Inputs and Assumptions of the EIGA 75 Method to Justify Smaller Separation Distances for Hydrogen Applications

Matthew Ferrier

January 7, 2025

Plan

Separation Distances

Separation Distance

The distance between a hazard source and object that will mitigate the effect of a foreseeable event, and prevent escalation of a minor incident due to damage to equipment or environment. [2]

Due to the properties of Hydrogen, appropriate separation distances are essential in the design of Hydrogen applications.

However, certain applications will be restricted by the physical amount of space available, for example GeoPura Hydrogen power units.

Consequence Based vs Risk Based Calculations

Separation distances can be calculated by consequence based methods (historically), or risk based methods (EIGA 75).

Consequence based calculations aim to eliminate risk, including considering the worst possible event. In applications with limited available space, it could be impractical, or impossible to achieve such separation distances.

A risk based approach considers potential hazard events, and calculates separation distances based on both the frequency of occurrence and the associated consequences of events.

Frequency of Events

The EIGA 75 method states that *"The risk from a hazardous activity should not be significant when compared with risk in everyday life"*, and proposes an individual harm exposure threshold of

$$Ft = 3.5x10^{-5} \text{ events per annum.}$$

The method compares this threshold with the frequency of hazard events, taking into account prevention and mitigation methods. For example, events that occur less frequently than Ft are so unlikely, that no separation distance is required, such as complete rupture of a storage tank.

To put Ft into context, in 2022 there were 333296 road traffic accidents in the UK. So a road traffic accidents are roughly 10^{10} times more frequent than Ft. The vast majority of road users would still consider this an acceptable level of personal risk.

Other Mitigating Factors

The method applies harm and no harm criteria to hazard events in the calculation of separation distances. However it is not just the basic frequency of an event that goes into the calculation, the impact of any prevention and mitigation measures is also taken into account.

The physical layout of the installation may reduce the risk from a particular event. For example, the direction which a pressure relief valve points, or physical barriers between equipment.

Other measures could include; training of the personnel operating the system, frequency of periodic inspections, using components made from a higher class of material, redundant components.

Conclusion

The EIGA 75 method provides a risk-based method for calculating separation distances, and considers the frequency of hazard events, as well as any prevention and mitigation measures.

The number of variables considered by this method means that smaller separation distances can be justified through the implementation of further mitigation methods.

Hydrogen specific information about the failure rate of components is something that was historically hard to come by, but recent research [1] into this area means that up to date information exists, especially as Hydrogen becomes more commonplace as a fuel used for vehicles.

References

[1] "A New Method to Quantify the Leakage Scenarios (Frequencies and Flowrates) on Hydrogen High Pressure Components". In: *Proceedings of the 10th International conference on hydrogen safety (ICHS 2023)*. 2023, pp. 595–607.

[2] *Methodology for Determination of Safety and Separation Distances*. Available online: https://www.eiga.eu/ct_documents/doc075-pdf/.

Questions?

Thanks for listening. Any questions?