

HyRAM+

Hydrogen Plus Other Alternative Fuels Risk Assessment Models

Hydrogen's small molecular size, high flammability, and rapid dispersal create distinctive safety challenges. The potential for leaks and their consequences requires validated tools to assess and mitigate risks.

WHAT IS HYRAM+?

The Hydrogen Plus Other Alternative Fuels Risk Assessment Models (HyRAM+) software is a toolkit that integrates publicly available data and models relevant to studying the safety, risk, and consequences of hydrogen and other alternative fuel systems. Developed by Sandia to provide a common platform for stakeholders conducting quantitative risk assessment and consequence analysis, the toolkit provides a way to access and use available models for hydrogen and alternative fuels (i.e., natural gas and propane) systems.

FUNCTIONALITY AND USE CASES

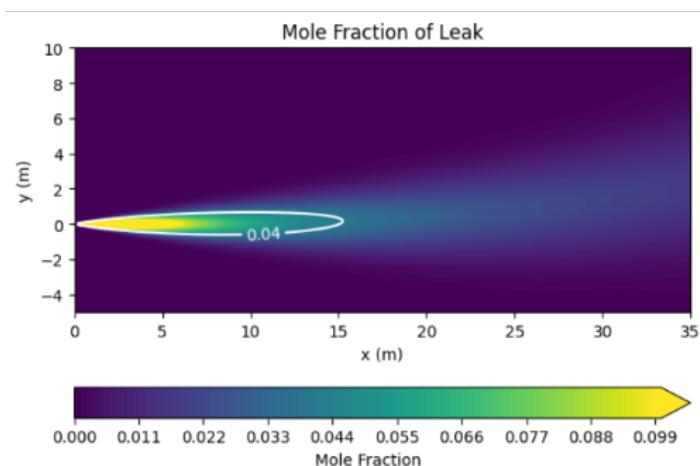
HyRAM+ integrates deterministic and probabilistic models to assess leak probabilities, predict physical effects (e.g., jet flames and explosions), and evaluate the impact on structures and individuals for different leak scenarios. The software provides essential capabilities for:

- Quantitative Risk Assessment: Analyzing potential failure scenarios and calculating risk metrics, such as the probability of ignition and potential loss of life.
- Plume Dispersion Modeling: Simulating the dispersion of hydrogen or other gases and evaluating safe distances and sensor placement.
- Scenario Analysis: Identifying the most impactful risk factors and visualizing event sequences.

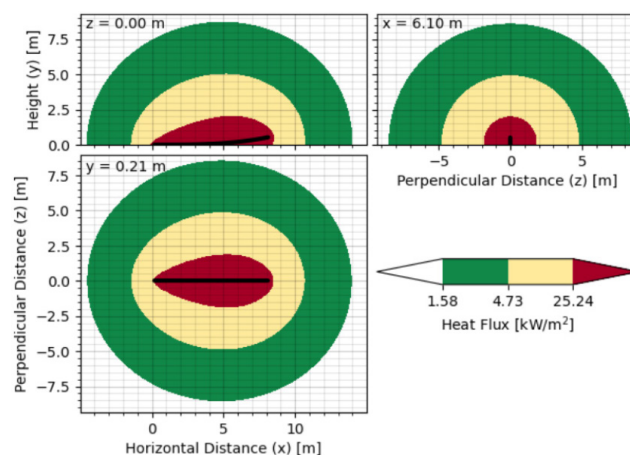
By enabling multiple types of analysis, HyRAM+ can support code and standards development, safety basis development, facility safety planning, and stakeholder engagement. HyRAM+ is especially valuable for industries which use hydrogen as a fuel or energy carrier, such as transportation, industrial processes, or energy storage.

FEATURES AND AVAILABILITY

HyRAM+ provides fast-running, reduced order models for unignited dispersion, flame trajectory and heat flux, and unconfined overpressure. The toolkit's behavior models can be used for standalone analysis or for quantitative risk assessment. The HyRAM+ toolkit is free, open-source, and available at hyram.sandia.gov.



The plume dispersion model in HyRAM+ shows the flammable extent from a potential leak of hydrogen as it mixes with air.



The jet flame model in HyRAM+ shows radiative heat flux values from a potential hydrogen leak, which can help quantify potential hazards to nearby people or buildings.

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