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EXCLUSIVE HOST

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Revealing Gas/Liquid Separator Performance in the Field

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&
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Introduction

Before natural gas can be transported, acid gases must be removed, as well as any liquids that could condense in the pipeline. Operators also must meet water and hydrocarbon dew point specifications before the gas is suitable for entry into a national gas transmission system as sales gas.

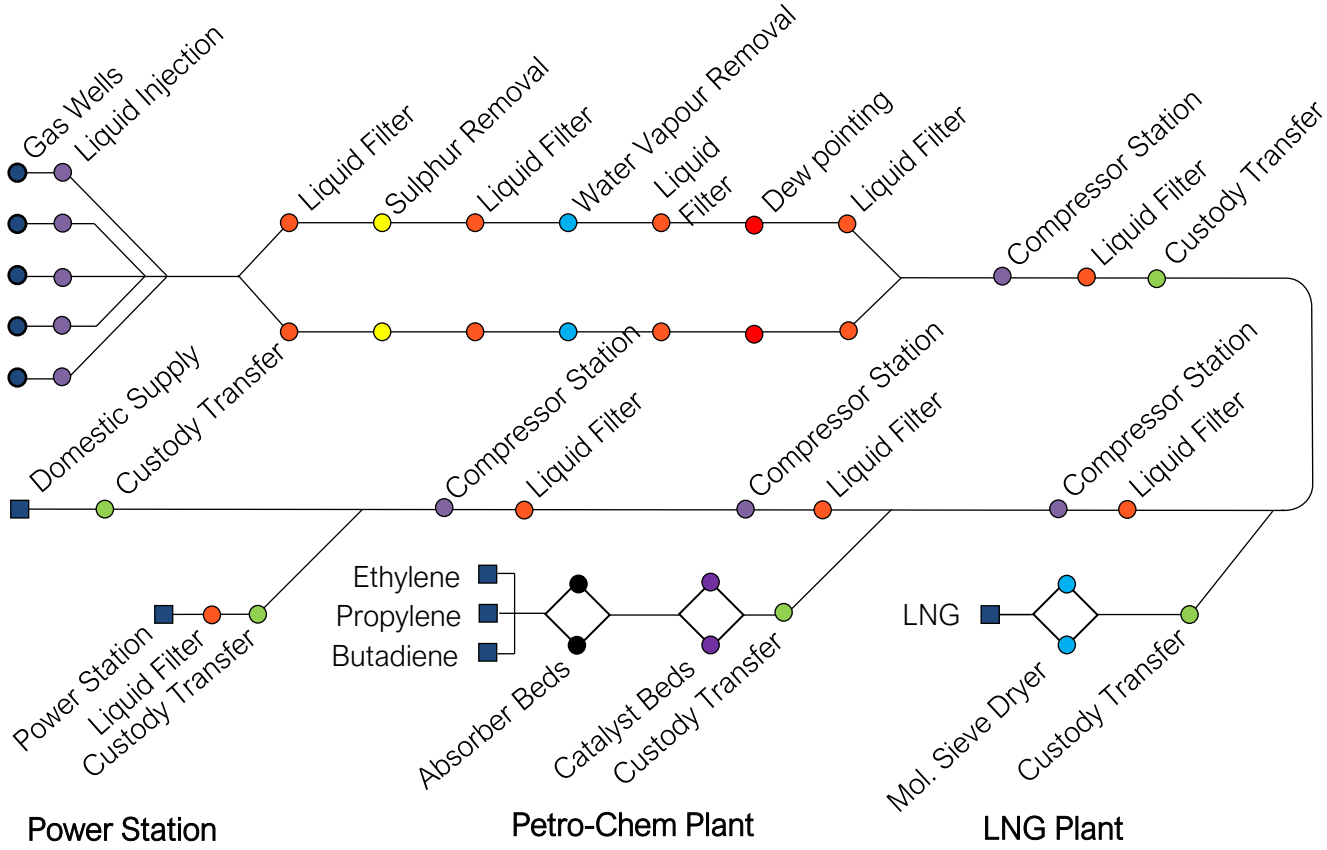
The Natural Gas Journey

From the gas well through gas treatment, transmission and use there's many points where liquids are injected and then removed in order to avoid corrosion, remove hydrogen sulphide (H_2S) and carbon dioxide (CO_2).

Gas/liquid separators are not 100% efficient, 100% of the time, in fact, their performance is one of the most common causes of problems and capacity constraints.

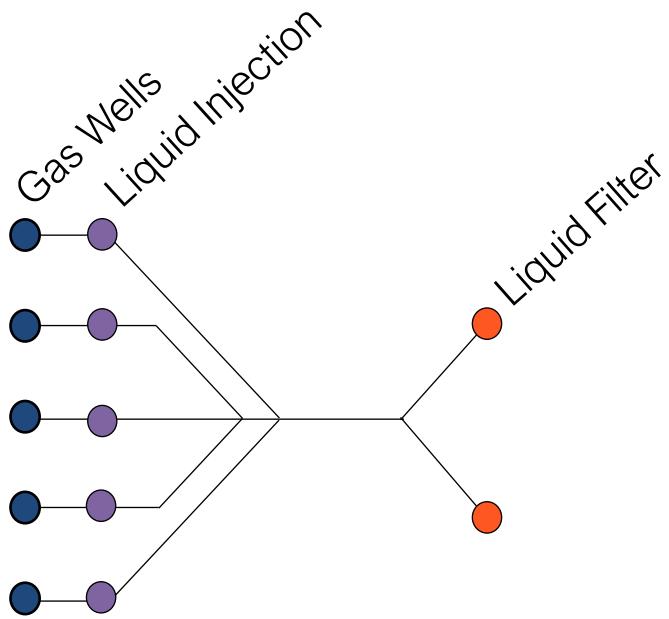
Foaming, flow surges, start-up, shutdown, and flow ramping are all common causes of liquid carry-over.

The Natural Gas Journey

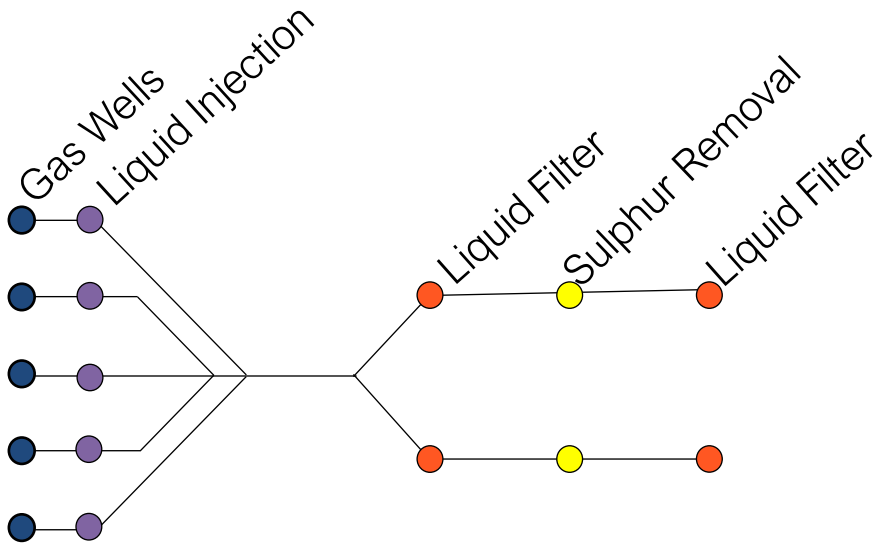


The Natural Gas Journey

At the entry to gas treatment process all condensate, corrosion inhibitor and anti-hydrate liquids present in the gas stream should be removed. If not, foaming occurs during gas treatment that can severely limit production, in some cases by as much as 50%.

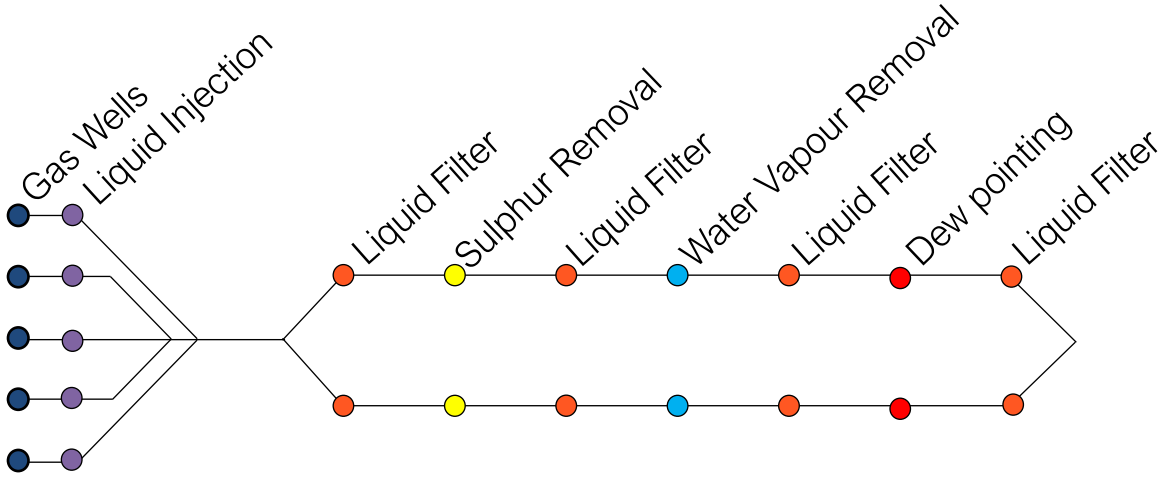


Loss of amine due to carry-over into the dehydration system can be costly and cause further process problem in the dehydration unit.



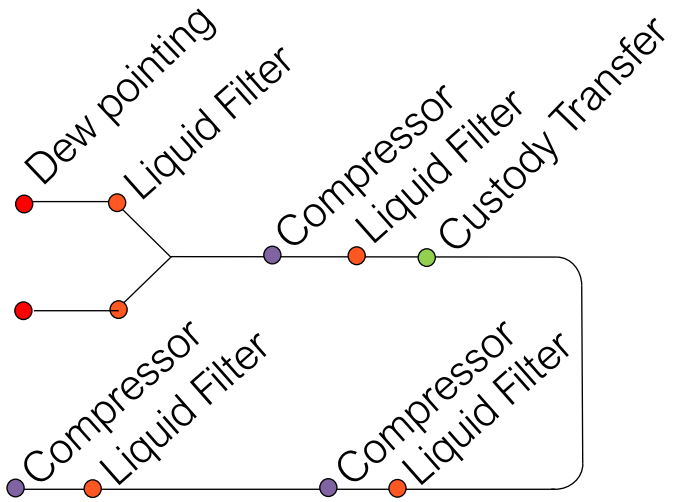
The Natural Gas Journey

Liquid carry-over from the dehydrator can cause serious damage to a mercury removal bed (if present). Dew pointing reduces the temperature of the gas to remove as much condensate as possible. If glycol enters this system, it can freeze and cause blockages and temperature control problems.



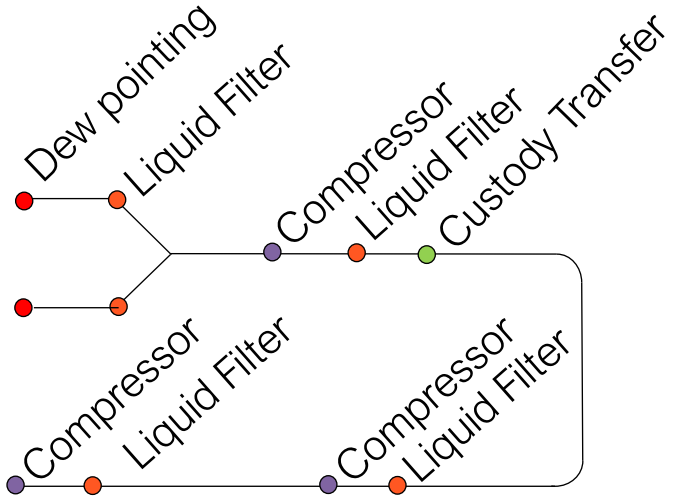
The Natural Gas Journey

Effective removal of condensate ensures that maximum value is extracted from the gas. If any liquids are present in the sales gas at the custody transfer point. The supplier can be accountable for breaking the tariff agreement and be fined, the sales price can be re-negotiated, and the supplier can be held responsible for the clean-up and rectification of the network. In addition to contamination of the gas network, flow meters calibrated for dry gas will over-read if the gas is unexpectedly wet causing fiscal measurement problems.



The Natural Gas Journey

Once in a gas network, liquids cause corrosion, or are swept out as a slug of liquid that can damage to compressors and sensitive equipment downstream. Liquid builds up at the low point in a gas network until a point is reached where enough liquid is present to move forward as a large “slug” of liquid. Separators should be monitored and maintained to ensure optimum performance in order to prevent liquids entering compressors stations. Compressors themselves can be responsible for contaminating gas supplies allowing around 20 litres of lubrication oil into the system when seals fail.



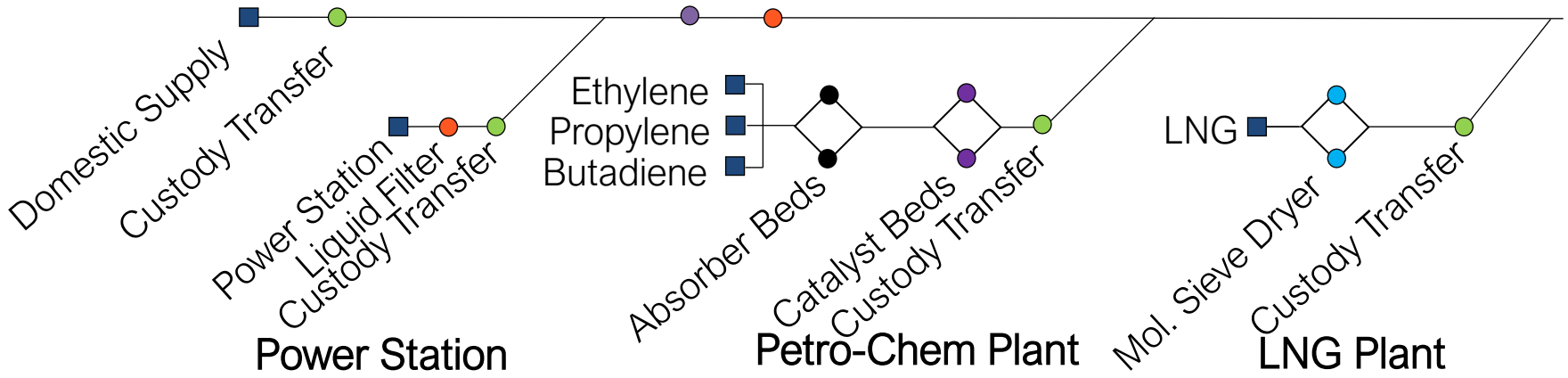
The Natural Gas Journey

Dryers are damaged when liquid slugs enter a molecular sieve dryers used to achieve low levels of humidity prior to liquefaction in Liquid Natural Gas (LNG) production. More importantly their life is insidiously reduced by small, constant, undetectable liquid carry-over.

Gas stored in underground caverns needs to be dried prior to entry to the transmission system. Glycol carry-over can cause the gas to be outside of specification and cause damage to plant and equipment.

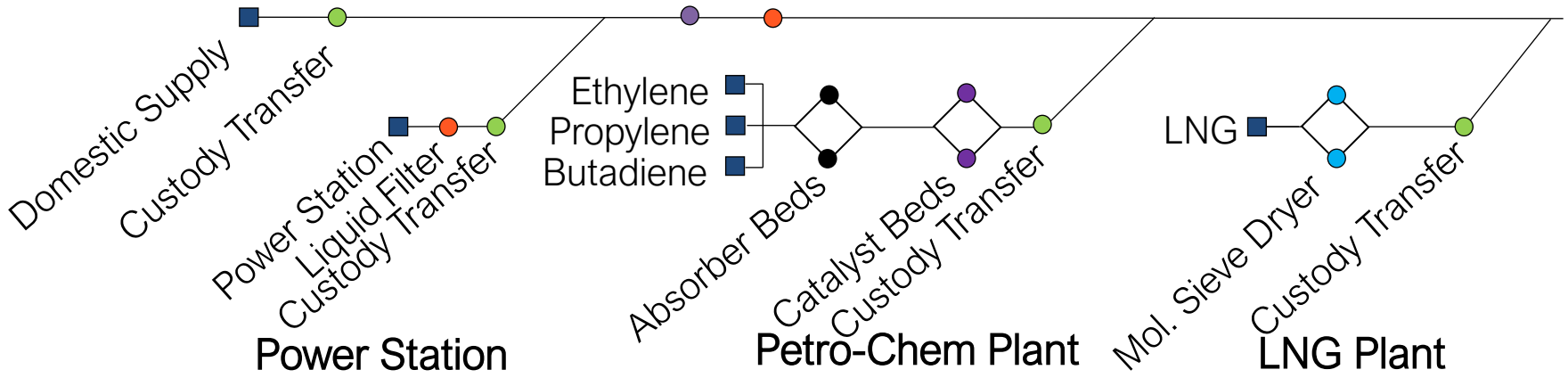
The Natural Gas Journey

Fuel gas, and other gases present in refineries and Petro-chemical plants, are often required to be free of liquids. This is because catalysts, distillation towers and absorption beds can be damaged or written-off if liquids are present.



The Natural Gas Journey

Liquids in the fuel gas entering gas turbine power stations and Combined Heat and Power units (CHP) causes significant damage by corrosion, pitting or melting the turbine blades. An unbalance in the rotors then occurs leading to complete failure.



The Natural Gas Journey

Processing liquids (amine and glycol) used in desulphurisation and de-humidification are the most common liquids found in transmission networks. These are designed to have an extremely low vapour pressure and therefore difficult to detect with conventional gas analysis systems. Indeed, gas analyser systems are intentionally designed to avoid and remove liquids that may be entrained in the gas stream.

The Natural Gas Journey

In the case of water vapour and hydrocarbons, analysers can report that the gas is saturated but not the amount of liquid in the gas stream.

Lack of suitable monitoring and alarm systems are the cause of liquids being known as “the silent killer” often discovered to be the cause of serious incidents.

The Natural Gas Journey

Within a plant, poor separator performance can be a real problem. Process engineers have the unenviable task of making critical process decisions based on an educated guess of what may be happening. For example, an increase in differential pressure across a glycol contactor may indicate foaming.

The Natural Gas Journey

The normal response is to add de-foaming agent but, adding too much causes foaming to increase and overflow past the liquid separator at the exit of the process.

Undetected liquids cost the industry $Ms every year in damage, lost revenue and labour costs.

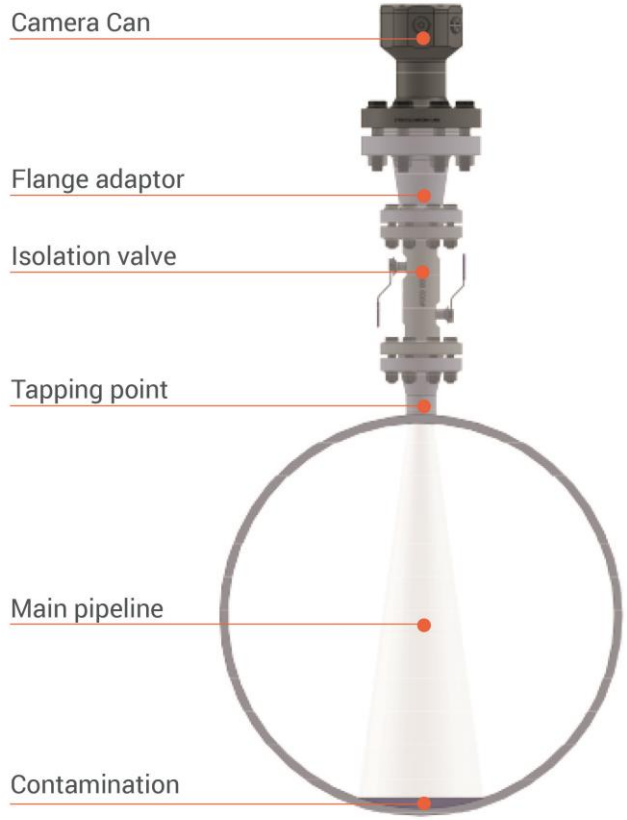
LineVu

LineVu is a new camera based system designed to detect liquids, hydrates and foam is ATEX and Class 1 Div 1 certified.

It is expected that LineVu will provide improved process control and accountability. Permanently installed on a standard tapping point above a pipeline or process, LineVu is a camera and illumination system using image processing to trigger an alarm if contamination is seen.

LineVu

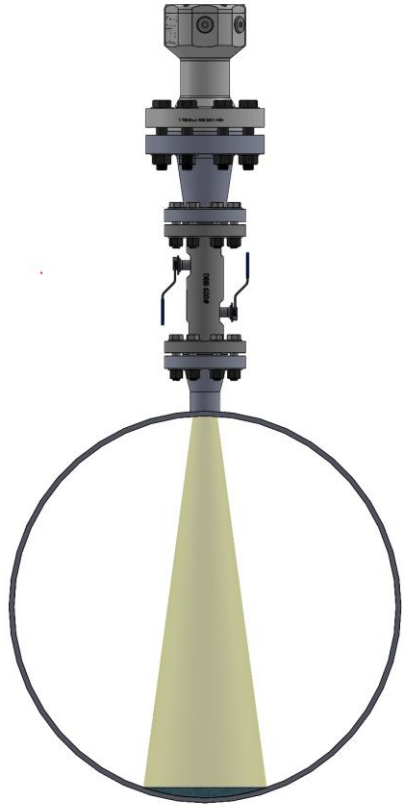
With the Camera Can of LineVu normally mounted behind an isolation valve, it creates enough stand-off above the gas stream to prevent contamination of the optics when liquids are present. Also, the heat produced from the illumination system is managed so that the windows remain a few degrees higher than ambient and therefore condensation on the windows is prevented when monitoring pipeline gas that is saturated.



LineVu

LineVu does not intrude into the pipeline, allowing lines to be pigged. As the on-pipe system is mounted above the pipeline.

With better information it is expected that LineVu will increase up-time, improve process safety, lower maintenance costs and extend asset life.



LineVu

A live video stream is available to operators to allow improved process decisions to be made and to review process incidents. Upon activation of the alarm, LineVu automatically starts to record the event.

LineVu

This can be used for:

- process de-bottlenecking
- investigations to increase production
- diagnosis of faults
- ensuring separator performance is maintained
- filter cartridges have been installed correctly
- training
- evidence to support operational decisions
- evidence to form the basis of compensation claims.

LineVu

LineVu includes a, patented , secondary containment system ensuring that, even with an optical window failure, there is no loss of containment and providing a level of safety sufficiently high enough for permanent mounting to a high-pressure gas system.

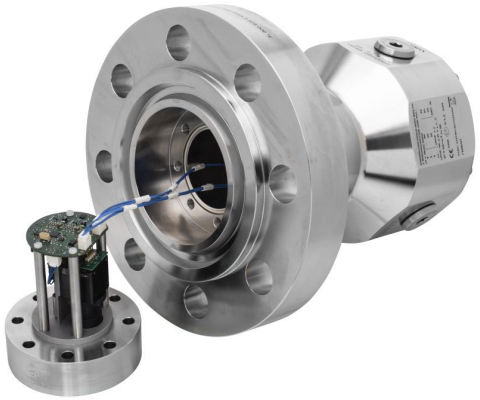
LineVu

With a class 600 flange, the standard system has a maximum pressure rating of 2,220 psi (153 Bar). Higher pressure ratings are available if required.

The user interface is web compliant making integration into existing SCADA and DCS systems. The data can also be made available remotely to ensure improved accountability when multiple assets are connected to the network or tie-back.

LineVu

The camera and illumination assembly are mounted on the Window Puck. The Window Puck houses illumination and camera ports. All ports house a pressure retaining sapphire window. Pressure testing from a systematic viewpoint has been performed at over 700 Bar G (10,152 psi) without damage.



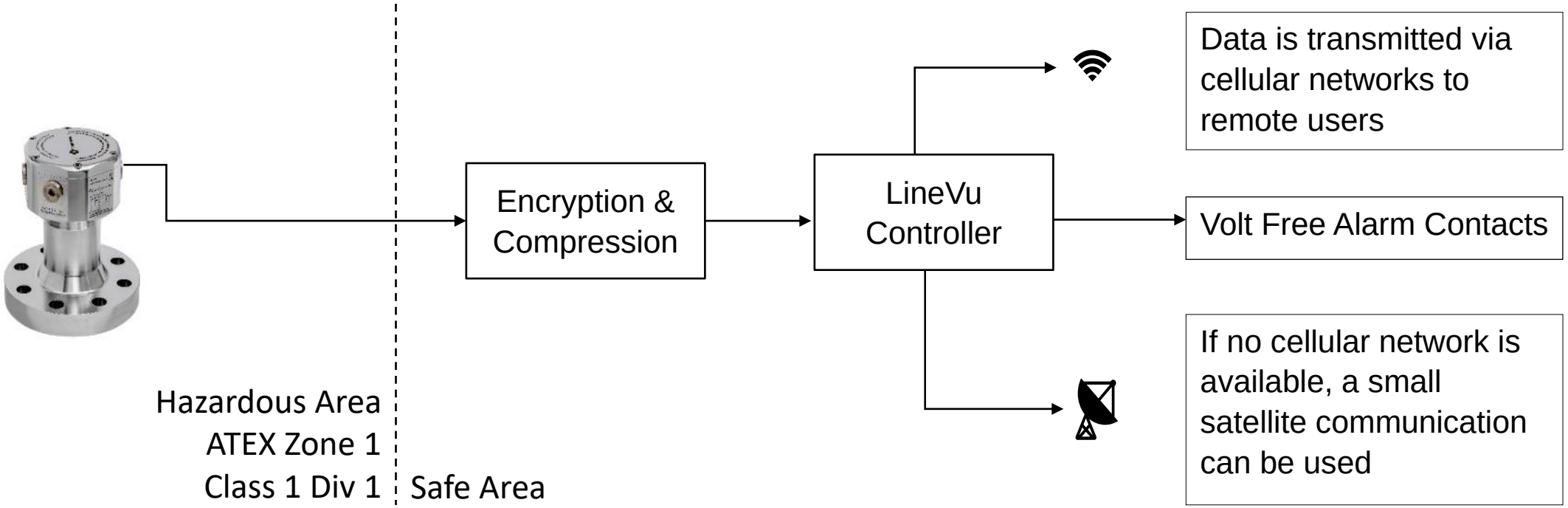
The Window Puck assembly is inserted into a secondary containment chamber in the Camera Can body, ensuring that, if there is a window or seal failure, there is no loss of containment.

LineVu

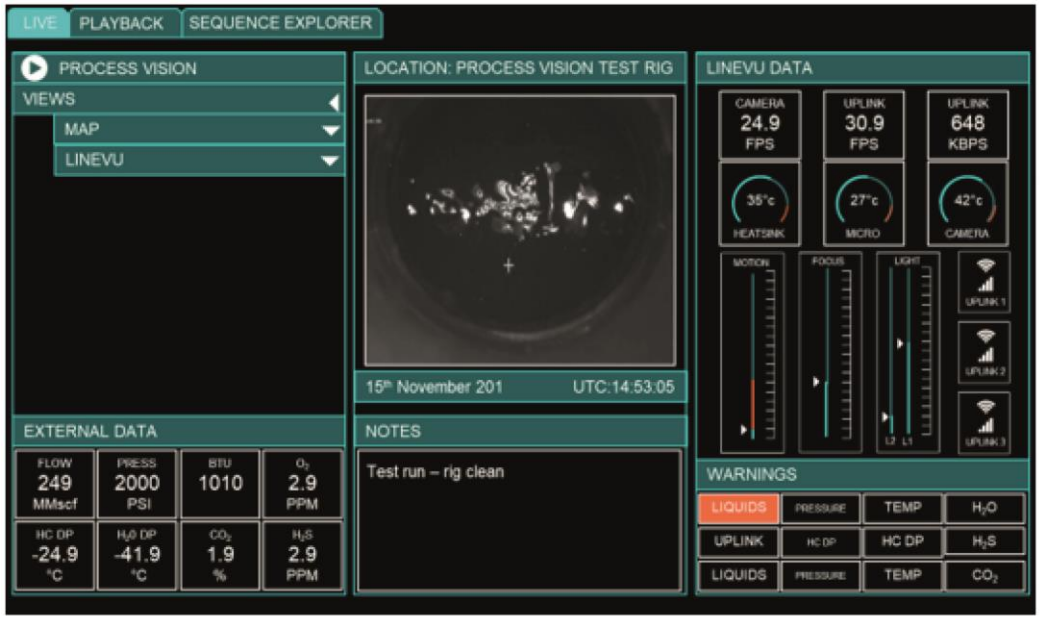
Electrical connections exit the secondary containment chamber via a pressure rated feedthrough to the upper chamber. The Camera Can bodies go through two pressure tests, one for the upper chamber to comply with certification and the same pressure test as the Window Puck on the lower chamber.

Once assembled, a final pressure test is performed on the complete Camera Can.

On-site System



User Interface



- Via internet browser
- Printed report
- Email
- SMS message
- Mobile phone push notification
- Available to central technical resource

User Interface

When several cameras are installed on a network, the network map can be generated on the user interface with nodes for each LineVu where network controllers can view pipeline activity at any of the locations.

User Interface

When a contamination event occurs, an alarm is automatically generated, and video is recorded. It is likely that both local and remote engineers will need access to the data in the alarm condition. Several actions can be taken upon an alarm condition including:

- volt free relay activation
- push video notifications
- push still shot notifications
- SMS texts
- email

Thank You / Questions