OG INNOVATION

Spring 2023

A Leading Voice
In the Energy Transition

THE BIG MIDSTREAM EDITION!

DRONES, UAV'S AND ROBOTICS: SPECIAL

HYDROGEN SPECIAL: WHERE DO WE GO FROM HERE?

Spring 2023

CEO
Matthew Patten

Managing Editor
Simon Milliere

Publishing Director
Edward Findlay
edward@oilandgasinnovation.co.uk

Commercial Director
& Advertising Enquiries
Nicholas Parker
nparker@oilandgasinnovation.co.uk

Technical Director and Website
Nathan Bedmann
admin@oilandgasinnovation.co.uk

Office Assistants
Janet Elseberg
accounts@oilandgasinnovation.co.uk

Contributing Journalist
Emma Patten

Business Development Executives
Mylene Patten
mylene@oilandgasinnovation.co.uk
Augusto Trinidad Jr
augusto@oginnovation.co.uk
Homer Dominguez
homer@oginnovation.co.uk
Daryl Cruz
daryl@oilandgasinnovation.co.uk
Anjel Miller
anjel@oginnovation.co.uk

Emery Hill Media Ltd
Dalton House
60 Winsor Avenue
London
SW19 2RR
Tel: +44 330 043 49

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A NOTE FROM THE EDITOR

The midstream sector is in a period of transition, driven by several factors. One of the most notable trends is the growth of unconventional oil and gas production, which has created significant demand for midstream infrastructure. Shale oil and gas reserves have expanded production, particularly in the United States, and require the development of extensive pipelines, storage facilities, and transportation networks. This has resulted in a wave of investment in the midstream sector, with companies seeking to capitalize on the growing demand for infrastructure.

Another critical trend in the midstream sector is the shift towards renewable energy sources. While oil and gas will continue to play a significant role in the global energy mix for the foreseeable future, renewable energy sources such as wind and solar are becoming increasingly important. This shift is driving the development of new infrastructure, such as transmission lines and storage facilities, to support renewable energy generation and distribution.

Regulatory changes are also impacting the midstream sector. In recent years, there has been a heightened focus on safety and environmental protection, leading to stricter regulations for midstream operators. Companies are now required to adhere to higher safety standards, implement spill prevention and response plans, and conduct regular inspections and maintenance. These changes have increased compliance costs and placed a greater emphasis on risk management for midstream companies.

Lastly, technological advancements are transforming the midstream sector. Innovations such as pipeline monitoring systems, drone inspections, and digital twinning are improving operational efficiency and safety. Data analytics and machine learning are also being used to optimize pipeline routing, maintenance schedules, and supply chain management.

The midstream sector is expected to continue to grow in the coming years, driven by increasing demand for oil and gas and the development of new infrastructure to support renewable energy sources. However, the sector will also face significant challenges, such as increased competition, regulatory scrutiny, and pressure to reduce greenhouse gas emissions.

One of the most significant challenges facing the midstream sector is the need to reduce its carbon footprint. The midstream sector accounts for a significant portion of greenhouse gas emissions, primarily through leaks and flaring. Companies are now under pressure to reduce these emissions and transition towards lower-carbon energy sources. This will require significant investment in new technologies and infrastructure, such as carbon capture and storage, hydrogen pipelines, and renewable energy generation.

In conclusion, the midstream sector plays a crucial role in the global energy industry, providing the infrastructure needed to transport and store oil and gas between upstream and downstream operations. The sector is in a period of transition, driven by factors such as the growth of unconventional oil and gas production, the shift towards renewable energy sources, regulatory changes, and technological advancements. While the sector is expected to continue to grow in the coming years, it will also face significant challenges, such as reducing its carbon footprint and adapting to changing market conditions. Please enjoy OGI Magazine, Spring 2023.

Kind Regards,

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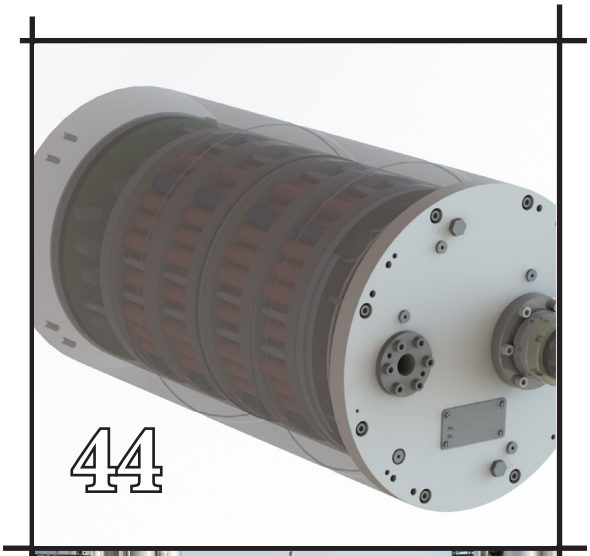


See What's Happening in Your Pipeline

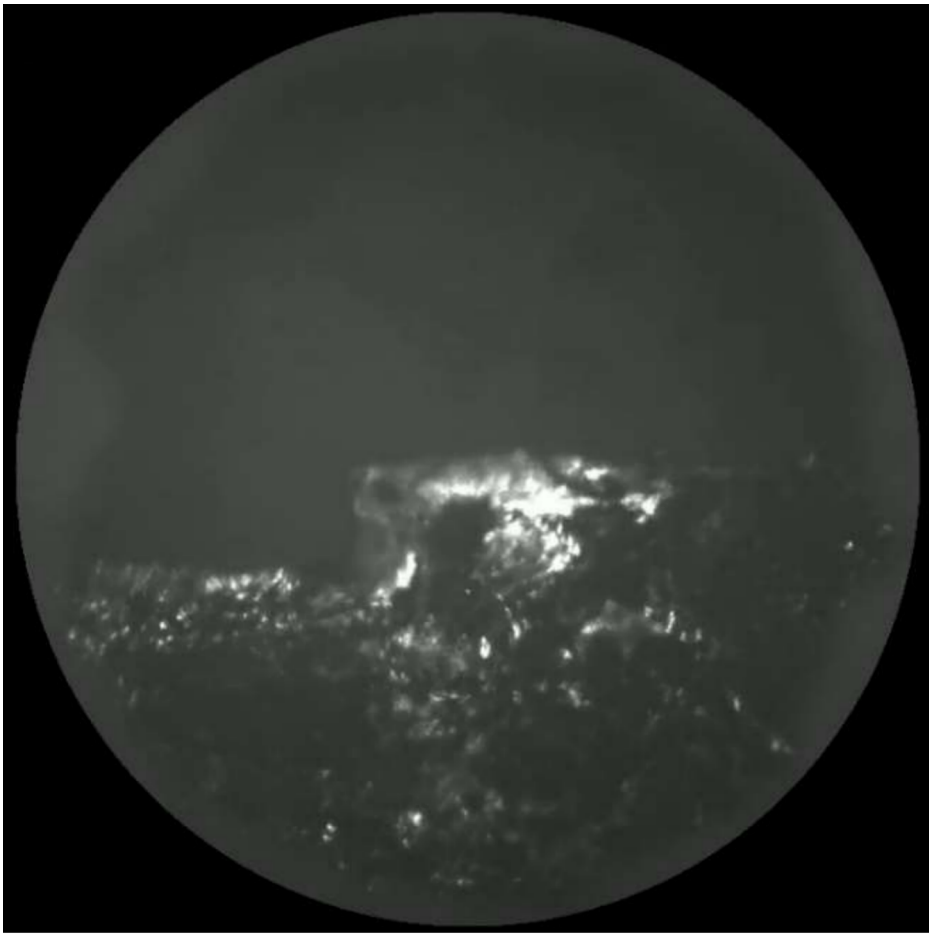
The presence of liquids in gas transmission networks is a major issue that affects both the financial performance and safety of the industry. When liquids are present in normally dry gas streams, the accuracy of the two fiscal measurements of flow and calorific value are compromised, leading to significant losses of revenue. In some cases, the industry is giving away BTUs in the form of NGLs without even realising it.

Process Vision explores the use of the innovative LineVu, process camera system to monitor gas flows and detect the presence of liquids. The technology provides a direct view into high-pressure gas pipelines and reveals that phase separation and NGL recovery systems are not always performing to specification. With the ability to categorize the severity of contamination using image processing and machine learning, the process camera system provides a new metric for process control.

The impact of liquid carryover in gas processing and transportation affects various disciplines within the industry, from asset integrity and reliability managers to process control managers and flow assurance managers. However, there is currently no permanent monitoring system for phase separation and filtration systems. LineVu, a process camera system, provides real-time feedback to operators and helps to minimize carryover and reduce the threat of foaming, as well as improve compliance with tariffs and reduce the cost of operations for Transmission System Operators (TSOs).

The presence of liquids in gas flows can go unnoticed and unreported, causing losses of billions of dollars annually. With LineVu, a process camera system, operators are now able to see what is really happening in the pipeline and validate the performance of gas processing and transportation. The live-streamed video and associated data provides a useful new metric for process control and can be used as an additional quality check on gas entering the gas network.

LineVu, a process camera system, is typically mounted vertically on a pipeline and provides a plan view of the pipeline floor by illuminating and imaging through an isolation valve. The live-streamed video reveals liquid streams, solids, and mist flows, and the associated data provides a deeper understanding of the stability of the gas flow. The use of machine learning provides an automated alarm system and categorization of the severity of the incident.



Above: Grease-like contamination.

Foaming is a major issue in the gas industry, which can cause operational problems and result in reduced efficiency. To mitigate this risk, gas plants often limit their gas flow and operate at a lower-than-optimal flow rate to provide a margin of safety. However, this approach can limit the potential for maximum production and reduce the recovery of NGLs (Natural Gas Liquids). The use of LineVu, a process camera system, can help operators to confidently run closer to the optimum flow rate, as it provides real-time monitoring and early warning of any potential foaming events.

As the gas moves through de-sulphuration and de-humidification processes, it comes into contact with large quantities of liquid. If not properly separated, this liquid carryover will contaminate the subsequent NGL removal stage. The typical method of extracting NGLs is to reduce the temperature of the gas, forcing it below its hydrocarbon dewpoint and separating the liquids. However, when temperature reduction is achieved through pressure reduction, it creates the right environment for a sub-micron mist flow to form. This type of flow is difficult to filter and requires specialist filtration systems, not commonly used in this application. As the gas warms up, the liquids vaporise, making the vapour phase saturated with respect to hydrocarbons and mist flows occur with small temperature drops in the gas system.

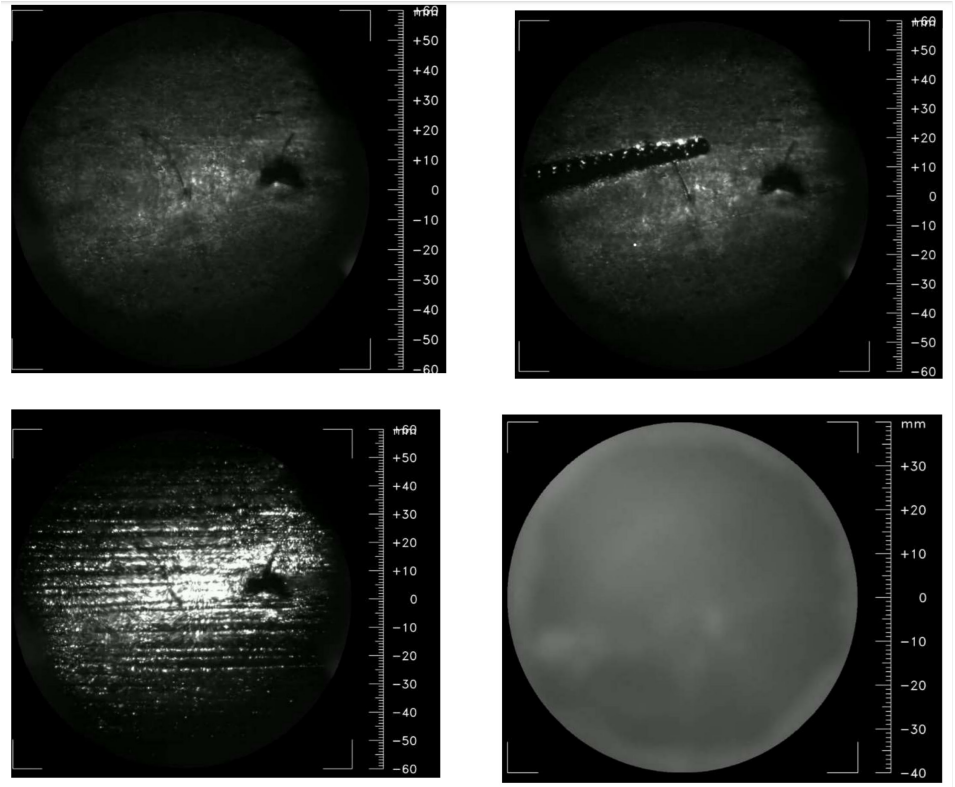
Allowing wet gas into a transmission system causes many safety concerns. A survey by the Health and Safety Executive in the UK investigated 71 natural gas compressor failures and found that the required design life for dry gas seals required by both manufactures and users was 5 years. However the survey found that actual life was on 1 year 20 days on average. The main cause of these failures was contaminated gas. In 100% of the cases, liquids were found between the faces of the compressor's dry gas seal, compromising its

performance and lifespan. The presence of mist flow is also a common issue, with diurnal changes observed in some cases. This phenomenon suggests the presence of volatile gases, likely NGLs.

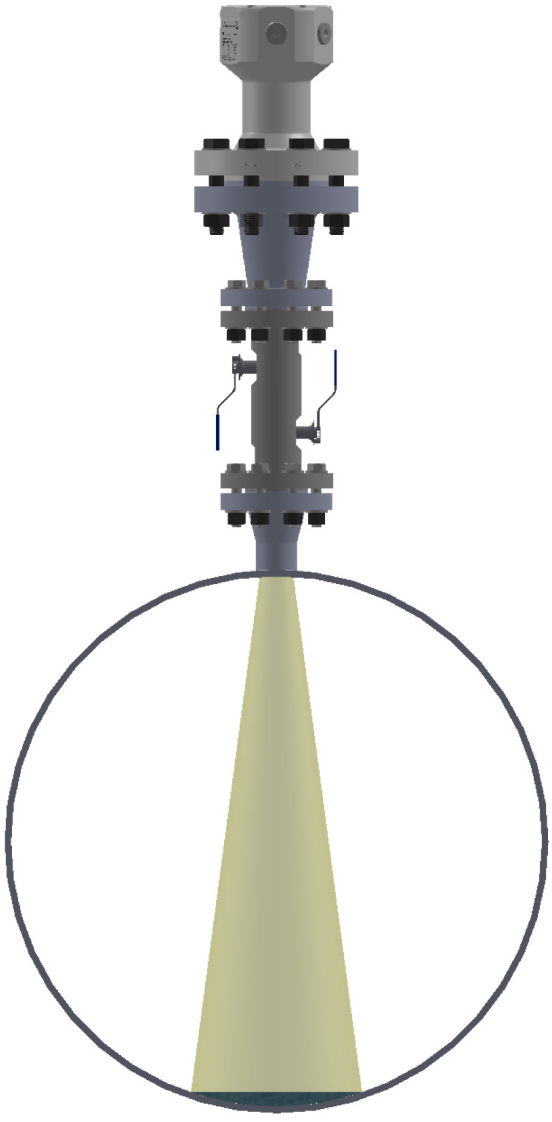
To protect gas chromatographs and other gas analysers from liquids, API and GPA standards require the use of a stabbing probe or quill to remove gas samples from the middle third sector of the pipeline. Additional filters are also used to ensure long-term, uninterrupted service. However, this sample system design leaves operators unaware of large-scale liquid events that may occur.

When liquid onset start, a stratified liquid flow can often be seen, but both water and hydrocarbon dewpoint show no response from the analyser system. In this situation, it could be assumed that the liquids were glycol. However, after purging the pipeline with nitrogen and introducing air, the liquid evaporated over 24 hours. As the liquid was volatile, it ruled out glycol and compressor oil, leaving only NGLs as the possible cause.

During periods of mixed-phase flow, there will be large errors in calorific value, making it difficult to obtain an accurate picture of the fluid stream.



Examples of videos stills: Top left - dry gas. Top right - stratified flow of compressor oil. Bottom left – stratified flow of condensate. Bottom right - mist flow.



LineVu, a process camera, mounted on a gas pipeline.

Gas analysers can only report on the portion of fluid they are presented with, which means that flow measurements made at custody transfer points are unreliable when a two-phase flow is present. Operators may also be unaware of mixed-phase flow. Installing LineVu, a process camera system, can validate gas analyser measurements when there is single phase flow and alert operators when a mixed-phase flow is present.

The flow uncertainty budgets for fiscal flow measurements need to account for potential errors, as specified by Sarbanes-Oxley compliance. Unexpected liquids in dry gas systems can add a substantial amount to the uncertainty budget for flow measurement. When liquids are present, dry gas flow meters will read in error, with these errors being up to 2% of the reading. LineVu, a process camera system, can provide assurance that the gas is actually a single phase and reduce flow meter errors.

As the gas reaches the power station, the likelihood of contamination increases due to factors such as glycol and NGLs contaminating the gas, lubrication grease from valve operations, compressor oil leaking into the gas, and iron sulphides collected from the pipe wall. Contaminated gas can cause a number of maintenance issues, including stratified flow causing uneven combustion, high wear on fuel nozzles, and hot spots on turbine blades. So it is important to understand what is in the pipelines at critical junctions.

In conclusion, LineVu, a process camera, has the potential to revolutionise the way that the natural gas industry operates. By allowing operators to monitor the quality of the gas as it moves through the transmission system, LineVu, a process camera, helps to ensure that the gas is free from contaminants and flowing smoothly. This not only reduces the risk of maintenance issues, but also improves the overall efficiency of the transmission system. The ability to monitor the presence of liquid events and solids in the gas also helps to reduce the risk of flow meter errors, which can be costly and difficult to correct. Furthermore, the use of process cameras can help to lower pigging and disposal costs for TSOs and reduce the need for compressor servicing. Overall, process cameras offer a cost-effective solution to a range of challenges faced by the natural gas industry, and it is expected that their use will become increasingly widespread in the coming years. •

If you would like to know more about how Process Vision Ltd can help your company and its operations, please contact them at:

Process Vision Ltd

T: +44 (0)1256 883 304

E: info@processvision.com

W: www. processvision.com