

Oil and Gas INNOVATION®

Spring 2022

A Leading Voice
of the Energy Transition

**CRISIS IN EUROPE -
WAR, RISING ENERGY
PRICES.**

**FOCUS:
HAZARDOUS
AREAS**

**MIDSTREAM:
ALL THE LATEST
DEVELOPMENTS**

**THE BENEFITS
OF WATER JET
CUTTING**



Spring 2022

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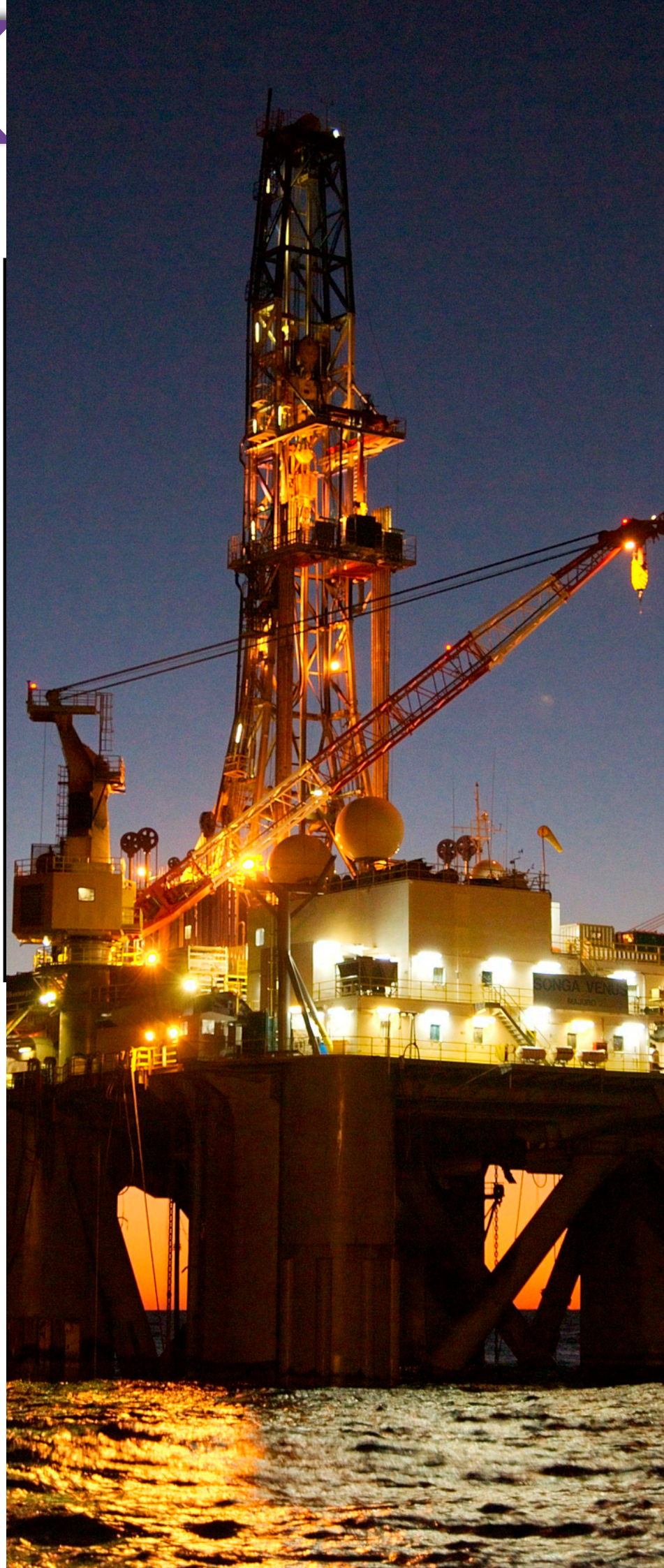
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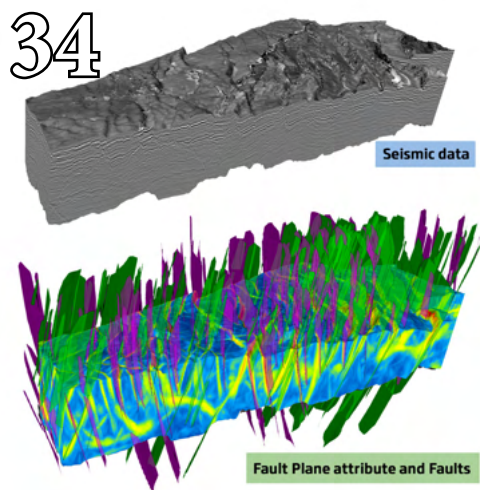
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Increasing Gas Production by Responding to Phase Separator Efficiency

The tragic situation in Ukraine has rapidly changed trading relationships with Russia. Natural gas supply is now headline news, and the outlook for the natural gas industry has changed. With Russian gas being phased out as soon as possible by all European countries, the rest of the world has been challenged to increase gas production. This article explores the possibility of getting more production out of existing assets by monitoring phase separator efficiency.

A New Way of Thinking

Foaming and fouling in gas treatment plants has long been a problem. A new approach to monitoring and controlling gas entering treatment plants could improve process efficiency and provide a much-needed boost in production.

When liquids and other contaminants are not fully separated before the gas enters gas processing, it can cause the amine (used to remove sulphur and carbon dioxide) and glycol systems (used to remove water vapour) to foam. There is also a longer-term problem: as hydrocarbon liquids accumulate in the amine or glycol systems they turn to carbon and other solids when they undergo regeneration at high temperature. If unfiltered, solids are another trigger for a foaming incident.

Adding a defoamer is common practice, but the operators are working blind, relying on differential pressure measurements to indicate the presence of foam, by which time it is often too late. When foaming occurs, gas flow has to be reduced or even stopped, defoamer added, and

operators have to either wait until the foam subsides, or to physically open everything up and remove the foam. Defoamers often cause secondary problems when they foul heat exchangers. As the cost of a foaming event is high, most operators lower the gas flow from optimum to lower the risk of foaming.

Estimates from the USA and the Middle East indicate that systems are running 10% to 20% below their optimum level.

A new way of thinking could provide operators with the necessary insight to take better operational decisions. LineVu is a camera system that shows operators if there is contamination entrained in the incoming gas. It provides a live video stream that, with image processing, can be categorised into different levels of contamination and indicate the efficiency of phase separation. Providing process managers with a live video of pipeline activity means they can start to tackle the cause, instead of treating the symptoms. More importantly with today's demands, they can have the confidence to increase gas flow when it is safe to do so.

Sources - where do liquids come from?

As fluids leave the gas well, they may exist in four phases, gas, water, hydrocarbon liquids and solids (sand). In addition, liquids are added at the well head such as corrosion inhibitor, hydrate mitigation and bactericides (Figure 1). Liquid and solid phases should be removed before the gas enters gas treatment. To date, it has not been possible to permanently monitor the efficiency of the phase separators, and the industry has grown to accept that liquids are a normal part of gas treatment. Operators tackle the resulting processing problems or accept that the plant cannot produce gas at the design flow rate. LineVu is shedding new light on how the day to day, and hour to hour, efficiencies can change.

Figure 1 shows the points in gas processing where liquids are in contact with the gas, and, therefore, the areas where monitoring provides valuable information. While the front-end phase separation is a key area, there are other points (exit of the desulphurisation and dehumidification) where liquid carryover causes short term and long term process

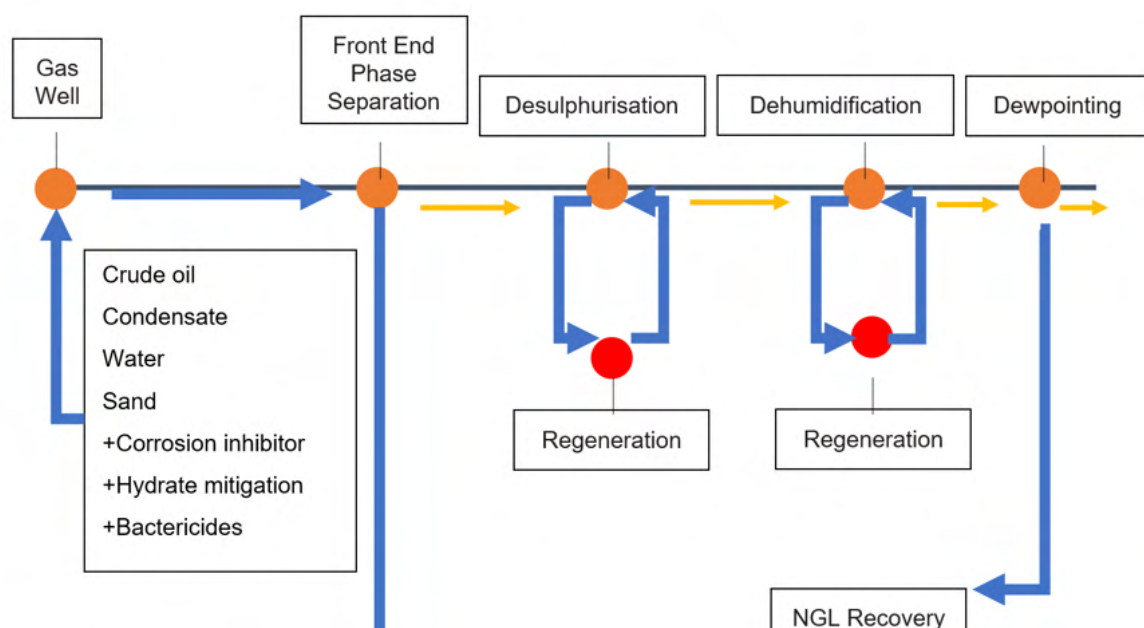


Figure 1: Sources of liquid during gas processing.

problems.

In addition to the primary problems caused by liquids entering gas processing, defoamers used to combat the symptoms of liquid carryover can cause secondary problems, fouling heat exchangers and causing further down-time and maintenance costs.

Gas separator performance is one of the most common causes of problems and capacity constraints. The LineVu camera is normally mounted on an existing tapping point (Figure 2), looking down into the pipeline below to provide an image of the pipe floor. Image processing provides the detection method for both mist flow (liquids entrained in the gas) and stratified flow (liquids separated from the gas flow seen on the pipe wall).

The vertical space between the camera optics and the gas flow provides



Figure 2

a “cushion”, preventing contamination accumulating on the optics. The small amount of heat from the illumination system is distributed to the window mount to prevent condensation if the gas is saturated.

Increasing Gas Production

New operating parameters may mean different operating methods. Rather than accepting that there is some level of contamination in the incoming gas, LineVu provides the evidence and justification for filter maintenance to improve phase separation. With proof that the incoming gas is clean, the operator can have confidence to increase gas flow without incurring process problems.

LineVu uses machine learning, to automatically categorise the observed contamination into 8 levels, thereby changing the video footage into data that can be a process parameter:

7	Very high activity of mist flow and streaming liquids
6	View of pipe floor is obscured, and free liquids are observed
5	View of the pipe floor is totally obscured
4	View of the pipe floor is partially obscured by shadows
3	Heavy shadows and dark areas
2	Light shadows
1	Clear view of pipe floor with some light shadows in parts
0	Very clear view of pipe floor

The graph in Figure 3 shows data from an installation averaged over a 6-month period. It shows a distinct diurnal change with levels of mist flow improving at night. If level 3 was selected as the threshold, a considerable part of the day could be considered for an increase in gas flow. The causes of variations in the liquid content at the outlet of a phase separator are many: changing densities and viscosities of the liquids being separated, changes to pore size with temperature, liquid loading at the inlet, fouling within the separator, gas flow rate, all have an effect on the quality of gas at the outlet. Whatever the cause, it is clear that performance can change throughout the day.

Conclusion

With a LineVu system installed, sources of contamination can be better understood and therefore reduced. Threats to process upsets, and asset integrity such as compressors, and corrosion can be better managed. •

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

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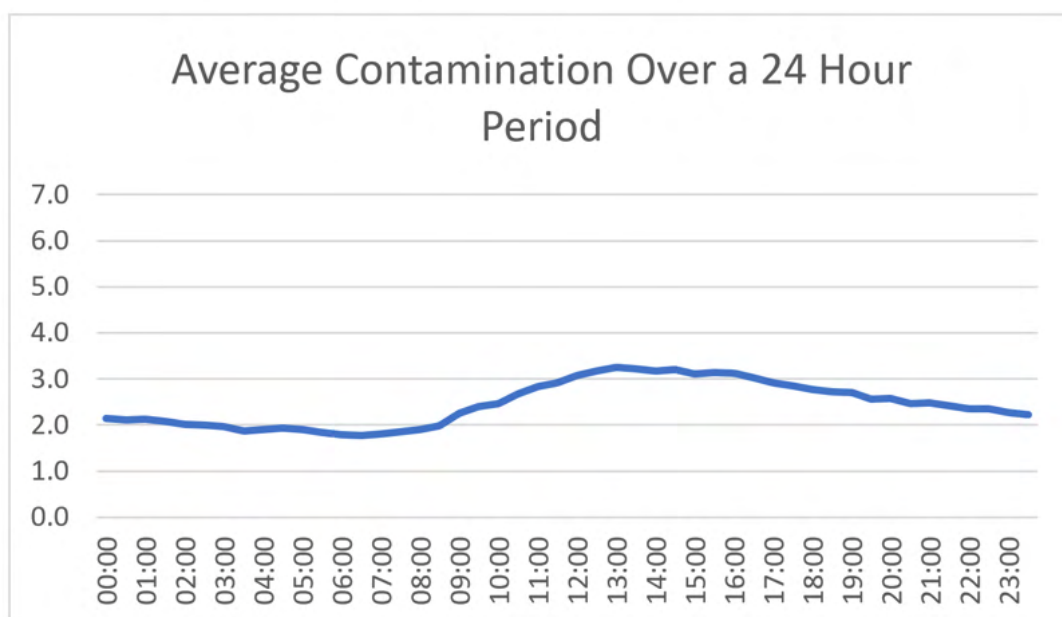


Figure 3: Data from an installation averaged over a 6-month period.