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IN BRIEF

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Claude Letourneau, President and CEO of Svante, stands at the company's Centre of Excellence for Carbon Capture & Removal in Vancouver, Canada.
The machine behind him is Svante's contactor for point-source industrial carbon capture.

FROM WASTE TO WEALTH: THE ECONOMIC OPPORTUNITY OF A CARBON MANAGEMENT REVOLUTION

By Svante President and CEO Claude Letourneau

In today's economy, forward-thinking businesses strive to create value from every aspect of their operations – even from byproducts that would traditionally be discarded. Farms transform agricultural waste into compost or animal feed, lumber mills repurpose sawdust into fuel pellets or fiberboard, and construction companies recycle old concrete and asphalt into fresh materials for new projects.

There is one particular byproduct that is both invisible and odourless yet highly impactful: carbon dioxide (CO_2). Human activities release over 36 billion metric tons of CO_2 every year, as reported by the International Energy Agency (IEA).

Natural processes, including forests, plants, and oceans, absorb around half of this total. Still, approximately 18 billion metric tons accumulate in the atmosphere each year, creating a massive environmental challenge. What if, instead of letting this CO_2 remain a waste product, it could be converted into a valuable asset?

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INSIDE

Addressing the world's excess CO_2 requires a comprehensive carbon management strategy. Just as waste management systems have evolved to collect, transport, and either store or repurpose waste materials, we need engineered solutions to manage CO_2. With countries and industries moving to decarbonise, power plants and manufacturing companies face growing pressure to reduce their carbon footprints.

Carbon capture, use and storage (CCUS) has emerged as a critical strategy for handling emissions effectively. But for CCUS to succeed, industries must tackle three primary challenges: technological innovation, large-scale deployment, and monetisation.

Chevron Demo Plant – flue gas line

Turning sustainability into economic opportunity

The technological landscape for CCUS has seen remarkable advancements. New nano-engineered materials, for instance, are now capable of adsorbing substantial volumes of CO_2 from industrial smokestacks or directly from the air, concentrating it to a purity level of 95%.

This technology can be likened to compacting waste before sending it to a landfill – it minimises volume, making storage or reuse more efficient. Advanced materials capable of capturing CO_2 are key to scaling carbon capture, yet technology alone is only part of the equation.

The deployment of CCUS infrastructure on a large scale has required innovative financing and deal structures. Industry experts have developed specialised project financing, risk-sharing models and underwriting mechanisms that reduce financial risk and allow carbon capture facilities to scale. The ability to build, replicate and expand CCUS infrastructure is essential to meet growing demand and make carbon capture commercially viable.

The third challenge – and perhaps the most crucial – is monetising captured CO_2. Finding ways to turn CO_2 into a revenue-generating resource offsets the cost of capture, providing companies with an economic incentive to adopt CCUS.

Carbon monetisation also helps create a circular economy, where captured carbon serves as a raw material for other industrial applications, such as sustainable fuels and construction products. Realising the economic value of captured CO_2 is critical for driving investment in carbon management and ensuring that CCUS is embraced widely and sustainably.

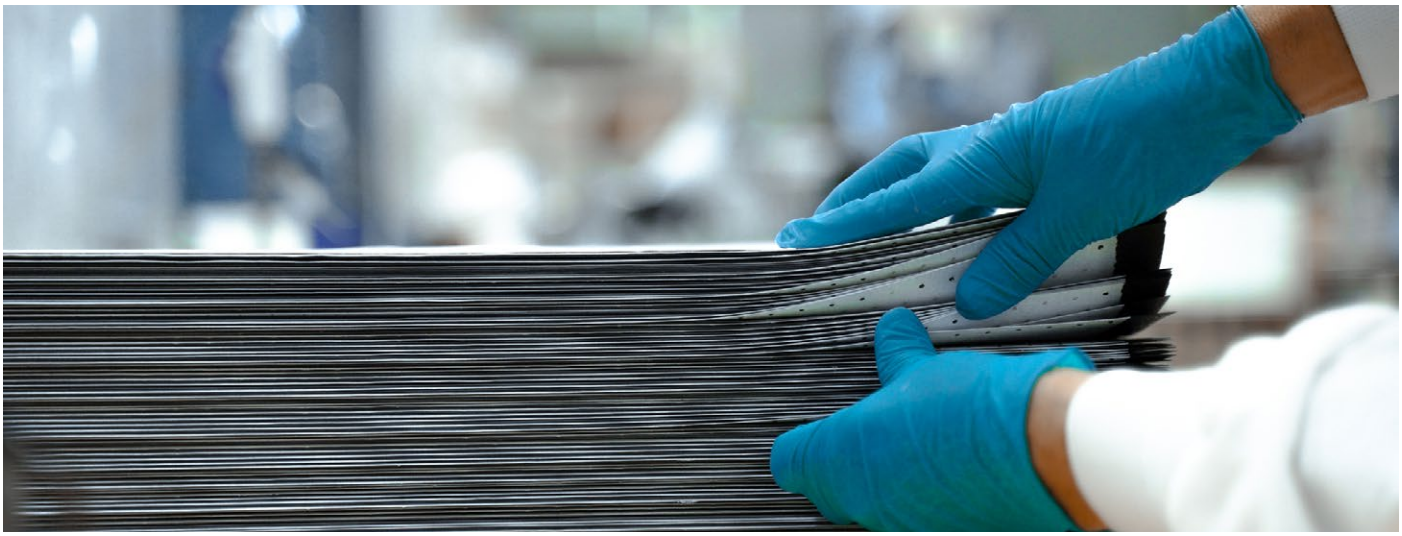
The value of carbon: Differentiating biogenic and anthropogenic CO_2

For CO_2 monetisation to be fully effective, industries must also consider the differences between biogenic and anthropogenic CO_2. Biogenic CO_2 comes from sources like plants and animals, and because this CO_2 was recently part of the above-ground ecosystem, it's a preferred option for reuse.

In contrast, anthropogenic CO_2 results from burning fossil fuels or industrial processes, which introduce net-new carbon into the atmosphere that was previously stored underground.

To effectively manage anthropogenic CO_2, most of it will need secure, long-term storage to prevent additional contributions to climate change. This storage approach aligns with the understanding that while the average individual emits around ten tons of CO_2 per year, mitigating these emissions requires infrastructure investments similar to those used for managing household waste. With a mitigation cost of roughly US$150 per ton, carbon management could become as commonplace – and financially manageable – as trash collection.

Despite these distinctions, all CO_2 molecules contribute equally to global warming, regardless of origin. Therefore, establishing a reliable market for captured CO_2 creates incentives for businesses and policymakers to adopt carbon management measures that reduce environmental impacts while opening new economic pathways.



Uncovering the potential in CO_2 monetisation$_2$

Effective carbon monetisation could significantly shift how industries and governments approach emissions. Understanding the 'social cost' of carbon, or the economic damage from each additional ton of CO_2, is vital to making this shift. The social cost of CO_2 includes various expenses, from crop losses and health costs due to extreme weather to infrastructure damage from natural disasters.

In the United States, this cost is currently estimated at around US$190 per ton and could increase to US$300 per ton within the next decade. Such an increase would only amplify the financial burden of inaction, underscoring the economic argument for immediate investment in carbon capture and reduction strategies.

For industries, the rationale is clear: as long as the cost of implementing CCUS is lower than the social cost of CO_2, investing in carbon management is economically advantageous. Additionally, government policies that set carbon pricing and establish rules around emissions play a pivotal role.

By offering clarity and reducing risks for industrial buyers, regulatory frameworks help make the initial cost of carbon capture and storage more manageable, thereby accelerating adoption.

Governments alone possess the tools to bridge the gap between the social cost of carbon and the actual expenses industries incur today. Ignoring carbon emissions is similar to taking on debt without a plan to pay it back – the longer it takes to address, the higher the ultimate cost. Regulatory action now can help prevent even greater expenses and environmental repercussions in the future.

Paving the way for a 'Carbon Smart' economy

Although the carbon management market is relatively young, progress is evident. Technological advancements, increased deployment, and innovative monetisation strategies are driving significant investment into the CCUS sector, with the IEA predicting that global carbon capture capacity will increase more than sixfold by 2030.

While early efforts have focused on a business-to-government model – necessary to fund and de-risk initial infrastructure investments – the future lies in a business-to-business approach, where 'Carbon Smart' industrial pricing could stimulate an efficient carbon market. This market would create value across the supply chain, allowing companies to benefit from reduced carbon intensity and the economic gains of carbon management.

At Svante, we are actively contributing to this future. Our highly efficient carbon capture filters are already in production and being deployed at scale, positioning us at the forefront of CO_2 capture and removal technology. However, our approach goes beyond technology.

We collaborate with clients to develop viable revenue models for captured CO_2, leveraging our extensive experience and industry networks. These partnerships enable us to support businesses in transforming trapped carbon emissions into economic assets.

Achieving a Carbon Smart economy requires collaboration among multiple stakeholders, from technology providers and industrial clients to policymakers and financial institutions. Each stakeholder brings unique expertise that is essential for solving the complex puzzle of CO_2 monetisation. Together, these partnerships hold the potential to address one of the primary challenges for industries seeking sustainable carbon management solutions.

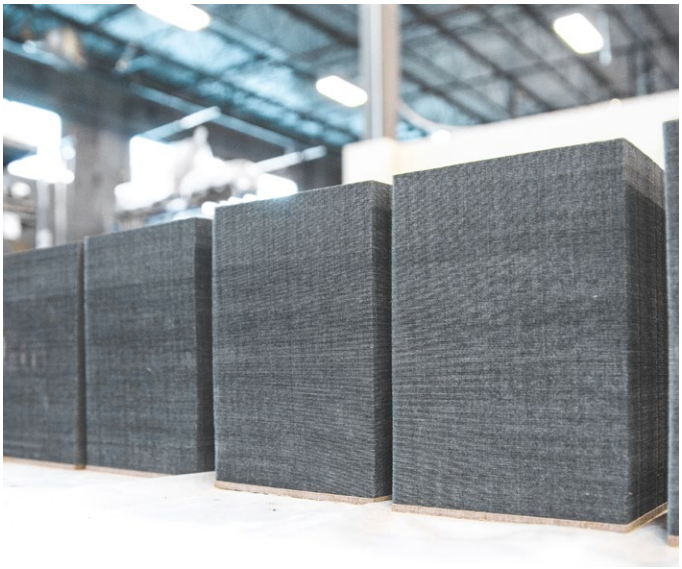
The road ahead: Building infrastructure, partnerships and awareness

Establishing a profitable carbon management market also requires a substantial investment in infrastructure. From pipelines that transport CO_2 to storage sites to facilities capable of repurposing captured carbon into new products, a network of assets must be built and expanded to support a large-scale carbon economy.

The initial costs of this infrastructure can be high, but as deployment becomes widespread and technology advances, the costs are expected to decrease, making CCUS more accessible for smaller companies as well as larger corporations.

Building this infrastructure also creates job opportunities across engineering, manufacturing, and technology sectors, contributing to economic growth while tackling the climate crisis. Additionally, with regulatory and financial incentives, governments can support infrastructure projects that attract private investments and reduce the financial risks associated with initial capital outlay.

The public also plays a key role in the success of carbon management. Raising awareness of carbon's social cost and the benefits of CO_2 utilisation can help drive consumer demand for products and services with lower carbon footprints. Consumer preference for Carbon Smart products can further incentivise industries to invest in CCUS solutions, creating a feedback loop that amplifies demand for sustainable carbon management practices.



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A new era of environmental accountability

As we move toward a future where CO_2 emissions are treated not as an environmental liability but as a resource, industries are positioned to take on a new level of environmental accountability.

Capturing CO_2 is no longer just about meeting regulatory requirements; it's about building resilience in a shifting economic landscape – rewiring of the industrial sector by reducing CO2 emissions, not reducing our energy choices, to make products for our day-to-day lifestyle.

Companies that invest in CCUS today gain a competitive edge, establishing themselves as leaders in the transition to a low-carbon economy.

The development of a robust carbon market could also benefit countries and regions that rely on carbon-intensive industries. By adopting carbon management solutions, these regions can continue to support local economies while aligning with global decarbonisation goals. For example, oil and gas companies that invest in CCUS can use carbon management to mitigate emissions from fossil fuel production, enabling them to support economic growth while reducing environmental impact.

Achieving a circular carbon economy, where carbon cycles seamlessly from one industry to another without adding to atmospheric CO_2, is the ultimate goal. In this vision, CO_2 is a valuable resource that serves as an input for various industrial processes rather than a harmful byproduct. Carbon captured from industrial emissions or directly from the air could be repurposed into everything from synthetic fuels to sustainable building materials.

Such an economy would provide stability to industries that historically relied on carbon-intensive processes, offering a path to sustainability that doesn't compromise productivity. To make this a reality, continuous advancements in CCUS technology, infrastructure investment, regulatory support, and public awareness are essential.

In summary, the path to a circular carbon economy involves much more than cutting emissions; it requires a complete transformation in how we think about and handle CO_2.

Through effective carbon management, technological innovation and strategic partnerships, the world can transform carbon from an environmental burden into a driver of economic value and environmental sustainability.

Companies like Svante are at the forefront of this transformation, using their expertise to help industries make carbon work for, rather than against, the planet. The time to act is now, as the future of carbon management holds the potential for profit and the promise of a healthier, more resilient world.

A BUSY AND REWARDING YEAR

2024 is coming to a close, and what a year we have had! Some of the busiest times for our industry. Combining traditional gas processing, minimising/reducing emissions and the new gas processing for the energy transition.

Approaching the end of the year, we also approach to realisation of the mountain we have to climb to get to Net Zero. Here in the UK, regulations and standards, together with government funding are coming to light for the new projects, be they CO_2 capture or hydrogen production. We expect to see the green light before 2024 ends – we remain hopeful that Europe and the rest of the world will follow swiftly.

We need to remember that is not only the Energy Transition themes, but also the Energy Security for our countries. We need to keep pushing forward.

Here at GPA Europe, we continued to engage our members on topics such as Hydrogen, CCUS and Natural Gas (traditional and renewable) in our webinars and in our Annual Conference in Milan in September.

I take once again the opportunity to remind you, that our webinars can be watched at your leisure at https://gpaeurope.com/category/presentations and all the papers from our conferences are https://gpaeurope.com/library. So if you couldn't join us please refer to these links, also please request a copy of our InBrief publication, if you do not receive it.

As this will be my last 'view from the top', I just want to reiterate that it has been an absolute honour to be chairperson for the last two years.

I would like to thank everyone in the team: the Technical and Management committees, the members of the various Key Strategic Initiatives groups and Helen, our Executive Administrator (who, by the way, will be taking a year off to become a Mum) – she is really the engine in our organisation. Lesley Potts will cover for Helen during this time, so I also take the opportunity to welcome her to our organisation and I ask you all to please offer your support.

I will continue in the GPAE, so it's not really goodbye from me, just Hasta Pronto!

Enjoy the coming holidays, take time with your loved ones, recharge and I look forward to engaging with you once again in 2025. We will have another year packed with excellent technical exchange and learnings.

All the best

Myrian Schenk

GPAE Chairperson

GPAE YOUNG PROFESSIONALS TRAINING DAY

Wednesday 25 September

A day crafted by GPAE Young Professionals and supported by GPAE Senior (not so young) Professionals.

Fireside Chat

Open discussion with key Senior Engineers involved within GPAE focused on your development.

Moderated by: Filip Ceijka, Bryan Research & Engineering and Cassidy Ooi, Parker Hannifin

Our Senior Engineers:

Carmella Alfano, Axens
Gary Bowerbank, Shell
Martin Copp, Parker Hannifin
Dave Knight, SLB
Samantha Nicholson, Fluor
Myrian Schenk, T.EN

Take away points:

"Enjoy what you do"
"Take control of your career"
"Say yes to opportunities"
"Follow your passion"
"You never stop learning"
"Seek a mentor"
"Don't be afraid of change"

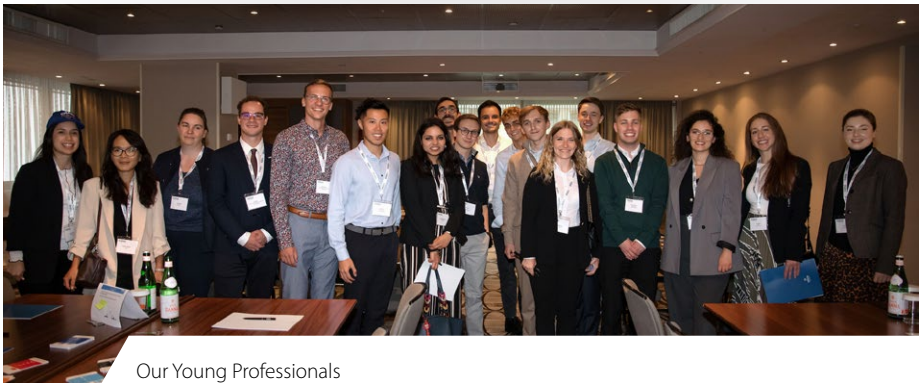
Our YP Moderators, Filip Ceijka and Cassidy Ooi

Our (not so young) Senior Engineers

Speed networking session

Speed Networking

One-to-one time with our Senior Engineers and their chance to ask questions regarding the industry and their development.



Our Young Professionals

Our YPs feed back to the Annual Conference

Group Exercise by TotalEnergies

One-to-one time with our Senior Engineers and their chance to ask questions regarding the industry and their development.

Hosted by Céline Volpi and Erika Quintero, TotalEnergies

Optimising the value chain for H2 production by TotalEnergies

Objective:
"The German government has committed to net zero emissions. It requires the port of Hamburg to meet the zero GHG emission target. The new tender specifies zero or negative emissions for the hydrogen energy chain."

Value Chain Constraints:

- Cost
- Carbon Emissions
- Land
- Water Usage
- Protest (Social Impacts & Disagreement)

Erika Quintero, TotalEnergies

GPAE ANNUAL CONFERENCE

Wednesday 25 September

Workshop

Speaker: Malcolm Harrison, PetroSkills

PetroSkills was asked by GPAE to facilitate a half day workshop to kick off GPAE'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.

Malcolm Harrison and Alessandro Roviello, PetroSkills

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

The evidence that the world is getting warmer and that GHG 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 of the world are failing, and will continue to fail, to meet the promises, made in Paris in 2015 i.e. to take the necessary steps to limit global warming to C_2 and do everything reasonable to limit it to 1.5 ^{C}.

They will continue to fail yet also continue to finance new green technologies through tax breaks and subsidy. The money will be spent unevenly and inefficiently, as they will also fail to develop a global carbon pricing mechanism, the only way in which markets, rather than politicians will make investment decisions

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.

Perak oil is some time way. In the medium-term gas and LNG will become more popular not less. Gas and LNG are recognised transition fuels, that transition is going to take some time. If we think of the oil and gas industry as a Chinese restaurant, it is not yet time to become an Italian restaurant but maybe to add pizza and pasta to the menu.

Our workshop attendees

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 NOCs, even the mighty Saudi Aramco, have committed to improving operations efficiency and reducing methane losses. 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 must happen:

- Given that the Paris Acord targets will be dramatically missed, CCUS4, 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 CO_2) as source for petrochemical and transport fuel production for large transport e.g. planes, boats and trains.

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 confirmed, global warming will be a positive influence on the lives of those who chose to work in the energy industry.

There is a real need for awareness training of the type provided at this workshop. There is a larger need for fundamental and technical training.

Our panellists

Thursday 25 September

Panel Discussion

Moderated by Leonardo BRUNORI, Energy Executive Vice President, RINA

Panellists:

Dina LANZI, Head of Technological Development in the Decarbonization Projects Unit di Snam and President of Comitato Italiano Gas

Claudio EVANGELISTI, CEO, Gas & Heat S.p.A.

Raimondo GIAVI, VP Hydrogen, Marketing & Strategy, Baker Hughes

Energy Transition from Oil to Gas and recent developments in renewable & low carbon fuels

Our panel answered five questions:

1. From your perspective, how do you see evolving the energy sector?
2. Future trends: Decarbonisation and energy transition
3. What can we do today to improve fossil industry sustainability?
4. Are you witnessing geographical differentiations for what concerns the energy transition?
5. How are your organisations are evolving, adapting themselves to the new scenario in the different regions?

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Thursday speakers

Thursday 25 September

Morning Session

Moderated by Paul Hopkinson

Ligia Pana, Saipem

Saipem's Enzymatic Carbon Capture Technology: A Strategic Advance in Industrial Decarbonisation

Ligia Pana, Saipem

Climate change is one of the most pressing challenges of our time, requiring urgent action from all industrial sectors. As a global leader in engineering solutions, Saipem is committed to developing and implementing cutting-edge technologies that can reduce greenhouse gas emissions and foster a sustainable future.

Introducing the enzymatic CO_2 capture solution, Saipem demonstrates the vision and leadership in engineering a sustainable future, setting a new benchmark for environmental care.

The solution developed by Saipem is an innovative enzyme-catalysed carbon capture technology using a non-toxic and non-volatile solvent that excels in rapid CO_2 absorption. The technology offers a unique, industrialised approach to decarbonisation that combines sustainability, safety and economic viability. Its modular and pre-engineered packages are a replicable, plug-and-play, perfect for quick and effective carbon-neutral transition, as it reduces onsite work and speeds up project timelines.

By harnessing the power of nature and innovation, the enzymatic carbon capture process can help a wide range of industrial sectors meet their environmental and economic goals and take a substantial step towards consistent environmental responsibility.

Furthermore, its innovative approach allows for the use of low-temperature heating medium for solvent regeneration, leading to OpEx reduction through integration with residual heat or low-grade geothermal sources.

Georgios Lithoxoos, Saudi Aramco

AADZORB Technologies for Gas Treatment and Carbon Capture

The presentation showcased the progress that researchers at Saudi Aramco R&D Center have made, towards demonstrating the cost-effectiveness of a technology option that targets achieving 99.99%+ sulfur recovery inside sulfur recover units (SRUs).

This technology, dubbed AADZORB, comes in the form of an SRU tail gas treatment process that uses solid sorbents in two consecutive stages, the first stage for drying the tail gas stream while the second one for removal of H2S from the dehydrated tail gas stream.

In this talk, details on the journey of transforming an idea for cost-effective treatment of SRU tail gas streams (WO 2021/035081 A1) to a demonstration plant will be shared. The demonstration plant will be operational in a US refinery, using a tail gas flow of 1 MMSCFD, during the next 12 months.

Giovanni Petrachi, Shell Global Solutions

The discussion will focus on the results obtained during bench- and pilot-scale testing, which convinced the team that the separation capacity and selectivity, as well as hydrothermal stability of the adsorbents make AADZORB very competitive with the industry commercially proven technology.

Based on results from the pilot plant tests, AADZORB technology is expected to achieve sulfur recovery exceeding 99.9% at gas plants and refineries, along with a minimum -20% reduction in capital expenditure (CAPEX) and -30% decrease in operating costs compared to reduction-absorption process for managing 50 ppm of SO2 emissions. Furthermore, AADZORB prepares the SRUs tail gas streams for a cost-effective CO_2 capture.

Adish Jain, Fluor

Get more for less: Decarbonising existing assets – Some lessons learned

Adish Jain, Fluor

Decarbonisation programmes are demanding increasing attention and Fluor's Global new project awards illustrates this trend with a rise from 80+ Energy Transition Projects in 2022 to over 200 projects in 2023.

Lessons learned from two of the case studies of existing facilities illustrate:

- A targeted but strategic approach is required at the organisation level to achieve carbon reduction.
- Develop ;helicopter view; to identify opportunities at macro level.
- Assess existing facilities remaining life and technology 'fit-for-purpose'.
- Assess impact on operations, plant availability and cost to prioritise these opportunities over long period.
- Combine energy transition with phased end-of-life asset renewal for improved return.

In the author's experience, some of the typical short term global opportunities are replacing fuel oil with fuel gas, electrification of combustion equipment, steam pressure rationalisation, recovering vent gases and recycle, flare gas recovery etc. The challenges are production loss during changeover, reduced availability, technology risk and importantly, the mindset to change.

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Thursday 25 September

Afternoon Session

Moderated by Gary Bowerbank, Shell

The afternoon session focused on three different elements of the Energy Transition. Including the challenge of making sustainable aviation fuel (SAF) from waste material affordable, understanding the construction difficulties for largescale CO_2 capture, to the cutting-edge science of Plasmonics.

Trevor Best, Syzygy Plasmonics

Electrifying the Chemical Value Chain with Photocatalyst

Trevor is the CEO and Co-Founder of Syzygy Plasmonics, which is pioneering industrial reactor cells to produce chemicals at lower cost and with fewer carbon emissions. Using a photocatalyst in an electrified reactor can increase efficiency in catalytic cracking and eliminate CO_2/NOx emissions when powered by renewable electricity.

As well as enabling the electrification of many traditional conversion processes, such as ammonia cracking and reforming, the increased efficiencies allow reactor volumes to be significantly reduced and side reactions to be minimised.

The technology has the potential to address the tri-dilemma: Decarbonisation, efficiency and affordability, and you heard about it here first at GPAE.

Trevor Best, Syzygy Plasmonics

The second presentation looked at CO_2 capture, but rather than focusing on the process aspects this presentation focused on the constructability.

Esme Elman, Bechtel

Esme Elman, Bechtel

Development of a Site-Assembled CO_2 Absorber Column

Esme is the lead mechanical engineer at Bechtel's Energy Transition hub in London and shared some insights into the construction challenges associated with the CO_2 absorber.

In post combustion CO_2 capture units, the CO_2 capture absorber is the largest piece of equipment, at over 65m high and 16.7m in diameter in Bechtel's standard 1 million ton per year carbon capture plant design.

A range of construction methods were evaluated against criteria such as material cost, fabrication cost, ease of transport and ease of construction, with the key outcomes presented.

Syed Hasan and Sangeeta Ankam, Kent Energies

The session closed with a presentation on the production of sustainable aviation fuel (SAF), highlighting the complexity and integrated nature of such plants.

Syed Hasan and Sangeeta Ankam, Kent Energies

Syngas Conditioning and Decarbonisation: Design, Footprints, Safety and Emissions Criteria from Project Experience

There is a clear demand for sustainable aviation fuel (SAF), which is produced from feedstock such as Municipal Solid Waste (MSW). Syed and Sangeeta talked us through the numerous processing steps required in such a facility, from feedstock preparation, gasification, syngas treatment, Fischer-Tropsch (FT) conversion, Hydrocracking and Fractionation unit, not to mention the utilities.

To make such an integrated facility economical there is a need for economy of scale, careful technology and Licensor selection, as well as great focus on heat integration. A key enabler for success is the ability to leverage utilities and key chemicals (oxygen and hydrogen) from adjacent facilities.

Friday 27 September

Morning Session

Moderated by Gerald Vorberg, BASF SE

The morning session focused on hybrid technologies for the removal of mercaptans besides H2S and CO_2. While the first two papers provided also operational data on its individual technologies, the last presentation gave a general overview on the boundaries of hybrid technologies and showed some fundamentals on modelling itself.

In the first paper, Eni and Shell introduced Shell's new DM-101 and optimisation measures to meet stringent sulfur specifications in one of Eni's production facilities.

Marco Oliva, ENI and Giovanni Petrachi, Shell Global Solutions

Generating Value Removing CO_2, H2S and Mercaptans with a Novel Solvent

After the implementation of more stringent sales gas specifications affecting CO_2, H2S and mercaptans, ENI experienced bottlenecks in the Acid Gas Removal Units operated with MDEA-based solvent, which led to throughput reduction and higher operational costs due to penalties and blending with sulfur-free natural gas.

The test-run performed in the ENI gas production facility showed that the new DM-101 solvent, based on single-amine aqueous solution can meet the new sales gas specifications, achieving mercaptans removal efficiency of 60% and up to more than 90% depending on the operational conditions, without any modification of the existing facilities.

The lean solvent temperature and especially the liquid-to-gas ratio are the available operational levers to adjust the mercaptans removal, finding the optimal trade-off between the sales gas specification and the SOx emissions from the Thermal Incinerator stack (via the Acid Gas Enrichment Units off-gas).

The test-run showed that the DM-101 can support the site goals, increasing the operational flexibility and assuring the production continuity, through the compliance with the sale gas specs and the production optimisation of the asset, thanks to the exploitation of the sour section of the reservoir.

Marco Oliva, ENI

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In the second paper, Axens and Total have provided their insights on its solvent technology HySWEET. Major difference compared with other technologies in this field is the utilisation of a novel hybrid formulation allowing very tight sulfur specifications, while unwanted hydrocarbon coabsorption is also reduced to a minimum.

Renaud Cadours, TotalEnergies and Carmella Alfano, Axens

Benefits of Latest HySWEET® Solvent Formulation: Insights from Recent Operational Units

Over the last decade TotalEnergies developed a new gas treatment process by taking advantage of its extensive know-how and experience in sour gas processing. This new solvent technology relies on a hybrid solvent formulation using a mixture of amines and a physical compound to simultaneously remove acid gases and mercaptans. Additionally, this 'all in one' solvent also simplifies the gas treatment chain, requires less energy and thus reduces the carbon intensity of the plant.

This technology has first been demonstrated and implemented in existing units of the Lacq plant since 2007. The last formulation based on MethylDiEthanolamine, Piperazine and a physical compound has been in operation in the SOBEGI industrial complex for six years.

Renaud Cadours, TotalEnergies

Carmella Alfano, Axens

Today AXENS is the exclusive Licensor of this new technology and has granted several licenses in the Middle East and North America. Recently the first Axens commercial units have been successfully started-up.

This presentation presented the benefits of the HySWEET® technology application on sour gas fields, relying on start-up and operational results.

With the last paper of this morning session, BASF provides a comprehensive fundamentals lecture about the use of hybrid solvents, absorption behaviour of various mercaptan species and the impact of different operational parameters, being the basis of precise of good modelling practise.

Philip le Grange, BASF Gas Treatment

Hybrid Solvent System Design Approach Upgraded

Hybrid solvents, a mixture of aqueous amine solutions and a physical solvent, are frequently used for removal of mercaptan sulfur species and for the energy savings they offer over a conventional amine system. This presentation presented BASF's cutting edge approach to these systems.

The design approach upgrade encompassed as a core element lab measurements investigating the gas solubility of CO_2, H_2S, mercaptans (methyl, ethyl, propyl), COS, CS_2 and hydrocarbon components in the hybrid solvent. In open literature the data for hybrid solvents is scarce or not available.

If any information is published, often only one solvent composition was investigated, whereas the impact of different concentrations of the physical solvent or different ratios between amine and physical solvent was not part of the research activity.

Based on the lab test result comprising gas solubilities, physical properties and reaction kinetics a rate-based simulation model was developed.

Philip le Grange, BASF Gas Treatment

For model validation an extensive test programme was performed in BASF's pilot plant. There was a good match between the model and pilot plant data. Next the reengineered simulation model was compared to an industrial reference plant currently using BASFs hybrid solvent with good result.

Unwanted hydrocarbon co-absorption by the solvent is the traditional downside to any hybrid system. A comparison of field data and simulation results was presented for hydrocarbon co-absorption as well as a novel (patented) process configuration to minimise hydrocarbon in the acid gas.

Friday 27 September

Afternoon Session

Moderated by Myrian Schenk, T.EN

The final two presentations of the conference moved to looking at Operations.

Paolo Cari, Saipem

Optimizing The Process Design to Manage the Impurities Effects on CO_2 -Rich Streams Processing

As the global natural gas industry accelerates its efforts towards emissions and carbon footprint reduction, carbon capture, utilisation and storage (CCUS) plays a key role on this path. In fact, what was once considered a waste emission stream is now emerging as a feed stream for CO_2 capture, purification and handling processes.

Consequently, CCUS facilities are increasingly essential either as an additional part of any industrial plant or as standalone facilities (i.e. hubs) purposely designed to collect, treat, store and utilise/dispose the CO_2-rich streams from different sources as the primary feedstock.

Due to the nature of the emissions and sources, such as but not limited to post combustion power plants, pre-combustion gas treatment plants, ammonia/urea production plants, etc, the composition of CO_2-rich streams could vary significantly depending on emitters. Consequently, the CO_2-rich streams resulting from the first capture steps may contain dissimilar amounts of different impurities.

Such impurities affect the physical behaviour and properties of the CO_2-rich streams and, therefore, have different implications in the process design. In addition, since the concentrations of such species are often a result of co-absorption or slip phenomena from upstream processes, they are typically not fixed parameters, but rather vary within ranges, requiring the process design to account for wider envelopes.

Therefore, understanding the effects of impurities over the operating and compositional envelope of the CO_2-rich streams becomes of the utmost importance to achieve a robust and flexible design of CO_2 handling facilities. Many process and engineering design choices, together with their subsequent CAPEX impact, are driven by this specific issue.

Paolo Cari, Saipem

Using case studies based on the EPC Contractor experience gained in executing several CCUS projects, this paper presents a thorough analysis of the impurities in post capture CO_2-rich streams and their effect on the fluid behaviour and properties, with a specific focus on the relevant implications on process design considerations for CO_2 handling systems relevant to:

- compression facilities
- liquefaction processes
- storage and transportation facilities
- auto-refrigeration processes

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Friday speakers

Loic Van-de-Velde, T.EN

Depressurization of AGR unit, a Critical and Complex Study for Projects

During the design of LNG plants, gas treatment, NGL recovery units and offshore facilities, depressurisation study is part of fundamental calculations for the material selection of equipment and flare network design ensuring meeting all the safety design criteria.

Until the fifth release of API 521, an empirical approach was clearly defined and commonly used for all types of projects and units. Only a few exceptions on the duration of depressurisation were applied on specific cases such as LPG systems or units with large inventory such as slug-catcher finger types.

However, in 2014 with the publication of the sixth version of API 521, the codes and standards knew a major update dealing with a new analytical approach based on Stefan-Boltzmann law and considering different types of fires and a stress-based calculations and performance criterion.

The new methodology has been developed based on fire test data from laboratory API recommendations to comply with these requirements.

Loic Van-de-Velde, T.EN

This presentation was built on experiences and feedback attained through recent LNG projects in different world regions and for different facilities. It highlighted the issues of the new types of fire and evaluating their impact on depressurisation calculations.

The use case of an acid gas removal unit blowdown with T.EN in-house software LNGDYN® illustrated the challenges of complex systems (multiple equipment, internals, various operating conditions...) with huge inventory for the flare design.

Onur Serin, Atlas Copco Gas and Process

CO_2 Liquefaction: Achieving Feasible Plant Economics and Efficiency Through Improved Compression Duty

Onur Serin, Atlas Copco Gas and Process

In tackling the challenge of carbon footprint and carbon emissions reduction, the liquefaction of CO_2 has emerged as one of the most effective methods in transporting captured CO_2 and supplying it for use in other industries.

Compressors are essential machinery for CO_2 liquefaction. In terms of the process, the traditional (and also most cost friendly) liquefaction method includes the use of external refrigerants such as ammonia (the main purpose of applying an external refrigerant to the process being that the refrigerant isn't in contact with the CO_2 during liquefaction).

In liquefaction processes using ammonia as a refrigerant, CO_2 is compressed and liquified after using the ammonia as cooling medium. In a next step, it is transported to the storage location. During the process, CO_2 first runs through a separator, where water and other condensed gases are removed from the CO_2.

After being sent to compression, ammonia is used as cooling medium with help of the heat exchanger, while also being compressed after evaporation and later cooled (thus completing the cycle).

Even though this liquefaction process is, by definition, a cost-feasible solution, capital expenditures (CAPEX) still are a weighty factor in the overall investment decision. This cost is mainly impacted by the compressors needed in the process.

In the application discussed in the presentation, the two compression duties (CO_2 and ammonia) can be handled in different sections of just one single-skid compressor, instead of two separate units. This makes the compressor footprint in the liquefaction plant more compact, robust and cost-efficient.

Like CAPEX, operational expenditures (OPEX) are primarily defined by the compressors (especially the power consumption cost of the liquefaction process). This is why compressor considerations are essential for plant operators: The combined compressor solutions package is more optimised in terms of size and equipment cost compared to alternative compression solutions (where CO_2 and ammonia are handled on separate compressors units).

Using the examples of current plants in Europe, the presentation discussed the design concept and performance data of handling the two duties through a single compressor. Specifically, it considered the different inlet and outlet conditions for the ammonia cycle and CO_2 cycle, respectively, describing how this impacts compressor design and performance (speeds, flow management etc.)

Jonathan Stain, Arkema

Jonathan Stain, Arkema

Energy Savings and Mitigation of H2S/CO_2 Spikes in Molecular Sieves Gas Drying

Molecular sieves play a crucial role in the process of drying and purifying natural gas, often being the sole technology capable of achieving dew points compatible with cryogenic processes.

While these units are generally reliable, operational complexities arise when dealing with feed gases containing traces of H_2S and / or CO_2. The oversight of these contaminants can lead to significant spikes in regeneration, introducing significant operational challenges.

This presentation explored solutions to minimize H_2S and CO_2 spikes during regeneration, with a focus on reducing energy consumption, thereby enhancing the efficiency and reliability of the process.

EXHIBITOR RECEPTION AND DIGITAL TECHNICAL POSTERS

Our delegates finished off day two of the annual conference with a 90-minute reception with our exhibitors.

Fluor (Gold Sponsors), Kent (Gold Sponsors), Parker (Gold Sponsors), SLB, Technip Energies and The Competency Alliance were among the exhibitors.

After the success at the previous year's Annual Conference, we once again offered a Digital Technical Poster session within the exhibition area. Each presenter had a five-minute minute slot to present their poster.

The digital posters were as follows:

Indrajit Mazumder, Bechtel: Transportation of Captured CO2 from a 'Stranded' Facility to the Sequestration Site via Rail

Gerardo Chiapetta, Inerco Inspección y Control SA: Advantages of implementing a Leak, Detection and Repair (LDAR) Program

Louis Mounsey, Arkema: Unlocking the Potential of Molecular Sieve Units: Cost-Effective and Sustainable Solutions for Maximum Efficiency

Jonathan Girault, T.EN: Optimizing Fully Off-Grid, Industrial Scale Green Hydrogen Plant LCOH with Specialized Process Modelling

Peggy Chan, Axens: Results & Experience from DMX™ at ArcelorMittal's Plant in Dunkirk, France

Jade Gray, Bechtel: Maximising The Carbon Capture Value Chain

Mac Mirazee, Chart Industries Inc : Maximising Fan Efficiency - Mega Fans and FRP Fans

Umesh Lad, SLB: Flare Gas to Value

IN MEMORY

DON COONEY REMEMBERED WITH 'OLD GOLD' FLOWERS

Don Cooney, a previous GPAE Chair, passed away earlier this year and we paid tribute to him in the last issue.

Don's family very kindly gave Management Committee member Adrian Finn a rose bush to remind him of his great friend Don. In honour of his birthplace and his favourite football team Wolverhampton Wanderers , the rose bush is of the 'Molineux' variety and the flowers are in the team's colours (Old Gold).

EVENTS DIARY – GPA EUROPE IN 2025

Go Beyond

Share the knowledge and become part of the movement that will Go Beyond in our Energy Transition.

Annual Conference

4–6 June 2025

The Marriott Hotel, The Hague

A conference and networking event organised by GPAE, organised for the European Gas Processing Industry.

One of the strengths of GPAE is the large number of people who have been active members of our organisation and the industry for many years.

What's on?

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

Young Professional Training Day

04 June 2025

The Marriott Hotel, The Hague

Running in parallel to the first day of our Annual Conference, a FREE 1-day Training Day for graduates and chartered engineers with up to 5 years' experience. A day focused on development.

Technical Meeting & Annual General Meeting

20 November 2025

The Clermont Hotel, London

A 1-day event in London alongside our AGM.

Our call for papers is now open!

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

We are looking for stories around Digitisation, Sulphur, Acid Gas Removal, Energy Efficiency, Energy Security, Energy Transition Technologies, Decarbonisation of LNG, Projects, Operational Troubleshooting, Hydrogen, Biogas, Ammonia, Carbon Capture and Storage, to inspire the gas processing community.

SUBMIT YOUR PROPOSAL

Do you have a story to tell? All we need is a 100-200-word abstract. Tell us what your idea is and why you think it is special. Send your abstract stating title and author to **admin@gpaeurope.com**

It will be reviewed by our Technical Committee and, if accepted, we can help you to develop it into a technical paper and presentation.

Ideas deadline for our Annual Conference being staged 4-6 June 2025 (The Hague) is 17 January 2025.

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