required prior to treatment in the reclaimer, removal of solids, breaking of oil emulsions and removal of aliphatic condensate, and distilling off light ends, water and organic acids. These operations are accomplished in the glycol unit regeneration section.

The reclamation is either carried out on a batch or continuous process basis depending on the rate of degradation. TEG applications usually only require batch reclamation, but MEG used for hydrate prevention often needs continuous reclamation due to high rates of contamination. The continuous process takes a sidestream flow. The process features a vacuum reboiler where the glycol and water is boiled off and the brine and degradation materials are concentrated. The overhead glycol and water is condensed before being returned to the unit, and the brine and degradation materials are pumped to a storage tank before being transported for disposal by regulated hazardous waste processors. Dave concluded by describing a number of cases of successful application of the technology around the world.

The first paper after the coffee break, *A Re-think of the Mercury Removal Problem for LNG Plants*, was presented by Paul Frank of Johnson Matthey

Catalysts, co-authors Vince Row and Peter Carnell. He began by summarising the wide variations in mercury content in major gas fields around the world and covered the history of the need for development of mercury removal units to prevent catastrophic failures in cryogenic gas processing plants. The two major types of mercury corrosion, amalgam corrosion and liquid metal embrittlement, and their mechanisms were explained. HSE issues were covered and the hazards of formation of a mirror surface of mercury in pipework and equipment used in the transport and treating of mercury containing natural gas, in some cases causing severe problems in disposal.

The traditional method of removal of mercury has been the use of sulphur impregnated carbon. This material needs to be used on a dry gas, so the mercury removal unit has to be placed after the acid gas removal unit and the driers before the cryogenic unit. This location can lead to mercury emissions from acid gas venting and venting of drier regeneration gases. Potential problems with the adsorbent were covered, such as sulphur loss, capillary condensation of heavy hydrocarbons, start up delays whilst adsorbents equilibrate, and handling and disposal of the spent adsorbent. This has led to the development of new inorganic based adsorbents which rely on high reactivity between mercury and certain metal sulphides. These materials have the advantage of easier recycling and they can be used on wet gases thus being used on the raw gas before acid gas removal and drying. They have little affinity for hydrocarbons, with no risk of sulphur migration, and can be



Paul Frank

Spring Conference, Amsterdam, Holland



Paul Clinton

used on liquid hydrocarbons. Traditionally mercury removal has been carried out with axial flow reactors and the Radial flow reactor design developed by Johnson Matthey with the benefits of reduced pressure drop and diameter was described. The final paper of the morning session was *TEG Dehydration-Trays and Transfer Units: A comparison of contactor design methods*. It was presented by Paul Clinton of Shell Global Solutions. The paper dealt with the chemical engineering issues in the design of high capacity, high dehydration TEG absorbers and went over some of the basic methods, which those of us who are chemical engineers remember from our undergraduate courses. For the session chairman this was further back than he preferred to remember. The two approaches for absorber design evaluated were the theoretical plates and transfer units, with both analytical and numerical

solutions described. The methods covered were McCabe-Thiele, Kremser Souders Brown, the Transfer Units approach of Chilton and Colburn and Colburn's Equation developed as an analytical approach to the integrated NTU concept of Chilton and Colburn. Paul's conclusions are summarised as follows:

- For most problems, Colburn's equation agrees well with the rigorous NTU integration methods, but gives slightly conservative results for more difficult problems such as low unit circulation rates.
- Graphical methods have the advantage of showing the constraints of designs.
- Even for relatively easy problems, the use of McCabe Thiele with a straight operating line underestimates the number of theoretical plates.
- For difficult problems such as low unit circulation rates and tight pinches in the driving force for absorption, rigorous methods should be used, with NTU calculation by integration being the most rigorous method.
- The KSB methods covered in the paper are generally in good agreement with the charts in the GPSA Handbook 11th edition.

David Healey

Afternoon Session

After an excellent lunch, the afternoon session began with Satish Reddy and John Gilmartin of Fluor discussing *Fluor's Econamine FG PlusSM Technology for Post-Combustion CO₂ Capture*. Fluor's is one of the leading technologies for large scale post-combustion CO₂ capture. Their paper described recent process enhancements including solvent formulation, absorber intercooling, reclaiming, environmental signature betterment



John Gilmartin

and heat integration. The paper went on to note that available plot space for capture plants is often limited, especially in retrofit situations. Very large diameter absorbers for power plant, furnace and boiler flue gases have been developed to minimize plot space by a reduction in the number parallel of trains. These designs were based on prior knowledge gained in gas processing and refining applications together with the use of computational fluid dynamics.

Paul Mulders of Frames Process Systems followed up with his paper entitled *A Road Map to Marginal Gas Field Development*. Paul presented a case study where Frames has challenged the development of a non-economical marginal gas field by introducing a new approach to project implementation. Together with their client, NAM, Frames has developed a different roadmap starting from pre-feed phase until start-up in order to save



Paul Clinton gets to the crux of distillation



Satish Reddy



Paul Mulders

Spring Conference, Amsterdam, Holland



Claire Weise

time and money. The paper was well received by all.

Claire Weise of Total E&P presented a very good paper (on behalf of co-authors Francois Lallemand, and Damien Roquet) labeled *Development and Industrial Validations of a New Hybrid Solvent for Mercaptans Removal*. Mercaptans removal from sour natural gases has always been considered a challenge, as the solvent processes have a poor ability to remove these organic sulfur compounds together with H₂S and CO₂. Among all solvent processes, amines have been extensively used; however, they show a very limited performance for mercaptan removal. Hybrid solvents have a better efficiency to remove mercaptans, but present the disadvantage of a relatively poor selectivity towards hydrocarbons, leading to hydrocarbon losses in the separated acid gases. Claire's paper



Stephen Massie

described the methodology used by Total to identify the best adapted solvent formulation, starting from a large selection of molecules presenting favorable chemical functionalities then reducing the number of molecules through specific tests in laboratory and at pilot scale. One of the amine units treating sour gas at the Lacq plant, South-West France, was eventually converted to use the new solvent formulation, and has fully demonstrated the performance of the process.

After the coffee break, Stephen Massie of Criterion Catalysts and Technologies presented *Sulfiding of Tail Gas Catalyst - Proper Preparation of Tail Gas Hydrogenation Catalyst for a Long and Active Life*. In his paper, Stephen noted that reductive tail gas catalyst processes such as the SCOT®, Resulf®, Beavon®, etc. allow sulfur producing facilities such as refineries

and gas plants to meet stringent sulfur emission regulations. These processes include reactors containing cobalt molybdenum catalysts. It is critical that the proper methods are used to convert the as-manufactured tail gas catalyst to the active sulfide form so the tail gas process will operate up to its potential. His paper addressed the proper loading and in-situ sulfiding of the as-received tail gas catalysts for use, the various approaches that can be used depending on variations in the equipment included in the construction of the tail gas unit and the proper care of sulfided catalyst. The final paper of the day was presented by Jan Lambrichts of Dow Chemical (on behalf of co-authors S.A. Bedell and J.M. Griffin) entitled *Current and Future Solvent Technologies for Improved Mercaptan Removal*. Amine solvents have been used for several decades for removal of hydrogen sulfide and carbon dioxide from a variety of gas streams, but have proven to be less effective for mercaptan removal. More stringent regulations and legislation are pressuring gas processors to achieve deeper removal of sulfur compounds in addition to hydrogen sulfide. Today, hybrid solvents containing an amine and a physical solvent are often used for increasing mercaptan removal efficiencies. Jan's paper describes the benefits as well as the disadvantages of hybrid solvents in this particular application. The Dow Chemical Company presents a new concept for increasing mercaptan solubility in aqueous amine solutions. New mercaptan removal agents (MRA's) provide a different means for increasing mercaptan removal.

Jim Keogh



Session chairs Lorraine Fitzwater, Jim Keogh and David Healey with Ed Bras and the presenters



Jan Lambrichts

Knowledge Session, Amsterdam, Holland

The well attended knowledge session, *Overview of Early Production Facilities for Oil and Gas Processing*, was presented by Paul Lodge and Tom Birney of Exterran. Paul opened the Knowledge Session with the background of Exterran a new company formed 12 months ago by the merger of Hanover and Universal Compression. The session covered the requirements for an Early Production System (EPF), particularly to generate early production revenue and to conduct extended well testing to improve the understanding of the reservoir prior to design and expenditure on permanent facilities. It was explained that Exterran, by using pre-engineered, standard designs for both equipment and instrumentation, selected vendors, modularised construction and in-house project management, could have an EPF operational within 6-9 months of



Tom Birney and Paul Lodge



Your Chairman elect, Justin Hearn, composes the tricky question

initiation. This was illustrated with by the 2,000 bpd oil and 50 mmscfd gas production facilities installed for Unocal (Chevron) SAPI in Indonesia. Commercial issues of providing such facilities through Build, Own Operate to Cash Sale were also covered. This was followed by key equipment design features for oil separation and treatment, produced water treatment. This included an excellent overview of the design of such facilities, new technologies, current specifications and how this equipment could be modularised for EPF's. Tom Birney then covered the gas compression and treating aspects as they are required for EPF's. It was often the case that gas was an unwanted by-product or just required for fuel as often the gas export pipeline would not be in-place. Flaring is generally unacceptable

for new installations, so provision for reinjection is necessary. Reciprocating compressors, commonly with gas engine drive can be installed quickly and by the use of concrete filled skirts, excessive foundations are not required. Gas treatment methods, including acid gas removal, gas dehydration and hydrocarbon dewpoint reduction by both JT and mechanical refrigeration can be provided as required to meet the particular gas specifications, i.e. as fuel gas, for export or just for reinjection. Paul concluded the session with examples of Gas Treating EPF's which Exterran have installed across the world from Argentina to Egypt. Thank you Paul and Tom for an informative session with something of interest for all delegates as indicated by the many questions on each section.

Lorraine Fitzwater



Gas Processors Association - Europe

promoting technical and operational excellence throughout the European Gas Industry

Call for Papers

For Conferences already arranged for 2009
London - February, Offshore Processing
Barcelona, Spain - May, Sour Gas Treating
Venice, Italy - September, 26th Annual Conference
London, UK - November

Our meetings provide a forum on neutral ground where the users, contractors, consultants and specialists can meet together to receive and discuss relevant technical papers and network informally with their peers.

Papers on any aspect, technical or commercial, of the gas processing industry are requested and contributions from both operating companies and suppliers will be particularly welcome.

Papers may be offered by both members and non-members. Interested parties are requested to provide a title and abstract (100-200 words) as soon as possible. Please include your full mailing address, e-mail address, phone and fax number.

Paper selections will be advised in good time to enable preparation of the paper. Details for the presentation will be given to the speaker after the selections are made. Abstracts and other information should be sent to the Administration Office

GPA Europe, 10 Shetland Way, Fleet, Hampshire GU51 2UD
email: admin@gpaeurope.com facsimile: 01252 786260

Can you help us to provide better technical meetings and conferences?

Technical Meeting, Ashford, Kent

Morning Session

The day dawned bright and sunny and some 80 members forced themselves into the main conference room of the Ashford International Hotel and well reinforced with coffee and croissants settled down for the Chairman's opening remarks. The focus of the 2008 Spring Conference was LNG and this always guarantees a lively and attentive audience and top class papers, and this conference well lived up to expectations.

The members were delighted to welcome Cyril Collins back to present the first paper, *What's new in LNG*. Despite having retired some years ago, Cyril has maintained his knowledge of the LNG industry and indeed still works part time with M W Kellogg. The paper is an excellent summary of recent developments which has seen larger production facilities, larger ships and larger LNG storage tanks to enable more cost effective production when the demand for gas as the most efficient fuel has been increasing rapidly. He noted the significance of new entrants to the LNG business especially China and India where there was significant growth potential. Cyril highlighted off-shore LNG operations and carbon capture as the next significant developments to be expected.

The following paper, *Compander Technology in LNG Boil Off Gas Applications* was presented by Harald Dany of Atlas Copco and featured the many uses of Compander technology in the LNG business. These machines are built on the integrally geared compressor technology and feature both compressor stages and expander stages on the same 'bull wheel'. Harald showed how these machines can be used for boil-off gas management, fuel gas boosting and as the heart of small scale liquefaction processes. The



Cyril Collins

compact design of this machine lends itself towards on-board applications and for the modularisation of onshore facilities. Several examples of how the equipment can be applied were presented in the paper and clearly show the efficiency and compact advantages that can be achieved.

Michael Wilkes of ConocoPhillips then presented a paper titled *Floating LNG Liquefaction Using the Optimised CascadeSM Process*, co-author Kent Anderson. He noted the reliability and ease of operation as two key factors which commend the process for off-shore applications. Michael shared information on the Belanak FPSO which includes several process facilities required for LNG production including acid gas removal, dehydration, propane refrigeration and fractionation. He outlined other studies which had been performed by COP which has led to the view that there are no 'show-stoppers' and had obtained Approval in Principle from DNV.



Michael Wilkes

After the break, John Kennedy, co-author Martin Josten of BP presented a paper *Liquefaction in a Cold Climate*. He noted that a significant proportion of the world's unexploited gas reserves now reside in Arctic latitudes and that industry now has to think about the climatic implications for plant design. BP has performed specific studies to identify the implications and have established some key criteria. A major challenge is the wide temperature variation in these regions and whilst LNG production could be maximised during the low temperature periods, there are implications for the whole LNG chain. The studies point to the benefit of using mixed refrigerants for the pre-cooling cycle as the composition could be adjusted to reflect the seasonal temperature variation provided an appropriate equipment configuration is chosen.

The next paper was *Decarbonised Power System Design for LNG Production* in which Xuesong Zheng,



Harald Dany



An appreciative audience

Technical Meeting, Ashford, Kent



John Kennedy

co-authors Jin-Kuk Kim and Robin Smith challenged the audience to comprehend the issues associated with interaction between power systems and carbon capture processes. Based on his research work at UMIST, Zheng showed how the application of process synthesis principles could be used for the analysis of the power required for the compressor drivers and the potential for driver selection and design interactions. Many different designs can be quickly screened as Zheng showed in a case study. In the example, the effectiveness of the methodology was demonstrated as an engineering decision supporting tool in the design of energy systems in LNG facilities' under a carbon constrained business environment.

The final paper was presented by Jean-Claude Garcel of Total E&P in which he reported on studies on the *Liquefaction of non conventional gas*. He noted that many of the existing facilities are supplied by relatively



Xuesong Zheng



A chance to exchange views informally

clean gas which can easily be pre-treated by conventional means. But as these reserves have been exploited, attention now turns to alternative reserves where the gas composition presents a greater challenge. He illustrated his paper with an analysis of a gas stream where the CO₂ content was 40% and nitrogen was 10%. To minimise the energy requirement of the regeneration process, the studies showed a semi-regenerative process as being preferred for the CO₂ removal and a nitrogen rejection unit to reduce the nitrogen levels.

This ended the morning session and the audience enthusiastically showed their appreciation for the six excellent papers which they had attentively followed. In closing the session John Sheffield drew the members' attention to the LNG working party which GPA Europe had established some 4 years ago. The original purpose had been to provide a European input to a newly formed GPA technical committee,

Section N. However Section N floundered as most of the major companies withdrew their participation and support for its activities and it has now been subsumed into the Technical Committee. The Chairman asked what interest there was within the membership of the European GPA for a sub committee focused on LNG. He would welcome any interest and particularly suggestions as to what should be the role and focus of the sub committee.

John Sheffield

Afternoon Session

Following a pleasant buffet lunch, the afternoon session, chaired by Justin Hearn, began with a paper *Introducing Flexibility into LNG Operation* presented by Vince Atma Row, co-authors Peter Carnell and Adrian Lawrence from Johnson Matthey. Vince explained that the traditional model of producing and consuming gas locally had changed through the introduction of long-distance gas pipelines and increased trade in LNG. This has meant that countries with different gas quality specifications may find that importing gas from certain exporters with different specifications posed some technical challenges. For example, a graph of the gas heating value specifications, in different countries, showed that there is almost no overlap at all between Japan/Korea and that of the US. This provides a challenge to the LNG producer. When amine plants are treating varying gas qualities, there may be occasions when the H₂S slipped from the plant exceeds the NTS pipeline specification. This is particularly true of by-pass AGR plant designs, originally conceived for very low H₂S feed gas, which have become increasingly sour over the life of the gas plant. One way to totally remove H₂S from the recombined H₂S-rich stream,



Jean-Claude Garcel

Technical Meeting, Ashford, Kent

before it enters the pipeline and without removing the CO₂, is to pass it through a bed of Puraspec absorbent. This allows the gas to meet both Wobbe Index and sulphur specifications.

The gas specifications of most concern to importers are the Higher Heating Value (HHV) and the Wobbe Index. The HHV can usually be raised by simply adding LPG, but lowering the HHV is more difficult, and requires removal of NGL's and/or addition of nitrogen. This means that producing a low HHV gas for export potentially offers more market flexibility.

The ethane content of LNG is another potential problem, as the UK and US markets impose strict limits on the amount of C₂ in LNG. The "Catalytic De Richment" (CDR) Process from Davy Process Technology, using Johnson Matthey catalysts, provides an interesting alternative for the LNG producer. The process converts ethane and higher alkanes into methane, thus allowing an LNG producer to divert more or less ethane for conversion, and simultaneously increase the methane yield.

Mercury is a poisonous metal that attacks the aluminium present in most cryogenic equipment. In most LNG plants, mercury removal is located immediately downstream of the molecular sieve units to protect the cryogenic equipment. This leaves a significant part of the plant unprotected, and there may be significant mercury emissions from the AGRU and drier vents, as well as contamination of the NGL's. JM has now developed a mercury removal technology, based on inorganic components, which can be completely recycled via the metal recovery industry. Adoption of radial flow



Vince Row

reactor designs allows lower pressure drops. This means that by placing the reactor as far upstream as the process allows, the whole LNG plant can be made mercury-free, improving the operation, plant integrity and safety. The second paper *TOPNIR LNG Online Analysis allows controlling custody transfer and enables Advanced Process Control* was presented by Sebastien Osta, co-authors D. Lambert, B. Ribero from TOPNIR Systems and P. Barere of OPTAPERIPH. Sebastien explained that for LNG custody transfer at export terminals and at LNG production plants, it is common to determine the composition, density and Wobbe Index by direct on-line gas chromatograph (GC) plus indirect lab analysis methods. A specific sampling mechanism according to ISO 8943 standard is a prerequisite for both analytical methods. In addition, the availability of on-line analysis at the LNG plant enables the implementation of advanced process control (APC) in an efficient way. The Topnir online system is composed of an efficient

online sample probe and a vaporizer designed by Opta-Periph. This device can be provided together with any online GC for LNG. The sample probe and vaporizer are the key elements to ensure the integrity of the sample and therefore the accuracy of the online measurement.

The LNG sample has to be totally vaporized before being sent to the online GC. It is important that heavier components do not remain in the vaporizer. The key is to vaporize the LNG in the supercritical state, eliminating the risk of fractional vaporization. This ensures that the required sample quality and stability is carefully maintained before entering the GC. From the GC, HHV, specific gravity (SG), gas compressibility, GPM (liquids/mcf), Wobbe Index, Methane Number and speed of sound are delivered in real time to characterize the quality of the LNG. In combination with online GC analysis, it is now common to take samples of the LNG throughout the loading. Three sampling protocols are considered: Continuous sampling; spot continuous sampling and intermittent sampling. The Topnir aggregate auto-sampler is suitable for all these quality assurance methods.

APC has been used in the refining and petrochemical industries for more than 15 years. Typical benefits include 5% increased capacity throughput and 4% increase in plant reliability. The potential benefits of applying APC to LNG production are realized through smoother operation due to a reduced impact from process disturbances and the constraint handling ability of the controller. In this project, automatic control is used to achieve a desired LNG flow rate, temperature and WI



The meeting in progress



Sebastien Osta

Technical Meeting, Ashford, Kent

quality. This results in an ability to run the process at the true system constraints rather than having to operate at a safe distance from these constraints in anticipation of large upsets. A post-audit of the APC application quantified the benefits accurately and confirmed a project payback time of six months.

John Mak, Technical Director for Fluor in California, presented the third paper *LNG Wobbe Index Control*. John explained that one of the main challenges for an LNG import terminal is to deliver a consistent gas quality to their customers despite the large difference in LNG compositions that may be imported. The gas exported to the grid must comply with federal and local regulations that ensure operational safety, reliability and environmental compliance. The Wobbe Index of imported LNG is particularly strict in the UK and California. In addition, global concern on greenhouse gases and the increasingly stringent gas quality requirements present a new challenge to LNG importers.

LNG “weathering” over time in storage enriches the composition and impacts the Wobbe Index. Nitrogen blending for Wobbe Index control is commonly used for the different LNG sources. It is important to understand the connection between Wobbe Index (WI) and the higher heating value (HHV) of a gas. $WI = HHV \div \sqrt{(MW_{gas} / MW_{air})}$ Thus nitrogen dilution lowers the heating value of the gas and increases the molecular weight of the gas, and that further lowers the WI value. However, there is a maximum permissible inerts content of 3 mole% in pipeline gas. Fewer than 40% of the



John Mak



Laza Krstin & Nick Bates

LNG sources would meet the Californian WI specification even with 3% nitrogen dilution. For the UK and California something other than nitrogen dilution needs to be considered.

Boil off gas (BOG) re-liquefaction is currently installed on many new LNG carriers, but seldom used in conventional re-gasification terminals as the BOG is typically re-condensed by mixing with the send-out LNG. One benefit of BOG re-liquefaction is it produces a lean LNG that can be used for blending, thus reducing the effect of LNG weathering. NGL recovery is another process that would add trading flexibility to LNG receiving terminals. It would allow LNG to be imported from different sources. However, this is only attractive where there is a developed NGL market, so NGL extraction is minimized, and combined with nitrogen dilution. The Fluor CryoGas process is a high NGL recovery process which can be designed to recover over 97% of the propane and 70% of the ethane from a rich LNG feed. Only a portion of the rich LNG needs to be processed which significantly reduces the size and cost of the NGL recovery unit. The unique feature of the process is that the residue gas from the demethaniser is re-liquefied, producing a lean LNG, using the cryogenic refrigeration from the LNG feed. The lean LNG can be pumped, avoiding costly gas re-compression requirement. The CryoGas process can also be adapted for applications in Offshore LNG terminals. The NGL is actually extracted in a connected onshore facility, reducing costs, and avoiding

the offshore production and storage of NGL.

Following the coffee break, we were taken into the second half of the afternoon session by Laza Krstin from ABB Engineering and Nick Bates from National Grid UK. Their paper was called *Strategy for Assuring Integrity of National Grid LNG sites*. National Grid is one of the world's largest utilities, focusing on the safe and reliable delivery of energy. Its four UK LNG storage sites are Top Tier sites under COMAH Regulations. The operational assets need to be operated safely, reliably and in a flexible manner to meet both legal and business requirements. In addition, the assets need to have their condition maintained so that they can meet future customer expectations in regard to availability and reliability.

The maintenance policy used to meet these objectives uses reliability-centred, risk-based inspection techniques. A range of performance and assessment tools are used to establish the ongoing fitness for purpose, including an independent condition assessment in the form of a “spot-check”, designed to provide assurance and establish condition against wider industry standards. This assessment was used to feed into a wider review of the prevailing maintenance inspection regime and ongoing asset replacement programme.

The Asset Condition Assessment, performed by ABB Engineering Services, was a structured review of those aspects where the asset condition had a potentially large impact on loss of containment in terms of major HSE consequences. The review confirmed

Technical Meeting, Ashford, Kent

that most equipment on all sites was in satisfactory condition, though there were a number of areas of concern, including certain bellows expansion joints and some pipework.

After being subjected to a robust challenge and review process to ensure that the findings were put into the operational context, the results of the condition assessment were used to prioritise future maintenance and investment requirements. Strategic recommendations included: maintenance policy, spares, process improvements and asset modification and replacement. The success to date has been achieved through:

- Appropriate asset policy
- Effective scheduling
- Ongoing internal asset condition processes
- Use of skilled, external resources to undertake independent condition assessment.
- Using the results of the Asset Health Review to set longer-term strategy.

To introduce us to the Isle of Grain LNG Terminal, the venue for Friday's site visit, Eddy Wheeler from CB&I gave a presentation, *Isle of Grain; From LNG Peak-Shaving to LNG Import*. He explained that the Isle of Grain was a sparsely populated peninsula, located 60 km east of London, at the confluence of the Thames and Medway rivers. Due to its location and proximity to deep water, Grain has had a long history of industrial development since the arrival of the railways. Today, the Isle of Grain is home to 4 power stations and the Thamesport container port.

Demand for the UK's natural gas changes throughout the year, mainly due to seasonal temperature variations. At peak demand, there could be a shortfall in supply. As the varying demand for gas could not be economically met by baseload gas production in the North Sea, one way to supply the shortfall was to liquefy the gas at times of low demand, and re-gasify it during periods of high demand, thus "shaving" the peak demand. In 1952, BP built a 200,000 bbl/d refinery on Grain that covered an area of 4km². The refinery was eventually decommissioned and dismantled in 1982, the same year a small peak shaving LNG plant became operational nearby. Grain was one of the world's largest peak shaving facilities, with up to 410 t/d



Eddy Wheeler

liquefaction capacity and four 50,000 m³ double wall storage tanks. The re-gasification equipment allowed a gas export rate of up to 660t/h.

As North Sea gas began to decline, National Grid decided that the proximity of Grain to London, coupled with deep water frontage and existing gas export infrastructure, would make it a good location for its UK LNG import terminal. In 2002, a contract was awarded to convert the facility to an LNG import terminal with a capacity of 3.3 mtpa. The project included a new jetty, 4 km unloading ring main, refurbishment of the four LNG tanks, conversion of the tanks to allow unloading, new BOG compressors and new submerged combustion vaporisers (SCVs) to replace the existing units, together with a new nitrogen ballasting system.

As with most brownfield site developments, the project was

complex. The peak shaving unit was still operational, so all activities needed to comply with the site's 'permit to work' system. Working around the protected water vole population proved to be an additional challenge. However, on July 4th, 2005, the first LNG cargo arrived in Grain, beginning a new era in UK gas supply. In the same year, increasing UK gas demand and fast-depleting North Sea gas supplies prompted an expansion for the terminal. Three new 190,000 m³ LNG tanks, the world's largest above ground full containment systems are at the heart of the Phase 2/3 expansion with start-up scheduled for 2010. They are so large that London's Albert Hall would fit comfortably inside! The old refinery jetty will be demolished and a new jetty built, able to handle the large Q-Max LNG carriers. The protected status of the remains of an old pier, specially constructed for Queen Victoria's boat train, provided an historical hurdle to the jetty designers. This latest project will bring investment in the terminal up to £800 million. The total gas sendout will be 14.8 mtpa, a fifth of the UK's gas demand.

One special feature of the Phase 3 expansion will be the use low-grade heat, in the form of hot water from the nearby EON power station, to re-gasify the LNG in the SCVs. The heat integration benefits the power station by utilising a waste stream and reduces the heat discharged to the Medway. The LNG terminal benefits from reduced emissions, as the alternative is to burn natural gas to provide the heat source. Up to 340 MW of heat is available to Grain LNG, saving CO₂ emissions of 350,000 t/a.

Justin Hearn



Session Chairs John Sheffield and Justin Hearn with the speakers

Site Visit National Grid Isle of Grain LNG Import Terminal

The day of the GPAE site visit to the Isle of Grain dawned dull and overcast but was considerably brightened by the arrival of our transport, a bright yellow coach. Recuperating from the excesses of the previous night's Conference dinner, but fortified with a hearty breakfast, twenty-five intrepid members set off in convoy, headed by the big yellow bus, to blaze a colourful trail through North Kent to visit National Grid's Grain LNG Import Terminal. Motorways gave way to country roads before approaching the confluence of the rivers Medway and Thames and our ultimate destination, the Isle of Grain.

Thanks to Don's organizational skills, our party was expected and security passes were ready and waiting on our arrival and we were escorted to the Grain Visitors Centre to meet our hosts for the day, Simon Fairman and Keith Dennis.

By way of introduction, Simon, the Terminal Manager, gave a polished presentation about the origins of the terminal and the current expansion plans which were already underway.

Simon explained that LNG facilities have existed at the Isle of Grain since 1982. Built initially as a peak-shaving plant to smooth seasonal fluctuations in gas supply and demand in the south east of England, the existing site infrastructure made Grain the perfect candidate for conversion to LNG imports in order to supplement dwindling volumes of gas supplied from the UK North Sea. Phase I of the project began in 2003 and refurbished the four existing, bundled, single-containment storage



190,000m³ LNG tank, big enough to hold the Albert Hall!

tanks, each capable of storing 50,000m³ of LNG. On demand, stored LNG is pumped out of the tanks and vaporized in submerged combustion vaporizers before entering the National Transmission System at approximately 70 barg and 5°C. The first shipment of LNG was delivered to Grain from Algeria by the Berge Arzew in July 2005. The Phase I development has the capacity to supply 4% of total UK gas demand, equivalent to 4.4 billion cubic meters per year.

Simon then proceeded to describe Phase II of the development which is currently under construction and which, despite the best efforts of water voles, badgers and the greater crested newt, all of which have been scrupulously protected throughout by National Grid, will be completed winter, 2008. The Phase II project will expand terminal capacity to 13 billion cubic meters per year, or 12% of total UK gas demand, and adds the three largest above-ground LNG storage tanks in the world today. At 190,000m³ capacity each, the scale of these huge tanks was put into striking perspective when Simon showed a slide of the London's Royal Albert Hall completely contained within a single tank.

A third phase of development is scheduled for completion in 2010 and will add a fourth 190,000m³ LNG storage tank, providing an ultimate terminal capacity of 19.7 billion cubic meters per year (20% of total UK gas demand).

Our appetites duly whetted by Simon's presentation, we were then kitted out with all necessary PPE, including very fashionable and eye-catching yellow hi-vis jackets, to begin our tour! For site safety reasons, our party was divided into two groups and, under the expert guidance of Simon and Keith, we separately set off either side of lunch to view the Phase I and II facilities that had been so graphically described to us. The highlight of the tour was enjoyed during the morning group visit to the Phase II facilities, when Keith led everyone to the roof of one of the new, 190,000m³ LNG tanks.

Our tour complete, we departed the Isle of Grain for Rochester and Ashford to catch train connections to London and Paris. Our sincere thanks are extended to National Grid for allowing our visit and to Simon and Keith for their hospitality and expert guidance throughout the day.

David Weeks



Aerial view of the terminal. Photos courtesy of National Grid

Ashford Golf Club on 14th May was the venue for the annual GPAE Golf tournament. For the second year running we had glorious weather but, again, numbers were embarrassingly low with only 5 players making it to the tee off. Notwithstanding the lack of players we enjoyed a splendid lunch before setting out to "spoil a walk" as Winston Churchill once described golf. The course was, like last year, a pleasure to play, interesting, difficult in places, impossible in others and beautifully kept.



Andrew Vieler tackling another ditch

David Bleakley of Aspentech presented the winner's trophy to one of the regular attendees at the tournament, John Sheffield who managed a commendable 27 stapleford points. The longest drive was won by Jamie and nearest the pin by Sandy Dunlop. Andrew Vieler of VMG from Holland, visited nearly every drainage ditch on the course, purely in an engineering capacity of course. His heroics and sheer tenacity in completing the course earned him the "I took part" award for the day.

Our thanks to Aspentech for once again sponsoring the tournament, providing the catering and prizes for the players. In the light of the low turnout we will have to consider if it is worth arranging a tournament again next year. It will be a shame if we have to lose it after all these years.

Thanks to all five of you.

Brian Marshall



John Sheffield receives the Aspentech award, not just for sartorial elegance, from David

Sadly we have to report the death of two major contributors to the GPA in the US and one of the GPA Europe's own "Founding Fathers" Vince Doyle. My own memory of Vince was of a wise yet gracious gentleman, who was always prepared to give me, a younger Engineer at the time, the benefit of his experience, laced with a few anecdotes.

Ron Brunner

It is with deep regret that we must inform you of the passing of Ron Brunner. Ron had been fighting cancer for some time and passed peacefully on Sunday morning, 7th July 2008 in his Tulsa home. Ron served his entire professional career in the energy industry. His last 14 years were with the GPA as director of technical services. He will indeed be missed by all who knew and worked with him. Please keep his wife, Diana, and all loved ones in your thoughts and prayers.

Robert Maddox

It is with great regret that we inform you of the passing of Dr. Robert N. Maddox. Dr. Maddox was born in 1925 in Winslow, AR, and passed away on April 9 2008. He was a longtime member of the GPSA Editorial Review Board, for which he received the GPA Citation for Service for his work on the 11th edition of the GPSA Engineering Data Book. He was also a recipient of the prestigious GPA Hanlon Award. Dr. Maddox's technical capability was proven through the years by the publishing of eight books, nine handbook chapters, nearly 150 technical publications, almost 90 short courses and 30 publications with 50 different organizations. In 1989, GPSA awarded him recognition as the Robert N. Maddox professorship in chemical engineering at Oklahoma State University. Here in Europe, many will remember him, including those taught by him on the Campbell course.

Vince Doyle

It is with great sadness that we have to report the death of one of the GPA Europe's founder members. After a period of illness Vince Doyle passed away on February 19th 2008.

The GPA Europe chapter began in December 1982 with 14 representatives of interested companies meeting at Bechtel's offices in Hammersmith. Vince was a business development manager at Bechtel at the time and was one of the original 14. In 1983 Vince wrote in the In Brief magazine ...

"As an old timer in the Gas Processors Association, I am delighted to see the

progress made by the recently formed European/London chapter. In my 25 years associated with this group, I have seen it change from being very domestic orientated to one with aspirations for becoming active internationally."

How right he was in seeing the way forward from there.

I spent quite a time with Vince when I was at Bechtel, including one memorable business trip to North Africa. Sitting around a discussion table with the Client, some in their native dress, I couldn't help but liken him to John Simpson from the BBC; quietly spoken, polite to the degree and having an air of peace and tranquility despite the vigorous discussions going on. You should have heard his comments when we left the meeting though

I always made a point of talking to Vince at every meeting I saw him at, and he always reminded me of the "that trip". He attended meetings up until the last year or two when his health began to impede him; I calculate that as over 50 years association with the GPA.

Our thoughts go to his wife Phillipa and family.

Brian Marshall

I had breakfast at a GPA Meeting in Norwich with Vince a few years ago and he was kind enough to share with me some of his experiences from working in the Middle East. I remember it well for his valuable insights from a successful career at Bechtel - he had solved a few problems that were challenging me at the time! He was a delightful gentleman.

Adrian Finn

Vince was a very nice and kind man. He was a very prominent player in the BD group at Bechtel - and he was very favourable towards process engineers!!

Gordon Snashall

Vince was kind and helpful and always the perfect gentleman.

Christine Etherington

I knew him best when we went through a period when we were sharing painful limbs and restrictions on mobility. He was braver than I when overcoming his adversities. I don't think many people knew that when he supported the GPAE at the Rome conference, he had to travel some of the way in a wheel chair but he made it. He was such a nice man to know.

Ron Coultrup

A very sad loss - I always had a great deal of respect for Vince. *Cyril Collins*

New Corporate Members

Welcome to our new Corporate Members in July 2008

Level 1 PREMIER

Lurgi AG, Frankfurt am Main, Germany

Lurgi have reference plants on all continents which attest to their longstanding experience and leading market position in gas technologies. Around the world Lurgi has already built hundreds of plants for the generation of synthesis gas, hydrogen, carbon monoxide as well as sulfur recovery.

Particularly in the field of gas technology they have conducted extensive research for the development of new technologies and the optimization of proprietary processes that constitute the basis for Lurgi's leadership in this market.

Whessoe Oil and Gas, Darlington, UK

As a market leading LNG contractor, Whessoe Oil & Gas is committed to fulfilling specific client needs, using specialized engineering expertise and calling on over 40 years continuous experience in the low temperature and cryogenic sector.

From its UK base, Whessoe Oil & Gas combines contracting and risk management with engineering and design skills to offer its clients a complete engineering, procurement and construction (EPC) package.

With over 100 years international contracting experience, Whessoe has the capability to deliver projects on all five continents.

Level 1

Atlas Copco, Hemel Hempstead, UK

Atlas Copco's Compressor Technique business area develops, manufactures, markets, and services oil-free and oil-injected stationary air compressors, portable air compressors, gas and process compressors, turbo expanders, electric power generators, air treatment equipment and air management systems. It also offers specialty rental services.

Level Two

Siemens Nederlanden NV, Assen, The Netherlands

The Siemens Energy Sector is the world's leading supplier of a complete spectrum of products, services and solutions for the generation, transmission and distribution of power and for the extraction, conversion and transport of oil and gas.

Siemens in the Netherlands is active in the areas of Oil, Gas and Marine Total Solutions.

SNC Lavalin, Croydon, UK

SNC-Lavalin's vision, built on experience and innovation, is to maintain and strengthen its core engineering business, to develop new skills and activities, and to respond to the changing needs of clients and markets. Their strategy for sustained growth is anchored in the development of world-class products, its far-reaching international network and its financing capabilities.

SNC-Lavalin is one of the world's leading engineering, procurement, construction and related technical services organizations, serving selected industry sectors and geographic markets. They achieve this through the know-how of its people by contributing to the success of its clients

through value-added services and by continuous investment in the improvement of its technical and managerial competence.

Virtual Materials Group, Krimpen an den IJssel, The Netherlands

VMG are a chemical engineering software company, focused on developing high quality and cost-effective process simulation and thermophysical property software for the process industries. Virtual Materials Group (VMG) was founded in 1996 by a talented group of engineers and computer scientists previously involved in the Hyprotech project. The group brings extensive (15-40 years each) experience in thermodynamics, process simulation and software development. Our team has expanded rapidly and incorporated local offices across the globe that bring a wealth of experience and a proven track record of engineering software deployment and technical support.

VTU Engineering GmbH, Grambach, Austria

The companies of the VTU Group are know-how grantor and suppliers of plants in the fields of pharmaceutical, chemical and biotechnology, crude oil, natural gas and power engineering.

Services of VTU comprise the development of new processes, planning of processing plants, software for plant operating and billing, as well as the turnkey delivery of special plants.

The synergy of the single companies lies in the common basis for process technological processes. New processes developed in pilot plants are scaled up by professional and industrial engineering and delivered as turnkey plant.

The group has about 190 highly qualified employees.

Best Paper Awards 2006 & 2007

During 2006 and 2007, the GPA Conferences covered a wide range of topics associated with gas processing and with some 71 papers presented during the period, there were many excellent papers to chose from. The GPA Best Paper award is selected by the GPA Europe Committees on the basis of both Technical Content and Presentation.

The following awards have been announced.

The award for the **Best Paper 2006** is made to Martin Mayer of KBR (co-authors Gonzalo Fernandez of SEGAS, Ricardo Villaneuva of Union Fenosa Gas and Don Hill and Charles Durr of KBR) with the paper presented at the GPA May Conference in Antwerp, *Egypt's LNG Project Establishes New Industry Benchmarks*. This paper provided an update on the Damietta LNG project and feedback on operating performance since start-up during 2005. Calling it Egypt's Premier LNG Project, Martin described the essential features of the then largest LNG

Plant with 5mtpa nominal capacity, with many firsts such as the shortest time from conception (4.5years); 30% cost reduction from previous industry benchmarks; liquefying sales quality gas from local pipeline grid.

The award for the **Best Paper 2007** is made to George Cheriyan (co-authors William Mera, Vasiliy Malitsky, Alexander Elaev, Malcolm Smith and Andrey Medvedev) with the fascinating paper presented at the GPA Annual Conference in Bonn, *TNK-BP Marrying Two Facilities' Engineering Cultures*. This reviews the challenges of merging company cultures, covering both technical and regulatory aspects. Topics such as Russian standard design vs. Western tailor-made approach, use of P&IDs, Hazop and introduction of Russian standards were used to illustrate the efforts deployed to reach a convergence between two deep engineering cultures.

This award will be presented at the forthcoming GPA 25th Annual Conference in Paris in September.

Aungier Award

GPA Europe is pleased to announce that the next recipient of the Aungier Award is Soufyane Teffahi of BP for his paper *Managing Uncertainties in Reservoir Fluids in the Design of Processing Facilities*, presented in Amsterdam at the February 2008 GPA Conference. An overview of the paper is given elsewhere in this issue.

The Aungier Award is presented for the Best Paper on a novel Topic associated with Gas Processing, published or presented by a student or young professional person during the year.

The award is made in memory of Bob Aungier who was chairman of the Gas Processors Suppliers Association (GPSA) for eight years and who played a major role in establishing the GPA activities in Europe. He and his wife were killed in a tragic motor accident in 1991, and in his memory the Aungier Award was created. The purpose of the award is to foster the contribution of young aspiring engineers to the industry.

FORTHCOMING EVENTS

24th-26th September 2008

Paris, France - Residential

25th Anniversary
Annual Conference



Day 1

- pm Knowledge Session
- Welcome Reception

Day 2

- Keynote Speakers & Panel Discussion
- Technical Conference
- Gala Conference Dinner

Day 3

- Technical Conference

20th November 2008

London, UK

Gas Storage Issues

- am Knowledge Session
- Lunch and AGM
- pm: Technical Meeting

18 - 20th February 2009

London, UK

Offshore Processing

- Knowledge Session and
- Full Technical Conference

13th - 15th May 2009

Sitges, nr Barcelona, Spain

Sour Gas Treating

- Knowledge Session
- Technical Conference
- Site visit to BASF Tarragona

23rd - 25th September 2009

Venice, Italy

26th Annual Conference

- Knowledge Session
- Technical Sessions
- Conference Dinner
- Site visit to Porto Marghera Refinery

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GPA EUROPE

CORPORATE MEMBERS

This listing of current Corporate Members represents the status as at the end of July 2008. All companies are UK based unless otherwise stated.
In addition there were 215 Individual Members

Corporate Level 1 PREMIER (18)

Advantica Technologies Ltd		Lurgi AG	Germany
BASF SE	Germany	M W Kellogg Ltd	
Bechtel Ltd.		PBG SA	Poland
BP		Shell Global Solutions Int BV	Netherlands
Compressor Controls Corporation		Snamprogetti SpA	Italy
Costain Oil, Gas & Process Ltd		StatoilHydro ASA	Norway
Fluor Ltd.		Technip	France
Foster Wheeler Energy Ltd.		Total	France
Jacobs Engineering		Whessoe Oil and Gas Ltd	

Corporate Level 1 (31)

ABB Engineering Services		Koch-Glitsch (UK) Ltd	
Air Products Plc		Nalco Ltd	
Amec Group Ltd.		NORIT Nederland BV	Netherlands
Amines & Plasticizers Ltd	India	OAQ TNK-BP Management	Russia
AspenTech Ltd		Petrofac Engineering Ltd	
BG- Group		SAZEH Consultants	Iran
CB & I John Brown Hydrocarbons Ltd		Shaw Stone & Webster	
CB&I Lummus	Netherlands	Siirtec - Nigi S.p.A.	Italy
CECA SA	France	Sulzer Chemtech Ltd.	Switzerland
Chevron		Taminco	Belgium
Eni Div E&P	Italy	Techint S.p.A.	Italy
ExxonMobil North Sea Production		Tehran Raymand Consulting Engineers	Iran
Grace GmbH & Co. KG	Germany	Wintershall Holding AG	Germany
ILF Consulting Engineers		WorleyParsons	
Johnson Matthey		York International	
Kellogg Brown & Root			

Corporate Level 2 (57)

Aibel AS	Norway	Mott MacDonald	
Alderley plc		Newpoint Gas Services Inc	USA
Atkins Oil and Gas		Oil & Gas Systems Limited	
Barela International Group		P S Analytical	
BASF Catalysts Germany	Germany	Peerless Europe Ltd.	
Bryan Research And Engineering	USA	Penspen Ltd.	
Cameron Petroco Process Systems		Perry Equipment Ltd.	
Criterion Catalysts & Technologies LP	USA	Pietro Fiorentini	Italy
DiEC Services Limited		Procede Group BV	Netherlands
E & P Consulting		Prosernat	France
E.I.C. Cryodynamics Division		Purvin & Gertz Inc	
Escher Process Modules BV	Netherlands	PX (TGPP) Limited	
Exterran (UK) Ltd		QuantityWare GmbH	Germany
Fives Cryo	France	Rotor-Tech, Inc	USA
Frames Process Systems BV	Netherlands	SNC-Lavalin	
Gaz de France Produktion Exploration		Sterling Thermal Technology Limited	
Deutschland GmbH	Germany	Stork Protech (UK) Ltd.	
Granherne Ltd.		Technip Italy	Italy
Gusto BV	Netherlands	Teknica (UK) Ltd	
H.A.T. International		TGE Gas Engineering GmbH UK Branch	
Hamworthy Gas Systems	Norway	Toromont Energy Systems Ltd	
Heatric		Twister BV	Netherlands
IMA limited		UOP N.V.	Belgium
Invensys Process Systems (UK) Ltd		Virtual Materials Group	Netherlands
ISG	Italy	VTU Engineering GmbH	Austria
Iv-Oil & Gas	Netherlands	Weir LGE Process	
John M. Campbell & Co.	USA	WinSim Inc	USA
Juran Institute B.V.	Netherlands	Zeochem AG	Switzerland
M.S.E. (Consultants) Ltd.		Zeta-pdm Ltd	

Corporate Level 3 (5)

Abbey Industrial Sales Co Ltd	OAG Energy Consulting Ltd
Infochem Computer Services Ltd	Softbits Consultants Ltd
McMurtrie Limited	

Academic Level (1)

NTNU	Norway
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Please persuade your company to join the GPA Europe and help support our activities.