

Analysis for Explosion in the Vent Stack of Hydrogen Storage Tank

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A lot of researches have been done on hydrogen as an energy carrier, due to its clean emission, light weight, and abundance, to solve global warming. However, its extremely low volumetric density presents significant challenges to storage technologies such as cryogenic, compressed, and liquid storage technologies. To reduce the explosion risk of storage tank, it should be equipped with a pressure relief device and a vent stack. In this work, a simple model to predict the explosion pressure inside the vent stack is developed and it is used to theoretically analyze the effects of various parameters, such as burning velocity of flammable gas mixture, specific heat ratios, the exponent of burning velocity, dimensionless maximum explosion pressure at a adiabatic constant volume process, and the density of flammable gas mixture on the explosion pressure. The worst case of hydrogen-air mixture in the vent stack may be a concentration from stoichiometric value to 40% of hydrogen. With the simple model developed here, the worst concentration of hydrogen in air is observed at about 35%.