



In Brief...

GAS PROCESSORS ASSOCIATION EUROPE

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EXCELLENCE IN OPERATION AND RISK MANAGEMENT - PUSHING THE ASSET

With resources scarce to engineer and build new facilities, maximizing the existing asset has never been so vital. Join the GPA in the task of tackling Operation optimization at the forthcoming meeting in the UK in May 2007.

In 1963 when Harold McMillan opined, on the subject of the British populace, 'You have never had it so good', he may well have been right. He might equally well have been talking today about the energy industries. The oil, gas and downstream industries are caught up in the largest and most sustained period of capital investment that they ever seen (if we believe the economists). This investment is driven by the "perfect storm" caused by the coincidence of shortages in supply in primary oil and gas production capacity, shortages in refining capacity and shortages in primary petrochemicals capacity. The fire is fuelled by the longest period of continued growth in the world economy for 200 years.



The rate of growth in demand is so great that the weaknesses in the supply chain are evident in everything from arc welders to the Steel they work, with the greatest gap of all in the human capital necessary to successfully bring new production capacity to the market. There has surely never been a better time to join the industry. Tell a friend! All bar the ostrich know where this leads: projects will be delayed, prices will escalate, the smart guys will get rich, the meek will be trampled and the less sagacious will lose their shirts.

The first front is struggling and a second front has opened. It is in times like these that the world is focusing not just on buying more new toys but on making

more of the toys that it has in its toy box. Excellence in asset operation has never been more important. With little surplus capacity there are real, high and immediate benefits to pushing assets to their limit. The capital is sunk; the benefits go straight to the bottom line. Just think of the benefits of milking that 30 year old refinery against building a new one! But of course pushing old toys to the limit can make them break. This second front requires those with the skills to realise the opportunity and - as important - to manage the risks.

The next GPA Conference focuses on just this theme: Excellence in operation and in risk management. On the opportunity side, the Conference will address the topics of Asset Life Cycle Management, preventative maintenance, availability management, asset debottlenecking and on, the risk side, environmental management, social policy and safety, safety, safety.

Malcolm Harrison



Views of the Teesside px plant, the Operating Asset to be visited in May. Photos courtesy of px(TGPP)

View from the Top

Let me first introduce myself as your new chairman. My name is Ed Bras and I am sure many of you have seen me during one of the numerous GPA functions I have attended. I have been working in the Gas Industry since 1982 when I joined Shell's Gas Processing & LNG department. I started working in the central office of Shell in the Netherlands. After broadening experiences in a few overseas assignments (NGL Plant, LNG Plant and Upstream sector), I returned to the nest in 1995, where I lead a group of Gas Process Engineers providing technical service to the Gas Industry both within Shell as well as outside Shell.

I would like to thank Sandy Dunlop, our previous chairman, for his contributions to our GPA organisation over the past years. I am sure we will see more of Sandy when he returns from his assignment in the Far East. The GPA Europe has been running for about one year with the administration carried out by Don Cooney assisted by his wife Wendy. This has proven to be a great success and I think I can speak for both the Management Committee and the Program Committee. I look forward to working together with Don (and Wendy) in 2007.

We know that Gas has been playing an important role as an energy carrier for many decades now and it will certainly continue to do so for many years to come. Large gas reserves are still to be exploited, which will create great opportunities for us, gas processors. Firstly, we recognize that the 'easy to process' gas has been found and exploited already, leaving the more complicated (hydrogen sulphide, carbon dioxide, etc) gas fields to be developed. The pressure from the environmental side is expected to continue and we already see projects emerging that address the issue of Carbon Dioxide emissions via sequestration and/or EOR. These kinds of projects will present us with new challenges and will call upon our imagination to come up with novel solutions. If there is still some doubt in your mind about the importance of gas I only have to point you to a few recent events where gas has been used in the political power game. This fact will be closely monitored in Western Europe which is seeing an increased dependency on Gas from the East.



**GPA Europe Chairman
Ed Bras**

It is our plan to reflect the global trends in the Gas Processing Industry in our conferences and meetings. The GPA will in 2007 continue to provide you with a forum where developments in the gas business can be discussed. It is also very much our goal to interest younger gas process engineers for the GPA. The program committee has lined up conferences, technical

meetings and a few knowledge sessions in 2007. We will start in Paris with a knowledge session on 'molecular sieves' followed by a one-day conference, 22&23 February. From 22-24 May we are going to Teeside, where we will hold our Spring Technical Meeting. The annual conference will bring us to Bonn in Germany and will run from 26-28 of September. The year will be concluded with our annual meeting, which is preceded by another knowledge session.

With an increase in the number of people attending last year's functions and the enthusiastic responses we received, we can say that our events are becoming even more successful. One last point I would like to make. In 2008 the GPA Europe will celebrate its 25th anniversary and it is our plan to not let that go unnoticed. We will have a significant annual conference in Paris in 2008. Details are currently being worked. For more information on this topic I would say, "watch this space".

I hope to see many of you at our events and I wish all of you a successful 2007.

Ed Bras (Chairman)

e-mail: ed.bras@shell.com

CORRECTION

At a recent computer expo (COMDEX), Bill Gates reportedly compared the computer industry with the car industry and stated, "If GM had kept up with technology like the computer industry has, we would all be driving \$25.00 cars that got 1,000 miles to the gallon".

In response to Bill's comments, General Motors reportedly issued a press release stating: If GM had developed technology like Microsoft, we would all be driving cars with the following characteristics:

1. For no reason whatsoever, your car would crash twice a day.
2. Every time they repainted the lines in the road, you would have to buy a new car.
3. Occasionally your car would die on the motorway for no reason. You would have to pull to the side of the road, close all of the windows, shut off the car, restart it, and reopen the windows before you could continue. For some reason you would simply accept this.
4. Occasionally, executing a manoeuvre such as a left turn would cause your car to shut down and refuse to restart, in which case you would have to reinstall the engine.
5. Macintosh would make a car that was powered by the sun, was reliable, five times as fast and twice as easy to drive - but would run on only five percent of the roads.
6. The oil, water temperature, and alternator warning lights would all be replaced by a single "This Car Has Performed An Illegal Operation" warning light.
7. The airbag system would ask "Are you sure?" before deploying.
8. Occasionally, for no reason whatsoever, your car would lock you out and refuse to let you in until you simultaneously lifted the door handle, turned the key and grabbed hold of the radio antenna.
9. Every time a new car was introduced car buyers would have to learn how to drive all over again because none of the controls would operate in the same manner as the old car.
10. You'd have to press the "Start" button to turn the engine off.

Annual Conference, Oslo, Norway

Sandy Dunlop welcomed Gene Thomas, Mark Sutton (of the GPA executive) and us all to Oslo and repeated his thanks to Heatric for the reception the previous evening. Clearly, with a very complete turnout and full room, everyone had clear heads and were ready for the day's full session.

Andréa Foster of Johnson Matthey Catalysts, (co-author Marcha Jansen BP), presented the first paper of the conference, *Mercury Removal from Hydrocarbons*. The paper detailed how the client's requirement to remove mercury from a condensate stream led their company to develop new fixed bed absorbents for hydrocarbon liquid treating.

The second speaker was Theo Brok of Shell Global Solutions. His paper, *Integrated Treating Options for Sour Natural Gases*, summarized the various unit operation configurations available to the process engineer when designing sour gas treatment systems for natural gas containing carbon dioxide, hydrogen sulphide and mercaptans. The conclusion to the paper was that the whole system needs to be considered and optimized



Andréa Foster



Theo Brok



Sandy Dunlop, GPAE Chairman, thanks John Burn of Heatric for sponsoring the evening reception

rather than the focusing on each individual unit operation.

To conclude the first half of the morning session, Lars Henrik Gjertsen, on behalf of co-authors Bernt Rusten and Trond Austrheim, introduced the delegates to Statoil's impressive Gas-Liquid Separator testing facilities. His paper, titled *Knowledge of Real Fluid Behaviour - Key to Solve High pressure Separation Challenges*, described the three test rigs available to their research engineers and reviewed the observations from tests using actual hydrocarbon fluids, comparing the results to those attained using model fluids.

After the coffee break Pascal van Eck of Twister BV (co-author Hugh Epsom) continued the proceedings with his paper, *Supersonic Gas Conditioning, Introducing the Low Pressure Drop Twister*. Twister is a state-of-the-art device for reducing the gas dewpoint by "combining expansion, cyclonic gas/liquid separation and re-compression in a compact, static, tubular device". This paper explained how the falling well head pressures on the first commercial Twister installation had been the focus for modifications to the design, and went on to describe the CFD modelling and subsequent pilot testing that have resulted in the new Low Pressure Drop Twister.

The delegates were reminded of their chemical engineering theory by Lars Eric Øi with his paper, *Efficiency of trayed and packed dehydration*

absorbers. Lars, of Telemark University College, Norway, explained how traditionally Dehydration Absorbers have been modelled using Worley and Parrish vapour liquid equilibrium data and estimated overall efficiencies for trays or packing. This paper explained how more accurate vapour



Lars Henrik Gjertsen



Pascal van Eck

Annual Conference, Oslo, Norway



Lars Erik Øi

liquid equilibrium data has led the author to use Murphree efficiencies instead, to model trayed and packed dehydration absorbers with improved accuracy.

The final paper of the morning was presented by Craig Nazzar of Prime Services (Co-author Jim Keogh of Petreco) who recognized the prestige of the GPA Europe Conference by travelling all the way from New Zealand. His paper, *Advanced Design of Glycol Reclamation Plants*, began by introducing his original concept, the Vacuum Flash process, first installed in a gas plant in New Zealand 14 years ago, which has now become the adopted industry standard. He went on to explain how recent modifications to the design,



Lunch - a great time to refresh contacts

which have been incorporated in the most recently installed unit in the Gulf of Mexico, have improved the performance and reliability, while reducing the capital and operating costs.

Simon Crawley-Boevey

Despite an excellent lunch, Malcolm Beaumont of Shell Global Solutions International BV had no problem keeping people awake with his paper, *Integrated Production System Modelling*. The development of large-scale gas supply projects is becoming more complex, particularly where they are required to support long term LNG or GTL projects, often with a requirement for supply from multiple reservoirs and fields. An integrated production system model

(IPSM) can be used as a tool in field development planning in order to optimise the design of these types of systems and support decision making. An IPSM software model represents an oil or gas production system from the reservoir through to the export system and spans several discipline domains.

The components of the model should be sufficiently accurate to represent the behaviour of the system, at least in terms of pressure and rate, but, depending on the system, temperature and composition may also be required. The model can be used to look at 'what-if' scenarios, including the impact of potential subsurface uncertainties through the field's lifetime. The paper showed the



Craig Nazzar



Craig Nazzar, our most travelled presenter

Annual Conference, Oslo, Norway



Malcolm Beaumont

individual software elements that are employed by Shell in creating an IPSM model and how they can be linked together to model the full lifecycle of a field development. Some examples of where these models are currently being employed by Shell were described, namely onshore non-associated gas and offshore oil & gas fields in Nigeria and the hugely complex Sarawak gas system. Some perceptive questions from the floor helped give an insight into the size of the task to calibrate the models.

Paul Roberts of WorleyParsons Europe Limited presented a fascinating paper, *The Successful De-bottlenecking of an Amine Contactor Using the latest Analytical Techniques* (written in conjunction with Stuart Ferguson, Consultant to



Paul Roberts



Comfortably settled with no distractions

BG and Andrew Nicholls of BG Tunisia). It described how an attempt to uprate the acid gas treatment plant by 16% failed to meet its targets but that the application of several techniques successfully diagnosed, verified and helped implement a successful solution within a year. The Hannibal gas plant operated by BG Tunisia treats gas from the Miskar Gas Field and provides the largest supply of indigenous gas in Tunisia. New wells will result in an increased duty on the gas plant's processing equipment, primarily in the areas of acid gas removal, and WorleyParsons were commissioned to identify the work-scope required to upgrade.

Although the Koch-Glitsch random packing in the two parallel aMDEA contactors (for CO₂ removal) was rated above the required throughput, trials to prove this in practice resulted in flooding below the required duty. Investigation led the team to suspect the gas inlet design was leading to maldistribution of gas entering the bottom of the packed bed and that the redistributor was also flooding. Tracerco Process Diagnostics™ (from Johnson Matthey) were used to carry out radioactive scanning to 'look inside' the contactors while on line. This included a range of steady-state, transient and multi-plane scans across the columns. The scanning results verified the presence of flooding at the redistributor and foaming under the gas inlet. Computational Fluid Dynamics (CFD) modelling by Koch-Glitch successfully reflected the observed performance and was further used to demonstrate the

validity of the proposed solution. A redesigned redistributor and a new gas inlet diffuser were installed at the annual shut down following the initial problem and trials proved their success.

The third paper of the session, presented by Martyn Johnston of Petrofac Consulting (written jointly with Cecilie Fure of Gassco AS) described the awesome undertaking to carry out *Performance Modelling of the Kårstø Gas Plant*. The plant near Haugesund in Norway is one of the largest facilities of its kind in the world, processing up to 88 MSM³/d of rich gas and 12,000 Te/d of condensate from some 25 offshore fields in the Norwegian Sector of the North Sea. The plant produces sales quality gas for export to mainland Europe and the UK, plus liquid



Martyn Johnston

Annual Conference, Oslo, Norway

products. There are essentially six highly integrated processing trains plus supporting utilities.

To facilitate plant recovery and infrastructure development studies, a huge 20 MB performance-type Hysys model, including over 1000 unit operations grouped in over 50 subflowsheets, has been built and validated against actual plant operating data. Data management, including 500 input parameters and 2000 output parameters proved to be a huge problem, so that building an Excel interface using extensive visual basic automation was necessary to download and upload data. This alone took two months to build. During the presentation and subsequent questions, Martyn gave a vivid insight into some of the problems in constructing and subsequent tuning and validating the model, including difficulties in collecting data, matching uncorrected flow measurements and matching demethaniser tray temperatures. However, after independently confirming the accuracy of the model as within 1%, Gassco have used it extensively to manage the booking of processing capacity more effectively and support capacity expansion studies, as well as getting spin-off benefits such as improved monitoring of compressor performance.

Mark Roop of eSimulation, Inc, Houston, presented the next paper, *Optimizing BP's Crane Gathering and Processing System*, co-written with his colleague, James Jones, and Jan Estal Maberry, Ralph Eguren,



Mark Roop



Conference grapples with complex equations whilst trying not to think of the partners, tour in the sunshine

Mark Johnson and Andy Dial of BP America.

BP America Production Company commissioned eSimulationSM's web-based process optimization system on the Crane Gathering and Processing System in Texas in February 2005. Though the processing capacity at Crane is only 30 MMSCFD, it was chosen due to good instrumentation and available support staff. Although the initial project payout was projected to be small, it was still adequate for this pilot application.

The paper described how the model was built, incorporating current costs and product prices to enable economic optimisation, and subsequently implemented with appropriate testing, tuning and validation. The system consists of a small PC on plant to collect the data and act as a 'data pump' to send it, via a secure web interface, to the process & economic model held and operated by eSimulation. The presentation illustrated the programme outputs, which recommend the changes to various set points and the resulting improvement in profit per day.

As the scope of the application was developed, the study identified a key trade-off in coordinating delivery of unprocessed gas from the Midland compressor station to the Crane gas plant, approximately 20 miles away. BP's typical mode of operation was to bring as much gas from Midland to Crane as possible, rather than utilizing other processing options. The paper reported how the optimizer guided BP's plant operators to

effectively process more gas at the Crane Plant, with a resulting increase in residue gas and NGL production. The commercial benefits were independently validated by BP & eSimulation, in addition to the less tangible benefits around improved understanding of the plant economics and limits, better procedures and improved communication.

In the final paper of the session, Dr Turgay Pekdemir of Heriot-Watt University, UK (presenting his paper written with colleague Dr Graeme White), posed the question: *Marine Motion Effect: Is Your Processing Equipment Immune to Seasickness?* Due to the depletion of onshore and near offshore oil fields and discoveries of remote offshore oil and



Dr Turgay Pekdemir

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gas fields in many areas of the world, especially in deep water locations, FPSOs have recently become popular. The worldwide FPSO fleet has increased from ten ships in the late 1980s to their current number of well over 100. Despite this, there is not much information on the effect of marine-induced motion and tilt (MIMT) on the performance of important processing equipment, such as multiphase contacting columns (absorption, distillation), heat exchangers (especially those used in gas / liquid applications), separation vessels, LNG vaporisers, water treatment and potable water production equipment (mainly vaporisers, distillation columns, ion exchangers), etc.

The paper illustrated how the Chemical Engineering Department at Heriot Watt University (HWU) has internationally recognised research expertise and facilities on oil and gas processing in floating production plants. The different types of MIMT were described along with the factors that affect it. Large scale experimental facilities and to some extent computational approaches have been developed at HWU for studying effects of tilt and motion on floating production and processing systems and the presentation showed some of these facilities and examples of the data generated to date. Much of the research so far has been into the influence of marine motion and tilt on oil/water separation equipment and on to liquid distribution in packed bed contacting columns and tubular heat exchangers. Examples shown



Rob Turner

included the advantages of structured packing over random packing for resisting effects of tilt in contacting columns and the effects on 'sloshing' of baffles in tanks. Although many unsolved problems caused by MIMT remain (particularly for LNG processing), research output from HWU has been applied successfully on several fields in the North Sea, off West Africa and in the Timor Sea.

Matthew Humphrys

The Friday morning session comprised two parts: the morning started with three papers addressing safety considerations, followed after the coffee break by three further papers concerned with refrigeration applications. Rob Turner of ABB Engineering Services opened proceedings with his paper entitled



Jonathan Miles

The Contribution of Alarm Systems to Plant Safety, and successfully captured our attention with some graphic illustrations of recent fires, explosions, and even an air crash, where alarm handling shortcomings proved to be contributory factors. He then described the guidance available to those responsible for alarm management, including the work of the members-only Abnormal Situation Management (ASM) Consortium, the EEMUA 191 guide, the UK H&SE's information sheet, "Better Alarm Handling", and the forthcoming updated ISA S.18 standard. Rob then went on to discuss human capabilities, and the benefits of appropriate training, before concluding with some recommendations for operational management of alarm handling issues.

Our second paper was from Jonathan Miles, Argo Environmental Engineering Ltd, who spoke about *Zero Flaring - Environmental Improvement with Real Cost Benefits*. Jonathan began by contrasting the somewhat disappointing figures for flaring trends in the UK sector of the North Sea with those for the Norwegian sector, and highlighting the substantial difference between best-in-class and worst-in-class flaring performance. He then went on to describe how "zero flaring" can be implemented, and the operational, environmental and financial benefits. The definition of zero flaring is that the flare is not normally lit: hence, in upset circumstances when the



Rob Turner expands on his excellent paper during the coffee break

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recovery system is exceeded, the flare will need to be lit. Jonathan described the Statoil-developed pellet ignition system, marketed by Vetco Gas technology and successfully used on many installations worldwide.

Clive de Salis' paper on *SIL Codes* rounded off the morning's safety session. Clive, who is Managing Director at Rowan House Ltd, began with a startling tale of what can happen when cost and schedule ambitions overrule quality and sound engineering practice (no names here!). Having captured our attention, Clive then outlined the principal IEC 61508 standard and associated standards, before examining how proper understanding and use of layers of protection can enable us - process engineers, primarily - to substantially eliminate the need for SIL-rated systems. The paper concluded with a look at risk graphs and matrices, and how to avoid pitfalls when using them.

The concluding three papers of the Conference kicked-off with John Burn of Heatric with *LNG Applications of Compact Diffusion Bonded Heat Exchangers*. John described the manufacturing process



Clive de Salis

of both printed circuit (PCHE) and the diffusion bonded plate-fin style construction, and compared their respective temperature, pressure and operational capabilities with brazed aluminium heat exchangers. John went on to explain the benefits of using compact diffusion bonded exchangers within LNG regasification, superheating, and liquefaction processes, and NGL extraction.

Mahdi Nouri of Sazeh Consultants



John Burn

(co-authors, Hedayat Eshraghi-Azar, Jamshid Ovaici, Pendar Khomarloo) examined *Refrigeration System Optimisation in the NGL Recovery Plant*. He examined how the choice of refrigerant temperature(s), operating pressures and refrigerant sub-cooling influence plant layout, materials of construction and compressor power. Mahdi showed how an optimal arrangement was identified for the plant studied, to achieve a minimum compressor driver power requirement



Chairmen, Presenters and Guests at the Annual Conference, Oslo

Annual Conference, Oslo, Norway

Companions' Tour of Oslo



Mahdi Nouri

(and hence minimum electricity cost). The final paper of the Conference was from Frank Del Nogal of M W Kellogg, (co-authors Jin-Kuk Kim, Simon Perry and Robin Smith of the University of Manchester) who continued the theme of his previous presentations (2003 and 2005) with a paper innocuously entitled *Integrated Approach for the Design of Refrigeration and Power Systems*. Frank expanded the scope of analysis to include gas turbine and steam turbine drivers, as well as electric motors, and further included the option to export electricity and to adjust the plant capacity to optimally match available equipment. He then chose a cascade mixed refrigerant cycle for a case study to illustrate his integrated optimisation algorithm. Your Chairman suspects many in the audience will consider the optimal design of LNG refrigeration cycles is a task perhaps best left to others.

Svend Rumbold



Frank del Nogal

We met with Kirsten, our Tour Guide for the day, at the later time of 10.00 am and walked down to the Pier for a two hour Oslo Fjord sightseeing boat cruise passing through narrow sounds, idyllic bays and through a maze of islands with small, colourful summer houses. The sun was shining, as indeed it did all day, and it was difficult to imagine the Fjord frozen over during the winter months. *(We were by this time on our third technical paper and preparing to grapple with Van Laar parameters as based on the Herskowitz and Bestani data!!! Ed)*. Two hours later back at the Pier we walked the short distance to the D S Louise Restaurant for a light lunch. We were all a little alarmed when only three glasses of wine appeared between 13 of us; this was definitely not what we had meant by a “light” lunch. However, the mistake was soon rectified and the expected three bottles appeared on the table!

After lunch we were taken by coach first to Oslo City Hall where every year on 10th December the award ceremony takes place for the Nobel Peace Prize. This is attended by members of the Norwegian Royal Family and a number of Norwegian and international celebrities. Kirsten was anxious that we see the murals around the room which she explained to us and indeed they were very impressive.

From the City Hall we were driven through the old part of Oslo passing the Military Schools and Akerhus Fortress and around the bay past the Parliament Building and Palace.

On then to Frogner Park. This is one of the world's largest Sculpture Parks. All of the 200 or more sculptures in the Park were made by the sculptor Gustav Vigeland (1859 - 1943) who donated this entire collection to the City of Oslo on the condition that it provide the necessary grounds for showing it. Most famous among the sculptures is the 53 ft high Monolith with 121 human figures supporting each other, which is situated at the Park's highest point, and the little bronze sculpture of the “Angry Boy” which is to be found on the bridge of sculptures.

The sun continued to shine and not surprisingly we were an hour or more behind schedule leaving the Park for a drive and more hurried visit to the Holmenkollen Ski Jump. No trip to Oslo is complete without a trip to this world famous Ski Jump, if for no other reason than to enjoy the magnificent views over the City. Inevitably time ran out, and we made our way back by coach to the Hotel Bristol.

The weather had been kind to us and it was a very pleasant and varied day with, I hope, something of interest for everyone.

Wendy Cooney



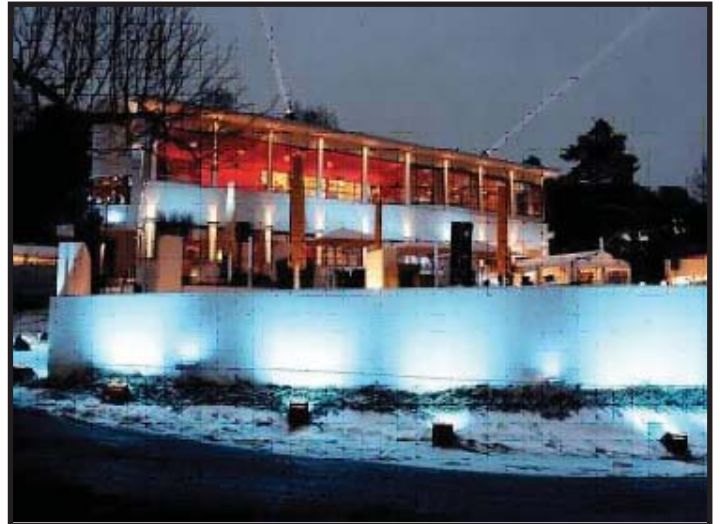
*A montage of some of the highlights of the Companions' Tour
Photos courtesy of Sandy Hearn and Wendy Cooney*

Conference Dinner at The Ekebergrestauranten

After a long day's conference, on Thursday evening three coaches awaited to take 145 delegates and their companions across Oslo to our Conference Dinner at the Ekebergrestauranten. Perched on a hill above the Oslo Fjord, the coaches had to climb the narrow, windy road one at a time, deposit their passengers and return down the hill before the next coach could venture forth. The weather was superb, a wonderful balmy evening considering it was the end of September, and we were able to have our welcome cocktails (courtesy of ABB Engineering Services Ltd) served outside on the terrace while people mingled and took in the superb panoramic view of Oslo Harbour and the City.

The Restaurant was designed by famous architect Lars Backer and is one of the earliest surviving functionalist-style buildings in Scandinavia; it was built in 1929 a year before the decisive Stockholm Exhibition. As architecture it represents the beginning of modernism in Norway and is an Oslo landmark.

After cocktails everyone went inside for the dinner which was served in the Store Festsal Room and again because of a full wall length picture window, the view could still be admired with the lights of Oslo ever changing as the evening dusk light gave way to a crisp, clear, dark night.



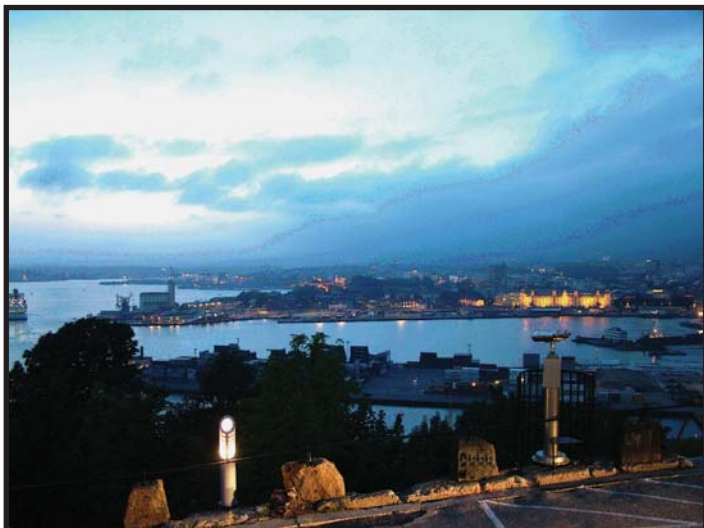
Gene, Mark and Sandy strategise (perhaps)

However, the food did not play second fiddle to the vista. A superb meal of Carpaccio of Smoked Trout with Herb Salad and Horseradish Cream was followed by Topside of Fallow Deer with a Sweet Potato Puree and Aigre Doux. Finally, the meal concluded with Passion Fruit Crème Brulee served with Chocolate Sorbet. Coffees and petit fours finished the evening before the coaches arrived to transport everyone back to the hotel.

Don Cooney



Networking at the pre-dinner reception party



The changing views of Oslo as the ambient light changed during the evening's proceedings

AGM Technical Session - Environmental Issues

The timing of the Technical Meeting on “Environmental Issues” proved highly appropriate with the Treasury’s “Stern Review on the Economics of Climate Change” having been published just three weeks previously. Each of the three presentations included consideration of the review to provide a topical assessment and their wide-ranging content provided an informative and highly relevant perspective on issues of great significance, in particular “global warming”.

The first two presentations, by Foster Wheeler Energy Ltd, were contained in a single paper. The first, *Carbon Capture and Storage: An introduction to relevant oil and gas processes and their uses* by Peter Brook (co-authors Chris Noble and David Scott), highlighted the compelling evidence that carbon dioxide emissions from the burning of hydrocarbon fuels contribute significantly to “global warming” and therefore present a major challenge to future human activity.

It is estimated that CO₂ emissions from all sources will grow 74% by 2020 compared to the year 2000 base level. About one quarter of all CO₂ emissions arise from electricity production so power plants, along with other major industrial contributors, provide the best opportunities to tackle major sources of CO₂ emissions. The 1997 Kyoto Protocol set emissions targets for all signatory nations. Even meeting these targets at bearable cost is challenging and more stringent targets will be needed to stabilise



Peter Brook

atmospheric CO₂ levels. As the feasibility of reducing emissions at source is virtually negligible, capture and storage of CO₂ must be considered. The bp / Scottish and Southern Energy 475MW hydrogen power project at Peterhead is an example of an “industrial scale, demonstration plant” which will store produced CO₂, in this case in the Miller oilfield to enhance oil recovery.

The three primary processes of CO₂ separation and capture, transportation and storage were reviewed. Physical and chemical absorption processes, based on well-established technology for CO₂ capture, are appropriate but need to be more cost-effective. Other technologies (adsorption, low temperature processing and membranes) require development



Chris Noble

and are only applicable for specific, niche scenarios.

CO₂ transportation is relatively conventional. More work is justified in the determination of CO₂ thermodynamic and transport properties at supercritical pressure and in avoiding leakage. The HSE are currently undertaking pipeline safety tests.

For carbon storage, saline aquifers offer an order of magnitude more potential storage capacity to the UK than depleted hydrocarbon reservoirs. However, CO₂ injection into coal seams can release valuable methane whilst injection into hydrocarbon reservoirs can recover oil and / or gas. Ocean storage has been considered but incurs potentially high environmental and ecological risk.

Examples of CO₂ sequestration were discussed, including the Statoil Sleipner project and the bp / Sonatrach In Salah project in Algeria. In the latter, around one million tonnes per annum of CO₂ are extracted from feed gas injected into saline wells. The commercial differences between this facility and the bp / Sonatrach In Amenas plant (that led to no CO₂ capture) were discussed in further detail in the Question and Answer session.

The second Foster Wheeler presentation, *Key Metrics for CO₂ Capture Project Assessment*, by Chris Noble, focussed in more detail on the recent Stern Review on the economics of climate change and how it provides clear messages on the need for urgent action by all. The



The Presenters with Session Chairman, Adrian Finn

AGM Technical Session - Environmental Issues

review concluded that available scientific evidence points to increasing risks of serious, irreversible impacts from climate change (assuming “business as usual” emissions levels). The annual cost of stabilising atmospheric CO₂ at 500-550 ppm by 2050 (as compared to 380 ppm today) is estimated at around 1% of GDP. The Stern Review shows the inadequacies of the Kyoto Protocol targets and the great cost of achieving and maintaining the stability of atmospheric CO₂.

Four methods of reducing greenhouse gas emissions are identified in the Stern Report: reduced demand for energy; increased efficiency in energy production and use; action on indirect issues such as avoiding deforestation and use of lower carbon technologies for power, heating and transport. A portfolio of technologies and approaches will be required. Even with large-scale expansion of renewable energy sources, the worldwide power sector may have to be as much as 75% decarbonised by 2050 to meet 550 ppm atmospheric CO₂. Extensive carbon capture and storage will be necessary for fossil fuels to remain as a key part of the energy scene. Technical developments in gas turbines, catalysis, CO₂ capture, process intensification and others will play an important role in achieving emission targets.

The third presentation, *Trends in the Regulatory Control of Emissions from Combustion Processes* by Ian Stewart

of Genesis Oil & Gas Consultants, provided a history of regulatory controls on emissions and discussed the pressures on industry to continually improve technology and practice to reduce harmful emissions in all forms.

Ian provided a fascinating review of how increasing awareness of effects on public health from emissions have been tackled by legislation in the UK from the 19th century to the present day. The justification for the legislation was explained. The 1956 and 1968 Clean Air Acts instigated dilution of pollution at source such as by taller chimneys. Increasingly, quality standards have been set for environmental protection, based on better understanding and quantification of the effects of emissions on the environment, including European legislation in the 1970s to protect continental Europe from the effects of “acid rain” (sulphur and nitrogen oxides) from the UK.

The 1988 Report of the Royal Commission on Environmental Protection developed the concept of Best Practicable Environmental Option (BPEO) to consider overall, systematic approaches to protection of all aspects of the environment. The BPEO concept formed part of the 1990 Environmental Protection Act, which introduced Integrated Pollution and Control (IPC) regulation and required operators to study and evaluate Best Available Techniques Not Entailing Excessive



Ian Stewart

Cost (BATNEEC) for specific processes and equipment (and to have a clear audit trail for decision-making). Ian showed how IPC has had a far-reaching effect on industrial emissions by controlling the most significant emitters and focussing on the most harmful processes and substances.

Introduction of Integrated Pollution Prevention and Control (IPPC) in year 2000 meant a broader range of industries was covered than by IPC. The NEEC element of BATNEEC was removed and BAT redefined (with indicative standards of compliance that apply across the EU). Ian proceeded to cover the effect of legislation being phased into the offshore oil and gas industry and in particular the impact on nitrogen oxide emissions from gas turbines. He also highlighted the effect of emissions trading and how this leads to the situation whereby Norway is installing offshore Combined Cycle Gas Turbines to offset high carbon taxes. As a result of the Stern Review, such technology may become more widespread as governments begin to appreciate the effect of carbon taxes in reducing emissions.

The three presentations gave a wealth of information (to which this summary can hardly do justice) and provided much for the GPA to consider - both in the bar immediately upon close of the meeting, but also for the future as environmental issues and legislation increasingly influence our business.



Enthusiasm and experience mingle for lunch

Adrian Finn

GPA Europe Chairman's Report 2006

Ladies and gentlemen, colleagues and fellow members of the Gas Processors' Association, Europe.

It is my pleasure to make the Chairman's presentation to the 2006 Annual General Meeting.

The Chairman of the GPA has, by tradition, been a two year appointment for some time now and our committee is organised such that the Vice-Chair is appointed also for two years in expectation that he will become the Chair in his turn.

Three or four years ago, in what now seems like another life, I was asked to be Vice-Chairman of the GPA Europe and fully expected to be able to contribute significantly to the organisation when my turn came to take over from Sigbjørn Svenes last year.

However, as things evolved, shortly after the appointment I was asked by my company to move to Malaysia in April of 2006. While I have been able to chair three Management Committee meetings this year, and to maintain contact with the day-to-day events of the GPA Europe, I rapidly came to the conclusion that it was impossible for me to give the Association the attention it needs without being in time zone and available for all meetings.

Accordingly, I have offered my resignation to the committee, which has been accepted, and I am glad to confirm that my Vice-Chair, Ed Bras of Shell Global Solutions, has agreed to be Chair a year earlier than he might have expected.

I am very sorry to have to shorten my tenure, but I think that I owe it to the Association to ensure that it has the most effective leadership and while I offer my services as a committee member for as long as you will have me, I commend the meeting to Ed's stewardship.

I can also confirm that I have not been totally inactive. At the GPA Convention in Grapevine in March, I was able to meet representatives of the gas industry from South East Asia and I am in contact with the GPA Management in Tulsa to help to facilitate the possibility of establishing a South East Asia Chapter of the GPA. I am confident that there will be an acceptable solution to this and expect to see the GPA family grow in the near future.

I should say that your Association has, however, had an excellent year, for which I take little credit, but must thank the team of committee members who are always willing to help to ensure that the meetings and events of the GPA Europe are a success. One reason why you do not see a gibbering wreck in front of you is that I felt very confident that even though I was thousands of miles away, the committee would continue to operate and run your Association efficiently and effectively.

This has been backed up and supported by the establishment of our dedicated



*Retiring GPA Europe Chairman
Sandy Dunlop*

management office. Last November was a major turning point for the GPA Europe with Don Cooney taking over the ad hoc services that had previously been provided so effectively by Eilis at Forcom. I think you will all agree that the decision to make that step, whilst we would have loved to continue the Forcom relationship, has turned out to be very effective and Don has been able to provide a very efficient service to the committee, but more importantly to you as members.

The high point of my year as Chairman was to attend on your behalf the GPA Convention in Grapevine, Texas, last March at which I co-chaired a session on international developments in gas processing with Tito Bonnadonna from the Venezuelan Chapter. I can tell you that the GPA Europe was well represented in Texas with a number of your colleagues present, and together we were very pleased to be able to receive on their behalf the Lifetime Achievement Awards for Christine Etherington and Ron Coultrup. You may recall that I presented a Service plaque to Ron on behalf of GPA Europe at the last AGM, but the award from the GPA was an international recognition of Ron & Christine's long term commitment to the Association and the committee and is justified and overdue recognition of their efforts. Without their strong and valuable commitment, I doubt whether your Association would be as strong and viable as it is today.

It is also, however, my duty to say farewell to members of the committee who have decided to resign their position. Corky Rose (Chevron) who has been a staunch member of the Management Committee and Secretary for many years has felt that as a consequence of his move to Moscow he could not continue as Secretary. Roy Banks (Costain), Paul Openshaw (Johnson Matthey), and Annette Kolb (Shell Norge)

have all, for various reasons, felt that they are not able to continue their membership of the committee. They all leave with our thanks, gratitude and best wishes for the future. I am also sure that we have not seen the last of them and they will turn up at meetings in the future.

I am also pleased to welcome Tim Goodhand (Worley Parsons) who has agreed to take over as Secretary and Matthew Humphrys of Johnson Matthey who, as a new member to the committee, is offered for election.

We have had very successful meetings during the year. In May we had 83 delegates from 10 countries at Antwerp followed by the visit to the Fluxys LNG Terminal, and then, of course, there was Oslo in September.

Those of you who were there will, I hope, join me in congratulating the Programme Committee on the most successful Annual Meeting ever with over 120 delegates and 17 very fine papers. In addition to playing host to Gene Thomas and Mark Sutton from GPA in USA, I had the pleasure of speaking to a number of the delegates who almost without exception said that the Oslo format was ideal and we have had a number of suggestions for what went really well that we can copy for the future.

Your GPA Europe can now consider itself as an expert in setting up meetings that truly meet the demands of our members and the industry and we will continue to develop the GPA Europe as a premier networking opportunity for our industry.

We have also spent time this year in working up the initial plans for the 25th Anniversary celebrations of the GPA Europe due for 2008. Plans are not yet, of course, fully developed, but I have met with the sub-committee charged with developing those plans today and I am confident that we will move forward over the next year with confidence in organising what will be a major event in the European Gas processing business.

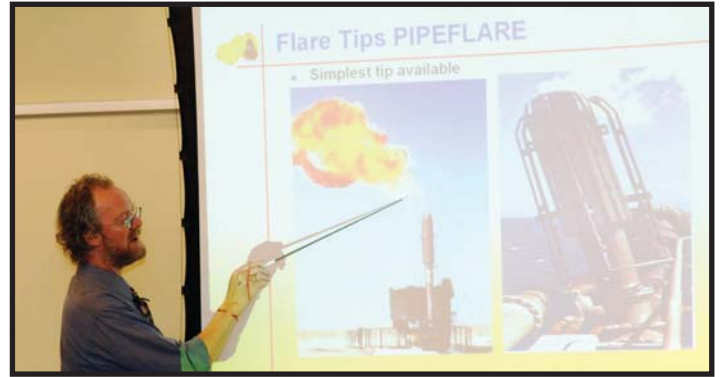
I can tell you that the highlight event of the year will be the Annual Conference to be held in Paris, where our first Conference was held in 1983, but there will be lots of other ways in which we will celebrate this major milestone. Please watch this space and block out your diaries for September 2008!

Ladies and gentlemen, thank you for your continuing support of the Gas Processors' Association Europe. It is your Association and I and the other members of the committee feel privileged to be able to represent your interests in the operation of the GPA Europe. Please, however, do not hesitate to let us know if there is any way that the association can help you in networking or providing more information and experiences to help you deliver the gas industry in Europe.

November Knowledge Session - Flare and Relief System Design

The Knowledge session, which took place on Thursday 23rd November 2007 in London, was attended by engineers ranging in experience from new graduates to field experts. The session was divided into two parts, the first part, entitled *Flare & Relief Systems, An Overview*, was delivered by Brian Marshall (Director, Softbits Consultants Ltd) and the second part, entitled *Flare and Relief Systems Design*, was delivered by Chris Bell (Senior Consultant, ABB Engineering Services).

The first part of the session introduced the basic design of onshore/offshore flare systems. This included the general components of the flare systems, how to approach a design with examples of design alternatives and modern concepts,



Brian Marshall in full flow



*Session presenters
Brian Marshall and Chris Bell*

flare piping layout and computerised modelling of piping networks, radiation intensity and dispersion.

A further in-depth presentation was then given on the sizing and selection of specific pressure relieving systems. An emphasis was made on the designer considering the whole pressure relief system and not just the device. The individual design methodology for pressure relief valves, rupture disc devices and pin-actuated devices was presented, followed by the complimentary methods for designing inlet and outlet lines from the pressure-relief devices. The importance of the fluid type was highlighted and guidance was given as to the appropriate design method for two-phase, supercritical and viscous / plugging services.

Both presentations outlined industry standards, including emission limits and typical ranges used during design, technical references and rules-of-thumb, which are valuable to new engineers. The clear power-point presentations, included many diagrams, models and site pictures. Both presenters delivered their presentations with an engaging enthusiasm for their field.

Adya Deshmukh / Gabriel Norwood

The Officers of the GPA Europe for 2007

Chairman:	Ed Bras	(Shell Global Solutions)
Deputy Chairman:	Justin Hearn	(BASF)
Secretary:	Tim Goodhead	(WorleyParsons)
Treasurer:	Christine Etherington	(Forcom International)

Management Committee members for the year 2007:

Nicholas Amott	Fluor Ltd	Murtaza Khakoo	BP Exploration
Colin Biggs	Consultant	David Linnett	Consultant
Denis Chretien	Total	Brian Marshall	Softbits
Ron Coultrup	Forcom Int	Graham Robinson	Business Solutions
Sandy Dunlop	AMEC	John Sheffield	John M Campbell
Philip Hagyard	Technip	Christian Streicher	Prosernat
Malcolm Harrison	Foster-Wheeler	Sigbjørn Svensen	Statoil ASA
Matthew Humphrys	Johnson Matthey	David Weeks	M W Kellogg Ltd

Ex-officio members of the Management Committee are:

Membership Secretary:	Paul Seccombe	Invensys
Programme Committee Chairman:	Lorraine Fitzwater	Petrofac

Best Paper Award 2005



The Best Paper Award 2005 was won by David Haynes of Advantica (inset). Luisa Shelenko accepts the award on his behalf from Sandy Dunlop, performing one of his last tasks as GPAE Chairman

Call for Papers

Papers are invited for GPA Europe's future meetings for 2007

May 22nd - 24th Teesside, UK
Sept 26th - 28th Bonn, Germany
Nov 22nd London, UK

Offers, abstracts, papers and other details should be sent to the Programme Committee Chairman:

Lorraine Fitzwater,
Process Group Manager,
Petrofac Engineering Ltd

Chester House,
76-86 Chertsey Road,
Woking,
Surrey GU21 5BJ
United Kingdom

Tel: +44 (0)1483 738555
Fax: +44 (0)1483 738501

E-mail:

lorraine.fitzwater@petrofac.co.uk
or alternatively to:

GPA Europe
Administration Office
10 Shetland Way, Fleet,
Hampshire GU51 2UD
United Kingdom

Tel: +44 (0)1252 625542
Fax: +44 (0)1252 786260

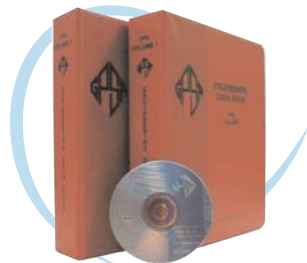
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FORTHCOMING EVENTS

February 22nd - 23rd 2007

Paris, France - Residential

LNG and Associated Gas Treating “(Molecular Sieves)”

- Day 1
 - pm Knowledge Session
 - eve Welcome Reception sponsored by:

CECA

ARKEMA GROUP
site: www.ceca.tr

ENGELHARD

site: www.engelhard.com

- eve Networking Dinner
- Day 2
 - am Technical Papers
 - Networking Lunch
 - pm Technical Papers

May 22nd-24th 2007

Teesside, UK - Residential

Operations and Maintenance

- Day 1
 - Golf Tournament
 - pm Registration
 - eve Welcome Reception
- Day 2
 - am Technical Meeting
 - pm Technical Meeting
 - eve Conference Dinner
- Day 3
 - Site Visit to px (TGGP)

GPA Europe Annual Conference

September 26th -28th 2007

Bonn, Germany - Residential

Commercial Legislative Issues CO2 Capture & Sequestration Stranded Gas - GTL

- Day 1
 - Registration
 - Welcome Reception
- Day 2
 - am Technical Session
 - Networking Lunch
 - pm Technical Session
 - eve Conference Dinner
- Day 3
 - am Technical Session

November 22nd

London, UK - Non Residential

Knowledge Session, AGM and Technical Meeting

- Day 1
 - am Knowledge Session
 - Networking Lunch
 - AGM
 - Technical Meeting

CONTACT DETAILS GPA ADMIN OFFICE

GPA Europe,
10 Shetland Way, Fleet,
Hampshire GU51 2UD, UK

T: +44 (0)1252 625542

F: +44 (0)1252 786260

E: admin@gpaeurope.com

W: www.gpaeurope.com

Contacts: Don and Wendy Cooney

GPA EUROPE

CORPORATE MEMBERS

This listing of current Corporate Members represents the status as at December 2006. Please welcome BASF as our first of several Premier Grade Members. In addition to this there are nearly 200 Individual Members.

Corporate Level 1 (45)

ABB Engineering Services	Hydro Oil and Energy; Norway
ABB Lummus Global BV; Netherlands	ILF Consulting Engineers
Advantica Technologies Ltd	Johnson Matthey
Air Products PLC	Kellogg Brown & Root
AMEC Group Ltd	Koch-Glitsch (UK) Ltd
Amines and Plasticizers Ltd; India	M W Kellogg Ltd
AspenTech Ltd	Nalco Ltd
BASF - Aktiengesellschaft; Germany	NORIT Nederlands BV
Bechtel Ltd	OAQ TNK-BP Management; Russia
BG-Group	PBG SA; Poland
BHP Billiton Petroleum	Saipem SA - Energies; France
BP	Shell Global Solutions Int BV; Netherlands
CB & I John Brown Hydrocarbons Ltd	Snamprogetti SpA; Italy
CD-Adapco	Statoil ASA; Norway
CECA SA; France	Sulzer Chemtech Ltd; Switzerland
Chevron	Techint SpA; Italy
Costain Oil, Gas & Process Ltd	Technip; France
Eni Div E&P; Italy	Total; France
ExxonMobil North Sea Production	Whesoe Oil and Gas Ltd
Fluor Ltd	Wintershall AG; Germany
Foster Wheeler Energy Ltd	WorleyParsons
Genesis Oil & Gas Consultants Ltd	York International
Grace GmbH & Co. KG; Germany	

Corporate Level 2 (48)

Able Instruments & Controls Ltd	Invensys Process Systems (UK) Ltd
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Atlas Engineering UK Ltd	Mott MacDonald
Axsis Howmar	Nordon Cryogenic; France
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Davy Process Technology Ltd	Perry Equipment Ltd
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Chemicals GmbH; Germany	ProPure AS; Norway
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Frames Process Systems BV; Netherlands	Rotor-Tech Inc; USA
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Hanover (GB) Ltd	UOP NV; Belgium
Heatric	Weir LGE Process
IHS Energy Group	Win Sim Inc; USA
IMA Ltd	Zeta-pdm Ltd

Corporate Level 3 (7)

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Filtan Filter Anlagenbau GmbH; Germany	Softbits Consultants Ltd
Infocem Computer Services Ltd	Toromont Energy Systems Ltd
McMurtrie Ltd	

Academic Level (1)

Heriot Watt University

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