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AMMO LASER Leak Detection System

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

Question 3:
Why is a passive leak detection system not acceptable anymore ?

In a passive leak detection system an indication of a leak in the liner only shows up when the leak emerges from the leak detection hole.

Or, in case the leak detection hole is connected via tubing to for example a bottle with a phenolphthalein solution, when the colour of the liquid in the bottle changes (refer to Figure 1).

Figure 1: An example of a passive leak detection system (bottles with phenolphthalein).

The detection occurs at a later moment then when the leak occurs in the liner. Time passes (dwell time) between the moment the leak occurred and the moment the leak emerges at the leak detector or when a field operator notifies the leak. The latter case is even worse as the dwell time can be much larger. Figure 2 shows a clogged leak detection hole.

During that dwell time the risk that the leak detection path gets clogged is realistic. That means that there will be ***a serious threat to the integrity of the carbon steel pressure bearing wall***.

Figure 2. Clogged leak detection hole

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A much more critical situation arises when the clogging occurs in the tubing or underneath the liner and no solids are visible. ***Nobody will be aware of an extremely dangerous situation***.

Figure 3. Clogged behind the liner

A leak contains ammonium carbamate, water and in some parts of the equipment also urea. At the lower pressure present in the leak detection system, ammonium carbamate will dissociate into ammonia and carbon dioxide but only if the temperature is higher than 60°C (140°F). Urea, however, can easily crystallize or polymerize and clog the leak detection path. In a paper presented during the AICHE Ammonia Safety Symposium in 2019, a clogged leak detection hole case is described with a solution which only contains ammonium carbamate and not any urea (reference 1).

It is the major challenge for any leak detection system to avoid clogging risks.

In case of clogging, the pressure and temperature increase preventing the dissociation of ammonium carbamate into the less corrosive components ammonia and carbon dioxide.

The trapped ammonium carbamate causes very high corrosion rates for carbon steel (1000 mm/year have been measured). Ammonium carbamate under these conditions can also actively corrode stainless steel as after some time oxygen is not available anymore for passivation. These risks will endanger the integrity of the high pressure vessel as history has shown us numerous times.

These are the reasons why, in our view, passive leak detection systems are not acceptable anymore.

Reference 1:
https://www.ureaknowhow.com/ukh2/images/stories/fiorda/2020142_UKH_FIORDA_05.pdf