

Challenges of explosion protection in hydrogen electrolysis plants

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Abstract

In consideration of a hydrogen economy, there is still a lack of guidelines and standards for the construction and safe operation of large-scale hydrogen production plants based on electrolyser technology. Although hydrogen and natural gas (methane) are both important industrial gases handling is different due to large differences in physical properties (e.g. molecule size). This becomes evident, for example, at adiabatic expansion or self-ignition behaviour. Accordingly, there is a lack of uniform specifications and clear instructions for these type of plants.

RWETI not only develops its own commercial hydrogen production projects, but also advises international partners on hydrogen projects. Based on experience from natural gas plants, any experience from hydrogen projects as well as the state of research and the current status of the regulations is incorporated into the RWE Ex Protection Guide so that this knowledge can be transferred holistically to other projects taking into account that different philosophies in Germany and the U.K. exist.

Interesting Ex protection challenges of the current projects at RWE are for example:

- The rupture of the electrolysis cell membrane and consequent mixing of hydrogen and oxygen until an explosive mixture has formed;
- The spontaneous ignition during the blow-off process of hydrogen through cold vents; and
- Appearance of jet fires due to leakages in the plant even if there are no active ignition sources.

Proposed solutions and suggestions are presented.

note: This document will be opened to the participants on IERE website before the Forum and opened to the public afterward.