IN BRIEF

ISSUE 4 SEPTEMBER 2013

GAS PROCESSORS ASSOCIATION EUROPE

30 YEARS OF GPA EUROPE

In Brief would like to take this opportunity to wish GPA Europe a very Happy 30th Birthday and to wish it every success in its growth and penetration over the next 30 years.

In December 1982 the GPA European Chapter was formed with the first issue of In Brief published in August 1983. In those days there were just four pages with a welcome letter from Vince Doyle of Bechtel who was on the International Committee of GPA. From such humble beginnings In Brief has been published almost twice a year since for the last 30 years with each issue concentrating on reporting on meetings and summarising papers presented.

As any successful organisation does, GPA has grown and developed over the last 30 years. Originally there were two complementary associations, GPA and GPSA mirroring the US organisation. However, in 1998 the two associations felt that as a joint body, GPA Europe would enhance the core objectives of operators and suppliers and enable the strong networking opportunities at meetings that members have come to appreciate.

Since 1998 GPA Europe has thrived and, at the time of the 25th Anniversary celebrated by a conference in Paris with a record number of attendees, the organisation had 83 corporate members and 190 individual members.

2006 saw the introduction of the Premier Corporate membership which gave up to twelve individuals in Premier member companies full access to the website. This has led to a considerable increase in the number of people who consider themselves as members of GPA Europe.

We are now sending monthly newsletters to almost 500 people providing information and news about GPA Europe meetings and papers being published, in addition to the bi-annual In Brief magazine.

Recent years have seen other innovations including the introduction of Young Professional training at conferences, organised by Young Professionals themselves (why should the oldies get in the way!) This concept proved particularly successful in Berlin in 2012 with over 80 people attending. Younger engineers are also encouraged to attend by the provision of special discounts on conference cost.

In 2011 and 2012, GPA Europe responded to an invitation from GasTech to produce a day's worth of technical papers within the GasTech Exhibition floor. This had a particular appeal, with GPA E organised sessions having sell-out and standing-room only audiences. The sessions also allowed us the opportunity to run a stand where we were able to attract a number of new members who had not otherwise heard of GPA Europe.

Throughout its history GPA Europe has evolved and developed its structure (for example establishing a full time Administration Office in 2005 and becoming a limited company in 2011) as well as its offerings to meet the demands of an ever-changing market. It will continue to do so over the next thirty years.

Sandy Dunlop

Executive Administrator, GPA Europe Ltd

Chairmen of GPA Europe

1983	Harold Wind	Marathon Oil UK
1984	Norman Stevenson	Phillips
1985	John Teskey	BP
1985/6	Mike Baker	BP
1987	Cyril Timmins	British Gas
1988	Ari Minkkinen	Total CFP
1989	Charles Wildash	Marathon Oil UK
1990	Brian Stevens	BP
1991	Cyril Collins	M.W. Kellogg
1992	Richard Gibbons	British Gas
1993	Don Cooney	SAST
1994	Colin Woodward	ICI Katalco
1995	Amer Sarssam	Parsons
1996	Fred Okimoto	Shell
1997	Dave Connell	Chevron
1998	Dave Simmonds	Shell
1999	Christine Etherington	Forcom
2001	John Sheffield	M.W. Kellogg
2003	Sigbjorn Svenes	Statoil
2005	Sandy Dunlop	Amec
2006	Ed Bras	Shell Global
2008	Justin Hearn	BASF SE
2010	David Weeks	M.W. Kellogg
2012	Keith Thomas	E.On Ruhrgas

In Brief Editors

1983	Brian Stevens	BP
1987	Mike Heath	Trident
1992	Mike Brooks	BP
2002	Nick Amott	Fluor
2012	Claire Haycock	ABB Consulting

INSIDE

In Brief..

GAS PROCESSORS ASSOCIATION
EUROPEAN/LONDON CHAPTER

Vol 1 Issue 1 August 1983

Hon. Secretary: J.Barnwell, Bechtel Great Britain Ltd.
Bechtel House, 245 Hammersmith Road, Hammersmith London W6 8DP

GPA Officers 1983/4

Chairman: *Harold Wind.* *Marathon*

Deputy-chairman: *Norman Stevenson.* *Phillips*

Deputy-chairman: *Ian Hartill.* *British Gas*

Secretary: *Julian Barnwell.* *Bechtel*

Treasurer: *Werner Schweizer.* *Elliott*

GPA/GPSA are in Europe!

GPA (Gas Processors' Association) and its affiliate GPSA (Gas Processors' Suppliers' Association) have started in Europe. In receiving directly this newsletter, you are one of the first 150 - plus paid up members of the GPA European/London Chapter.

The chapter began in December 1982, with 14 representatives of interested companies meeting at Bechtel's offices in Hammersmith. At this inaugural session, an obvious need for the GPA was apparent. Subsequent enthusiasm for the chapter with attendance of up to 100 at technical meetings, showed that initial feelings were right.

To date, there have been three technical sessions held at various locations in London, sponsored by Elliott, Fluor and Stone and Webster.

Future plans involve two more meetings this year and a further three more in the spring of 1984, one being in Paris. A site visit to Bacton in 1984 has also been arranged, courtesy of British Gas.

Julian Barnwell

Vince Doyle:
member International Committee. Bechtel

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. I believe it is the European/London chapter that will make it truly international.

The GPA (its earlier label was the Natural Gas Processors' Association) continues to be an effective technically orientated group where people operating in the gas processing industry can share their experiences. With the advent of the International Committee, of which I have been a member since 1980, it has been satisfying to watch the growth spread, first in Venezuela and now in Europe, of this type of technical and operating expertise in a common industry.

Good luck to a bigger and better European/ London chapter.

Vince Doyle

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Cover of the inaugural issue of InBrief, published in August 1983.

HOW SECURE IS EUROPE'S GAS SUPPLY?

By John A Sheffield, John M Campbell/Petroskills

As I write this, the news is of protestors objecting to Cuadrilla's test drilling at Balcombe in West Sussex, UK – protestors who are clearly ignorant of the true facts and are clearly intent on seeing the lights go out! Their cause is encouraged by the inertia and misguided policy from all of the European governments with respect to energy policy. So what are the facts?

John Sheffield

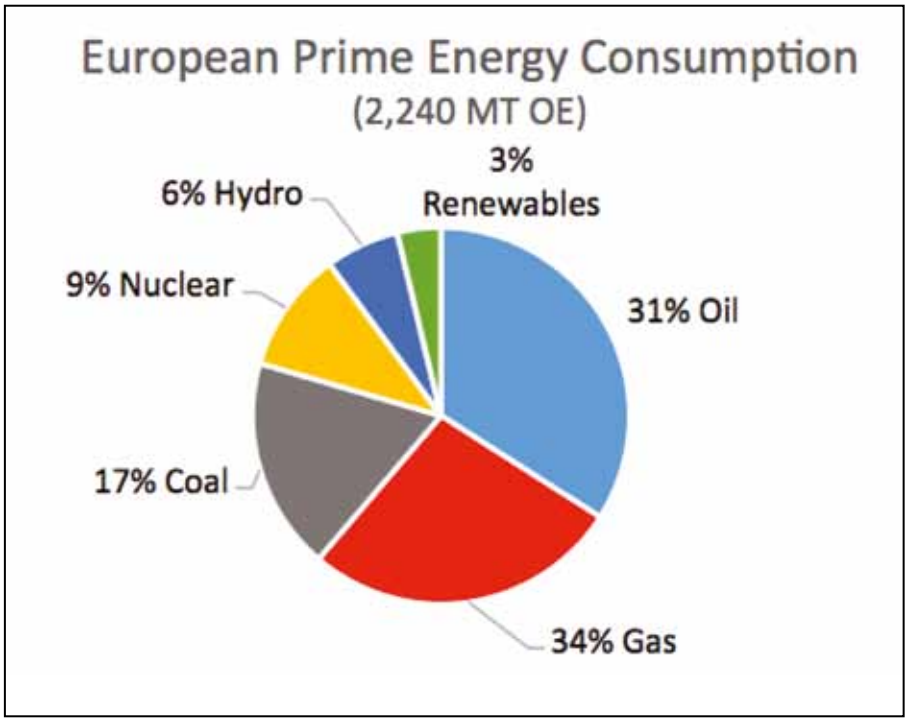


Chart 1

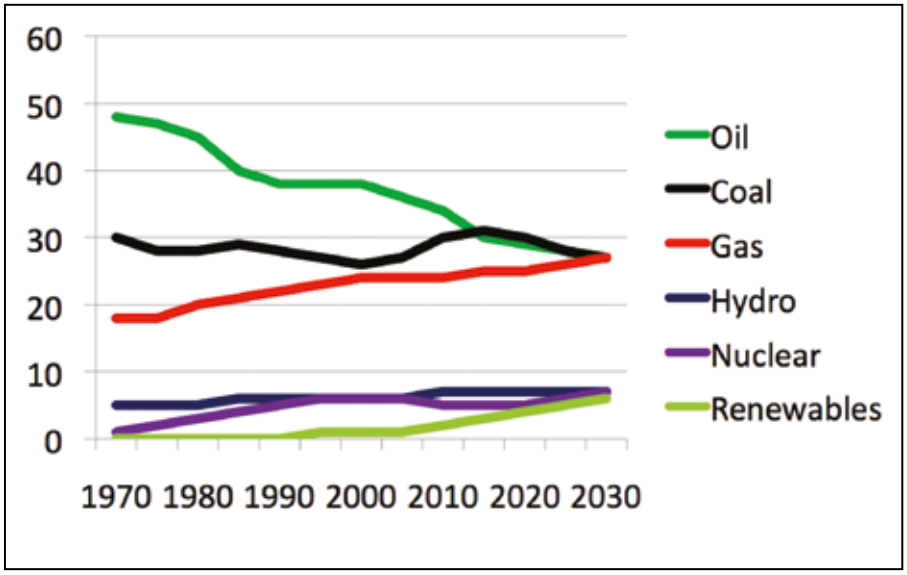


Chart 2

Firstly let us consider the overall Prime Energy demand in Europe:

Prime energy represents the supply of energy for all activities: power generation; transportation; and industrial feedstocks. The chart clearly shows the vital role that hydrocarbons plays and that total renewable energy sources including Hydro-electric power are only 10% of the total supply. Wind, solar, and wave power amount to only 4% of the total energy supply and it is clear that for the foreseeable future such energy sources cannot fulfil the contribution from the main hydrocarbon fuels.

It is likely that the percentage contribution of renewables will increase and chart 2 shows the anticipated percentage fuel consumption over the next few years:

The data indicates that by 2030, coal, oil and gas will each supply 27% of the total energy demand, whilst nuclear, hydro and renewables will supply about 9%. The data shows the increasing role of gas as a primary energy source with less reliance on oil. Coal is anticipated to remain at 27% declining after a modest increase in the immediate future, counteracting the loss of confidence in the nuclear industry.

The major component of renewable energy is wind power and in Europe, there has been a significant amount of wind power capacity installed, including major off-shore wind farms.

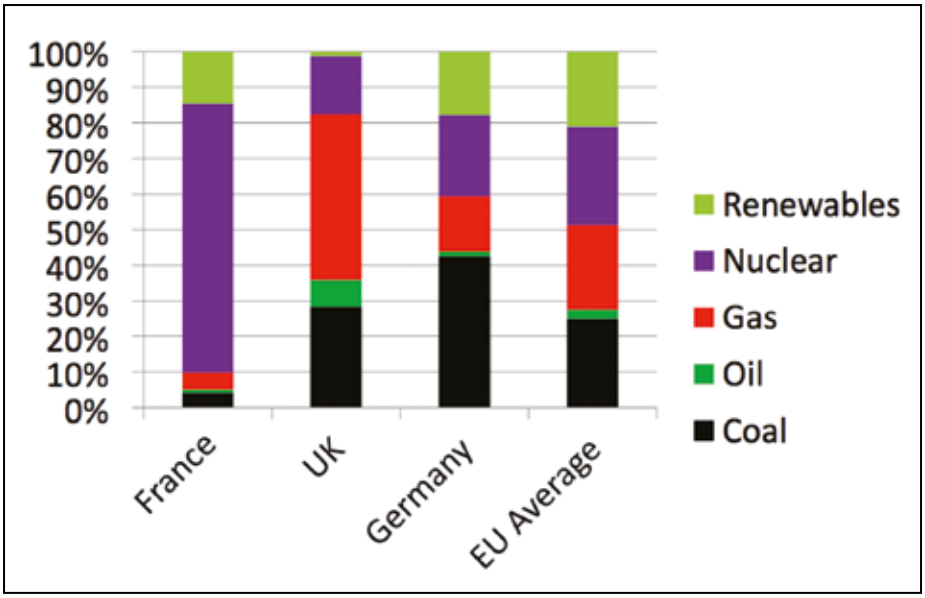
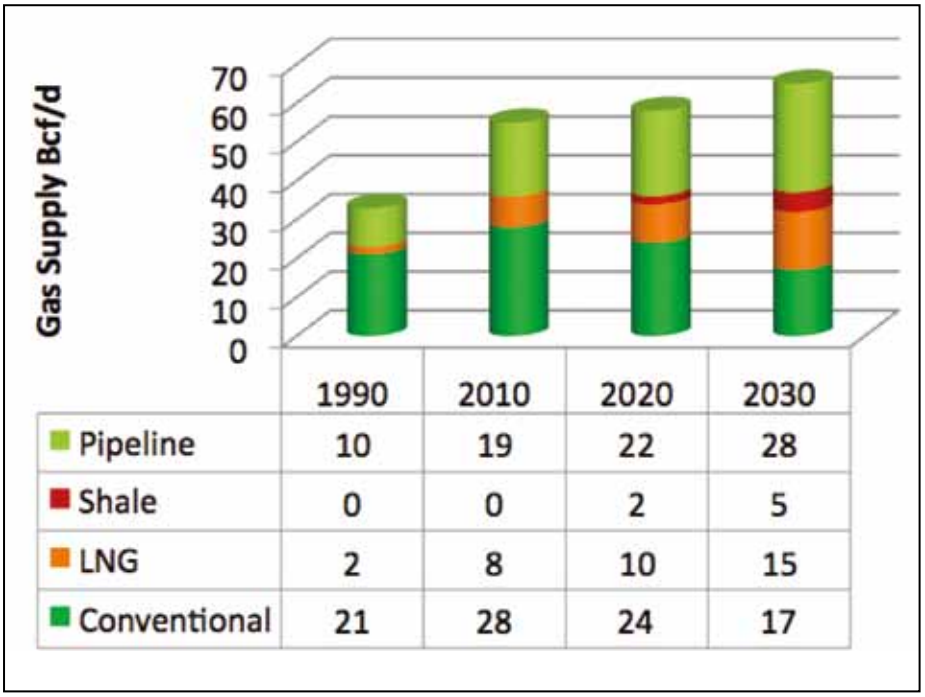


Chart 3



	1990	2010	2020	2030
Pipeline	10	19	22	28
Shale	0	0	2	5
LNG	2	8	10	15
Conventional	21	28	24	17

Chart 4

In the UK alone there is currently 4GW installed capacity (4% of total generating capacity), soon increasing to 10GW of installed capacity, of which some 3.6GW will be off-shore. Wind power contributed 5% to the overall power supply in 2012. But power is only available when the wind blows, and even when it does, not all of the power is needed. The wind power industry is, therefore, heavily subsidised and the cost of this has been passed on to the consumer, thus contributing to increased energy costs. Wind power needs to be backed up 100% by conventional power generation capacity and the most efficient and environmentally friendly fuel is gas.

The growth in gas consumption can be seen to be an inevitable consequence of rising energy demand and increasing pressure to reduce carbon emissions. It must be stressed that as a fuel source for power generation, gas is significantly less carbon intensive than coal or oil, with the CO_2 emissions from a gas fired power station amounting to 450kg CO_2/MWh compared to a typical coal fired power station at 1000kg CO_2/MWh plus significant other emissions and solid wastes.

The use of gas for power generation in Europe is well established and data published by the European Commission illustrates the proportion of fuels used:

The proportion of gas used for power generation needs to increase if coal and nuclear fuels are to be phased out, so it is appropriate to consider where the gas comes from.

Where does Europe's Gas come from?

Some gas is indigenous as in the North Sea reserves, more is delivered by pipeline from Russia and Algeria and some comes from LNG producing countries such as Qatar, Algeria and Nigeria. In this chart, "conventional" represents internal country reserves which can be seen to be increasingly depleted over the next 15 years. This will increase the amount of gas delivered by pipeline or as LNG and an increasing reliance on shale gas to supply the energy needs of Europe.

According to the latest BP statistics, the gas reserves in Europe excluding Russia and the 'Stans' amounts to 5TCM against a consumption of 531BCM, implying that the **Reserves to Consumption ratio is 9.4 years**. This implies Europe only has indigenous gas reserves to support 10 years at current consumption rates.

Europe is clearly going to be even more dependent on imported gas from Russia, Turkmenistan and Azerbaijan by pipeline and these pipelines when constructed will cross many nations. The other option is more LNG imports from an increasing unstable Middle East region. Surely the case for allowing and encouraging the development of shale gas becomes self-evident? Otherwise, to prevent the lights going out, we will be increasingly dependent on coal fired power generation with all the ensuing potential problems of increased CO_2 production.

Note that the data quoted in this report has been largely extracted from the BP Statistical Review of World Energy 2012

Hot air or cool gas?

30TH ANNIVERSARIES AND GLYCOL DEHYDRATION UNITS

VIEW FROM THE TOP

By Keith Thomas, Chairman, GPA Europe

In September the GPAE will be celebrating its 30th anniversary, and I was recently asked, as Chairman, the very interesting question: "Where do I believe the GPAE will be in 30 years time?" i.e. when it celebrates its 60th birthday.

Of course the honest answer to this is that I do not really know. The pace of change in the Gas Industry has been very rapid during the first decade of this century and I see no reason to believe it will slow down in the foreseeable future. Gas is now a global commodity in an energy hungry world. As such the demands on how it is won, processed and developed will continue to grow and develop. As I wrote in my last article, this is all good news to those working in the gas industry or looking to enter it.

However, this led me to extend this line of thought backwards in an area known to myself and probably 90% of those working in the gas industry. The common Glycol Dehydration Unit. One of the work horses of the gas industry, and a unit operation that many, quite wrongly, probably consider to be rather uninspiring. A recent paper at a GPA conference reminded me that the Glycol Dehydration Units we now find are a far cry from those built and operated in the early 1980s when I first came into contact with them. So why and how did they change?

Before the age of desk top computing, designing a Glycol Dehydration Unit involved a lot of rule-of-thumb engineering and reading of diagrams for equilibrium data and equipment sizing. With some hand calculations it was possible to build a unit that would work adequately for years (some of the units I worked on have just come to the end of their working life). So are the units built now the same as those built 30 years ago? The basic principle is still the same, counter-current absorption, and the basic operational steps are still the same, but the way the thing is designed and executed is totally different.

Beginning with the thermodynamics, 30 years ago we read from curves generated from limited data or gathered empirically. These were over a limited range and particularly, because of the vagaries of the TEG system, going for lower water dew points soon led to pushing the limits. Now the standard process simulation programmes have thermodynamic packages which have a level of accuracy that we could only dream of back in the 1980s. This means that concentrations and flow rates can now be optimised which logically knocks on to the equipment sizing and possible physical configuration. 30 years ago control was generally via relays and pneumatic values. The advance of control systems and "intelligent" control valves has meant that the control logic can be defined and implemented in a much more advanced way. Structured packing has decreased the size of the main equipment, the Absorber, and made the implementation of the process in moving offshore environments more practical and predictable. The use of incinerators, particularly those which take the overhead vapour from the regeneration and burn it directly, recuperating the heat back into the process, have led to a reduction in emissions to more or less CO_2 and water vapour. A far cry from the aromatics and hydrocarbon emissions the units used to vent.

There are probably more items that I could mention, however the issue is not the technical specifics, but that the humble glycol dehydration has followed the same path of development of all the gas industry. Firstly gas is now being produced in ever more remote and difficult environments. Gas processing has had to adapt to keep up with this. Because these markets are more demanding we have had to push our existing processes to new limits. This you can only achieve if you have a deeper understanding of how the system works (for example its thermodynamics). Other industries are also developing in parallel and by integrating these advances we can develop our own industry farther still (for example control technology). And last but not least the environmental constraints that being a responsible industry places upon us, have driven still further the technical developments to make the process safe, and sustainable (for example incinerators)

So to return to the point I addressed originally. Where Gas Processing will go in the next 30 years ultimately rests with how, on the one side our production colleagues push the envelope, and on the other side how and where the markets develop to take the gas. The sudden rush in LNG developments in the last 10 years has been led not so much by technical innovation, but by the two factors previously mentioned. That being said, the advances in the LNG industry have made many things more feasible than would have previously been considered so there is a certain amount of iteration in the whole subject. So assuming that the economics of gas production remain market driven, the answer to the question where we will be in 30 years is two-fold. Firstly, wherever the market drives us and secondly, technologically at least one step further than we are now. I would hope anyone reading this article 30 years from now in the GPAE would be able to reflect that the organisation played its part in creating the technical environment, both in terms of know-how, and its dissemination, to make it all possible. Certainly the GPAE in the last 30 years has performed this job admirably. Which to finish off, is the reason we all belong to the organisation. So happy 30th Anniversary GPAE and thanks to all those who have given their time to make it possible. Here's to the next 30 years.

Keith Thomas

KNOWLEDGE EXCHANGE OFFERS NEW INSIGHTS INTO GAS TREATMENT PROCESSES

By Naomi Sells, Knowledge Exchange Project Officer, University of Manchester

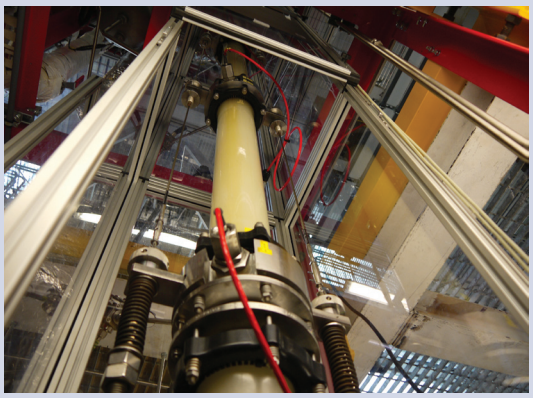
Deep water gas production requires sea bed pipelines at increased depths and distances as gas demand increases and older, shallower, fields deplete.

The low temperatures and extreme pressures found at such depths pose a challenge for production engineers as the gas and water form solid particles called hydrates that agglomerate and cause pipeline blockages. To solve this problem, monoethylene glycol (MEG) can be injected into the pipelines to prevent the formation of hydrates. The increased practice of MEG injection is opening up new opportunities to sell processes that can reclaim MEG from pipelines for reuse, leading to improved economic and environmental performance. Cameron is a leading provider of flow equipment products, systems and services to worldwide oil, gas and process industries. To exploit the market opportunities associated with MEG reclamation, Cameron's Process Systems division were keen to access The University of Manchester's world leading expertise.

The University of Manchester has a strong tradition of using its research to make a positive impact on real world challenges. Knowledge Exchange forms an integral part of the University's research strategy, working to drive improvements and growth in a wide range of external partners across all sectors. A highly qualified team of knowledge exchange experts offers a range of mechanisms and support for building mutually beneficial collaborative projects. An 'Exploitation Secondment' knowledge exchange project partnered Cameron with world-leading academics from the School of Chemical Engineering and Analytical Science (CEAS) at The University of Manchester. This supported the secondment-out of academic staff and secondment-in of Cameron's engineers

to focus on the further development of research outputs emerging from Engineering and Physical Sciences Research Council (EPSRC) funded research.

In doing so Cameron gains access to specialist expertise in the fundamentals of modelling for multiphase systems, corrosion, crystallisation, and solids separation – all of which are integral to the MEG reclamation process. Cameron also benefits from use of the University's unique pilot scale laboratories, where they have installed a bespoke MEG reclamation pilot rig over three storeys, which is capable of



replicating real plant conditions to aid the improvement of industrial equipment and process design. The three year collaborative project covers the following activities:

- **Technical experiments** investigating key processes, such as salt crystallization in mixed solvents, facilitate knowledge transfer and have led to new insights in the MEG Reclamation process.
- **Industrial trials** develop extensive in-house knowledge of end-users' successful operation strategies for real plant fluids with diverse characteristics.
- **Management tasks** have focused on best practice for embedding the newly acquired knowledge within the company, enabling successful exploitation.

The Knowledge Exchange project provides an invaluable platform for Cameron and The University of Manchester to advance their knowledge of the complex processes occurring in MEG reclamation units. These new capabilities are being embedded within the company to enable it to generate ideas for further process improvements in this area. The project has also produced direct financial gains for Cameron. By installing a state-of-the-art pilot scale MEG reclamation rig, Cameron are able to demonstrate their proprietary technology at a suitable scale and this evidence base has helped boost sales of their PureMEG™ Reclamation and Regeneration units.

Importantly, this project has cemented the relationship between Cameron and the University. "Cameron has benefitted from partnering with The University of Manchester beyond knowledge transfer from the University into Cameron's PureMEG™ technology," says Brian Messenger, Cameron's Senior R&D Engineer. "Cameron's HR Department has established links with the University to facilitate recruitment of University of Manchester graduates on to Cameron's graduate training programme." The collaboration has also led to extensive follow-on activity. Further investment has been made by Cameron for a bench scale version of the MEG process to be used in various research and industrial projects, generated as a result of the knowledge transfer project.

For the academic team the project has provided an exceptional opportunity to apply specialist techniques and knowledge developed at the laboratory scale to a pilot scale process. Crucially, the University will continue to benefit from the project for years to come. £1M state-of-the-art pilot scale MEG reclamation rig was donated to the University on commencement of the project, providing hundreds of researchers and students with unique hands on experience of industrial applications. The project has also raised the University's international profile. In 2011, over 90 delegates from major oil and gas producers attended the MEG pilot plant launch event at the University. "The project has opened up the oil and gas sector to my multiphase processing research group, initiating numerous research projects," says Dr Peter Martin, Senior Lecturer in Chemical Engineering. "Every year hundreds of undergraduates now benefit from using the processes in our state-of-the-art facilities."

Manchester's world-leading expertise is paving the way towards more efficient and environmentally friendly upstream gas treatment processes. "In the 35 years I've been in this industry, I've never been as excited by anything as much as the research being carried out here," says Gary Sams, Cameron Process Systems' Director of Research and Development.

For more information about engaging in Knowledge Exchange activity at The University of Manchester, please visit www.manchester.ac.uk/ke

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ASSIGNMENT DAY
(MEMORIES OF A JOURNEY TO THE US)

Note from the editor:
Based on personal experience (trying but failing miserably to get to recent GPA meetings due to a long list of misfortune: inclement weather; signal failure; power cuts etc etc), the editor felt a great deal of sympathy for the following submission and couldn't resist publishing, if only to prove that she's not the only one who has difficulty with travel arrangements!

Okay, I admit it! The events of that trip to Houston are a painful memory and a therapeutic recounting is probably long overdue. So, Dr Freud, I'll recline on your couch and get the whole sorry saga off my chest.

"We want you to go to Houston for a couple of weeks to work on a proposal. Travel on Sunday and report to the office at 7 a.m. Monday morning."

During our careers, we've all heard, or will hear, these, or similar words. So clutching my club-class Continental Airlines ticket (yes, the 1980's were halcyon days!), I set out at 08:30 a.m. Sunday morning to make my way to Gatwick Airport. No body scanners, X-ray machines, clear plastic bags or 100ml fluids limits, so I was checked in and at the gate comfortably in time for the scheduled 11.00 departure.

Uh-oh! Take-off time comes and goes, but no boarding call – the first hint of trouble to come. At 13.00, a technical fault is diagnosed and the flight is cancelled. I am transferred to the Air New Zealand flight to Auckland via Dallas leaving at 16:30 and will be upgraded to first class. Oh, happy day!

"What do you mean there are only eleven spare first class seats available and I am passenger twelve?" "Sorry, sir, we'll have to put you in Economy."

Ten-and-a-half hours later I arrive in Dallas, stiff and travel weary. US immigration safely navigated, I reach baggage claim to collect my bag and clear customs. One hour later, my eleven erstwhile club class fellow passengers and I are still waiting for our bags to appear. No luck! We all queue to report them missing, only to be told to do it in Houston.

Do you know how long it takes two girls to handwrite boarding cards for 177 re-routed passengers? I'll tell you – two-and-a-half hours, and if you lose your bags and are at the back of the queue, you get to enjoy every minute of the wait!

I stagger to the deserted gate to catch my flight. Hang on – where is everybody? Surely, I am not the only person on the 11 p.m. Dallas – Houston shuttle? Check the departure board – last minute gate change! I should be at the other end of the long terminal building. I discover that I can still run 400m in under a minute – a feat not accomplished since leaving school.

My Delta flight finally reaches Houston International at midnight local time. Trek from Terminal B to Terminal C to tell Continental that they have lost my bags. "It's nothing to do with us. It's the responsibility of your last carrier into your destination." Walk back to terminal B to tell Delta that they have lost my bag and that it might be in London, Dallas or Auckland. How bizarre – Delta didn't even know I existed until I got to Dallas!

Finally, at 01:45 a.m. Monday morning, I grab a taxi to my hotel. I don't even have the energy to question why the cabbie is drinking a beer on the freeway. I reach my hotel at 02:30 and fall into bed exhausted after, what feels like a lifetime, but is really only 24 hours since leaving home. Wide awake at 6 a.m. because of jet-lag, I report to work at 7 a.m. as instructed and am promptly sent back to bed. There is a God!!

My bag was finally returned on Tuesday, two days after my arrival at head office. It had, of course, been found in Cleveland. Apparently, checked-in bags on cancelled flights are placed on the next available flight of the original carrier. Continental Airlines, Gatwick to Cleveland.

Simple, eh?!

Anonymous

GPA EUROPE SPRING CONFERENCE
PARIS, 13–15 MARCH 2013

THURSDAY 14TH MARCH • MORNING SESSION

Despite the adverse, and extremely un-spring-like weather conditions, the majority of the audience managed to make it to the conference, awaiting the proceedings with great anticipation.

Revamp of an Offshore Gas Dehydration and TEG Regeneration System

The opening paper of the day was presented by Steve Gale, Technical Director with WorleyParsons, specializing in Gas Processing.

Steve described the challenges of revamping an existing offshore gas dehydration system in a "brownfield" environment.

Integration of an existing production platform, with a new wellhead platform development project, imposed a significant change of duty requirements for the existing gas dehydration unit. This more onerous gas dehydration duty was eventually achieved by means of a new glycol stripper containing high efficiency structured packing, in order to comply with the height constraints.

Steve Gale

The revamped unit was successfully re-started in January 2013, offering a high performance level as its lean glycol strength even exceeded the design requirements.

The presentation was concluded by numerous questions and remarks from the audience.

Eddie McHugh

Chemical Injection and Gas Metering for Subsea Gas Processing

The second paper, Chemical Injection and Gas Metering for Subsea Gas Processing, was presented by Eddie McHugh, the R&D Manager of Cameron Flow Control, based in Longford, Ireland (co-author Don Augenstein, also from Cameron).

The paper explained how Chemical Injection Metering Valves (CIMV) have been developed to meet the challenges of proper chemical injection at multiple subsea well heads.

Such challenges include long term effects of fluid particulate, chemistry issues caused by re-generated fluids (including varying water cut, aggressive chemical inclusions and varying fluid viscosities), and fluid dosage accuracy issues over a wide flow rate range.

The paper finally introduced the newly developed Gas Lift Metering Valves (GLMV), built upon the CIMV design principles and allowing the metering and control of gas via ultrasonic transit time flow measurement.

COSWEET™ makes COS Removal Compatible with Selective H_2S removal

Due to the cancellation of the third paper initially planned for the day (The Twin IPM Approach), Géraldine Laborie's presentation directly followed Eddie's, and inaugurated a sequence of French speakers that would last through most of the day.

Géraldine Laborie graduated in chemical engineering in 1998 at INSA Toulouse, and joined Prosernat in 2001 as a Process Engineer after starting her career in IFPEN. Géraldine now supports Prosernat's process engineering activities and the development of new technologies.

Co-authors of the paper were Gauthier Perdu and Laurent Normand of Prosernat, and Julia Magné-Drisch, Jérémy Gazarian and Sébastien Gonnard of IFP Energies Nouvelles.

Géraldine Laborie

COSWEET™, is developed for the treatment of natural gases containing COS, and is based on a combination of de-acidification with any alkanolamine solution, and COS destruction on a metal based catalyst.

The paper showed its benefits to CAPEX and OPEX, resulting from the quality of the acid gas which has positive consequences on the design of the Sulfur Recovery Facilities Units, and explained the results obtained on COS conversion, the model and simulation tool as well as a case study showing the advantages of coupling COSWEET™ to amine based solvent.

Gas Pre-Treatment on Molecular Sieves: FLNG Specificities

The morning session was closed by the presentation made by Alexandre Terrigeol, CECA's Technical & Market Manager in charge of Oil and Gas projects.

Holding Masters Degrees in Chemical Engineering and in Chemistry and Physics, Alexandre explained how the size and the performance of Molecular Sieve units can be optimized in an FLNG context, where usual and specific concerns such as safety, space optimization, process reliability and flexibility need to be addressed.

Even though the liquefaction of Natural Gas is a very well-known process, marinisation brings new constraints to the gas pre-treatment chain. These issues were studied in detail in the presentation, leading to the conclusion that solutions exist for footprint and weight optimization and for process simplification and reliability, and that molecular sieves can be a part of these solutions.

Alexandre Terrigeol

The reduced agenda due to cancellation of one paper allowed plenty of time for questions and comments from the audience, without needing to shorten the lunch break (which is, as everybody knows, a *"moment sacré"* in France).

Report by Gilles Aubert, Fives Cryo

The Marriott Rive Gauche - a great venue

GPA EUROPE SPRING CONFERENCE PARIS, 13–15 MARCH 2013

THURSDAY 14TH MARCH • AFTERNOON SESSION

While snow was melting in the streets of Paris on that afternoon, GPA Conference participants gathered for a "chilly" afternoon technical session addressing mostly "below 0°C" topics, such as NGL recovery, cryogenic heat exchangers, FLNG or depressurization. Interest nevertheless remained "hot" thanks to the high quality technical content of all the presented papers.

A New Approach to Debottlenecking of NGL Recovery Units

This paper was presented jointly by Sandra Thiebault and Julie Gouriou, both Process Engineers from the Gas Department of Technip in France. (Co-authors Vanessa Gahier and Christian Bladanet, also of Technip.) The paper described and evaluated various options to debottleneck an existing NGL recovery unit with the aim of increasing the ethane recovery level from a current level of 40% up to 98%, while keeping the number of additional equipment items minimal. At the same time, the propane recovery level is expected to be increased from 88% up to 99%. The existing process configuration was described, followed by an outline of several debottlenecking process options: Single Reflux Scheme; Dual Reflux Scheme; Cryomax®DEER-L; and Cryomax® DEER-R. The two latter options are recently patented processes which form a part of Technip 's Cryomax® license family. The different processes were compared in terms of achievement of the recovery objectives, number of additional equipment required and compression power. Recovery objectives can be achieved with all 3 last process options but not with the Single Reflux Scheme. DEER-L allows 8% compression power reduction compared with the Dual reflux Scheme, with exactly the same number of additional equipment items for both processes. DEER-R allows a 25% compression power reduction with only one more additional equipment item. In the final section of the presentation, the advantages, especially in terms of energy efficiency, of these two patented processes were also highlighted in the case of grassroots projects.

Sandra Thiebault and Julie Gouriou

Dynamic Simulation of Plate-fin heat Exchangers in Start-up Conditions

The paper was presented by Florian Picard, Specialist of cryogenic heat exchangers simulation and development at Fives Cryo. It illustrated how dynamic simulation can be used in order to study transient conditions in Brazed Alumina Heat Exchangers (BAHX). As an example, the case study of 2 different start-up procedures of a BAHX used in an ethylene plant was presented. Dynamic simulations for the two cases were performed with software internally developed at Fives Cryo. After describing the process configuration of the BAHX, its stacking sequence and the two considered start-up modes (1 – start-up by injecting cold liquid streams, 2 – start-up by injecting all streams in gas phase), detailed simulation results were presented for both start-up scenarios. Critical data such as outlet streams temperature profiles, mean plate temperatures according to length and time, and maximum temperature differences between adjacent plates, were presented. The study demonstrated that the second scenario was preferable since it allowed lower levels of thermal stresses on the BAHX. It was concluded that this kind of software can be tailored for any kind of BAHX application and used for the study of any type of transient operation mode (start-up, shut-down, trip cases) for instance in order to minimize plant start-up and shutdown times.

Sylvain Vovard

New Processes for Second Generation Offshore Liquefaction Processes

This paper was presented by Sylvain Vovard, Process Engineer at Technip France. (Co-author Dominique Gadelle, also of Technip.) The developments of processes presented in this paper addressed the specific requirements of floating liquefaction units: minimum plot and weight, minimum LPG inventories, maximum operability in a floating environment with the use of proven technologies and equipment.

The first is a pre-treatment process specifically developed for applications where no commercial production of C2+ components is required. This new process allows the production of a C4- stream which can be liquefied, and a low vapor pressure stabilized condensate stream, without the use of cold boxes as in conventional NGL recovery processes. This reduces the plot requirements and increases the robustness of the process.

The second process, called Tricycle Process is a three-refrigerant cycle process where each cycle is based on gaseous phase expansion of the refrigerant (Brayton cycles). The refrigerants used in the different cycles are based on methane, nitrogen of streams from the feed natural gas, with no need for any external refrigerant stream import or NGL production. The fact that no liquid NGL streams are used increases the safety of the process and also makes it more suitable to use in a floating environment, while offering a higher efficiency than the conventional nitrogen cycle process.

The third process, called HiPur, is an end flash process developed by Technip which allows the production of high purity nitrogen (< 0.1% residual HC). Liquid nitrogen and helium can also be produced by this process as may be required.

TOTAL's Approach to Selecting the Driving Mode for F-LNG

The paper was presented by Denis Chrétien, in charge of development of cryogenic processes for TOTAL. In this paper a comparison was made between the following three driving modes of compressors in a liquefaction process on a floating environment: direct drive by direct coupling between gas turbines and cycle compressors; steam drive; and all-electric drive. A generic study has been made for a 2.5 MMTPA floating LNG unit, using a nitrogen refrigeration cycle with CO_2 pre-cooling as the liquefaction process. The comparison considered the following criteria: design flexibility; operability; availability; inspection and maintenance requirements; weight; plot requirements; safety; and utility consumption. No significant differences between the three options appeared in terms of design flexibility, weight and lay-out. Regarding operability, inspection, maintenance and safety, the direct drive option is less favoured that the two other options. Although there is no significant difference between all options in terms of CAPEX, the fact that the steam drive requires about two times higher utility (fuel gas and cooling water) consumption than the two other options, makes it the least attractive from an economic point of view. The paper clearly concludes that the all-electric drive option is the most attractive for a floating environment and that this conclusion is backed-up by the positive experience that TOTAL had on other kinds of FPSOs, highlighting the Akpo experience with 100 MW electric power installed.

Denis Chrétien

Simone Amidei and Paul Sikora

Efficient Gas Depressurisation via the EGPT Process

The final paper of the day was presented jointly by Paul Sikora, Technical Director at EcoCute Innovation and Design and at EGTP Ltd, and by Simone Amidei, New Industrial Applications Technology Leader in the Global Service of GE Oil&Gas. (Co-authors James Byrne of EGPT and Francesca Monti and Stefano Ghiraldo of GE Oil and Gas.) The paper addressed the recovery of the energy lost at pressure reduction steps in gas distribution pipelines. Energy is lost not only because of loss of potential mechanical energy in the throttling valves usually used, but also because of the need to pre-heat the gas before depressurization, in order to avoid excessive cooling of the gas. The paper discussed the potential of energy recovery from such gas expansions estimated at 23 GW of electrical power at the world scale. The efficiency of the new patented EGTP process, combining recovery of mechanical power from gas expansion with gas pre-heating through a CO_2 transcritical heat pump, was then discussed. Pay-back times between 3 and 7 years were claimed according to local conditions and the main merits of the process were highlighted: savings in natural gas through avoided gas heating, production of clean power and as a consequence, reduction of CO_2 emissions.

Report by Christian Streicher, Prosernat

The speakers and moderators in a very cold Paris

GPA EUROPE SPRING CONFERENCE PARIS, 15 MARCH 2013

KNOWLEDGE SESSION – SUBSEA PROCESSING

Jagadeesh Unnam of Cameron (OneSubsea - A Cameron & Schlumberger Company) started the Friday knowledge session about subsea processing in front of a large and attentive audience.

The session was planned to be held by both Jagadeesh Unnam and John Byeseda of Cameron. Unfortunately John Byeseda was prevented to attend by illness and Jagadeesh had the unenviable task of presenting alone, all morning.

Jagadeesh Unnam

The goal of the session was to introduce the audience to not only the reasons that operators would consider subsea processing for either green or brown field scenarios but also to provide a broad understanding of the subsea production environment. With this general introduction to the subsea production world, the attendees could gain better insight into the design and operation of subsea processing equipment and systems.

Subsea processing technologies can provide the following benefits depending on the reservoir and project specifications:

- Increased wellhead flow
- Greater ultimate recovery from the reservoir
- Decreased operating expenses over project life
- Decreased or delayed capital expenses
- Enabling projects that might not otherwise be considered

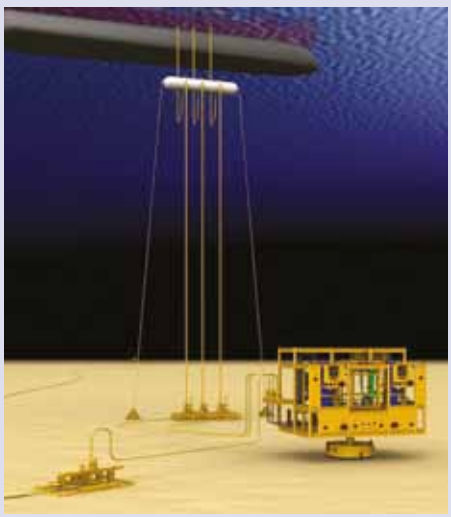
The technical session was divided into three main parts: in the first part, Jagadeesh presented an overview of subsea processing; the second part was dedicated to specific projects and the technology involved; and finally the session ended with technology gaps.

Jagadeesh started by presenting what the subsea architecture within an oil and gas field is, detailing the different field layout options such as cluster wells, templates, satellite wells and daisy chain wells and explaining the factors that influence the choice of field architecture layout. These parameters are many and varied, such as reservoir data, geophysical and geotechnical data, metocean, production strategy, installation scenarios, local infrastructure, not forgetting costs, schedule, company and location preferences. Means to intervene and install subsea equipment were then reviewed.

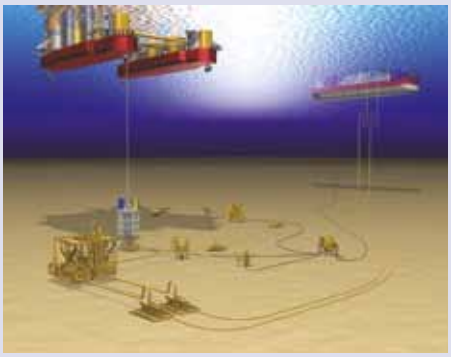
After this submersion in the subsea world, the audience was invited to the surface: the different topsides processing technologies required to treat well fluids were presented and the ones identified with potential subsea use within a subsea architecture were listed: boosting; separation; compression; water injection; metering and sampling. Subsea processing technology status was then explained for each of these technological families.

After the break and a lot of relevant questions, Jagadeesh Unnam presented multiphase boosting and separation. For these two systems, key characteristics, number of projects using the technology and maturity of this technology were detailed. Each aspect was well documented and the Cameron portfolio highlighted each time.

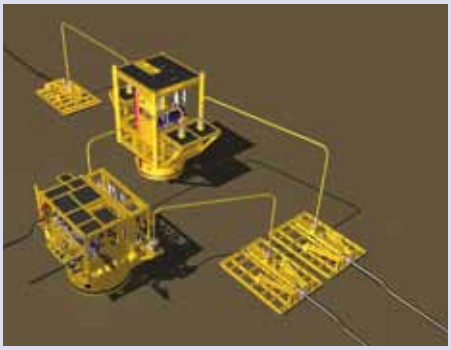
Regarding compression, the need for subsea compression and the advantages for subsea equipment was explained with examples of the options to enhance production. Then Jagadeesh focused on the deployment of subsea compression through the presentation of three flagship projects (Gulfaks, Asgard and Ormen Lange). For each project, field layout and key features of the compression module were given in addition to the drivers and challenges. Increase of water depth was outlined, from 135m for Gullfaks, 260m for Asgard to 1100m for Ormen Lange. The Compression section



Subsea processing



Subsea processing architecture



2 phase compact separation and boosting field layout

ended with a list of the challenges of this subsea technology such as the modularization, maintenance and power supply. Gulfaks and Asgard used alternative current with topside transformer while Orman Lange choice is alternative current with subsea transformer. The question of high voltage power distribution and power transmission was clearly identified as one of the key challenges for subsea processing.

Finally technology gaps were summarised: power supply and control concerns, robustness, reliability, separation efficiency. The use of all-electric control was discussed. This increases system reliability as well as eliminates potential discharges of hydraulic fluid. Furthermore, electric-operated valves offer fast response time that is necessary for accurate control of subsea processing systems. Electric actuation and control is an enabler for longer step out distances and deeper waters

Jagadeesh Unnam then described the ultimate goal, the subsea factory concept, process plant on seabed enabling remote controlled transport of hydrocarbons, a key to success in Arctic areas and deep-water areas.

Hélène Gauthey
Head of Upstream Offshore & Onshore Process Department

GPA AWARDS FOR 2012

The Aungier Award for Best Paper by a Younger Professional has not been awarded for some time due to the absence of any papers by Younger Professionals. However, thanks to a number of recent presentations, the Programme Committee of the GPA Europe was able to revive the reward in 2012. The committee was delighted to announce Stine Faugstad as the winner of the 2012 Aungier Award for her paper *"Natural Gas Liquefaction using Nitrogen Expander Cycle – An efficient and attractive alternative to the onshore base load plant"*, jointly authored with Inge Nilsen, and presented at the 2012 November AGM Technical Meeting. Stine discussed the analysis carried out during the design development of Nitrogen Expander Cycle for use in onshore base load natural gas liquefaction. The analysis concluded that there was no significant difference in overall thermodynamic efficiency between propane pre-cooled cycle and a dual nitrogen expander process particularly when considering the liquefaction drivers. The presentation prompted some debate in conference but was considered to have been an excellent analytical exercise.

Stine Faugstad – Winner of the 2012 Aungier Awarda

Alexandre Terrigeol – Winner of the 2012 Best Paper Award

The GPA Europe is keen to encourage other Younger Professionals to offer papers for presentation and to this end the Aungier Award, worth £1,000 is hoped to provide encouragement.

The Programme Committee has also selected Alexandre Terrigeol's paper, *"Molecular Sieve Contaminants: Effects, Consequences and Mitigation"* as the Best Paper of 2012 presented at the Annual Conference in Berlin in May 2012. Alexandre's paper discussed the impacts contaminant components present in Natural Gas streams can have to molecular sieve performance and bed life. Particular contamination discussed included oxygen, NaCl, liquid water and hydrocarbons and amines carryover. The paper was well-presented and served as a useful reminder to designers of the dangers of ignoring low concentration contamination.

In order to have papers selected as Best Paper available for offer to the GPA Annual Convention in the USA, GPA Europe now intends to select the Best Paper for 2013 from those presented at Conference between November 2012 and September 2013 and annually on this basis thereafter.

GPA CITATION FOR SERVICE – SIGBJØRN SVENES

For European delegates, a highlight of this year's GPA Annual Convention in San Antonio was the very well-deserved award of a Citation of Service to Sigbjørn Svenes of Statoil.

Sigbjørn graduated in Chemical Engineering in 1985 from the Norwegian University of Science & Technology (NTNU) in Trondheim. He then spent three years working on offshore oil and gas projects for an engineering company before joining Statoil. His areas of expertise cover gas processing and LNG and he has held a series of progressively more senior positions (technical and administrative) in R&D through design, construction and operation, up to his present role as "Leading Advisor Gas Processing and LNG Technology" in Statoil Research.

Sigbjørn joined GPA Europe in the early 1990s, its Programme and Management Committees a few years later and served as Chairman from 2003–05. In this role he oversaw the establishment of GPA Europe's dedicated Administration office. He remains a member of the Management Committee and, in 2011, also served on the sub-committee which managed the change of GPAE's legal status to the limited company of which he is a Director.

Well-deserved recognition for Sigbjørn Svenes

In the GPA US, he has attended the Annual Convention for twenty years and received an Outstanding Paper Award for his paper *"Major Expansion at Kårstø Gas Plant; Utilization of Synergies and Optimal Integration"* presented at the 1998 Convention. He has represented Statoil on the GPA Board of Directors since 2007 and was very active on the Technical Committee as Vice-Chair 2008–10 then as Chair 2010–12.

It was commented that Sigbjørn manages all this activity while living in Trondheim which, at latitude 63°N, is further north than Anchorage, Alaska!

As his casual dress suggests, the award at the President's Luncheon came as a complete, and we hope, pleasant surprise to Sigbjørn.

Colin Woodward

FORTHCOMING EVENTS

2013

September 18-20
Roxburghe Hotel, Edinburgh
30TH ANNUAL CONFERENCE

- 2 x Young Professional Training Sessions
- 4 x Half day themed Sessions
  - LNG Production & Regasification
  - Commercial Issues
  - Offshore Applications
  - Gas Treating
- Special Gala Dinner
- Companions Tour
- Golf Tournament

November 21
Hilton Paddington Hotel, London
KNOWLEDGE SESSION, AGM & TECHNICAL MEETING
"Safety & Asset Integrity"

2014

March 12-14
Marriott Rive-Gauche Hotel, Paris
2014 SPRING MEETING, PARIS
"Offshore Gas facilities and their Operation"

September 17-19
2014 ANNUAL CONFERENCE - MADRID

November 2014
KNOWLEDGE SESSION, AGM AND TECHNICAL MEETING

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CORPORATE MEMBERS

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

Corporate Level 1 – Premier

Aker Process Systems
Amines & Plasticizers Ltd
Atlas Copco Energas GmbH
BASF SE
Bechtel Ltd.
BG Group
BP Exploration Operating Co.
Compressor Controls Corporation
Costain Energy & Process
Dow Oil and Gas Europe
EON New Build & Technology
Fluor Ltd.
Foster Wheeler Energy Ltd.
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GDF SUEZ
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National Grid
Offshore Design Engineering Ltd
OMV E&P GmbH
Pall Europe
PECOFacet
Perenco UK
Petrofac Engineering Ltd
Saipem SpA
Shell Global Solutions Int BV
Siemens AG
SIME
South Hook LNG Terminal Company Ltd
Statoil ASA
Technip France
Total
Vitol
WorleyParsons

Corporate Level 1

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Air Products Plc
Alfa Laval
Amec Group Ltd.
Burckhardt Compression AG
Cameron Ltd
CB&I Ltd
CB&I Nederland B.V.
CECA SA
ENI Div E&P
Evonik Industries
Genesis Oil & Gas Consultants
Grace GmbH & Co. KG
GS Engineering & Construction Ltd
Huntsman (Belgium) BVBA
Jacobs
Johnson Matthey
Kinetics Technology SpA
Koch-Glitsch
MOL Hungarian Oil and Gas Co.
NORIT Nederland BV
Siirtec - Nigi S.p.A.
Sulzer Chemtech Ltd.
Taminco
Techint S.p.A.
Technip E&C Ltd
Wintershall Holding Gmbh
Xodus Group
Zettachem International

Corporate Level 2

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Bryan Research And Engineering
Chart Energy and Chemicals Inc
Compact GTL
Criterion Catalysts & Technologies LP
Danfoss A/S Oil and Gas
E & P Consulting
E.I.C. Cryodynamics Division
Enerflex (UK) Ltd
Energy Recovery Inc.
Escher Process Modules BV
Exterran (UK) Ltd
FEESA Ltd
Fives Cryogenie
Frames Process Systems BV
G.I. Dynamics
G3
GDF Suez E&P Deutschland GmbH
GEA Heat Exchangers Ltd.
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Hamworthy Gas Systems
Heatric
IMA Ltd.
Inprocess Technology & Consulting Group, S.L.
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Kanfa Aragon AS
M.S.E. (Consultants) Ltd.
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Peerless Europe Ltd.
Penspen Ltd.
PGNiG SA
Pietro Fiorentini
Procede Group BV
Process Systems Enterprise Ltd
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Refrigeration Engineering
Rotor-Tech Inc
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Siemens Nederland NV
SPT Group
Teesside Gas & Liquids
TGE Gas Engineering GmbH UK Branch
Tracerco
Tranter International AB
Twister BV
University of Surrey
UOP N.V.
Vahterus Oy
VTU Engineering GmbH
WinSim Inc
Zeochem AG
Zeta-pdm Ltd

Corporate Level 3

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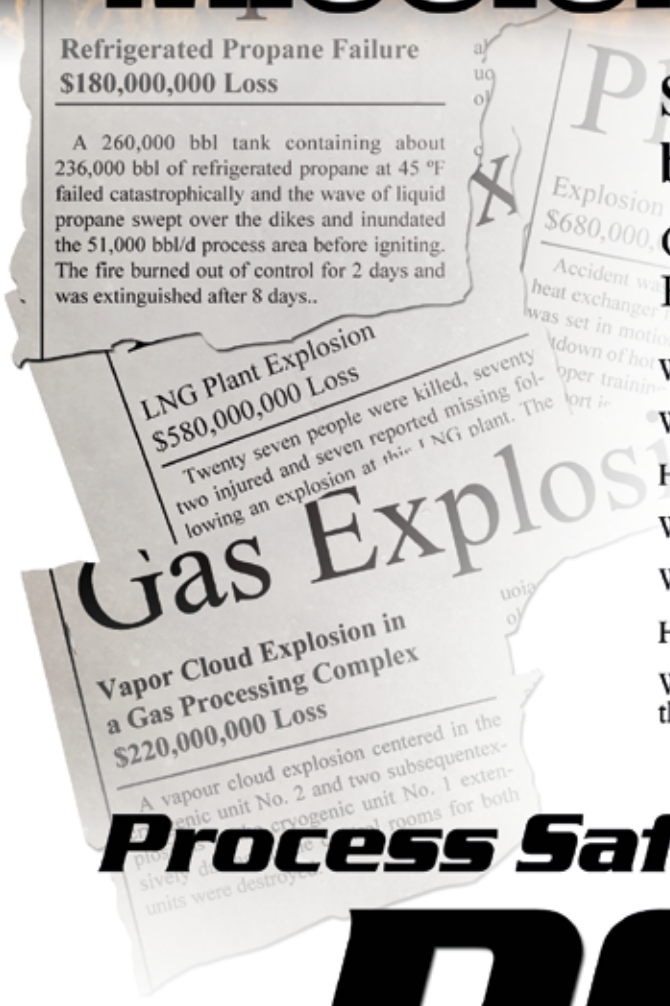
Infochem Computer Services Ltd
Juran Institute BV
Kirk Process Solutions
Matrix Chemicals BV
McMurtrie Limited
MPR Services
O&GBISS BVBA
OAG Ventures Ltd
Optimized Gas Treating
Rowan House Ltd
Softbits Consultants Ltd

HOUSTON KUALA LUMPUR DOHA PERTH LONDON CALGARY BRISBANE
RIO DE JANEIRO ORLANDO BAKERSFIELD DUBAI

Process Safety Engineering has become

MISSION CRITICAL



Slips, Trips and Falls are Decreasing… but Major Incidents are Increasing.

Gain Confidence in Process Safety Engineering by Knowing:

- What equipment causes the biggest problems.
- What processes are causing the major issues.
- How to apply the "Layers of Protection" .
- What are the keys to fundamental risk analysis.
- Where to use process hazard analysis most effectively.
- How to apply detection and mitigation methods for different hazards.
- What "Inherently Safer Design" really means and how to apply the principals in your everyday job and much more.

Process Safety Engineering PS-4

While slips, trips and falls are decreasing, larger and more severe incidents are on the rise. Over 1/3rd of the largest losses in the history of the oil and gas industry have occurred since 2003. Process Safety Engineering (PS-4) looks to address this important issue through referencing historical incidents and recurring problem areas.

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