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The Fitting of Tank Overflow Devices

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EEMUA believes that the fitting of overflow devices to storage tanks used for volatile liquids can adversely impact their operation, inspection and maintenance, and will not necessarily reduce the likelihood of a spillage or improve the consequences in the event of a spillage. While overflow devices may be considered for storage tanks, there are serious drawbacks that limit their benefits in many instances, especially when the tank contains a volatile liquid. Thus the fitting of overflow devices, whether to new tanks or as a retrofit, should not be compulsory.

Summary of issues

- Overflow devices for volatile fuels represent a significant breach in primary containment, introducing additional safety concerns and environmental issues with fugitive emissions. This is completely counter to current practice which is to focus on the integrity of primary containment.
- Integration of the overflow inlet with floating decks and venting arrangements leads to additional complexity and risk of failure.
- Overflow devices are still unproven technology. There are no published recommendations for overflow designs to handle volatile liquids, and work done to date has dealt with small scale experiments on low/zero vapour pressure fluids, with no work done on the effects of static electricity, for example.
- A reduction in tank working capacity will lead to taller tanks, with an attendant increased risk.
- There are currently no accepted and approved standards for overflow designs, increasing the risk of ineffective and possibly dangerous systems being viewed as improving safety and thus leading to misplaced and hazardous overconfidence.

Background

The final report of the Major Incident Investigation Board[1] (MIIB) that investigated the catastrophic explosion at Buncefield, UK on 11 December 2005 made a number of recommendations regarding the design and operation of storage sites. The ones that are the subject of this EEMUA position statement are:

Recommendation 14. Operators of new Buncefield-type sites or those making major modifications to existing sites (such as installing a new storage tank) should introduce further measures including, but not limited to, preventing the formation of flammable vapour in the event of tank overflow. ***Consideration*** *[EEMUA emphasis] should be given to modifications of tank top design and to the safe re-routing of overflowing liquids.*

Recommendation 16. Operators of existing sites, if their risk assessments show it is not practicable to introduce measures to the same extent as for new ones, should introduce measures as close to those recommended by Recommendation 14 as is reasonably practicable. The outcomes of the assessment should be incorporated into the safety report submitted to the Competent Authority.

Since the publication of this final report of the MIIB, the UK Health and Safety Laboratory (HSL) has carried out some investigative work and produced its own report[2]. It contains useful advice but much of the background data used has been obtained from small scale experiment and industry experience based on low/zero vapour pressure products. Such devices for volatile liquids are unproven technology, and there has been no work done on other issues, such as static, for example. It is clear from the report that:

- There are no specific published recommendations for the use of overflows for volatile fuels.
- There are important design issues, such as the integration of the overflow inlet with floating decks which need to be addressed.
- Additional design features or analyses would be required to deal with fugitive emissions and liquids with very high vapour pressures.
- These imply the addition of untested and complex design elements.

All tanks in operation today have been designed and built to an accepted and approved Standard – API, ISO, EN or BSI etc. Currently, none of these Standards include any information on the design, operation, inspection or maintenance of overflow devices. Any overflow device, whatever the type, will impact on tank design and operation.

The sizing of such overflows is of concern with the obvious mis-match of driving forces from a pumped supply inlet against a gravity overflow outlet. This will undoubtedly require substantial increases in overflow pipe diameter to accommodate the inlet flow rate. The venting arrangement also requires careful consideration when such overflows are fitted on tanks that may be fixed roof, floating roof or fitted with an internal floating roof. Furthermore, any overflow device will reduce the working capacity of a tank. If the available land means that the diameter cannot be increased to compensate for the loss of capacity then taller tanks will be constructed with all the associated risks that that brings.

Current practice is to focus on the integrity of primary containment. For gasoline storage, operators perform risk assessments, such as Layer of Protection Analysis (LOPA), to identify the safety integrity level required for an overfill prevention system to EN 61511[3], and to install a Safety Instrumented System (SIS) to fulfil this safety function to this level of reliability. When performed properly this risk based approach enables an accurate assessment of the system capability and safety without engendering possibly misplaced confidence in equipment that has had no assessment to a recognised standard, and no history of use in the field.

Where there are issues such as consent for land use close to population centres, and levels of risk need to be reduced from an unacceptable level then the fitting of an overflow device is one measure that could be considered, after extensive analysis, but they should be considered as one possible approach and not as a compulsory requirement.

References

1. The Buncefield Incident 11 December 2005. The final report of the Major Incident Investigation Board, Buncefield Major Incident Investigation Board, Volumes 1 to 3, ISBN 978 0 7176 6270 8, HSE, 2008
2. Design of overflow piping to mitigate the consequence of gasoline overfilling incidents. FP/12/37, Health and Safety Laboratory, 2012
3. EN 61511 - Functional safety: Safety instrumented systems for the process industry sector, Parts 1-3, International Electrotechnical Commission, 2004

About EEMUA

EEMUA - The Engineering Equipment & Materials Users' Association - is a non-profit membership organisation helping companies that own or operate industrial facilities - the users of engineering equipment and materials. By demonstrating and pursuing leadership in asset management, EEMUA helps improve the safety, environmental and operating performance of industrial facilities in the most cost-effective way. Member companies manage process plants, power stations offshore platforms, storage terminals and other industrial facilities around the world - engineering assets worth billions of Euros.

EEMUA has been representing users' interests for more than half a century and yet the Association's work has probably never been as relevant as now. Maintaining the right balance of in-house engineering expertise, keeping abreast of the regulatory environment and operating capital assets efficiently, effectively and in compliance - these are critical issues for owners of capital plants. The Association's members appreciate the value of the shared user community and the other benefits provided by membership of EEMUA.