

ACCELERATING THE DECARBONIZATION OF GAS PROCESSING ASSETS WITH PROCESS DIGITAL TWIN TECHNOLOGY: A TECHNICAL DEEP DIVE

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Introduction

Addressing climate change is the driving force behind a global imperative to achieve net-zero carbon emissions by mid-century. This ambitious goal pushes the need for transformation across all sectors of the global economy, with the energy industry at its forefront. Governments worldwide are enacting stricter environmental regulations, while international agreements like the Paris Agreement set clear targets for emissions reductions. In parallel, a growing wave of public and investor pressure, driven by Environmental, Social, and Governance (ESG) criteria, is compelling corporations to demonstrate tangible commitments to sustainability.

Within this evolving landscape, natural gas plays a complex yet crucial role in energy transition. Although a fossil fuel, its lower carbon intensity compared to coal positions it as a "bridge fuel," offering a more immediate pathway to reduce emissions from power generation and industrial processes. It provides essential flexibility and reliability, complementing the intermittency of renewable energy sources. However, continued reliance on natural gas requires significantly reducing its associated emissions, particularly carbon dioxide (CO₂) from combustion and methane (CH₄) from leakage and venting, in order to align with global decarbonization pathways.

The decarbonization challenge for Gas Processing assets

Gas processing assets are inherently energy-intensive operations. Their significant energy consumption for compression, heating, cooling, and separation leads to substantial direct CO₂ emissions from on-site combustion of natural gas in turbines and heaters. Beyond CO₂, methane emissions, a potent greenhouse gas with a much higher short-term warming potential, represent a critical concern. These emissions, along with venting and flaring, contribute significantly to the overall environmental footprint of the natural gas value chain.

The challenge for operators is multifaceted: achieving drastic emissions reductions without compromising the core objectives of meeting production targets, efficiency, and safety. Traditional operational approaches often involve conservative setpoints, leading to sub-optimal energy consumption and higher emissions. The sheer complexity of these facilities, with their highly interactive units and dynamic operating conditions, demands advanced, precise, and reliable strategies beyond conventional control systems. There is a pressing need for tools that can accurately quantify emissions, identify optimization opportunities, and predict the impacts of operational changes on both environmental performance and business outcomes.

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Emissions footprint of gas processing operations

Understanding the emissions profile of gas processing operations is a foundational step towards effective decarbonization. These facilities contribute to greenhouse gas emissions through both direct and indirect sources.

Direct emissions originate from sources within the operational boundary of the gas processing facility itself. Combustion is a primary source, stemming from burning natural gas in turbines, engines, and heaters for power generation, compression, and process heating, which directly releases CO₂. Methane emissions, unintended leaks from valves, flanges, connectors, compressors, and other equipment components, are a significant source of methane, challenging to detect and quantify. Flaring is another source, releasing CO₂ and, when combustion efficiency is low, un-combusted methane. Venting, the intentional release of uncombusted gas directly to the atmosphere for pressure relief, equipment depressurization, or maintenance, leads to direct methane emissions.

Indirect emissions are those associated with the production of energy consumed by the facility but occurring off-site. A prime example is the emissions from power plants that generate electricity consumed by the gas processing facility for pumps, compressors, and other electrical loads. Accurate measurement and attribution of these emissions present significant challenges, particularly for fugitive emissions, and the dynamic nature of operations means that emissions profiles can vary significantly over time.

Operational constraints and traditional approaches

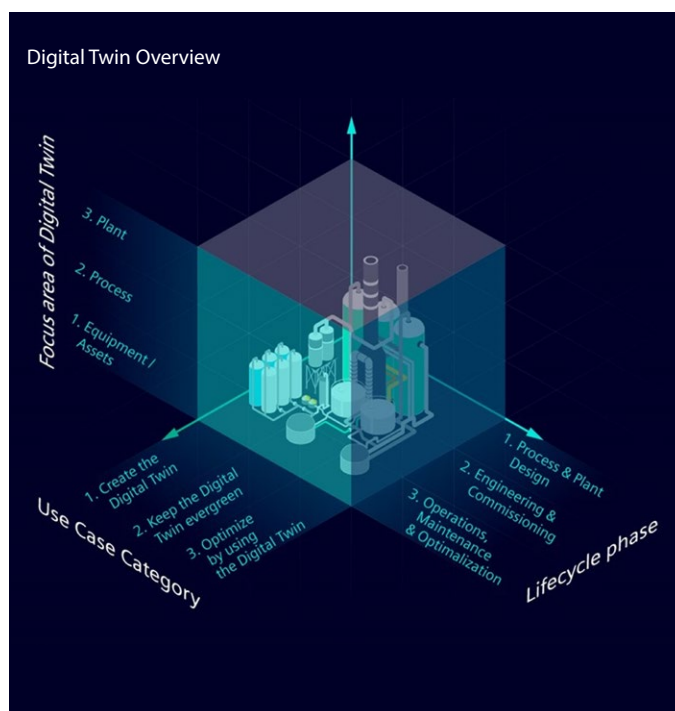
Gas processing operations are inherently complex, involving multi-component separation, significant phase changes, and highly interactive unit operations such as compressors, heat exchangers, and distillation columns. Optimizing such systems is a formidable task.

Conventional control systems, primarily relying on Proportional-Integral-Derivative (PID) loops and sequential logic, are designed to maintain individual process variables at specific setpoints. While effective for local control, they struggle with the global dynamic optimization of an entire plant. They cannot predict complex interactions between units or optimize across multiple objectives simultaneously, and their adjustments are typically reactive, responding to deviations rather than proactively preventing them.

In many facilities, critical setpoints are often determined based on conservative design data and/or the experience and intuition of operators. While this approach ensures safety and product quality, it frequently leads to sub-optimal energy consumption and higher emissions. In the face of uncertainty and risk aversion, operators tend to run with larger safety margins than physically

necessary, resulting in conservative operating margins that consume excess energy. This approach lacks the precision and predictive power required for aggressive decarbonization targets.

Introducing process digital twin technology



In response to these complex challenges, advanced digital technologies are emerging as vital enablers of decarbonization. Among these, the concept of a "process digital twin" stands out. A process digital twin is a high-fidelity virtual replica of a physical asset, process, or system, continuously updated with real-time data from its physical counterpart. This dynamic connection allows the digital twin to accurately mirror the behavior and performance of the physical entity, providing unprecedented insights and predictive capabilities.

This article presents a technical examination of how advanced process digital twin platforms, which leverage unique first-principles modeling and sophisticated solver technology, deliver unprecedented accuracy and enable dynamic optimization to accelerate the decarbonization of gas processing assets. It will address key operational concerns, such as energy efficiency, methane emissions reduction, and operation closer to design limits, while demonstrating tangible benefits through real-world application principles.



Defining the process digital twin

A process digital twin is a mathematical representation of a physical asset and its associated processes. Unlike simple data visualizations or historical trend analyses, it embodies a deep understanding of the underlying phenomena governing the process.

The distinguishing feature of high-fidelity process digital twins is their reliance on first-principles modeling. These models are built from fundamental physical, chemical, and engineering laws, including mass balances, energy balances, and momentum balances. They also incorporate thermodynamics, using advanced equations of state to accurately predict phase equilibria, densities, and enthalpies of multi-component mixtures under varying conditions, which is crucial for gas processing. For processes involving chemical reactions, reaction kinetics are included, alongside principles of heat transfer and fluid dynamics.

The construction of these models involves assembling pre-built or custom models representing the unit operations, each defined by a set of fundamental equations derived from first principles, to create a comprehensive representation of the entire process, typically as a flowsheet. This means the model understands *why* the process behaves in a certain way, rather than just *how* it has behaved in the past based on historical data.

This approach offers significant advantages over purely data-driven models. First-principles models possess extrapolative capability, meaning they can accurately predict behavior outside historical operating ranges or for novel scenarios, such as new feed compositions, different equipment configurations, or the integration of new technologies like Carbon Capture, Utilization, and Storage (CCUS). Data-driven models, relying solely on historical data, perform poorly when extrapolating beyond their training data. First-principles models offer true predictive power by providing an understanding of why a process behaves in a certain way, enabling operators to anticipate issues and proactively optimize. They are robust, being less susceptible to data noise, outliers, or missing data points because they are constrained by physical laws; they can even infer missing values or reconcile inconsistent data. In comparison to data driven models, first-principle require far less data to build an accurate model. They also enable reliable what-if scenario analysis, which is critical for evaluating process modifications, debottlenecking, or integrating new technologies without risking the physical plant, allowing for rapid and safe exploration of optimal decarbonization strategies.

Furthermore, CAPEX requirements are notably low, thanks to leveraging data from existing plant systems. Digital twin deployment also circumvents the need for substantial new hardware, such as servers or additional cabinet space, which are frequent concerns within control room environments.

Key technical advantages for decarbonization

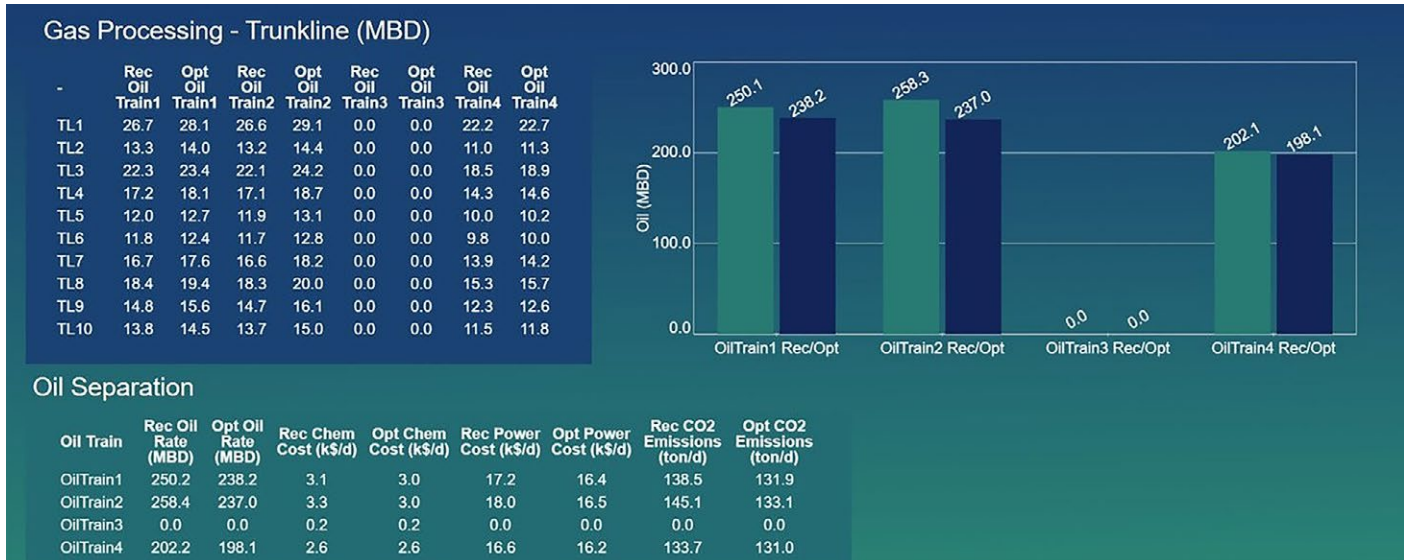
The inherent capabilities of process digital twin technology provide distinct technical advantages for accelerating decarbonization in gas processing. Their accuracy, derived from the first-principles approach, ensures that the model's predictions are highly reliable, which is critical for precise quantification of emissions, accurate identification of energy waste, and trustworthy optimization recommendations. Without high accuracy, optimization efforts can be misdirected or even detrimental.

They offer predictive capabilities, enabling a shift from merely reacting to process deviations to proactively predicting future behavior and prescribing optimal actions. This allows operators to anticipate energy consumption spikes, predict potential methane release events, and implement preventative measures. The technology provides a holistic process view by modeling entire processes and capturing the complex interactions and interdependencies between different unit operations. This comprehensive understanding is essential because optimizing one unit in isolation can inadvertently lead to sub-optimal performance or increased emissions elsewhere in the plant; the digital twin optimizes the entire system for global objectives.

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Real-time optimization (RTO) for energy efficiency

Real-Time Optimization (RTO) is a cornerstone of the decarbonization capabilities offered by high-fidelity process digital twins. It leverages the digital twin to continuously calculate and recommend optimal operating setpoints for the entire plant, aiming to minimize energy consumption and emissions while rigorously respecting all operational constraints.



A typical oil/gas plant online dashboard

RTO in gas processing can adjust numerous parameters to achieve energy efficiency. This includes optimizing compressor networks by adjusting speed, load distribution among parallel compressors, inter-stage cooling, and anti-surge valve positions to minimize power consumption while meeting flow and pressure targets. For heat exchanger networks, it optimizes utility usage (steam, cooling water) and maximizes heat recovery by adjusting flow rates and temperatures. In separation units like fractionators and absorbers, RTO optimizes reflux ratios, reboiler/condenser duties, and column pressures to minimize the energy required per unit of product, while ensuring product quality specifications are met. Furthermore, it adjusts flow rates and pressure setpoints across the plant, reduce pumping and compression energy requirements throughout the entire process.

The distinction between RTO leveraging high-fidelity process models and traditional control systems is fundamental. Traditional PID/DCS systems focus on maintaining individual process variables at pre-defined setpoints, operating largely in isolation using simple feedback loops. They cannot predict complex interactions across multiple units or optimize for a global objective, and their adjustments are reactive. In contrast, RTO continuously calculates the optimal setpoints for multiple interacting variables across the entire process. It achieves a global objective, such as minimizing energy consumption or emissions, while rigorously respecting all operational constraints like product quality, equipment limits, and safety interlocks. This model-predictive and constraint-handling optimization goes far beyond simple setpoint control, identifying the true optimal operating point for the entire plant, not just individual units.

While precise percentages vary significantly by plant design, age, and current operating practices, RTO solutions based on high-fidelity process models have consistently demonstrated substantial energy savings, often in the range of 5-15% of overall plant energy consumption.

Addressing reliability and operating closer to limits

A common operational reality is the natural tendency to maintain conservative operating margins, driven by uncertainty regarding equipment capabilities, process dynamics, and a strong aversion to risk. These "unofficial margins" mean plants often operate far from their true optimal and safe limits, leading to higher energy consumption and emissions.

Process digital twin technology offers a solution by inherently understanding the physical and operational limits of the equipment and the process. The first-principles model can accurately simulate plant behavior under various conditions, allowing operators to push boundaries safely, confidently and with less variability between individual operators. Optimization algorithms explicitly incorporate both hard constraints, such as physical limits of equipment and safety interlocks, and soft constraints, including operational targets and quality specifications. By providing a precise understanding of the process physics and equipment capabilities, the digital twin can

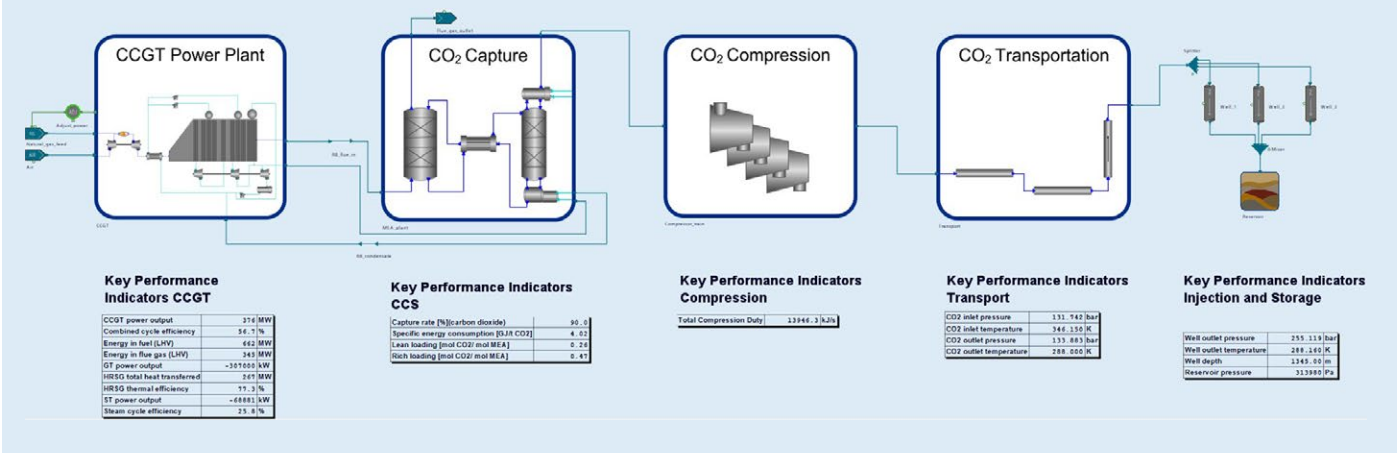
determine the true safe operating envelope, allowing for tighter operation within scientifically validated limits rather than arbitrary conservative margins. This enables safe optimization by providing the accurate predictive power needed to operate closer to the true optimal limits, reducing the "unofficial margin" without impacting plant uptime, safety, or reliability. It transforms risk aversion into informed risk management, unlocking significant hidden capacity and efficiency.

Enabling Carbon Capture, Utilization, and Storage (CCUS) integration

CCUS is a vital technology for deep decarbonization, and process digital twin technology is instrumental in its successful implementation. For feasibility and design optimization, digital twins support critical decision-making by accurately modeling the integration of carbon capture units into existing gas processing infrastructure, evaluating their impact on overall plant energy balance and performance. They can optimize the design parameters of capture units for energy efficiency, capture rates, and solvent regeneration, minimizing the energy load associated with CCUS. This also allows for testing the feasibility of novel capture technologies in a virtual environment before significant investment.

Once implemented, process digital twins can provide real-time monitoring and optimization of the entire CCUS chain (capture, compression, transport, storage) to maximize efficiency, ensuring the overall decarbonization benefit is maximized.

A typical CCS chain model



Case studies and collaboration with end-users

Two case studies are presented in this article to show how end users have benefit from using process digital twin technology.

The operators in the first study were Saudi Aramco (ref Aramco Journal of Technology, Fall 2020), who focused on optimizing the operations of their integrated network of gas-oil separation plants (GOSPs). These plants are crucial for processing crude oil and gas, and the study aimed to enhance their efficiency across the entire network rather than as individual units. The complexity of the GOSP network, including the presence of swing lines that allow for flexible production allocation, was a key aspect they sought to model and optimize.

To achieve this, Saudi Aramco developed a rigorous modelling approach. This involved combining a physics-based simulation model, which accurately represented the physical processes within the GOSPs, with a mixed-integer nonlinear programming (MINLP) optimization model. The resulting hybrid approach allowed them to capture both the detailed operational characteristics and the overarching network-wide constraints and objectives, enabling a comprehensive optimization strategy.

The results of this optimization were highly significant, demonstrating substantial improvements in operational efficiency. The model achieved power savings of up to 51% when compared to a base case without optimization. These savings were realized by strategically optimizing feed allocation to different GOSPs, improving equipment utilization across the network, and identifying opportunities to shut down underutilized GOSPs. This highlighted the considerable value of applying a holistic, network-wide optimization approach to complex industrial facilities.

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The operators in the second case were the Shell Basrah Gas Company (BGC) in southern Iraq. Their primary objective was to optimize their integrated natural gas production and distribution network. This network is particularly complex due to the unique characteristics of natural gas, such as the lack of intermediate storage and the inability to easily curtail well production, which often leads to gas flaring and associated environmental and economic penalties. The specific components modelled included compressor stations, pipelines, and NGL (Natural Gas Liquids) and LPG (Liquefied Petroleum Gas) plants.

Shell Basrah Gas Company approached the modelling using detailed process models combined with rigorous mathematical optimization techniques (ref Gas Process Magazine Sep/Oct 2016). This methodology allowed them to accurately represent the intricate operations and interdependencies within their natural gas supply chain. The optimization aimed to improve multiple objectives simultaneously, including overall profitability, total gas production, product yields (such as propane), and critically, the reduction of gas flaring. They also explored the benefits of multi-period optimization to consider production and sales over consecutive timeframes.

The optimization efforts yielded impressive results across several key performance indicators. The BGC network saw a potential increase in profitability of up to 4.9%, a 3.5% increase in total production, and a significant 47.8% increase in propane yield. Furthermore, the most impactful result was an 87.2% reduction in gas flaring, which has substantial environmental and economic benefits. These outcomes underscore how advanced modelling and optimization techniques can dramatically enhance the efficiency and performance of complex natural gas supply networks.

Conclusion

In conclusion, process digital twin technology stands as a proven, technically robust solution for accelerating the decarbonization of gas processing assets. Its unique capabilities, rooted in high-fidelity first-principles modelling and advanced solver technology, enable unprecedented accuracy and dynamic optimization. This allows gas processing facilities to address critical operational realities, from minimizing energy consumption through sophisticated Real-Time Optimization (RTO) to significantly reducing emissions and safely operating closer to true physical limits. The ability of this technology to provide predictive and prescriptive insights, coupled with its holistic view of complex processes, positions it as an indispensable tool in the industry's journey towards sustainability.

The adoption of high-fidelity process digital twins is set for continued maturation and broader integration across the energy sector. Looking ahead, we see increased deployment across the entire natural gas value chain, from upstream production to midstream processing and downstream distribution, and extending to other energy-intensive industries. There will be further integration with models for emerging energy technologies, such as hydrogen production (e.g., electrolysis, steam methane reforming with CCS), ammonia production, and complex carbon capture networks, enabling the optimization of entire low-carbon energy ecosystems. This technology will play an increasingly central role in enabling the "digital thread" for sustainable asset management, connecting and leveraging digital models from the earliest stages of design and engineering, through construction and commissioning, and into ongoing operations and maintenance. This continuous digital flow of information ensures that decarbonization objectives are embedded throughout the asset lifecycle.



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NEGOTIATING UNCERTAINTY AND BUILDING RESILIENCE IN ENERGY SUPPLY

As a process engineer my daily considerations are safety, constructability and operability. From this perspective it can seem unrealistic to influence the macro energy security, cost and sustainability trilemma facing our energy future. We do see these factors impacting our business as we negotiate market conditions affected by waves of political change and economic uncertainty.

Political decisions and announcements - or absence of them - can create uncertainty for investors, meaning projects are delayed or cancelled. Some countries, like Canada and Germany, have redoubled their efforts to become more autonomous but many have stalled as governments struggle to invest in the energy transition. Others in the EU closer to Russia point to the difficulty in redirecting supplies due to geographical constraints.

Political instability, sanctions such as those also imposed on Venezuela and Iran, conflicts over land and sea boundaries and territorial disputes all have their effect on natural gas supply chains. In Europe we are still directly affected by the ongoing war in Ukraine and infrastructure damage. Cyber-attacks and sabotage have also been seen to have national and regional impacts on energy infrastructure.

Not only does this cause disruption to supply but also makes companies less willing to invest or to delay investment. Any drop in gas supply due to wide-scale infrastructure damage will make prices increase world-wide. Meanwhile consensus is weak for progression of climate policies in developed economies still struggling with post-pandemic revitalisation.



Solving the energy trilemma therefore still feels a long way off in the face of these new imperatives.

Diversification and co-operation across regions and suppliers can help companies manage the risks caused by geopolitics. We need to work together across Europe and beyond to achieve this. If we also help governments and investors understand the world's energy demands and complexities, perhaps they can still follow suit and co-operate to weather the geopolitical storm and invest in a stable future.

As an industry we strive to deliver cost effective, safe and sustainable solutions. At GPAE we do not seek to lobby governments or promote a policy agenda, but represent the face of the industry, including a role to educate others about the importance of natural gas and emerging low carbon fuels in tomorrow's energy future. I commend all of our members on their efforts - whether operators, contractors, OEM's and suppliers - in leading the way to deliver the resilient industry needed for a secure future.

Samantha Nicholson

GPAE Chairperson

TECHNICAL CONFERENCE

Thursday 5th June

Morning Session

Prepared by Javier Alfonzo, Kent UK Engineering – Session Chair.



Javier Alfonzo

Firstly, there was a Welcome Address from the GPAE Chairperson, Samantha Nicholson of Fluor.

Samantha gave a warm welcome to the conference on behalf of GPAE, in particular to the well-attended Young Professionals, and encouraged member organisations to continue the participation and development of the next generation of engineers at GPAE events.

The Keynote Address by Pavan Chilukuri, Head of Middle East at Energex Partners, previously Vice President for CCUS & e-fuels at Holcim, Director for Decarbonisation at Shell.

Pavan Chilukuri gave a high impact presentation titled 'Looking Beyond the Technology in CCS', highlighting some of the challenges and complexities facing CCUS projects, drawing in part on his experience supporting Holcim, a leading cement producer, in their decarbonisation efforts.

The takeaways were that CAPEX & OPEX of carbon capture systems (particularly applied to cement industry with low margins) can often be prohibitive and the required 'green premium' cannot be passed on in a commodity market where price is set by the 'grey' alternative.

The importance of deep collaboration to achieve the cement sector's CCUS ambitions was highlighted. Alignment of project level requirements to the satisfaction of the various stakeholders, particularly to reach financial close on the same timescale, is challenging. The value chain will comprise very different businesses with varying cost models and risk/reward considerations.

On current carbon capture projects, carbon capture technology itself can account for between 25-50% of project cost depending on the logistics, transport, and storage.



Thursday AM Speakers & Session Chair (left to right): Leorelis Vasquez (Worley Comprimo) – Speaker; Javier Alfonzo (Kent UK Engineering) – Session Chair; Stuart Penson (Hydrocarbon Economist and Carbon Economist) – Panel Moderator; Thomas de Cazenove (Shell) – Panellist; Myrian Schenk (Baker Hughes) – Speaker; Samantha Nicholson (Fluor) - GPAE Chairperson; Tobias Eckardt (BASF) – Speaker; Manohara Gudiyor Veerabhadrapa (National Physical Laboratory) – Panellist; Peter van Elferen (Gasunie) - Panellist; Thomas Fontfreyde (Genesis Energies) – Panellist



Conference networking

Challenges on CCUS projects include modes of transport and long distances for CO₂ storage. Underwriting of the public risk also needs to be considered due to the safety and performance risk of any releases.

In the future, it is likely that the value chain of carbon capture technology can reduce CAPEX and OPEX expenditure down from the current case of approx. 180 Eur/t total levelized cost, but improvements exceeding 20% may be difficult to achieve. To reduce project costs and to enable future projects, steps must be taken to consider the wider levers, which can enable carbon capture projects like common CO₂ hubs to minimise costs on logistics, transport, and storage. Leaders in this space could be major emitters in hard to abate sectors, who would orchestrate hubs for industrial areas.

Case studies were presented for CCUS from cement, including an Antwerp CCS hub, and the Lagerdorf C2B project, which includes methanol and e-SAF production, utilising green hydrogen and supply of CO₂ captured from Holcim kilns in northern Germany.

Pavan highlighted the need for shared infrastructure for CO₂ transport and storage to enable widescale deployment of CCS in Europe. The current state is that market price for ETS (Emissions Trading Scheme) is set by emitters. In future, decarbonising margins could prove disruptive (which is the intention of the ETS scheme). The major enablers of carbon capture as a global carbon reduction method will relate to so-called 'non-technical enablers' such as external funding, green premiums, CTR credits and wider policy in addition to ETS price support. Future carbon infrastructure could also be based around hydrogen availability – and thus potential for integration to production of synthetic fuels.

The **Panel Discussion** moderated by Stuart Penson, Managing Editor for Hydrocarbon Economist and Carbon Economist based in London, previously held senior roles at Reuters, Dow Jones and Argus Media.

The subject of the Panel Discussion was “Roadmap or Roadblock? – CO₂ and Hydrogen Pipelines”

Stuart introduced our four Panellists: Manohara Gudiyor Veerabhadrapappa, a Senior Scientist at National Physical Laboratory (NPL); Peter van Elferen, a Senior Project Manager at Gasunie; Thomas Fontfreyde, Deputy Country Manager for Upstream & Transverse Service Manager at Genesis Energies; and, Thomas de Cazenove, Senior Engineer CO₂ Abatement Deployment at Shell.

The session aimed to provide a comprehensive outlook on the current state and future prospects of pipeline networks essential for the energy transition. The panel highlighted the critical role of strategic planning and collaboration in overcoming the obstacles to establishing efficient and sustainable pipeline systems for CO₂ and hydrogen transport.

Summary/Key takeaways:

1. The major steps will be to prioritise small networks first, which then can form clusters and gradually establish the formation of the larger 'backbones.'
2. The panel agreed that CO₂ is leading against H₂ currently. They suggest that CCS systems will follow the path of onshore, then offshore is most feasible currently. It is expected that H₂ will lag by 5-10 years behind CO₂.
3. The leaders were identified as the UK, the Netherlands, and the USA (US using CCS for EOR).
4. Major players for the enabling actions to develop networks were France and Germany (as countries who establish many of the practices of the EU).
5. Major policy will require specification of CO₂ quality. CO₂ quality is difficult to specify, too stringent will prohibit projects due to excessive CO₂ purification, and too lenient will have various issues with impurities, e.g. nitrogen and sulphurous compounds.

Three Technical Papers on CO₂ Infrastructure and Capture followed the Panel Discussion.

Speakers: Myrian Schenk - Baker Hughes (BH), and Tobias Eckardt - BASF CO₂ Conditioning - Design Challenges

CO₂ Conditioning - Design Challenges, paper presented by Myrian Schenk, Senior Engineering and Technology Manager at Baker Hughes, previously at Technip Energies, KBR and Jacobs; and, Tobias Eckardt, Global Technical Expert Gas Treatment at BASF.

Their presentation touched upon contaminants in CO₂ and their current industry specification limits. Independent of the technology used for CO₂ capture, the CO₂ needs to be conditioned before it can be transported and injected into selected reservoirs. Purification and compression are always needed, and different impurities will be present depending on the CO₂ source. There are no industry-wide agreed specifications for the treated CO₂. Allowed contaminant concentrations will affect design considerations and employed technologies.

Key Challenges:

- The paper emphasizes that refrigeration is essential in CCUS facilities to convert CO₂ into its liquid or supercritical state, facilitating efficient transportation via pipelines, ships, or trucks.
- Managing the thermodynamic properties of CO₂ to prevent issues like hydrate formation and corrosion during compression and liquefaction processes.
- Designing systems that minimize energy consumption while maintaining the required CO₂ flow rates and pressures.

Myrian Schenk (Baker Hughes)

Myrian is a doctor in chemical engineering with over 20 years' experience in the energy industries including CO₂ capture, purification and management, sales gas export, LNG and others.



Myrian Schenk

Myrian graduated as a Chemical Engineer from the Universidad Nacional del Sur, Bahia Blanca-Argentina, before obtaining her PhD in Chemical Engineering from the University of London, London-United Kingdom.

Myrian is a subject matter and peer-recognized expert in gas processing in general, with strong focus on carbon capture. She is also a highly experienced modeler and has been involved in projects at all stages of execution, from conceptual design through FEED and detailed design.

Myrian has also been working on the GPAE management team for over 10 years and is past Chair of the organization and currently serving as Secretary.



Tobias Eckardt

Tobias Eckardt (BASF)

Tobias studied chemistry at the University Göttingen and UCD Dublin. He graduated from the University of Cologne, with a PhD in organic chemistry and joined BASF. He started his industry career in Product Development, moving to positions with increasing responsibility.

In a global team of adsorption specialists, Tobias serves in BASF as the Global Technical Expert Gas Purification with a strong focus on Natural Gas applications and emerging environmental gas applications.

Tobias has presented numerous papers on international conferences and is holding several patents in the field of adsorption technology.

Speaker: Paolo Cari - Saipem SpA**Authors: Paolo Cari and Alessandro Mari - Saipem SpA****Process Design Considerations in Defining the Refrigeration Techniques for CO₂ Handling Facilities**

Paolo, Subject Matter Expert for CO₂ Technologies, presented Saipem's experience in refrigeration techniques, external refrigeration and auto refrigeration and fluid selection (HC, NH₃, CO₂) utilised for CO₂ handling facilities of CCUS project. Some of the design considerations used in evaluating these technologies were also touched upon. Paolo also presented the influence / effect of flue gas contaminants (NO_x and Sox, etc.) on the post-combustion amine-based CO₂ capture units.

Key Findings:

- The presentation emphasized that refrigeration is essential in CCUS facilities to convert CO₂ into its liquid or supercritical state, facilitating efficient transportation via pipelines, ships, or trucks.
- The choice of refrigerant impacts the efficiency, safety, and environmental footprint of the refrigeration system.
- Key design considerations, such as ambient temperature variations, CO₂ purity levels, and transportation distances, influence the selection and optimization of refrigeration systems.

Paolo Cari (pictured) is the Process Manager and Subject Matter Expert (SME) for CO₂ Technologies in the Sustainable Natural Gas Process Technologies department for SAIPEM S.p.A., Milan, Italy.

He has 20 years of experience in process design and management of Engineering, Procurement & Construction projects in the Oil & Gas industry and is actively involved in several Carbon Capture, Utilization and Storage initiatives since 2022.

His expertise includes also a deep knowledge of process dynamic simulation tools and methods.

Paolo joined SAIPEM S.p.A. in 2005 and holds a master's degree in chemical engineering, Energy and Hydrocarbons Specialization, from Politecnico di Milano, Italy

**Speaker: Leorelis Vasquez - Senior Process Engineer, Worley Comprimo****Authors: Leorelis Vasquez and Nathan Smith – Worley Comprimo****Carbon Capture: An Integrated Solution**

The presented paper assisted with gaining a better understanding of carbon capture cost components, the relative contribution of CAPEX and OPEX in the total cost. The presentation also discussed options for amine-based carbon capture solutions and how the selection of gas pre-treatment and solvent reclaiming can be

essential in finding the optimal solution for whole life-cycle value evaluation.

Leorelis (pictured) presented amine-based carbon capture solutions, highlighting cost contributions by pre-treatment (up to 40%) and reclaiming (5~10%) unit in the total cost. Importance to carry out a thorough techno-economic analysis

integrating mature and novel technologies, technologies for the optimum cost-effective results were emphasised.

Adopting standardized project delivery models and fostering unprecedented levels of collaboration across the value chain could be beneficial in reducing costs and enhancing the efficiency of project execution.

Leorelis Vasquez has worked for various sectors of the oil & gas and petrochemical industries for 18 years, joining Worley in 2011.

Leorelis completed her bachelor's degree in chemical engineering at the Simon Bolivar university in Venezuela (2005) and a MSc in Refinery, Design and Operation at the University of Manchester in the United Kingdom (2008).

In her current position Leorelis develops feasibility studies and process design packages for various technologies, including Carbon Capture and Storage, within Worley Comprimo.

TECHNICAL CONFERENCE

Thursday 5th June

Afternoon Session

Prepared by *Oliver Carter, Fluor – Session Chair*



Oliver Carter

The afternoon session continued with the energy transition focus to discuss development of hydrogen, with perspectives for green hydrogen ranging from fundamentals, general engineering design developments, to machinery requirements for hydrogen compression.

The session was kicked off by Asif Ali, Deputy Global Chief Engineer of Bechtel on the subject of Selection of Compression System(s) for Green Hydrogen Facilities. The paper focused on selection of the efficient combination of technologies for given requirements. The effect of process parameters and electrolyser types on the optimum compressor selection, scalability, efficiency and power consumption, and other factors including integration of compression train(s) with downstream processes, technology readiness level was discussed. In particular, a hybrid scheme comprising centrifugal and reciprocating machines

was recommended for large capacity and higher-pressure applications.

This was followed by a presentation Modelling Equilibria and Fluid Properties of Hydrogen Mixtures for a Sustainable Energy Economy from Dr. Behnam Salimi, Senior Product Manager with KBC Process Technology who took the conference into process fundamentals, looking at the thermodynamic properties of hydrogen rich gases. The paper was particularly relevant given the discussions of hydrogen blending during the pipelines workshop of the Wednesday panel session.

This paper examined the capabilities of existing thermodynamic and transport property models in KBC Multiflash® software to predict the physical behaviour of hydrogen-rich mixtures, particularly for integration into existing energy systems. Results for calculation of key properties such



Technical presentation



as density, viscosity, heat capacity, and phase behaviour were presented and compared with results from standard cubic equations of state (EoS) and other models such as GERG, calculated by other commercial programs. This led to suggested improvements to enhance predictive accuracy.

The session was concluded by Dr. Andrew Till, Study Manager for Hydrogen and Sustainable Aviation Fuels of Bechtel, discussing Factors affecting the Design of Hydrogen Plant Based on PEM and Alkaline Electrolysers. The talk centered on modular designs developed by Bechtel for green hydrogen plants, focusing on 200 MW but scalable to 1GW capacity, based on PEM, Pressurised and Atmospheric Alkaline Electrolysers. These modular designs include all electrical systems, electrolysers, compression, and gas conditioning. The electrolysers were noted to typically carry approximately 40-50% of project TIC.

This paper then presented some of the key design considerations for hydrogen plants based on the different technologies, such as safety (in operation and construction), plant design and layout, building size, utility requirements and equipment count.

Dr Till discussed the removal and replacement of electrolyser stacks - alkaline electrolyser stacks can exceed 2m in diameter and 6 in length and can weigh up to 60 tonnes (however PEM stacks were expected to be 40% smaller than alkaline). A 1 GW plant can have as many as 200 stacks, which, at the end of their life, must be removed and replaced. Economic provision of utilities was shown to be key to a successful project, for example cooling forms a large cost but with the potential for heat recovery.

He noted that these themes need to be addressed at an early stage of the project design, when layout and buildings are still in draft areas that to date are often neglected. The optimum size for these plants was not a straightforward question from the conference, and is complicated by the costs and context for power supply and offtake, but could be in the lower 200 MW range.

Speaker: Asif Ali, Deputy Global Chief Engineer, Bechtel

Selection of Compression System(s) for Green Hydrogen Facilities

Asif Ali (pictured) is working with Bechtel Energy as Deputy Global Chief Engineer. Asif has over 20 years of experience in functional and engineering management; and in design, fabrication and testing of mechanical equipment. Asif is, in particular, interested in fitness-for-service assessment of aging pressure retaining equipment and translate lessons learned from these brownfield assessments to design and selection of new equipment.

Asif holds BSc honours degree in mechanical engineering and an MS in engineering design. Asif is a chartered engineer, registered with Institute of Mechanical Engineers, UK.



Speaker: Dr. Behnam Salimi - KBC

Process Technology

Modelling Equilibria and Fluid Properties of Hydrogen Mixtures for a Sustainable Energy Economy



Dr. Behnam Salimi (pictured) is a Senior Product Manager responsible for overseeing Multiflash and KBC's PVT and Flow Assurance Technology, along with upcoming digital offerings. With over 15 years of experience in petroleum thermodynamics, multiphase flow, flow assurance analysis, and PVT modelling, he provides strategic direction

and manages new product development to meet financial targets and drive business initiatives.

He is a chartered engineer and holds a Ph.D. in Mechanical Engineering from the University of Manchester.

Speaker & Author:

Dr. Andrew Till - Bechtel

The Factors Affecting the Design of Hydrogen Plant Based on PEM and Alkaline Electrolysers

Dr. Andrew Till (pictured) is a Study Manager for Hydrogen and Sustainable Aviation Fuels at Bechtel in London.

He has a PhD in Chemical Engineering from Aston University and is a Fellow of the Institution of Chemical Engineers (FIChemE).

His vast experience in engineering and project management includes the petrochemicals, refining and LNG sectors, as well as hydrogen.

Andrew currently focuses on the production of green hydrogen and its derivatives, as well as its storage and transportation.



TECHNICAL CONFERENCE

Friday 6th June

Morning Session

Prepared by Paul Hopkinson, Pall Europe Ltd – Session Chair



Paul Hopkinson

The Friday morning session started with a presentation by some of the delegates who participated in the YP Training Day.

They first gave their feedback on the morning workshop presented by Malcom Harrison and Ron Frend of Petroskills regarding Overview of Net Zero and role played by various stakeholders. After that they gave their feedback on the afternoon session which was a “Shell Climate Action Simulation Game”, facilitated by Shell.

After the Young Professionals had concluded, the conference moved onto six technical papers. The first paper focused on free water carry in NGL Production Facilities. The next four papers looked at various issues in acid gas and amine treating systems in traditional gas plants. The final paper was looking at an update on an amine pilot plant for CO₂ capture on a steel mill application.



GPAE Young Professional presentation. Left to right: Scott Ewen, McDermott International; Giorgio Maria del Mitri, McDermott International; Filip Cejka, Bryan Research & Engineering; Freya Roe, Fluor.

Speaker: Taib Abang - Saudi Aramco

**Paper Authors: Ali M Al-Abbas
and Taib B Abang - Saudi Aramco**

Resolution on Free Water Carryover in C3+ NGL Product at NGL Producing Facilities

Saudi Aramco operates various hydrocarbon networks, including the Natural Gas Liquid (NGL) network, which transports C2+ and C3+ NGL products from gas processing and gas-oil separation plants to NGL facilities for use in petrochemical and refining industries.

A key challenge in this network is the presence of free water in C3+ NGL streams, which can disrupt pipeline operations and downstream fractionation, particularly in the depropanizer column.

The paper presents a successful case study on controlling water removal in condensate feed drums. It highlights four critical operating parameters for effective gravity separation:

1. Optimal water interface level
2. Automatic level control
3. Fixed/mid-range level set points
4. Water valve operation within limits

The study outlines the methodology, challenges, and performance indicators that validate the effectiveness of this strategy in improving operational reliability and product quality

Taib Abang (pictured) is an Engineering Consultant from the Process & Control Systems Department, Saudi Aramco.

He has 30 years of working experience, 17 years with Saudi Aramco and before that he was with PETRONAS LNG for 13 years.

Taib is a Chartered Engineer from the Engineering Council, a Chartered Member of IChemE UK and a Technical Committee member of the GPA-GCC Chapter.



Speaker: Dr. Faiz Almansour - Saudi Aramco

**Authors: Dr. Faiz Almansour and
Ahmed Ameen - Saudi Aramco**

Enhancing Acid Gas Separation with Durable PIM-1 Membranes in Hybrid Systems

Efficient treatment of sour gas streams requires innovative methods to separate hydrogen sulfide (H₂S) and carbon dioxide (CO₂) while minimizing hydrocarbon losses and energy use. This study explores a hybrid system combining PIM-1 membranes with amine sweetening for sustainable acid gas separation.

PIM-1 membranes are known for high permeability and selectivity, making them effective for acid gas removal. However, membrane aging poses a challenge.

The study addresses this through:

1. Alcohol vapor treatment to stabilize structure
2. Graphene oxide integration for durability
3. Blending with Cardo-based polymers to enhance robustness

These strategies significantly improve membrane lifespan and performance under industrial conditions.

The hybrid system showed:

- Efficient acid gas separation
- Reduced hydrocarbon slippage
- Lower energy consumption
- Decreased CO₂ emissions and carbon footprint

Overall, the research highlights PIM-1 membranes as a scalable, sustainable solution for industrial sour gas treatment.

Faiz Almansour (pictured) is a chemical engineer with 13 years at Saudi Aramco, specializing in membrane technology for sour gas separation.

He earned his PhD in Chemical Engineering and Analytical Science in 2023, focusing on PIM-1 membrane aging strategies.

Faiz completed a two-year field assignment as a process engineer at a major gas plant in Saudi Arabia, gaining hands-on experience in gas treatment operation. He has published six research papers and presented at several international conferences. Currently, he works with the Oil and Gas Treatment Division in the Research and Development Center at Saudi Aramco, focusing on advanced separation technologies.



Speaker: Mike Sheilan, Amine Experts Inc

Authors: Ben Spooner, P.Eng and Michael Sheilan, Amine Experts Inc.

Iron Sulphide - Friend or Foe Revisited

Twenty years ago, Amine Experts published a foundational paper titled "Iron Sulphide – Friend or Foe", exploring the role of iron sulphides formed from H₂S reacting with steel in amine systems. These compounds can offer insights into corrosion mechanisms, severity, and operational impact.

Iron sulphides are common in amine plants treating H₂S-rich gas. They have both beneficial and harmful effects:

- **Pros: Can form protective films that reduce corrosion.**
- **Cons: Promote fouling, are pyrophoric (can ignite spontaneously), and complicate operations.**

The original paper clarified these dual roles. The new paper builds on two decades of global troubleshooting experience, offering updated guidelines for operating low-pressure units like Acid Gas Enrichment (AGE) and Tail Gas Treating Units (TGTU)—increasingly relevant in Middle East gas production.

Mike has been involved in the gas processing industry for 44 years. He has a long history of expertise in training operators and engineers in gas processing as well as troubleshooting all aspects of upstream gas treating processes.

More recently, Mike has focused on dehydration and amine sweetening as a senior principal engineer for both Amine and Dehydration Experts. He is one of the Principal Speakers of the Amine Experts' 5-day Amine Treating and Sour Water Stripping courses, as well as the 4-day Dehydration Course.

Mike is an authority on gas processing and has provided technical support to over 500 facilities on every continent (except Antarctica). He has been published in the Oil and Gas Journal, Hydrocarbon Processing, LNG Magazine and Chemical Engineering magazine and has presented at various conferences, including the LRGCC, GPA Midstream, NACE/AMPP, SOGAT, Sulphur and AFPM. He is also a Senior advisor to the Laurance Reid Gas Conditioning Conference in Norman, Oklahoma.

He has multiple publications on topics as far reaching as Inlet Separation and Filtration, Amine Sweetening, Glycol Dehydration, Corrosion and Sour Water Stripping. He is also one of the principal authors of the industry reference textbook Amine Sweetening and Sour Water Stripping.

Mike is a Professional Engineer in Alberta (APEGA), is a member of the Gas Processors Association of Canada (GPAC) and the Association for Materials Protection and Performance (AMPP; formerly NACE).



Mike Sheilan



Friday AM Speakers & Session Chair (left to right): Kaiyr Tekebayev (SGS Sulphur Experts) - Speaker, Taib Abang (Saudi Aramco) - Speaker, Paul Hopkinson (Pall) - Session Chair, Inna Kim (SINTEF) - Speaker, Mike Sheilan (Amine Experts Inc) - Speaker

Speaker: Kaiyr Tekebayev, SGS Sulphur Experts

Authors: Philip le Grange, Kaiyr Tekebayev, Francis LeBlanc, Michael Sheilan (Amine Experts) and Marcus Adolfsson, Daniel Yarnold, Gilles Thevenet (Preem raff Lysekil)

The Other Sulfides: Organic Sulfur Species in Amine Solvents

“The Other Sulfides: Organic Sulfur Species in Amine Solvents” paper investigates the behavior of various organic sulfur compounds—such as COS, C₁-C₅ mercaptans, MES, DMS, and DMDS—in amine solvent systems. The study combines a detailed chemical review with operational data from 50 industrial absorbers and a case study from a European refinery.

Key findings include:

- Optimizing removal of organic sulfur species can reduce the size of downstream gas conditioning units in new facilities.
- In existing systems, it can extend molecular sieve cycle times, lower caustic consumption, and reduce waste volumes (mercaptides and disulfides).
- The study emphasizes the economic and operational importance of understanding these compounds and calls for further research and field data to improve industry practices.

Kaiyr (pictured) is a Chemical Engineer with 10+ years of industry experience.

His focus areas are commissioning and start-up of amine and sulphur units.

He has performed engineering, testing, commissioning, start-up, and troubleshooting of amine treating and sulphur recovery systems for more than 30 production facilities in 20 countries.

Kaiyr is a co-author of several papers which are published in Hydrocarbon Processing, Gas Processing & LNG, and Sulphur journals.



Speaker: Dr. Inna Kim, SINTEF

Authors: Dr. Inna Kim, SINTEF and Mike Hegarty, H2W United LLC

Solubility of Light Hydrocarbons in Amine Treating Solutions

GPA Midstream Projects have explored how amine concentration and acid gas loading affect hydrocarbon solubility in aqueous amine solutions:

Observations:

- Hydrocarbon solubility increased with amine concentration.
- At lower concentrations, solubility showed a temperature-dependent minimum (333–353 K).
- At higher concentrations, solubility became temperature-insensitive.
- Unlike water, where solubility decreases from methane to n-butane, concentrated amine solutions showed highest solubility for n-pentane.
- CO₂ loading (and ionic strength) caused a linear decrease in hydrocarbon solubility.

Dr. Inna Kim (pictured) holds an honours diploma in Chemical Engineering from Tomsk Polytechnic Institute (1985–1990). She began her career as a researcher at the university before moving to South Korea, where she worked at research centres for Ulsan Chemical Company and Samsung General Chemicals.



She earned a PhD in Chemical Engineering from the Norwegian University of Science and Technology (2004–2009), focusing on CO₂ capture solvents. In 2009, she joined SINTEF and contributed to its largest R&D project, SOLVit, which led to the development of a novel CO₂ capture technology now commercialised and used in full-scale CCS projects in Norway.

Since 2004, she has participated in and led numerous national and international CCS projects. From 2020 to 2024, she coordinated the EU-funded REALISE project on CO₂ capture from refineries. She is the author or co-author of over 50 publications and holds two patents.

TECHNICAL CONFERENCE

Friday 6th June

Afternoon Session

Prepared by Philip Le Grange, Axens – Session Chair



Philip Le Grange

Speaker: Dr. Qiao Zhao - Axens

Authors: Qiao ZHAO(a), Martin Pfeiffer(a), Vincent Carlier(b), David Albarracin-Zaidiza(b), Céline Bertino-Ghera(b), Hugo Vandezande(c), Stéphane Jouenne(d) (a)AXENS; (b) IFPEN; (c) ArcelorMittal France; (d) TotalEnergies

DMX™ CO₂ Capture in Dunkirk: Final Outcomes and Key Takeaways



Carbon capture is essential for achieving Net Zero by 2050. Amine scrubbing remains a robust and adaptable technology for large CO₂ emitters. Among emerging technologies, the DMX™ process, developed by IFPEN and commercialized by Axens, has shown strong potential for energy and cost savings.

The demonstrator successfully validated the DMX™ process for industrial CO₂ capture. It is now being commercialized by Axens and is suitable for a wide range of applications.

Qiao Zhao (Pictured) is a Technology Engineer at Axens, specializing in carbon capture technologies. Since 2020, she has been working on the development and commercialization of the DMX™ process, a CO₂ capture solution designed for industrial decarbonization. Her core responsibilities include preparing technical proposals, addressing high-level development topics, and supporting strategic deployment of the DMX™ process. With both academic expertise and industrial experience, she bridges innovation and real-world application in the decarbonization of various industries.

She holds a Master's degree in Chemical Engineering and a PhD focused on CO₂ utilization in supercritical power cycles, both obtained in France.

Speaker: Alessandro Mari - Saipem

Authors: Alessandro Mari and Paolo Cari – Saipem

Enhancing Post-Combustion CO₂ Capture: Flue Gas Contaminant Management in Amine-Based Solvent Systems



Session Chair Notes: Discussed causes of solvent losses in amine systems, specifically loss resulting from contaminants in the gas being fed into post combustion carbon capture amine units, SO_x and NO_x. Nitrosamine formation was also addressed.

Two industrial cases were presented. Case one was a steam reformer offgas with a deNO_x system. SO_x, NO_x, NH₃ and particulates were present and of concern in this project. These were addressed with a fluegas quench and caustic scrubber to remove SO₂. A wet electrostatic separator was deemed insufficient for SO₃ and particulate removal. An additional wash technology was required in the top of the absorber in order to address SO₃.

Case two was a waste to energy plant with existing deNO_x, wet electrostatic separator and quench with scrubber. NH₄Cl was a contaminant of concern in this system.

Alessandro Mari (pictured above) has over six years of experience at SAIPEM as a Subject Matter Expert in Acid Gas Capture and Sulphur Recovery Technologies. Previously, he spent seven years at KT (Maire Tecnimont Group) as a Process Lead Engineer, specializing in Sulfur Recovery and Gas Treatment technologies, and participating in various field activities. Alessandro has led process engineering for major onshore projects at SAIPEM and has published and presented numerous papers on gas treatment and sulfur recovery.



Friday PM Speakers & Session Chair (left to right): Enrique Gomez Suarez (TotalEnergies) – Speaker; Sebastien Duval (Saudi Aramco) – Speaker; Jerome Bayle (TotalEnergies) – Speaker; Alessandro Mari (Saipem) – Speaker; Kaaeid Lokhandwala Kaaeid – (MTR Inc) – paper co-author; Qiao Zhao (Axens) – Speaker; Philip Le Grange (Axens) – Session Chair



Jerome Bayle & Enrique Gomez Suarez (TotalEnergies)

Speakers: Jerome Bayle & Enrique Gomez Suarez - TotalEnergies

Authors: Beining Wang, Mahdi Yazdanpanah, Luc-Emmanuel Combes-de-Prades, Tuan Le-Quang, Jerome Bayle, Enrique Gomez Suarez, and Renaud Cadours - TotalEnergies

CO₂ Capture in Brownfields Units: Application in Refining and Power Industry

Jerome and Enrique presented the outcomes of a study on an integrated refinery complex in Europe. The study focused on CO₂ capture from Fluidized Catalytic Cracker (FCC) offgas. The high CO₂ content of FCC offgases (ranging from 14 to 18%) makes it an ideal target for CO₂ capture. The stream is responsible for about a quarter of the refineries total CO₂ emissions.

The full value chain of carbon capture and storage was investigated. Both mature amine based and cryogenic processes were considered. Both technology approaches required several auxiliary pretreatment units on the gas prior to capturing the CO₂. These approaches, their pros and cons were presented as well as some economic comparisons of the approaches.

Jerome Bayle graduated from Ecole Polytechnique of France and Ecole Nationale Supérieure des Petroles et des Moteurs in 1994.

He first joined the Institute of French Petroleum (IFP) to work on Fluid Catalytic Cracking FCC technology, then worked as process engineer for TOTAL DONGES refinery, after which he joined TOTALENERGIES engineering headquarters in Le Havre by 2007 and was involved in process retrofit including reduction of SO₂ emissions on sites, retrofit of conversion units, revamp of sulfur chain units.

Jerome has been involved in several studies for CO₂ capture technology and was recently appointed as Head of Internal Sulphur Network.

Enrique Gomez Suarez is an LNG & Cryogenics process engineer at TotalEnergies at the Process Department of the OneTech technical branch of the company.

He received in 2018 a Diploma of Engineer in Chemical Industries from the Ecole Nationale Supérieure des Industries Chimiques (ENSIC, France) and a Diploma on Chemical Engineering from the Industrial University of Santander (UIS, Colombia).

He finished in 2019 a Specialized Master in energy and refining processes at the IFP School and started working as an Energy Efficiency Engineer contributing in feasibility studies to reach TotalEnergies' refineries ambitions in decarbonization.

Working now in LNG & Cryogenic processes, Enrique has had the opportunity to work in CO₂ capture studies for the company's refineries.

Speakers: Sebastien Duval - Saudi Aramco

Authors: Ahmed W. Ameen(1), Feras Hamad(1), Sebastien A. Duval(1), Milind M. Vaidya(1), John O'Connell, Shabbir Ghulam(1), Olatunde Onasanya(1), Lokhandwala Kaaeid(2), Richard Baker(2) and Tim Merkel(2) (1) Saudi Aramco (2) MTR Inc.

Innovative CO₂ Capture Technique for Natural Gas Operations

The presentation commenced with an outline of the sources of emissions in natural gas processing plants and drew attention to the scale of CO₂ emissions from the Sulphur Plant.

Dr Duval described the acid gas enrichment (AGE) process using selective amines and presented a membrane based alternative process. As well as a hybrid process containing both membrane and amine technology in the same unit.

Results of a pilot study conducted on a slipstream on an industrial AGE unit were presented. An economic comparison of the new proposed system to a conventional AGE unit was presented. Additionally, a process configuration of an acid gas removal unit (AGRU) and tail gas treatment unit (TGTU) with nonselective solvent and membranes to perform the selective separation of H₂S from CO₂ was presented.

Sebastien Duval (pictured) is a Senior Research Consultant in the Oil and Gas Treatment Research Division at Saudi Aramco.

His work focuses on advanced gas separation, particularly H₂S and CO₂ removal from natural gas using polymeric membranes and adsorbents.

Sebastien is part of a team developing CO₂ capture from acid gas upstream of sulfur recovery units to reduce emissions. He has also developed online instruments for monitoring crude quality, including salt and water content.

Sebastien holds a PhD in Electrochemistry from Sorbonne University, a chemical engineering degree, and a postgraduate degree in materials science from the Chemical Engineering School of Toulouse.



A question from a delegate



CONFERENCE WORKSHOP

4th June

With the YP day in full swing, the afternoon of Wednesday 4th June brought the first event of the conference for others. Over recent years the GPA Europe has run an additional half day ahead of the main conference which often takes the form of an interactive workshop, led by industry authority.

Many of the delegates took advantage of the delicious buffet lunch ahead registration and commencement of the workshop. The title of the workshop was "Purification of Gas for Cryogenic Processes".

Samantha Nicholson is the current Chair of the GPA Europe and also acted as the session chair for Wednesday afternoon workshop.

After welcoming everyone Samantha encouraged full audience participation in this session.

The workshop was led by 4 presenters all of whom are renowned experts in their respective fields.



Wednesday 4th June – Workshop Speakers & Session Chair (left to right): Paul Stockwell (Process Vision) – Speaker, Hans Kumar (SLB) – Speaker, Marcel Scholten (Norit) – Speaker, Samantha Nicholson (Fluor) – Session Chair, Tobias Eckardt (BASF) – Speaker

**Speaker: Paul Stockwell,
Process Vision Ltd**

**Hydrocarbon Dewpoint; the Gap
Between Theory and Reality**



First up was Paul Stockwell (pictured) who is the Managing Director of Process Vision Ltd. Paul is a keen member of the GPA Europe, having attended and spoken at conferences for many years. In addition, Paul regularly attends conferences of the GPA Europe's sister chapters; the GPA-GCC conference in the Middle East and GPA Midstream in the US.

In 1991, Paul Stockwell created International Moisture Analysers (IMA). From the outset, the company intended to have the ability to look at multi-species analysis, and Paul served on working parties for the National Physical Laboratory in the UK for the improvement of moisture measurement. One of the group intents was providing dewpoint measurement training for a variety of techniques for measurement engineers. Paul has worked in the oil and gas industry for 35 years and been instrumental in the introduction of laser absorption spectroscopy using tunable diode lasers (TDL) for natural gas measurements assisting in the development of the first TDL system for natural gas which has now become the industry-standard method for moisture measurement in Natural Gas.

Paul described how, for decades, hydrocarbon dewpoint has served as the industry's standard for determining gas "dryness" in natural gas transmission and distribution. However, recent findings are suggesting that relying solely on hydrocarbon dewpoint is not enough to ensure dry gas. Widely variable

results across dewpoint measurement methods highlight a significant accuracy gap that leads to undetected liquids in pipelines. This variability introduces risks to operations, making a case for advanced tools to provide a more comprehensive approach to gas quality.

Traditional hydrocarbon dewpoint is a key factor in gas sales contracts, determining if natural gas supplies meet the “dry gas” criteria essential for safe transmission. Even small volumes of liquids—mist or stratified flows of hydrocarbons—can cause increased risks, increased costs and operational challenges and downstream. When these go undetected, they can lead to equipment damage, costly disruptions, and inefficient operations. Unfortunately, variations in dewpoint measurement and calculation methods can create uncertainty about the true condition of gas in the pipeline, with the error for a single gas mixture sometimes spanning up to 100°C. This inconsistency is a growing concern for gas suppliers and end-users alike.

Paul showed examples of errors observed in the field and introduced a solution on how to bridge this reliability gap and how the introduction of advanced visual monitoring technologies can improve efficiency and performance of both gas processors and gas transportation. Demonstrating the use of the real-time visualisation of gas flows inside high-pressure pipelines, the audience could understand how operators are able to detect actual liquid presence directly. Paul showed attendees video footage of spot liquid mist, stratified flows, and small volumes of natural gas liquids (NGLs) that traditional measurements fail to report. Paul’s paper advocates for a new approach to standard gas quality protocols, where advanced visual monitoring is incorporated as a complementary tool to hydrocarbon dewpoint, ensuring that gas quality measurements are both accurate and reliable.

Speaker: Marcel Scholten, Norit Activated Carbon

Designing and commissioning Activated Carbon Filters for Purification of Gas Scrubber Liquids

Marcel Scholten (pictured) studied chemical engineering at the University of Applied Sciences in The Hague, graduating in 1982. He is a Senior Application Specialist at Norit Activated Carbon and he has over 30 years of experience with the purification of industrial process liquids with activated carbon (AC). Marcel has specialized in scaling up from lab testing to industrial process design and optimisation of purification processes.

Marcel’s paper looked at the use of activated carbon filters, in particular in the gas sweetening arena. He talked about their application in several processes known for the removal of acidic gases such as H₂S and CO₂ from neutral industrial gases and the absorption of the acidic gases by alkaline liquids, such as Organic-alkanolamines (MEA, DEA etc.). During repeated recirculation of the absorbent, organic impurities accumulate in the absorbent. The organic impurities are usually degradation products having a corrosive nature. After prolonged use, the absorbent becomes corrosive to an extent, proportional to its age, and in addition becomes less effective for absorption of acid gases. Further, accumulation of higher hydrocarbons may give foaming problems in time. In many systems, the gas treater liquid is purified with Granular Activated Carbon (GAC) or Extruded Activated Carbon (EAC) to remove the organic impurities to such an extent that the absorption system runs well.

The presenter discussed enhanced gas scrubber system performance optimizing input for filter design, supporting commissioning engineers during system setup, and offering detailed spent carbon sample analysis. Marcel encouraged questions and numerous questions were posed.

The discussion was not limited to alkaline liquids, Marcel educated the audience about the extensive application of carbon filter, the differing characteristics required for different industries. We were told these included water, food, medical, biogas and abatement. The manufacture, structure and size of the individual particles is specific for a particular purpose. Speaking to others afterwards, the audience came away having a greatly expanded knowledge but realizing there is still a great deal to learn.

Our networking coffee break followed, many of us taking the opportunity to continue with our questions for Paul and Marcel. For the Chair, I took the opportunity to meet with Dr. Kumar, SLB (formerly Schlumberger) and reacquaint with Dr. Eckardt, BASF who were to talk with us after the break.



continued on page 24

Speaker: Dr. Hans Kumar, SLB
CO₂ Ethane Separation Using Cellulose Triacetate Based Hollow Fiber Membranes for Cryogenic Plants

Dr. Hans Kumar has been with SLB for 16 years and over 21 years in industry. He has worked on various gas technologies for onshore and offshore projects from concept development stage to detailed engineering and start-ups. Currently, he serves as the Global Gas Domain Champion for SLB Midstream Production System, striving to enhance SLB's gas technology portfolio for future gas expansion. A subject matter expert in gas separation membranes and gas treatment technologies, Hans holds a PhD from Texas A&M University, College Station. Prior to SLB, he worked at Technip in Houston and EIL in New Delhi. Hans is also a member of the Facilities committee of the GPA Midstream Association

Hans discussed CO₂ removal upstream of cryogenic plants trying to optimise the level of CO₂ in the feed to ensure the optimum techno-economic approach. Considerations include the CO₂ specs in export NGL but also CO₂ freeze in the Demethaniser column. Changes in the reservoir production behaviour in an existing operating Cryo plant such as increased CO₂ content in the feed can often become bottlenecks for the cryo plants, especially when higher ethane recoveries are desired. One obvious solution to handle the increased CO₂ in the feed gas scenario is to add extra amine treatment capacity in the gas pretreatment section to remove the excess CO₂. However, this option requires significant capital investment.

Because of the similar volatility of CO₂ and ethane, the majority of CO₂ tend to stay with the ethane product. Hans discussed an alternative debottlenecking scenario where the overhead from the deethanizer column can be processed in a hollow-fiber Cellulose Triacetate (CTA) membrane unit to reduce the CO₂ content in the export ethane product. Alternatively, if a separate distillation column is used for the separation of CO₂ and ethane, membranes can be used to break the ethane-CO₂ azeotrope for higher CO₂ recovery. The experience of CTA hollow fiber membranes in the oil and gas industry for separating CO₂ from natural gas was discussed but Hans pointed out that there is limited reference for separating CO₂ from ethane. Test results for the ethane CO₂ separation were presented and he explained that the larger molecular size of ethane compared to methane provides much higher selectivities for CO₂-C₂ separation compared to CO₂-C₁ separation. The presentation discussed a case study demonstrating the advantages of a membrane-based Cryogenic unit for separating CO₂ from ethane.



Hans Kumar

Speaker: Dr. Tobias Eckardt, BASF

LNG pre-treatment - Heavy Hydrocarbon Removal from Lean Natural Gas

Tobias Eckardt studied chemistry at the University Göttingen and UCD Dublin. He graduated from the University of Cologne, with a PhD in organic chemistry and joined BASF. He started his industry career in Product Development, moving to positions with increasing responsibility. Tobias serves in BASF as the Global Technical Expert Gas Purification with a strong focus on Natural Gas applications and emerging environmental gas applications, in a global team of adsorption specialists. Tobias has presented numerous papers on international conferences and is holding several patents in the field of adsorption technology. This was Tobias' first offering at the conference as we were privileged to hear from him again on a different topic in the main conference.

Tobias provided an interactive workshop which addressed technology fundamentals as well as limitations and advantages of different approaches to address heavy hydrocarbon freezeout. Operational data from existing plants were discussed. Tobias talked about aromatic compounds, such as benzene, toluene, ethylbenzene, and xylene (BTEX), having relatively high frost points in methane, leading to early freezing in the cold section of an LNG plant. Traditionally, these hydrocarbons have been removed in a Scrub Column or in a NGL Recovery unit with a turbo-expander process. Increasingly, LNG plants, especially in North America, are fed by natural gas from the pipeline grid. NGL's have been extracted from this gas, resulting in a lean gas with a tail of heavy hydrocarbons in trace concentrations.

Liquefied natural gas (LNG) is produced by cooling natural gas to negative 160°C. Prior to cooling to these low temperatures, impurities must be removed from the gas to ensure proper performance of the downstream liquefaction process. A standard pre-treatment line-up consists of an acid gas removal unit (AGRU), a molecular sieve dehydration unit to remove water to <0.1 ppm, and a mercury removal unit. It wasn't until the first baseload LNG plants in the United States processing lean gas started up in the mid-2010s and began to experience freezing in the cryogenic heat exchangers that this typical pre-treatment approach was questioned. Meanwhile, the industry has acknowledged and started to address the freezing problem, which reduces LNG throughput throughout the region.

Tobias talked passionately about a solution that he has been researching for a number of years using Sorbead® technology and we congratulate him for recent user take-up and technological advances in this area.



Tobias Eckardt

YOUNG PROFESSIONAL TRAINING DAY



Gary Bowerbank

By Gary Bowerbank, Shell

Based on feedback from our Young Professionals Committee, we have continued to provide a more dynamic and interactive Young Professionals Training Day – moving away from ‘death by PowerPoint’ lectures. This year, the two workshop sessions explored the Climate Change challenge.

Climate Change, Carbon Emissions, how to reduce them and how you can help

The first session was facilitated by Malcolm Harrison and Ron Frend from PetroSkills, a company that provides training to people in the energy industry. Both Ron and Malcolm have a wealth of experience across the Gas Processing industry (Shell, BP, BOC, GC, Foster Wheeler) and have been facilitating training for more than 10 years.

Malcolm, in his typically engaging and entertaining style, grounded the session by discussing the following questions:

- Is the world getting warmer?
- Do we understand why?
- Does it matter?
- What are our leaders doing?
- How can it be fixed?

The participants were then split into four groups (each with a mix of representatives from operators, technology providers and engineering contractors), with each given a challenging climate change question to answer.

After some lively discussions, and a wonderful lunch, the groups reconvened to feedback and face the odd provocative question from their peers.

While no silver bullet was discovered, there was clear consensus that something needs to be done, there will be great technical challenges as well as perhaps even more difficult non-technical ones to overcome. This represents an exciting opportunity for the Young Professionals in the room to solve the climate change puzzle.



Young Professional Training Day

Shell Climate Action Simulation Game

Building on the first session, Francesco Franco and Ahmed Msahli (two young professionals from Shell Gas Processing group) challenged the YPs to meet the Paris Climate Accord limit global temperatures rise to well below 2°C (and ideally 1.5°C).

Again, the YPs were split into teams taking on roles of different global stakeholders (i.e. governments, businesses, and activists) and work together to create a plan to tackle climate change.

They used En-ROADS simulator, a powerful tool developed by Climate Interactive and MIT, to see how decisions affect the planet in real time.

THE FUTURE OF THE ENERGY INDUSTRY

By Malcolm Harrison, Instructor

PetroSkills was asked by GPA Europe to facilitate a half day workshop to kick off GPA Europe's annual conference on the subject of global warming, climate change, the various technologies which might become a part of the solution and the barriers to their commercial application.

The workshop provoked a lot of interaction and post event conversation. It proved an unexpectedly rich source of market intelligence and helped to clear the clouds and to see a clear road ahead for those who wish to Follow the Green Brick Road.

In the words of Warren Buffet 'He who predicts the future is wrong, even if he is right'. This report should probably be assigned to the bottom drawer for now, to be withdrawn so that future generations can laugh at how wrong we were.

Finally, in a world of uncertainty, the workshop concluded with several cast iron certainties:

The evidence that the world is get warmer and that GHG¹ emissions are the main cause is compelling. That the consequences are important is less so as effects will be localised and will mostly impact the low lying, the poor, the poorly governed and ill prepared.

The governments made a commitments in Paris in 2015. to take the necessary steps to limit global warming to 2 C² and do everything reasonable to limit it to 1.5 C. FAILURE IS CERTAIN.

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Left to right: Ahmed Msali (Shell) – Session Facilitator, Francesco Franco (Shell) – Session Facilitator, Malcolm Harrison (PetroSkills) – Session Facilitator, Gary Bowerbank (Shell) – Session Chair, Ron Frend (PetroSkills) – Session Facilitator

Nonetheless, despite their failure they continue to finance new green technologies through tax breaks and subsidy. The money will be spent unevenly and inefficiently,

None of the current technologies to reduce GHG emissions is commercially viable. It is not possible to pick a winner as in the absence of a global carbon price winners are being chosen by politicians.

Peak oil is some time way. Gas and LNG are recognised transition fuels and that transition is going to take some time.

In the absence of clear government direction the oil and gas companies have a full spectrum of corporate strategies. Everyone has strategy, everyone needs a strategy and they will all be wrong.

Efficiency is going to become more important. Both the IOCs and NOCs³, even the mighty Saudi Aramco, have committed to improving operations efficiency, reducing methane emissions and eliminating operational flaring and doing so quickly. This is new territory for them. The industry has been insouciant of efficiency and emissions until now.

While the actions of governments will be random and inefficient, there are three technologies that have to happen:

Given that the Paris Accord targets will be dramatically missed, CCUS, albeit from a small base, will see stellar growth.

The use of green hydrogen as an energy source and as an alternative to batteries for storage of intermittent solar panels and wind turbine supplies.

The use of syngas (using green hydrogen and captured or green CO₂) as source for petrochemical and transport fuel production for large transport e.g. planes, boats and trains

There is enormous confusion over the importance of climate change even among the engineers and scientists most capable of objective reasoning. There is a large need to raise awareness in the broader community and for more detailed training within all companies engaged in the energy industry. Organisations like GPA Europe and PetroSkills are well placed to help

The need for creativity and innovation is unparalleled. The industry will be a fantastic place to work for the next few decades. It is crying out for the brightest and the best engineers and scientists. As many at the workshop observed, global warming will be a positive influence on the lives of those who chose to work in the energy industry.

1 Greenhouse gases

2 Above pre-industrial average temperatures

3 International and National Oil Companies



Young Professional Training Day



Young Professional Training Day

SHELL CLIMATE ACTION SIMULATION GAME

Facilitated by Ahmed Msahli and Francesco Franco

As part of the GPAE Young Professional Training Day, we had the opportunity to facilitate the Shell Climate Action Simulation Game, an interactive and experiential learning session designed to simulate the complexities of global climate negotiations.

The session was based on the En-ROADS Climate Solutions Simulator, a scientifically grounded, user-friendly tool developed by Climate Interactive and MIT Sloan that allows users to explore the impact of various climate policies in real time.

Purpose and Objectives

The primary objective of the simulation was to provide young professionals with a hands-on experience in climate policy-making, helping them understand the interconnectedness of energy, economic, and environmental systems. By stepping into the shoes of global stakeholders, participants were challenged to negotiate and implement strategies that could collectively limit global warming to well below 2°C, in line with the goals of the Paris Agreement.

Simulation Design and Stakeholder Roles

Participants were divided into six stakeholder groups, each representing a critical voice in the climate dialogue:

- 1. National Governments** – focused on policy, regulation, and international cooperation.
- 2. Conventional Energy Sector** – representing fossil fuel interests and energy security concerns.
- 3. Clean Tech Industry** – advocating for innovation, renewables, and green infrastructure.
- 4. Land, Agriculture & Forestry** – emphasizing land use, food systems, and carbon sinks.
- 5. Climate Justice Advocates** – prioritizing equity, vulnerable populations, and intergenerational fairness.
- 6. Financial Institutions** – exploring investment strategies, risk management, and green finance.

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Young Professional Training Day

Each group was tasked with proposing and negotiating policy actions aligned with their interests, while also contributing to a shared global climate goal. The En-ROADS simulator provided immediate feedback on the global temperature trajectory, emissions, energy mix, and other key indicators based on the proposed policies.

Key Outcomes and Insights

The session was marked by high levels of engagement, collaboration, and critical thinking. Participants quickly embraced their roles, engaging in lively debates, strategic alliances, and creative problem-solving.

Some of the most impactful proposals included:

- Implementation of a global carbon price.
- Phasing out coal subsidies and increasing investment in renewables.
- Large-scale afforestation and sustainable land management.
- Increased funding for climate adaptation and resilience in developing countries.
- Financial incentives for clean technology R&D and deployment.

Through iterative rounds of negotiation and simulation, the group succeeded in reducing the projected global temperature rise to approximately 1.8°C—a powerful demonstration of what is possible through informed, cooperative action.

Learning and Reflections

Participants reported several key takeaways from the experience:

- **Systems Thinking:** A deeper understanding of how energy, economy, and climate systems interact.
- **Stakeholder Complexity:** Appreciation for the diverse motivations and constraints faced by different actors.
- **Urgency and Agency:** Recognition of the urgent need for action and the role individuals and organizations can play in driving change.
- **Collaborative Leadership:** Insights into the importance of negotiation, compromise, and coalition-building in achieving global goals.

The simulation also sparked meaningful conversations about climate justice, the role of innovation, and the importance of aligning financial flows with climate objectives.

Conclusion

The Shell Climate Action Simulation Game was a highlight of the GPAE Young Professional Training Day, offering a dynamic and impactful learning experience. It not only enhanced participants' understanding of climate policy but also empowered them to think critically and act decisively in their professional roles. We are grateful to GPAE for supporting this initiative and look forward to continuing to engage and inspire the next generation of energy leaders.

Ahmed Msahli & Francesco Franco
Facilitators, Shell Climate Action Simulation Game

CHAIRPERSON'S REPORT

It's been another busy year for GPAE.

Shortly after the 2024 AGM, Helen Body began her maternity leave and for many, that event was the first opportunity to meet Lesley Potts. Lesley stepped in as maternity cover for Helen, and we said "Au revoir" to her on 7th November.

Personally, I'd like to extend a heartfelt thank you to Lesley for looking after us so well during her time with us. We're also grateful to Helen, who has jumped back in at the deep end, taking up the reins and being back in the saddle for the AGM.

We've had a productive year of knowledge sharing through our webinars. In 2025, we ran two sessions — one in April and another in September. The April webinar was presented by Jade Gray and Martin Curtis from Bechtel Ltd., who explored "Why You Need a Carbon Capture Pilot Plant for Your Flue Gas."

In September, we heard from Filip Cejka of BRE on Blue Hydrogen Production, and Glen Hay from SLB on Scoping Opportunities for Flared Gas Monetisation.

These short lunchtime sessions allow us to cover a wide range of themes and are offered to our members free of charge.

If you missed any of them, the good news is they're available to our members on our website: <https://gpaeurope.com/category/presentations>

Your support for these events is appreciated — and a big thank you to our speakers for stepping up and sharing their expertise.

Our main conference took place in The Hague from 4–6 June 2025 at the Marriott Hotel.

The event ran from Wednesday to Friday, with the main conference kicking off on Wednesday afternoon, followed by a welcome drinks reception in the evening.



Samantha Nicholson, GPAE Chairperson

Earlier that day, we hosted two parallel sessions:

- The Young Professionals' Training Day, designed to support and inspire the next generation in our industry.
- An interactive knowledge session for the less-young professionals (like myself!), offering a chance to hear from and engage with industry experts, as a warm up ahead of the main conference.

Reinvigorating our Young Professionals Activities has been a key focus for many of us — and it's something we'll continue to prioritise in 2026. We take great pride in our YP heritage. GPAE provides a Young Professionals' Training Day, free of charge to our member companies, as part of our commitment to developing future leaders in gas processing.

In 2024, we challenged the YPs to shape the format of their day. "Not another day of presentations," they said. "Oh!" we replied, "Then what?"

The result was a fresh, engaging approach — and in 2025, the YPs were once again in charge. Based on the feedback, the subject matter was thoroughly engaging, and the day was a great success.

PetroSkills kindly ran the first of two workshops, exploring how we tackle climate change and carbon emissions. The second was the Shell Climate Action Simulation Game, delivered by two YPs from Shell's Gas Processing Group.

We said goodbye to some of our YPs after the drinks reception, while others stayed on to join the main conference. Those who remained were invited to report out on the YP Day during the final day of the conference.

A huge thank you to all participants, organisers, and especially the YPs who provided feedback.

I encourage all our member companies to consider whether their YPs would benefit from attending the next training day — and the answer is simple: yes, they absolutely would!

We were fortunate to have two Gold Sponsors for this year's conference — Kent plc and Parker Hannifin.

We're truly grateful for their support, which helps us deliver high-quality events like the Young Professionals' Training Day free of charge to our member companies.

As a not-for-profit organisation, sponsorship is not only a great way to showcase your company to a targeted industry audience, but also a meaningful way to contribute to the development and sharing of knowledge across our sector.

I encourage you to consider whether your company might be interested in sponsoring a future GPAE event. Please contact admin@gpaeurope.com if you would like details about sponsorship packages for the 2026 conference.



On 5th June, we were honoured to welcome our keynote speaker, Pavan Chilukuri from Energex.

Mr. Chilukuri delivered a thought-provoking address titled "Looking Beyond the Technology in CCS". Drawing on his extensive experience in the cement industry, he explored the challenges and complexities facing CCUS projects — not just from a technical standpoint, but also through the lens of broader strategic and operational considerations.

His insights added real value to the conference and sparked meaningful conversations around the future of carbon capture and storage.

Next on the agenda was a panel discussion moderated by Stuart Penson, representing both the Hydrocarbon Economist and Carbon Economist. The session focused on a timely and complex topic:

"Roadmap or Roadblock? – CO₂ and Hydrogen Pipelines."

Stuart was joined by a panel of industry experts who brought diverse perspectives and deep technical insight to the conversation:

- Manohara Gudiyor Veerabhadrapa, National Physical Laboratory (NPL)
- Peter van Elferen, Gasunie
- Thomas Fontfreyde, Genesis Energies
- Thomas de Cazenove, Shell

The discussion explored the opportunities and challenges in developing pipeline infrastructure for CO₂ and hydrogen — which are critical enablers for the energy transition.

Following the panel discussion, our session chairs guided us through a rich programme of technical papers.

One of the things I find particularly positive about GPAE conferences is the balance we strike between networking





and technical content. While there are plenty of opportunities to connect over coffee breaks, the majority of participants are genuinely keen to attend all the technical sessions.

This means our speakers benefit from presenting to large, engaged audiences — and attendees gain valuable insights from industry experts discussing highly relevant topics. It's a testament to the quality of our programme and the commitment of our community.

Thursday featured our poster sessions, held in the exhibition area.

A big thank you to all the presenters and contributors who shared their work and insights — these sessions continue to be a valuable part of our technical programme.

Later that evening, we gathered for the conference dinner, just a stone's throw from the venue. The close proximity allowed everyone to enjoy the evening while still getting a good night's rest — especially helpful given the timing adjustments we made on the final day to ensure everyone could get to their transport home safely. Lesley did a fantastic job organising everything, though even she couldn't prevent a rail strike in the Netherlands!

Finally, I'd like to extend my sincere thanks to everyone who contributed to making the event a success.

To our speakers, session chairs, sponsors, and every one of you — however you participated — thank you. Your time and expertise are what make GPAE events valuable and impactful.

So, what's next?

We're already looking ahead to our 2026 Spring Webinar, which will take place ahead of the Annual Conference in Bergen, Norway, from 3rd–5th June.

Planning is well underway, and I'm excited to announce that we've secured a limited number of visitor passes to the Northern Lights centre in Øygarden for Wednesday 3rd June. Keep an eye on our monthly newsletter for registration details — and book early to avoid disappointment!

We are not only concentrating on the Bergen conference and webinars. Our Young Professionals have been working on their charter encouraging networking events, further learning opportunities and encouraging YP engagement as the future of the industry. This is being extended further by the KSI groups who are reaching out to alma maters, to other universities and to new gas processing industry contacts for the benefit of all members. If you would like to get involved, don't be shy, please let us know at admin@gpaeurope.com.

I would also like to say thank you to all of those people operating behind the scenes, the Technical Committee, the KSI group members, the Management Committee, the Board of Directors, the Executive Administrator and those who've provided input to In Brief. All of these individuals working for different companies help the GPAE in growing connections, knowledge and advancing implementation of up-to-date gas processing technologies. Through our ability to communicate effectively and connect across the industry, we are shaping the future of industry together.

Samantha Nicholson

GPAE Chairperson

EVENTS DIARY

Be part of our conferences promoting a new energy future and the transition of our industry towards that future.

Technical Meeting & AGM

20th November 2025

The Clermont Hotel, London, UK

Technical Webinar

23rd April 2026

Annual Conference & Young Professional Training Day

3rd-5th June 2026

The Norge Hotel, Bergen, Norway

Conference theme: decarbonisation

** includes a visit to The Northern Lights Project **

A conference and networking event organised by GPA Europe.

What's on?

- Free Young Professional Training Day
- Technical Conference
- Workshop
- Keynote Address
- Executive Panel
- Social Activities

Technical Webinar

24th September 2026

If you are interested in presenting at a GPA Europe event, please submit your abstract title plus 100-200 words to admin@gpaeurope.com

GPAE 2025 TECHNICAL WEBINARS

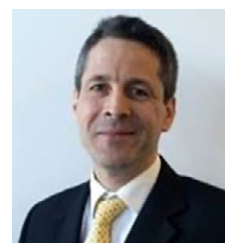
Below are details of the GPAE 2025

Technical Webinars, which are FREE of charge for all, and available to members in the <https://gpaeurope.com/library>

April 2025 Presentation



Jade Gray



Martin Curtis

Speakers: Jade Gray and Martin Curtis - Bechtel Ltd

Why you Need a Carbon Capture Pilot Plant for your Flue Gas

Abstract: This paper presents the reasons for carbon capture pilot plants, to provide greater confidence in the design, emissions, and operation of a full-sized carbon capture plant.

Carbon capture is proposed as the approach for achieving Net Zero targets for several flue gas-emitting industries such as gas/coal/biomass power, waste-to-energy plants, and refineries. However, there is limited data available to indicate if the process design can meet the performance requirements for government funding, and what the gaseous and liquid emissions will be. One of the big questions the pilot plant would aim to answer is post carbon capture flue gas emissions, which is particularly important for determining Nitrosamine emissions in proposed clusters.

The Bechtel 7tph pilot plant is designed for flexible operations, with variable water wash and acid wash combinations demonstrating the impact on emissions, variable packing heights facilitating the testing of capture efficiency at different bed heights and a reclaim skid connection to improve understanding of reclaiming requirements and amine degradation.

The pilot plant design is stand-alone, with integrated air cooling and on-skid utilities, so that proprietary solvents can be tested and modular designs can enable transportation within the UK road transportation envelope.

September 2025 Presentations

Speaker: Glen Hay, SLB

Scoping Opportunities for Flared Gas Monetisation

Abstract: For methane abatement efforts, SLB Emissions Technologies and Solutions uses a plan, measure, act methodology. This presentation will provide an overview of the methodology behind the “plan” pillar for flared gas monetization, investigating the economic challenges and risks behind optimal site selection matched with current and future technological solutions. Within the presentation, the impact of the flared gas composition, pressure, and volumetric flow rates on process solutions will be discussed.



Glen Hay, SLB

he optimal technology strategies will then be matched using an approach to showcase the cost of additional treatment before and after the core process when choosing solutions involving power generation, gas compression, gas liquefaction, or more complex conversion technologies. The presentation will also cover the market for potential products resulting from such solutions and how distance to market can impact economics.

September 2025 Presentations

Speaker: Filip Cejka, BRE

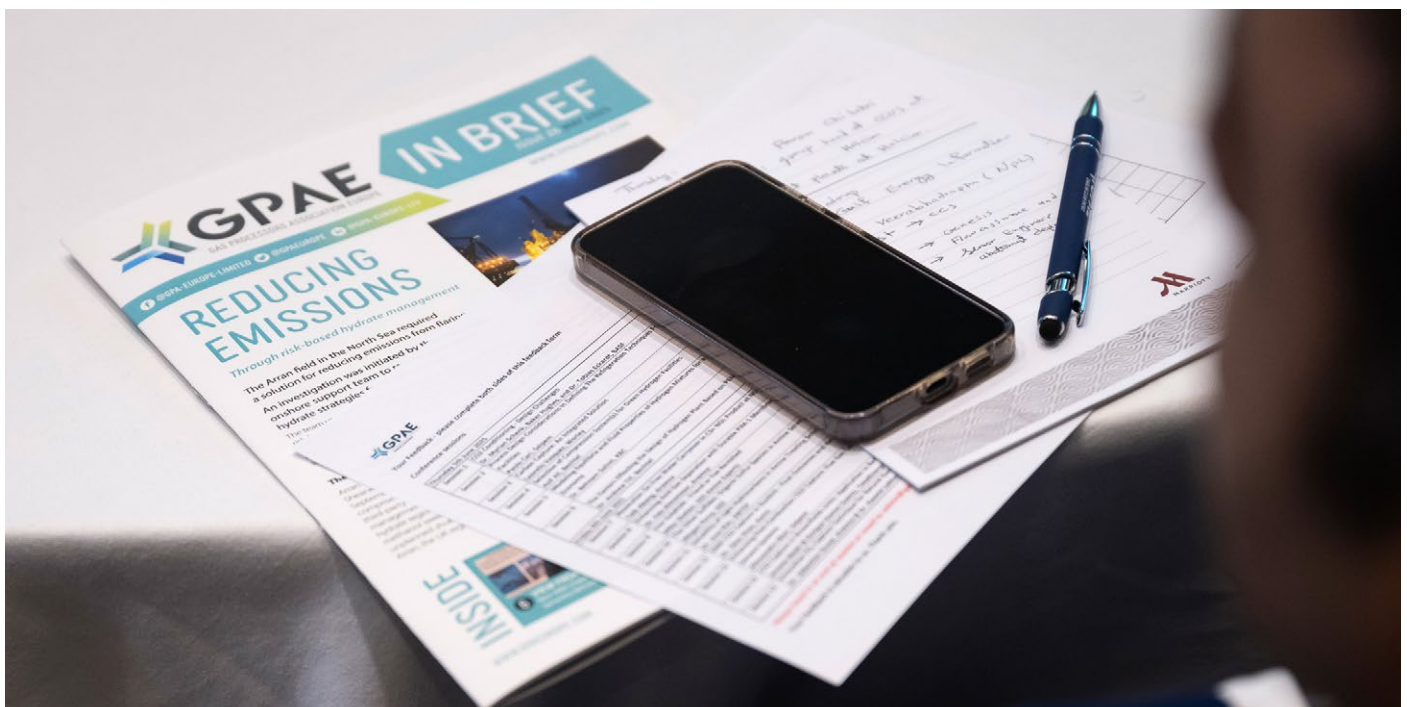
Blue Hydrogen Production- Hydrogen Production from Natural Gas with Carbon Capture

Abstract: As global energy systems transition toward low-carbon solutions, blue hydrogen – produced from natural gas with carbon capture and storage (CCS) – offers a promising pathway. In this webinar, we compare two key process options for hydrogen production: steam methane reforming (SMR) and autothermal reforming (ATR) with partial oxidation. We evaluate each configuration under multiple carbon capture strategies, including the baseline capture of process CO₂ and an enhanced approach that incorporates additional CO₂ capture from flue gas used in preheating.



Filip Cejka

The session also explores a hybrid system that integrates ATR with electrolysis to further reduce emissions and optimize resource use. Comprehensive results will be presented, covering hydrogen yield, natural gas consumption, CO₂ emissions, electricity demand, and steam production and utilization.



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This listing of current Corporate Members represents the status at 3rd September 2025.

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