# Abstract 081 Comparative Analysis of Modeling Methods for Hydrogen-Air Detonation

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**ABSTRACT**

As the global community moves towards a more sustainable future, hydrogen is emerging as a key component of the energy supply system. However, the inherent combustible and detonable properties of hydrogen necessitate careful consideration of potential explosion accidents throughout its production, transportation, storage, distribution, and consumption processes. The study begins by reviewing two traditional modeling methods for gas explosions: the TNT equivalent method and the high-pressure volume method. In addition to the conventional approaches, a novel method called the CESE-chemistry coupling method is introduced in this study. This method integrates the compressible CESE solver with the Finite Element Method (FEM) and a chemistry solver in LS-DYNA. By considering the chemical reactions during detonation, the CESE-chemistry coupling method aims to provide a more comprehensive and precise representation of hydrogen detonation phenomena. This study compared the results obtained from these three methods against experimental data to evaluate their applicability in difference scenarios. By identifying the strengths and limitations of the TNT equivalent method, the high-pressure volume method, and the CESE-chemistry coupling method, this study provides valuable insights for researchers and safety professionals involved in assessing and mitigating the risks associated with hydrogen explosion accidents.

**Keywords**: Hydrogen detonation, TNT equivalent method, high-pressure volume method, CESE – chemistry coupling method