

# The Specialist – “sharing through experience”

Machines Vessels Piping Materials Fired Equipment Civil Structural Inspection Electrical Instrument Control Process Safety Projects

## Developments in Low Pressure Storage Tanks

“Breathe in, Breathe out”

Low pressure storage tanks are traditionally built to BS 2654, API 620 or 650. They are very susceptible to under and over pressure because of their “low” design pressure.

API 2000 5th edition has been used to calculate inbreathing and outbreathing requirements for these tanks. However there have been recent changes in this area.

BS2654 has been replaced by BSEN 14015. A new ISO 28300 has been released which includes methods to calculate inbreathing and outbreathing requirements which are different to API 2000 methods.

ISO 28300 also states that it is possible for a flame to pass through a breather valve and recommends installing a flame arrestor in conjunction with a pressure/vacuum valve. However the industry has had good experience with tanks protected by breather valves without flame arrestors. The advice is to

“assess the risks of potential flame arrestor blockage compared to possible ignition of a flammable atmosphere (“flashback”)”.

The soon-to-be-released API 2000 6th edition is expected to be in line with ISO 28300.

## Tank failure due to blocked vent leads to costly repair and impact on production

### Background

- 1800 m<sup>3</sup> waste water storage tank design pressure -6mbarg, +56mbarg
- NPS 14 carbon filter installed in vent line to limit odour emissions
- NPS 4 swan vent also installed on top of tank
- NPS 8 overflow line routed to grade
- Storage tank located in bunded area

### Investigation

- Prolonged rain filled the bund to a level above the overflow pipe exit.
- Later, the pressure in the storage tank fell either due to thermal cooling or liquid transfer out (or both).
- The inbreathing capacity of the vents was insufficient and the roof was sucked in.
- The incident had not occurred before because the storage tank inbreathed through the overflow line.
- The carbon filter vent was blocked – it hadn't been inspected or maintained for at least 5 years
- The water level in the bund stopped the overflow from acting as a vent; the 4” vent had insufficient inbreathing capacity.

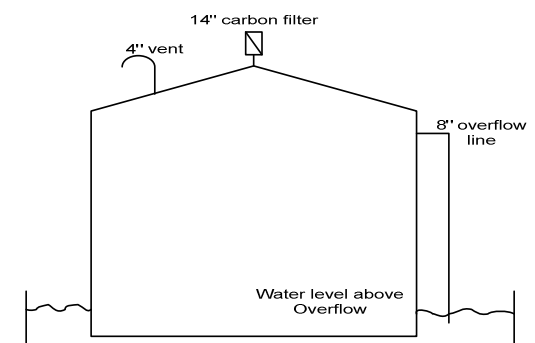
### Key Elements

1. In this incident the tank failed at the roof. More commonly tanks tend to fail at shell and floor to shell weld with increased likelihood of a significant loss of containment. In this case the bund also had a level of water!!
2. The vent / relief case on storage tanks must be thoroughly understood and documented and measures put in place to prevent potential failures occurring.
3. This incident highlights the danger of ignoring the maintenance of fine element equipment in vent lines and bund house keeping.

An apt quote applied to Tanks,

*“Life is not measured by the number of breaths we take, but by the moments that take our breath away.”*

attributed to various persons



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