



# GPA Europe Spring Conference The European Gas Industry

14 – 17 May 2019 | Shell Technology Centre, Amsterdam

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## GPA Europe Spring Conference

**Four Days of Powerful Talks**

**14 May 2019 09:00am**

A new type of event for us. A conference and networking event organised by GPA Europe and hosted by Shell, on the theme of, and organised for, the European Gas Industry. This will be big.

One of the strengths of GPA Europe is the large number of people who have been active members of our organisation and the industry for many years – several of whom will be presenting.

Our conference kicks off on Tuesday 14 May with a day dedicated to our Young Professionals. The Technical Conference starts on Wednesday 15 May.

### Why attend?

Our Spring Conference brings together business and technical leaders from a range of gas processing organisations, at the offices of the world's largest independent gas company, Shell.

- 1 Learn** - Immerse yourself in three days of technical talks and presentations
- 2 Explore** - Discover innovations from GPA Europe partners in one space
- 3 Connect** - Take time to network with other attendees
- 4 Have Fun** - The week wouldn't be complete without our Conference Dinner. Additional activities include our Welcome and Exhibitor Reception



# About GPA Europe

## Who are we?

We are a not for profit organisation that brings players of the European gas industry together to do business around technical stories.

Our role is two-fold:

- 1 GPA Europe promotes technical and operational excellence
- 2 GPA Europe serves as a forum for the exchange of ideas and information

## How can we help you?

We are a not for profit organisation that brings players of the European gas industry together to do business around technical stories.

- 1 Priority and reduced cost access to our conferences
- 2 Introduction to a network of people and companies who can help your business
- 3 Access to the GPSA Databook - every process engineer should have one
- 4 A library of papers
- 5 Contacts with our American and Middle Eastern Chapters
- 6 Innovative ideas that can enhance your business operations

## What's on?

### Young Professional Day

We have a one-day Young Professional Training on 14 May. It is Free.

### Low Carbon Technology Workshop

Join a round table workshop to share views on the low carbon technologies that will influence the future of GPA Europe members.

### Keynote Address

Don't miss the Keynote address by none other than Yuri Sebrechts, Shell's Executive Vice President of Technology and Chief Technology Officer.

### The Executive Panel

One hour in the company of some of the industry's most influential decision makers.

## Technical Conference

Hear from selected speakers during the three-day programme.

## Laboratory Tours

Would you like to know how the world's biggest independent gas company sees the future? You have a chance.

## Exhibition

We have limited, but high quality, exhibition space. Would you like to exhibit your wares in the home of the world's biggest independent gas company?

## Social Activities

Don't miss the opportunities for networking with your peers during your time in Amsterdam.



## Hotel

We have a limited number of discounted rooms available at the Park Plaza Victoria Amsterdam Hotel. Book soon to avoid disappointment.

## Registration Packages

Don't delay, check out our registration packages and pricing.



# The Programme

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TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

Young Professional Day

Reception

Low Carbon Technology Workshop

Keynote Address

Large Capital Project Execution

Exhibitor Reception

The Executive Panel

LNG and FLNG

Operations Troubleshooting

Conference Dinner

Advanced Modelling Techniques / Equipment Advances

Laboratory Tours



# Young Professional Day

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## Who?

The Young Professional Day is designed for people, who have recently joined or are thinking of joining the energy industries. Delegates are anticipated to have a strong technical backgrounds or interest. The day is intended to help in understanding how your technical expertise can be applied within our industry. Our focus is on technical aspects seen in few other industries.

## Why?

So, what's it for you?

Well, you'll return to work with knowledge you didn't have when you left. You'll make contacts and meet people who can help you do your job better and build a broader career and, of course, because...

**High quality training comes no cheaper than FREE.**

## How much?

It's FREE. But take care, numbers are capped. Don't delay in making your booking.

Delegates from non-member companies are welcome to attend for a fee of £ 100.

Accommodation is not included but there are several convenient hotels in the vicinity.

## What?

The day has been designed by the GPA Europe Young Professional Committee and will focus in four areas.

## Young Professional Reception

Following the conference, we would like to invite you to take the short walk to the THT for drinks and canapés. A chance to meet your fellow delegates. Good company and a relaxing atmosphere.

THT is situated in the old canteen of the Shell factory. From 1941-2011 over 1,200 employees of Shell ate their breakfast and lunch here, every single day. Exactly 70 years later the artistic building, that was designed by the architect 'Staal', has been given cultural status.



# Young Professional Day Sessions

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We are delighted to present our 1-day programme to you. Please note this is a provisional programme and subject to change. Information is being added regularly so do come back!

## TUESDAY 14 MAY 2019

### **European Gas Industry: Where are we going?**

Europe is trying to move into a hydrocarbon free economy. This is a process which is expected to take a long time, many decades. But is this consistent with the environmental objectives? Probably not if one examines the numbers and see the size of the gap between Hydrocarbon fuels and Renewables. The total world Primary Energy consumption is 13,511BOE (barrels of oil equivalent) and is growing at 2% per year. The European share of the worlds Primary Energy is 14.6% and is also growing at 1.8%.

In the energy mix, Hydrocarbons (coal, oil and gas) amount to 85% in the world and in Europe 75%, but in Europe this percentage increased about 0.5% in the past year, partially due to closure of Nuclear facilities and reduction in Hydro possibly reflecting climate problems.

So, what is the future of gas? Firstly, gas is now becoming recognised as the best transition fuel whilst the necessary technologies and concepts for renewable improve and mature. Secondly, gas in the form of LNG is developing a strong position in marine and transportation fuels and this will impact on oil consumption. This paper will examine all aspects of these issue and indicate a reliable forward strategy, should our National Governments a willingness to listen to the pragmatic scientists and engineers and less to the environmental lobby.

### **Successful Projects - a Contractor's view**

*Barry Weightman, KBR*

An important aspect of the likelihood of success on any project is to ensure that the starting point information for the contractor is agreed and confirmed within the scope of work supplied the client and used for the basis for design. This also requires a good rapport to be established with the client personnel to ensure data needed by the contractor is provided at all project stages. This will help to clarify the scope of work, minimise change, and avoid undue delays to the project schedule. The presentation will talk through all the issues and concerns surrounding this aspect through a project's lifetime, from the proposal phase through project conception to project handover.

### **A Method of Predicting Transient Pipeline Holdup and Liquid Outflow**

*Peter Kauders, CDE Projects Limited*

At the AGM in London last November doubts were raised over the value of two-phase flow correlations. The purpose of this paper is to recall the experimental work carried out by Esso Australia on gas condensate pipelines in the Bass Strait, published in the Oil & Gas Journal in 1978, and its significance. The author, R. Cunliffe, had made two key observations on pipeline behaviour following a step change in gas flow. One concerned a phenomenon that he termed the transit time. The other concerned the validity of two-phase flow holdup correlations, the Eaton method providing the best fit for the experimental data.

Using Cunliffe's observations, a method was developed for predicting transient pipeline behaviour in which the relationship between liquid outflow and pipeline holdup could be treated in the same way as a first order chemical reaction. This method was subsequently used for a number of gas fields including the Shell SE Indefatigable project in the North Sea, and the onshore Karachaganak project in Kazakhstan. In setting the operating parameters, in effect the operating policy for the pipeline, Owner participation is vital.

The presentation will conclude with a more general review of some design problems in gas plants, and how they can be solved in a straightforward manner.



## **Affordable Carbon Dioxide Capture in the Middle East**

*Author: Michael Turley, Shell Global Solutions International BV*

*Presenter: Matt Mardell, Shell Global Solutions International BV*

Many countries in the Middle East are seeking to harness their vast natural gas resources to meet future electricity demand. In some cases, this natural gas, which can contain up to 35% hydrogen sulphide (H<sub>2</sub>S) and 15% carbon dioxide (CO<sub>2</sub>), may already be needed for enhanced oil recovery (EOR) to sustain crude oil production while CO<sub>2</sub> from gas facilities is vented. This creates a unique opportunity to capture produced CO<sub>2</sub> from sour gas processing facilities, use it for EOR and free the natural gas currently used for EOR for electricity generation. This change in use may reduce the need to develop new natural gas reserves.

However, the captured CO<sub>2</sub> must be affordable for it to be used for EOR. At present, capital costs are high, as low-pressure CO<sub>2</sub> sources in natural gas plants require large amine solvent volumes and thus large equipment sizes. Solvent regeneration steam requirements can also be high, which means high operational costs.

This paper highlights three Shell technologies that can help to reduce capital and operational costs, and potentially cut captured CO<sub>2</sub> costs by 20–40%:

- \* ADIP® ULTRA solvent technology for lowering solvent circulation rates;
- \* Shell Turbo Trays for smaller absorbers and/or fewer capture trains; and
- \* the CANSOLV® CO<sub>2</sub> Capture System for lower steam requirements and/or fewer capture trains.

Keywords: gas processing, technology, CO<sub>2</sub> capture.

## **Carbon Capture Utilisation and Storage, is it the Holy Grail toward a sustainable energy system?**

*Javier F. de la Fuente, Fluor Amsterdam and Nick Amott, Fluor Ltd UK*

Carbon dioxide (CO<sub>2</sub>) has globally been declared the planet's public enemy. Carbon Capture and Storage (CCS) in the short-term and, more importantly, Carbon Capture Utilisation and Storage (CCUS) in the long-term are perhaps the most relevant strategies worldwide to reverse the increasing emissions of CO<sub>2</sub> into the atmosphere. Of course, whilst Carbon Capture might be perceived as an "end of pipe" solution to address climate change, it must also be viewed in the context of rapidly dealing with the mitigation of CO<sub>2</sub> emissions and the burgeoning application of green, renewable and zero carbon energy sources. A number of promising CCU projects have been successful at a demonstration-scale including: (1) producing liquid hydrocarbons (e.g. methanol) from CO<sub>2</sub>, water and electricity; (2) making polyurethanes, polyols and polycarbonates from CO<sub>2</sub> as feedstock; and (3) using CO<sub>2</sub> to accelerate the carbonation of waste residues to produce construction materials. One of the key components for these technologies to become industrially scalable and economically feasible is the capacity to capture and purify CO<sub>2</sub> at a competitive cost. Existing carbon capture technologies, such as amine plants, membranes and physical solvents and their applications are compared to technologies currently under development including the concept of air to fuels, which has been intensively developed by Carbon Engineering, and the use of enzymes as a catalyst to cheaply absorb CO<sub>2</sub>. The presentation comes from the perspective of a Young Engineer and the views of "Millennial's" looking to the future, perhaps tempered by the retrospective of a "Baby Boomer".



## **Low Temperature Process Design (2019)**

*Adrian Finn, Costain*

Low temperature gas processing and liquefaction is a major subject in natural gas processing. It enables the production of natural gas to specification for fuel or chemicals feedstock, extracts valuable components for sale and is used to produce liquefied natural gas (LNG) on which many countries depend for clean energy.

Low temperature processes need cost-effective production of refrigeration and can be very large power consumers, especially for liquefaction. Cost-effective processing relies on understanding the relation between energy and power (or work) and process integration techniques for energy efficiency and optimisation.

Both cryogenic nitrogen removal from natural gas and natural gas liquids extraction need efficient distillation and present challenges in optimising separation processes and energy transfer.

Optimal process design will be discussed by examining some fundamental thermodynamic principles and related process evaluation techniques (especially for multicomponent distillation). These help to screen and select low-cost designs prior to detailed process simulation. Industrial examples will be shown to demonstrate key equipment such as turbo-expanders and plate-fin heat exchangers.

## **The importance of trace components in the development of natural gas processing schemes. What if you overlook an impurity during your design?**

*Bart Beuckels, Honeywell UOP*

The development of a natural gas processing facility involves the careful selection of a series of separation and treating technologies. It is not uncommon that feed gases are poorly specified either due to unknown well head compositions or due to the inaccuracy in analytical measurements. The presence of a component that was not accounted for during design can impact the process performance of the unit and may require changes to the process design or the selection of a different technology all together. It is hence important that the process engineer understands the impact of components that are often not identified in the early phases of the project. Equally important is that the process engineer recognizes an unrealistic design basis. Trace components that need careful consideration are mercury, metals, sulphur compounds including COS and mercaptans, heavy hydrocarbons, methanol, oxygen, helium as well as the possible presence of solids and liquids.

## **Sulphur Plants, The Seven Deadly Sins**

*Jan Kiebert, Sulphur Experts*

Tighter emissions and heavier, more sour, crude processing and more sour gas is putting pressure on refineries and gas plants to ensure high availability and optimum performance of the Claus Sulphur Recovery Units. This paper attempts to reduce the topic of sulphur plant optimization down to its basics. Viewed in this way, it can be seen that there are only seven key items that can reduce sulphur plant efficiency, the Seven Deadly Sins of Sulphur Recovery. Each of these seven sins is analyzed in detail, providing some indication of typical losses in each case based on test results obtained by Sulphur Experts. Additionally, "worst case" examples from Sulphur Experts' files showing the potential for efficiency losses in each of these cases are also presented. This paper can be used as a simple checklist by sulphur plant operators and engineers to determine the potential for efficiency losses in their own facilities, and conversely the potential for optimization of recovery efficiency.



# Workshop

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## Workshop description

We will all be impacted by the agreements made by 202 governments to reduce carbon emissions; the energy industry more than most. Only a fool thinks that he knows the future. Only a fool fails to plan for it.

Like all of the oil and gas companies, Shell is planning for the unknown future and will need the support of their consultants, contractors and equipment suppliers.

In this four-hour workshop, we will present one possible future and some of the technologies that can help to deliver it. We will have some fun, and invite you to share your views on how we as individuals and companies should respond.

The workshop is to be booked in conjunction with one of our conference passes.

## Potential participants

This is a technical workshop. The workshop is intended for people in technical or business development roles who are courageous and confident enough to participate and contribute.

*To facilitate collaborative work and creative environment the workshop numbers will be capped. If you are interested then don't delay.*

## Workshop certificate

A Gas Processors Association Europe certificate will be issued to all attendees.

# The Executive Panel

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## What?

One hour in the company of some of the industry's most influential decision makers. After a brief opening statement from each of the panel members, the floor will be open to questions from the audience on any subject.

To help the proceedings flow, they will be facilitated by Nick Amott, a member of the GPA Europe Management Committee.

To help the shy and the timid, questions can be posed via an on-line app. The seriously timid can even remain anonymous.



# Technical Conference Sessions

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We are delighted to present our 3-day programme to you. Please note this is a provisional programme and subject to change. Information is being added regularly so do come back!

**WEDNESDAY 15 MAY 2019**

## Large Capital Project Execution

### **The Insoluble Equation: How to Balance Europe's Natural Gas Supply and Demand**

*Adrienne Blume, Hydrocarbon Processing*

The balance of supply and demand of natural gas in Europe is approaching a perfect storm, blown by geological, geopolitical and regulatory forces.

Although North Sea production is still very active, supply continues to decline, and production of the giant Groningen field continues to be reduced following earthquakes induced by the depleted reservoir.

On the other side of the equation, Europe's gas demand continues to increase in line with GDP growth. Also, many governments have agreed to phase out coal for power generation; gas is the obvious alternative. Countering this is the unachievable goal of reducing CO2 emissions by 20% of 1990 levels per decade and energy-efficiency initiatives in the industrial sector.

The equation has many unknowns, but there are options for filling the gap. Few technical barriers exist but many geopolitical considerations are on the table, informing views on the security of supply.

Additional gas imports are available via the northern corridor (Russia), the southern corridor (the Caspian) or, with new discoveries in the Eastern Mediterranean, from the Middle East and Africa. LNG is available from the usual sources, but with two new and competing players: the ever-growing capacity of Russia's Arctic LNG projects, which are cheaply and reliably available now; or from new liquefaction projects yet to start up in the US.

In this paper, we will discuss the choices available to the governments of Europe, along with their relative merits and potential consequences, and paint a picture of just one of several futures for European gas.

### **Pursuing Local Content Sustainably**

*David Simmonds, Simmonds Energy Ltd*

Project delivery requires both investors and governments to consider local content. Governments usually insist on this to maximise local and state benefits including jobs, achieving this through legislation. Investors, on the other hand, look to minimise cost, maintain schedule and maximise returns. A blanket approach to policy drives inefficiencies through promotion of non-sustainable local goods and services and corrupt practices. There are many examples where it has been difficult to square the circle on these and other stakeholder drivers, and local businesses and communities become the pawns in the final solution. In extremis, projects may not secure sanction eliminating potential for any benefit.

In this presentation, based upon personal experiences in the Oil and Gas sector, I will outline new strategies for local content to successfully deliver major projects AND long-term jobs sustainably. These must be project specific and consider improved planning of a region's infrastructure needs, skills levels, local jobs and growth opportunities. A 'planned, opportunity driven regional approach' to project execution will foster a virtuous development cycle tempering the demands of governments, civil societies and local communities, ensuring investors and donors secure more favourable hearings as they look to develop major projects sustainably in a changing world.



## **Yamal LNG – A Project Beyond Limits**

*Christian Bladanet and Christophe Thomas, Technip*

After four years of development, the Yamal LNG plant is now producing at full capacity. From design to operation, through construction, module shipment and commissioning, this article will share some insight of the extraordinary journey of the project, and how a wild white land was turned into a profitable and sustainable plant. Finally, the methodology to validate the operation beyond its nameplate capacity, taking advantage of the coolest months of the year will be described. Through insight of the challenges tackled and amazing pictures of some of the largest modules shipped through the Northern Sea Route, the authors will share some of the passion that made this project come true.

## **THURSDAY 16 MAY 2019**

### **Sky: A scenario to meet the goals of the Paris Agreement**

*Eric Puik, Shell*

The Paris Agreement has sent a signal around the world: climate change is a serious issue that governments are determined to address.

Shell published its latest energy-system scenario, called Sky, which illustrates a technically possible, but challenging pathway for society to achieve the goals of the Paris Agreement.

Scenarios are not policy proposals – they do not argue for what should be done, nor forecasts – what will be done. They are not predictions, nor Shell business plans and investors should not rely on them to make decisions. Rather, they can help reveal useful insights for the present and provide flexible guidance around which actions and opportunities can form.

## **LNG and FLNG**

### **Zero Refrigerant Liquefaction – developments in the ZR LNG Technology**

*Bill Howe and Geoff Skinner, Gasconsult Limited*

Increasing LNG plant complexity and the high capital costs associated with recent mega-scale LNG developments are being challenged to improve project economics and reduce commercial risk. The patented ZR-LNG process requires no external gaseous or liquid hydrocarbon refrigerants, no refrigerant extraction, import system or storage facilities and no ongoing refrigerant make-up. It provides a simpler and safer low-cost liquefaction solution whilst achieving an energy efficiency close to dual mixed refrigerant schemes. Heavy components and aromatics can be removed within the expander-based ZR-LNG liquefaction unit, without need for a scrub column or stand-alone upstream turbo-expander NGL recovery unit, thus significantly reducing investment cost and footprint of the liquefaction train.

This elimination of equipment reduces capital cost and together with the absence of liquid hydrocarbon refrigerants makes the process particularly well suited to FLNG where weight, space constraints and safety are key design drivers.

The paper will describe the design development of a gas turbine driven nominal 1.5 Mtpa FLNG unit and other recent developments around the ZR-LNG process. Data on process efficiency, footprint, weights and costs will be included.



## LNG and FLNG

### **CeFront – Improved hull design leads to greater stability and better economics for FLNG**

*Lars Odeskaug, Front Energy; and Saeid Mokhtab, Gas Processing Consultant*

Natural gas is the cleanest and most environmentally friendly fossil fuel, and as global demand for natural gas increases, the development of offshore Floating Liquefied Natural Gas (FLNG) production technology is becoming an important factor in maintaining sustained growth. Although offshore FLNG production concepts have been the focus of research and development for decades, it is only in the last ten years that a few FLNG projects have achieved a Final Investment Decision (FID) and have progressed to detailed design and construction.

The Cefront FLNG vessel provides a more stable and economical platform for the offshore gas pre-treatment and liquefaction processes than conventional ship-shaped hulls. It is a further development of the axisymmetric hull and is more fabrication “friendly” and thereby less costly than earlier designs. The Cefront FLNG vessel has a more efficient topsides layout than the axisymmetric units, and at the same time it has significantly less pitch and roll motions than a conventional ship-shaped hull. This eliminates the need for expensive turret and swivel solutions.

### **Compact and Light Weight Boil Off Gas Management**

*Cinzu Czenn, Sulzer*

On a Floating Storage Regasification Unit (FRSU), LNG carrier or on-shore LNG storage, excess boil-off gas (BOG) is inevitable. BOG has to be recondensed for environmental and economic reasons. Conventional BOG recondensers are relatively large columns equipped with structured packing. With limited space on FSRUs and LNG carriers, a smaller unit is preferred.

Sulzer has developed an innovative way to recondensing BOG incorporating its static-mixing technology. Instead of having gas as the continuous phase, liquid is the continuous operation in the new unit. The BOG distribution orifices on its inner pipe enable the unit to operate in a self-regulating manner, and therefore a wide range of load conditions is handled without the need for complex controls. This results in a smaller, lighter recondenser with a lower footprint, suiting it well for FSRUs or LNG carrier application.

This compact and lightweight recondenser has been in successful commercial operation since 2012.



## Operations Troubleshooting

### **Why Sulphur Plants Plug**

*Jan Kiebert, Sulphur Experts*

Plugging of piping and vessels within modified-Claus sulphur recovery units is extremely common, and the causes are often poorly understood, and the proper solutions often improperly implemented. In some cases, the plugging causes additional pressure drop through the sulphur plant, resulting in reduced sulphur plant capacity and possibly limiting the gas plant or refinery throughput as well. In other cases, it results in complete blockage of parts of the sulphur plant, often meaning an unplanned shutdown, high SO<sub>2</sub> emissions, expensive turnaround costs, and lost gas plant or refinery production. The first step in dealing with sulphur plant plugging is to have the proper monitoring methods to detect plugging, the right tools to locate where the plugging has occurred, and the right methods to analyze the plugging material in order to determine the root cause(s) of the plugging. The most common root causes of plugging include; soot formation from poor stoichiometry during fuel gas startups and shutdowns; ammonia salt formation from poor reaction furnace destruction and / or over oxidizing process environments; alumina dust from refractory or catalyst pieces and fines; iron-based corrosion products from a variety of corrosion mechanisms; and frozen or high viscosity sulphur from incorrect process temperatures or incorrect vessel insulation / heating. The key to avoiding plugging is to understand and avoid these plugging mechanisms in the first place, and processing, design, and procedure options for each of these areas are discussed in this paper. In addition, some of these plugging mechanisms can be reversed on line, and recommended reversal procedures are also covered in the paper. The paper will include actual case studies from a wide variety of gas plant and refinery sulphur plants from around the world.

### **Stabilizer Reboilers Fouling Preventive, Mitigation and Enhancement Efforts**

*Paul, Mishar K - Haradh Gas Plant Department, Saudi Aramco*

*Abdulrahman Al-Methn - Haradh Gas Plant Department, Saudi Aramco*

*Taib Abang – Process & Control Systems Department, Saudi Aramco*

*Mohammed Saati - Process & Control Systems Department, Saudi Aramco*

HdGP condensate stabilization unit is designed to produce condensate mainly C<sub>3</sub>+ by processing HC liquid separated from gas and water through three phase separators (slug catchers and separators). There are two identical trains, each with design capacity of 78 MBD. The condensate is stabilized to achieve the export true vapor pressure specification of 50 psig. Each stabilizer column consist of two identical thermosiphon reboilers with 100% design margin. Since end of 2017, these reboilers experienced frequent fouling due to salt (99 wt. % NaCl) accumulation on reboilers' tubes surface. This fouling was significantly affecting the plant throughputs and product specification which mandating frequent mechanical cleaning. As a result, the plant maintenance cost was increased significantly in addition to extensive operational activities with frequent start-up and shutdown of the stabilizer units. The root cause was identified and number of enhancement efforts were implemented to overcome the operational challenges. This paper will highlight the approach taken to identify the source of the salt fouling including evaluating the upstream gas producing wells and transmission lines. Short and long terms action plan will also be shared to address and mitigate this challenge in future.

Keywords: Haradh gas plant (HdGP), hydrocarbon (HC), thousand barrels per day (MBD).

### **Operational Reliability and Improvement through root case analysis of plant trips**

*Ahmed Al-Harrasi, PDO Oman*

Reliable and safe operations are a cornerstone of PDO's sustainability, helping to deliver on our business commitment and contribute to our license to production. PDO has embarked on the concept of "Sweat the Assets" to optimize the production and to enable opportunity identification all the way from operators to managers. The implementation of Operational Reliability Improvement Process (ORIP) in Gas Assets was an enabler to the proactive threat mitigation by the gas operations team, with the drive and support from Gas leadership team. 'No Trip Campaign' was initiated by Gas team to enhance the current ORIP process, in Jan 2016 to reduce unscheduled deferment by 50%. The main objective is to prevent trips and minimize re-occurrence of identical failure modes through revisiting of previous RCAs and 5-Whys for their completeness and in addressing the root cause of the failure. In addition to this, new comprehensive RCAs were performed to address certain complex failure modes in equipment and process and have embarked on the "Enhanced Problem-Solving Team (EPST)" approach to resolve some of these high consequence issues. The "No Trip Campaign" was conducted for 3 of the gas facilities in 2016, which have identified number of improvement measures that will be replicated in other gas facilities. The outcome of this campaign has identified a total of 100+ improvement actions for gas facilities which are being actioned and tracked under the ORIP process for execution. This presentation will highlight the business cases and value realization that were realized in PDO gas facilities.



## Operations Troubleshooting

### **Improved availability and reduction of losses on a the Kauther Gas Plant TEG unit**

*Maraw Al-Harrisi and Muhammad Akiel Anwar, PDO Oman*

PDO's Kauther Gas Plant (KGP) was commissioned in November 2007 with a capacity of 20 MMSCMD. Its Glycol (TEG) dehydration package uses an overhead vapor combustion (OVC) unit to burn the stripping column off gas and provide the required reboiler heating duty.

The TEG plant has experienced major operating issues with higher than expected TEG losses being the most significant. Several studies have been conducted to assess the losses. These included: poor heat transfer in TEG regenerator by OVC; retrograde condensation and carryover of feed gas to the contactor; differences of the feed gas composition to the design; the effect of H<sub>2</sub>S scavenger and scale inhibitor injection; critical aspects of equipment design; configuration of the equipment and pipe work; vessel internals, instrumentation and control issues; fluid chemistry issues causing foaming and liquid carry-over. etc.

This paper outlines a number of the key operational issues on the TEG plant, the approach taken to troubleshoot them and to implement solutions. It will share lessons learned and provide a guideline for good engineering practices for TEG system design and operation.

FRIDAY 17 MAY 2019

## Advanced Modelling Techniques / Equipment Advances

### **Prevention of Flare Overload During Emergency Depressurization**

*Marcus England, KBR*

Large oil and gas processing installations are commonly equipped with the ability to quickly depressure hydrocarbon inventories to minimise risks in abnormal situations. For the largest installations, it can be case that the flare capacity is insufficient to accommodate the full plant depressurising load at a single time. These plants depressure section by section, to remain within the constraints of the flare capacity. However, despite the fact that simultaneous depressurising of multiple sections may potentially overload the flare system, there is often no physical interlock system to prevent coincident operation of multiple sections; instead administrative systems are used, with a reliance on operator action. It is a concern that during emergency response situations, the potential exists for a flare system to be overloaded. Through the use of dynamic simulation of the flare network and depressurising system this paper demonstrates, via a case study of a large LNG plant, how an emergency depressurising interlock system was designed and implemented, to safeguard the flare system against overload.

### **Using Artificial Intelligence to optimise pipeline network design**

*Andrew Lewis, Augmented Engineering*

CAPEX of pipeline networks can be minimised through the simultaneous optimization of pipeline sizing, pipeline route selection, and geographic location of the tees and any compression/pumping stations within a network, whilst ensuring that flow and pressure-loss requirements are respected. However, such an optimization process presents itself as a complex problem that is rarely addressed due to it requiring an unfeasibly large number of manual workflow iterations spanning multiple engineering disciplines. This lack of field layout optimization at the concept-select phase can result in invalid conclusions being made when ranking concepts for further development, with consequential loss in project value being incurred at the earliest of phases. Augmented Engineering Ltd is pioneering technology which leverages cloud-scale compute capacity to apply a combination of engineering calculations, bespoke algorithms and artificial intelligence to automate the optimization process. This paper outlines the complexity of the challenges involved and demonstrates how the aforementioned technologies can be applied to automatically determine the optimum network configuration within a reasonable computational timescale, allowing such optimizations to be performed during the early stages of a project lifecycle.



## Advanced Modelling Techniques / Equipment Advances

### **Process intensification: H<sub>2</sub>S and hydrate control for subsea application**

*Eirini Skylogianni and Hanna K. Knuutila,*

The trend in the oil and gas sector is towards subsea production and processing, where increased modularity of process equipment and reduced weight, size, complexity and footprint are key elements. SUBPRO is a Norwegian center for research-based innovation within subsea production and processing, which together with the most important industrial players in the subsea field aims to address challenges for subsea applications. Today on a typical topside platform, acid gas removal, dehydration and glycol injection take place, giving three different chemical systems. We are working on the development of a new regenerative process for simultaneous removal of H<sub>2</sub>S and water from the natural gas, which could lead to a more compact, smaller installation with lower energy requirements as well as allow for production from high H<sub>2</sub>S-concentration gas fields. The feasibility investigation of such complex process requires knowledge of the thermodynamic behavior and physical properties of the proposed system, which can only be obtained by experimental data. Time-consuming and demanding experiments at high pressures have been conducted and provided the basis for the development of models and tools to be used by the industry for the evaluation of this combined process.

### **Increasing the efficiency and capacity of two-phase separators**

*Tijmen Ton, Twister BV*

The increase in the global oil and gas demand is pushing operators to constantly increase production from existing assets. Within these facilities, the separation of oil, water, gas and added chemicals plays a key role in meeting export gas specifications. The carry-over of liquids from a liquid gas separator vessel, however, can easily lead to compressor failure or increase the dewpoint outside specification. Separation of the phases in separators strongly depends on the sizes of the dispersed droplets. The bigger the droplets, the more efficient the separation. By improving the droplet size in the feed stream, the separator capacity can be increased without any modifications to the separator itself or installation of any new additional equipment.

Upstream pressure reducing valves inherently create flow shear, which reduces the mean droplet size. This presentation will review the options available of reduced shear control valves which also maximise droplet size and the advantages this has on separation efficiency for greenfield sites and debottlenecking existing separation facilities.

### **Design Emulation and Its Uses in Project Planning, Cost Estimating and Plant Optimisation**

*Robert Broad, GESMEX and Peter Kauders, CDE Projects Limited*

Conceptual Design Emulation (CDE) is logic-based mathematical system that can predict the outcome of the work of a project design team. A complex process unit such as crude distillation unit can be 'designed' in under 30 seconds, including the thermal design of two dozen heat exchangers, with conceptual layout dimensions and design package all updated. The piping & valve MTO takes a few minutes. However, no drawings are produced. Models have been built for processes such as integrated crude and vacuum units and distillate hydrocrackers, and are only limited by the need to construct catalogues of engineering data for equipment types and piping materials.

Project costs are found to be approximately linear with capacity, whatever the process. As we build ever larger process plants, the apparent cost exponent goes up relentlessly, irrespective of the process. The concept of the two-thirds rule (or six-tenths rule), is simply mistaken. There is no such logarithmic behaviour. Small process plants have an apparent incremental cost exponent of about 0.3, rising towards 1.0 the larger the facility.

CDE expresses the process flow sheet, equipment types, design bases and design policies that are to be used, all in mathematical form. The consequences of a change in any input parameter can therefore be established in seconds. In essence, CDE removes design risk to the cost estimate. It can also be used for design optimisation.

The comparison between plate-shell and S&T HTXs will be used to illustrate this. Laser welded plate-shell heat exchangers are compact and leak proof. The plate-shell variant is particularly strong and lightweight, and an ideal replacement for the traditional shell and tube heat exchanger given its wide range of service applications. Its potential use in gas processing will be described, and the advantages of using it in a gas plant will be evaluated.



# Laboratory Tours

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*Would you like to know how the world's biggest independent gas company sees the future? You have a chance.*

*On Friday afternoon, after conference closure, Shell have kindly offered to conduct tours of their laboratory facilities. There is no charge for this. Places are limited for obvious reasons and we expect to be oversubscribed. If we are, we will select the lucky few at the end of March.*

## Some Background?

Almost incredibly, Shell have been carrying out research and development in Amsterdam for over a hundred years. They have made a little progress since then!! They started with nine research employees. Today about 1000 people are employed in the Shell Technology Centre Amsterdam (known as STCA).

The STCA is a research and development success in its own right. It was opened in 2009 and is one of Amsterdam's largest building. It is almost carbon neutral. Electricity is supplied from wind power, or solar power panels that, when the sun shines in Amsterdam can generate 45 MWh of electricity. When the sun don't shine and the wind don't blow, there is an underground thermal storage to control, building temperature.

## So, What Goes On in the STCA?

What do all these people do you might. Maybe we'll find out. This is what they say:

- Gas technology (Gas-to-Liquids, Gasification, Carbon Capture, Gas & Liquid treating, liquefied Natural Gas).
- Downstream technology (Process Development, Catalysis, Hydrocarbon Refining, Base Chemicals, EOG /Solvents, Analytical Techniques).
- Engineering (Pipelines, Flow Assurance & Subsea, Fluid Flow & Reactor Engineering, Mechanical Materials Integrity, Materials & Corrosion, Utilities &Heat Transfer)
- Hydrocarbon Recovery (Rock and Fluid Science, Enhanced Oil Recovery)
- New Energies (New Fuels, Integrated Energy Solutions and Connected customer)

Apparently, STCA lead the way in 3D printing, they have one of the world's largest CT scanners, which won't help much with your medical problems but is just the job for studying the interaction between rocks and fluids. Now how could that relate to the oil industry?

Rather bizarrely, they have some state-of-the-art glass blowing facilities. We need to know more about that for sure.

The Laboratory Tours are to be booked in conjunction with one of our conference passes.

# Social Activities

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Don't miss these opportunities for networking with your peers during your time at the GPA Europe Spring Conference.

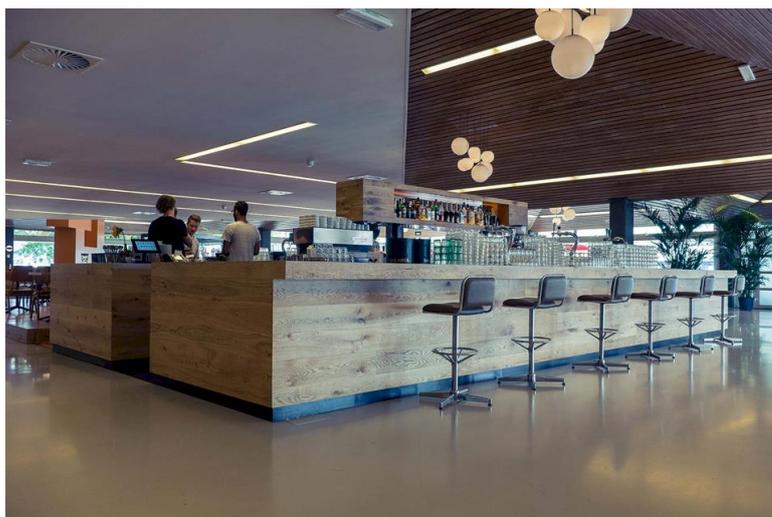
## WEDNESDAY 15 MAY 2019

### Exhibitor Reception

Join us in the exhibition area, within the foyer of the Shell Technology Centre, following the first day of the conference, to speak with our exhibitors and network with your fellow delegates.

Continuing the evening and following on from the exhibitor reception, we would like to invite you all to take the short walk to the THT for drinks and canapés.

THT is situated in the old canteen of the Shell factory. From 1941-2011 over 1,200 employees of Shell ate their breakfast and lunch here, every single day. Exactly 70 years later the artistic building, that was designed by the architect 'Staal', has been given cultural status.



## THURSDAY 16 MAY 2019

### Conference Dinner

The Conference Dinner 'A Night in magical Amsterdam' on Thursday 16 May will be an ideal networking opportunity for all.

## DAILY BREAKS

Join us in the Bar for snacks and beverages during your morning, lunch and afternoon breaks.

# Hotel

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GPA Europe have secured a limited number of discounted rooms at the Park Plaza Victoria Amsterdam.

A clever combination of antique and modern, Park Plaza Victoria Amsterdam boasts historic architecture and contemporary accommodation in the city centre, just a five-minute walk from Amsterdam Central Station.

Hotel amenities include free Wi-Fi, flavourful on-site dining, a fitness centre, an indoor pool, a sauna and a solarium.

Attendees will be required to make their own way over to the Shell Technology Centre for the Conference. The quickest method is via the free Ferry at Amsterdam Central Station and taking the five-minute walk from the Ferry Terminal to the Shell Technology Centre.

We can request additional nights at the hotel on your behalf, these are not guaranteed until confirmed by the hotel. We have a limited number of rooms available in our room block on Monday 14 May and Tuesday 15 May at the conference room rate of:

- Single Occupancy: £ 218 / € 250
- Double Occupancy: £ 235 / € 270

Please note that the room rate we have secured for the conference dates cannot be guaranteed for any additional nights booked outside of these dates due to limited availability at the hotel.





# Pricing

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Please find below details of the Conference Passes available and associated costs.

**Book before 28 February 2019 to receive an Early Bird discount of £ 150 / € 175 off each Conference Pass price.**

## Young Professional Day

- Full access to the Young Professional Day on Tuesday 14 May 2019

GPA E Member	Non-Member
<b>£ 0 / € 0</b>	<b>£ 100 / € 115</b>

## Workshop

- Access to the Workshop on Wednesday 15 May 2019
- To be booked in conjunction with one of our conference passes

GPA E Member	Non-Member
<b>£ 0 / € 0</b>	<b>£ 0 / € 0</b>

## Two-night participant pass (single)

- Full access to the conference
- Welcome Reception
- Conference Dinner
- Single occupancy accommodation on 15 and 16 May 2019 at the Park Plaza Victoria Amsterdam

GPA E Member	Non-Member
<b>£ 1,500 / € 1,700</b>	<b>£ 1,600 / € 1,820</b>

## Two-night participant pass (double)

- Full access to the conference
- Welcome Reception for two
- Conference Dinner for two
- Double occupancy accommodation on 15 and 16 May 2019 at the Park Plaza Victoria Amsterdam

GPA E Member	Non-Member
<b>£ 1,650 / € 1,850</b>	<b>£ 1,750 / € 1,970</b>

## Conference only pass

- Full access to the conference
- Welcome Reception
- Conference Dinner

GPA E Member	Non-Member
<b>£ 1,000 / € 1,150</b>	<b>£ 1,100 / € 1,270</b>

### [Young Professional Discount](#)

GPA Europe is offering Graduate Engineers the opportunity to attend the Technical Conferences at a discount of £ 200 / € 240 on the fees paid by an accompanying senior engineer. The graduate engineer should not have attended a residential GPA Europe Conferences previously and have less than five years' experience. Simply complete the form ticking the 'Young Professional discount' box and submit registration form with the senior attendee's registration form.



# Sponsoring and Exhibiting

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Our conference provides a direct marketing channel to commercial and technical leaders from the whole gas processing value chain. You can meet and engage with around 100-member companies, all in one place.

The conference exhibition is open to all Shell employees, as well as our delegates. We plan an Exhibitor Reception after hours on Wednesday 14 May. Grab a chance to educate 1,000 Shell employees as well as the GPA Europe members.

## The benefits of sponsoring

- 1 Networking**  
Make valuable connections as you interact with GPA Europe loyalists and key industry leaders
- 2 Branding**  
Improve your exposure and visibility as you position your organisation as an essential GPA Europe partner
- 3 Advertising opportunities**  
Purchase from a range of advertising options in print and digital

[Discover our Sponsor and Exhibition Packages >>](#)



# Registration

Please complete your details below and send by email to the GPA Europe at [admin@gpaeurope.com](mailto:admin@gpaeurope.com)

All fields marked with an \* are mandatory

## Your details

- \* Title Please select
- \* First (given) name Click here to enter text
- \* Last (family) name Click here to enter text
- \* Email address Click here to enter text
- \* Job title Click here to enter text
- \* Company Click here to enter text
- \* Telephone Click here to enter text
- Please enter your Country Code, followed by number without any spaces*
- \* Mobile Click here to enter text
- Please enter your Country Code, followed by number without any spaces*
- Name on badge Click here to enter text
- If different from above*
- Company name on badge Click here to enter text
- If different from above*
- Country on badge Click here to enter text

## Emergency contact details

Please provide details of someone who will not be at the conference with you.

- \* Emergency contact name Click here to enter text
- \* Emergency contact number Click here to enter text
- \* Relationship Click here to enter text

## Special requirements

- \* Dietary requirements Please select
- Special requirements Click here to enter text

## GPA Europe Spring Conference 2019 passes

- Young Professional Day
- Two-night participant pass (single)
- Two-night participant pass (double)
- Conference only pass
- Low Carbon Technology Workshop
- Laboratory Tours

## Accommodation options

Please confirm your accommodation requirements:

- \* Additional accommodation required Click here to enter text  
*These will be requested, but are not guaranteed until confirmed by the hotel*
- \* Special room requests Click here to enter text

## Travel

Please provide your estimated travel details:

- \* Estimated Arrival Date Click here to enter text
- \* Estimated Arrival Time Click here to enter text
- \* Estimated Departure Date Click here to enter text
- \* Estimated Departure Time Click here to enter text



## Payment details

- |                             |                          |
|-----------------------------|--------------------------|
| * Preferred currency        | Please select            |
| * Payment method            | Please select            |
| * Invoice address 1         | Click here to enter text |
| * Invoice address 2         | Click here to enter text |
| * Invoice city              | Click here to enter text |
| * Invoice state / county    | Click here to enter text |
| * Invoice zip / postal code | Click here to enter text |
| * Invoice country           | Click here to enter text |
| * GPA E member              | Please select            |
| Young Professional discount | Please select            |

Payment is due immediately and may be made by:

### Credit Card

To pay by Credit Card or American Express, please send form and call the administration office. Payment will be taken in Sterling. Do not send Credit Card details by email or fax.

### Bank Transfer

When you confirm your booking, we will provide you with an invoice and instructions on how to pay by bank transfer. Please note GPA Europe cannot accept any bank charges on money transfers.

A receipt will be issued once payment has been received in full.

Cheques are no longer accepted for Payment.

### Data protection

Please tick the box to receive information about future GPA Europe events:

Please tick the box if you are interested in a free trial subscription to Hydrocarbon Processing Magazine, Official SOGAT Publication:

### Terms and Conditions

By submitting this form, you are agreeing to the [terms and conditions](#)



# Terms and Conditions

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GPA Europe Ltd., as the data controller, is responsible for ensuring that the information you provide is protected and secure. GPA Europe Ltd. shall process information in compliance with the Data Protection Act 1998. The information you have provided in your registration form will be collected by GPA Europe Ltd. to secure your event registration. In processing such information, GPA Europe Ltd. shall ensure that all suppliers to whom personal information is passed shall be made aware of the restrictions in using such personal information and shall only use the personal information to process any event registration, for the sole purpose of providing event registration services for the event. This also applies to any sensitive information you provide such as details of any disabilities or dietary or religious requirements. The information may also be provided to public authorities including (but not limited to) customs/immigration if required by them, or by law.

Please be aware that if GPA Europe Ltd. cannot pass this information to the relevant suppliers, whether in the European Economic Area (EEA) or not, your registration cannot be processed. By submitting your registration form you consent to this information being passed onto the relevant persons.

In order to perform and provide the services, suppliers may be required to pass personal information onto third parties. In such instances GPA Europe Ltd. will approve such transfers on the condition that these third parties will adhere to the restrictions and obligations imposed on suppliers on the use of personal information.

By signing this questionnaire, you consent to this information being passed on to relevant persons. You are entitled to a copy of your information held by GPA Europe Ltd. If you would like to see this, please email [admin@gpaeurope.com](mailto:admin@gpaeurope.com)

## **Cancellation**

If you cancel after submission of your registration, a £ 75 administration fee will be charged. If you have requested accommodation, the cost of the hotel room will be charged, unless the room is resold. Any cancellations within 2 weeks of the start of the conference will result in a 100% cancellation charge.

## **Insurance**

It is the responsibility of each person to provide for their own travel / personal accident insurance. GPA Europe Ltd. will not be held responsible for any accident / injury incurred during the duration of the conference

By submitting a registration, you are agreeing to the terms and conditions.