Cannerweg 123
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The Netherlands

AMMO LASER Leak Detection System

The #1 Safety Measure for Urea Plants with a Guaranteed Pay Back

Question 12:
What is reason number 6 to choose for a vacuum system ?

High pressure urea equipment consists of a carbon steel pressure bearing wall, which is protected against corrosion by a protective layer. This protective layer is typically an overlay welding or a loose liner. Any leak in a loose liner will lead to a dangerous situation in that a large surface of the carbon steel pressure bearing wall underneath the leaking loose liner compartment will be exposed to the extremely corrosive ammonium carbamate. Experience has shown that ammonium carbamate can corrode carbon steels with very high corrosion rates up to 1,000 mm (40 inch) per year.

When talking about active leak detection systems, one can distinguish a pressurized system, in which an inert carrier gas stream flows through the leak detection circuits and a vacuum based system, where one pulls vacuum pressure behind the liner (refer to FAQ 5)

It is a real challenge to avoid clogging as urea easily crystallises at any temperature even above its melting point due to its polymerisation behaviour forming biuret, triuret etc. with high melting points. This is the main reason that we strongly recommend to upgrade any passive leak detection system (FAQ 3).

We recommend to use a vacuum based leak detection system for several important reasons:

Reason #1: No risk of liner bulging (refer to FAQ 6)

Reason #2: Direct coverage of the complete carbon steel surface of a compartment (refer to FAQ 7)

Reason #3: A vacuum system is less prone to clogging (refer to FAQ 9)

Reason #4: A vacuum system does not restrict the leaking flow and does not built-up pressure or introduces risks for backflow (refer to FAQ 10)

Reason #5: A vacuum system also works when there is only one leak detection hole in a liner compartment (refer to FAQ 11)

Reason #6 is: A vacuum system also works when there are clogged grooves or no grooves.

A liner compartment is defined as that part of a loose liner which is compromised between four welds connecting the liner material to the carbon steel of the pressure vessel wall. Typically along these welds grooves are machined connected to at least two leak detection holes who should be optimal positioned as far apart as possible from each other

Note: there are typically two parallel routes for an inert gas to flow from one leak detection hole to another leak detection holes in a liner compartment. Refer to the figure below.

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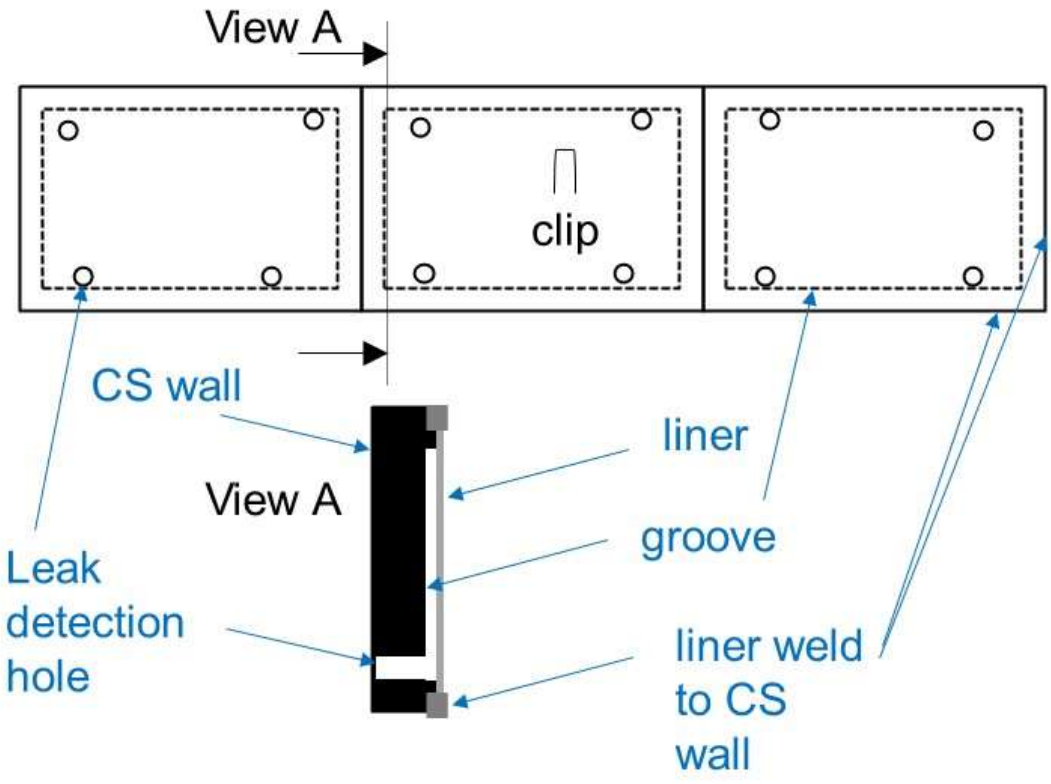

However, in some high pressure equipment, mostly older ones, no grooves are installed.

A pressurised leak detection system cannot work when there are no grooves because the liner will be pressed against the carbon pressure vessel wall due to the internal pressure. A vacuum leak detection system still works even when there are no grooves fluid will pass due to the roughness and tolerances of the two cylinders.

More often, grooves are clogged due to for example earlier liner leaks, corrosion, but also a bad design or fabrication can be a cause for a clogged groove.

In case one of the grooves is clogged, in a pressurised leak detection system the inert gas will flow only through the other parallel groove. This means there is no direct detection of the liner area and liner welds close to the clogged groove. This means that half of the critical welds are not covered! A vacuum system in that case still covers the maximum liner area and thus all the liner welds.

In case both grooves are clogged, a pressurised leak detection system is no longer reliable, a vacuum system will still work. This is the same in the situation when only one leak detection hole is present (refer to FAQ 11). In that case the vacuum system pulls any leaking fluid towards the ammonia analyser by means of the vacuum pump.