Process Safety Challenges in View of the Upcoming Hydrogen Economy

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Abstract

If arranged in the right way, hydrogen as a new, large-scale energy carrier brings along the promise of reduction of at least a good part of carbon dioxide emissions. It is light, not toxic, and clean burning. Beside its good burning properties hydrogen has also some disadvantages such as it is not simple to store in quantity. Like other fuels it is also flammable, but its flammable range in air is relatively wide and its ignition sensitivity very high, and because the molecule is so small it will also easily escape from its containment. This will put a heavy requirement on leak free connection techniques. Although outside in open space it will easily disperse but when leaking in semi-confined or confined space explosion is not unlikely. Safety measures are necessary certainly when it is being manufactured, distributed and used on the large scale that many envisage in a hydrogen economy in which we drive, generate power and heat housing with hydrogen as an intermediate fuel.

In different parts of the world, U.S., Japan and Europe programs have started some years ago to investigate its hazardous properties in more detail and to develop special safety measures where necessary. Recently, in September 2009, the third International Conference on Hydrogen Safety (3rd ICHS) has been held at Corsica, France. CFD tools have been adapted to describe hydrogen dispersion and explosion. Field tests have been carried out, an incident databank has been founded, knowledge gaps defined and risk analysis methods reviewed. The latter are required for drafting installation guidelines and for making the necessary planning for safe distances in land use planning and licensing of hydrogen storage locations, pipelines and re-fuelling stations. Yet some challenges remain. The paper will summarize results and will go into hydrogen related issues where we can use more knowledge and reduce uncertainty to improve the quality of risk control.