



# Shell FRED

for Future Fuels

More than just a  
consequence modelling tool





# Shell FRED for Future Fuels

Features full thermodynamic model for safety and risk management across multiple assets.

Shell FRED is a fire, release, explosion and dispersion consequence modelling tool developed by Shell and available exclusively through Gexcon.

Based on more than 40 years of R&D, the software is a well-validated consequence modelling tool, with a range of models that are well suited for future fuel applications.



Perform various simulations at the same time

## Uses and Applications

Shell FRED can be used for broad applications, enabling the analysis of various scenarios that involve future fuels, including hydrogen, ammonia, CO<sub>2</sub>, methylcyclohexane, and methanol.

You can use Shell FRED to analyse the consequence of planned or accidental releases at a production and storage facility, from a vehicle, or at a distribution terminal. It is applicable throughout the design, construction, operation, and modification phases.

The software has been developed based on the need for accurate results and actionable outputs, such as:

- Justifying new design and operation
- Optimising facility and equipment layout
- Optimising prevention and protection measures
- Analysing domino effects/escalation management studies, through specific scenarios for modelling the effect of Passive Fire Protection (PFP) and vessel heat-up
- Preparing and updating safety cases
- Analysing pre-incident and emergency response planning studies
- Conducting accident investigation
- Performing quantitative fire and explosion risk analysis – with results directly integrated into Shell’s QRA tool Shell Shepherd



Analysing missile fragments after vessel burst

## Benefits

### 1 | Accurately Model the Behaviour of Simple and Complex Mixtures

The software features an advanced thermodynamic model, which allows extended multi-component fuel representation to be used across nearly all models.

Users can accurately model the behaviour of simple and complex mixtures, such as:

- Temperature changes on high-pressure release (e.g., Hydrogen – Joule-Thompson Effect)
- Pool flashing/off gassing for liquid releases (e.g., methanol)
- Flashing of dense phase releases (such as CO<sub>2</sub> and ammonia), and ensuing dense gas dispersion

### 2 | Create Infinite Mixtures

Shell FRED includes over 1200 chemical components, which can be blended to create custom compositions for your analysis. The thermodynamic package will accurately model the release behaviour of these mixtures.

### 3 | Trustworthy based on Over 40 Years of Validations

Shell FRED has been extensively tested and validated against experimental data for more than 40 years. It has a range of models that are well suited for hydrogen, ammonia, methanol, methylcyclohexane, and CO<sub>2</sub> applications. Specific validation has been conducted for over a decade for future fuel applications (such as hydrogen dispersion and jet fires, dense CO<sub>2</sub> dispersion).

Shell has invested well over \$100m in experimental studies and participates in many JIP (Joint Industry Projects) in addition to conducting bespoke research.

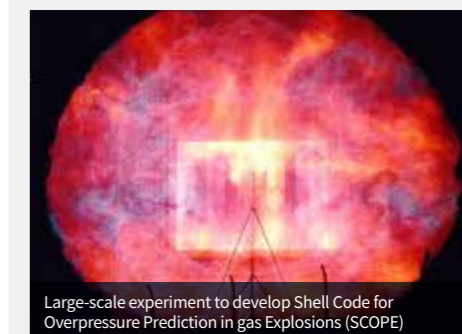
### 4 | User-Friendly Interface

Easily navigate through Shell FRED when performing your safety studies. The software’s ease-of-use decreases your search time and increases your productivity.

The software underwent a comprehensive update (released in 2020), giving a complete user interface overhaul and a brand new, intuitive and easy-to-use interface. This was developed with extensive input from real users all over the world.

### 5 | Communicate Results Effectively

Use a background image with a chart to show the effects of accidental releases. Create visual results that can be clearly understood even by non-technical professionals.



Large-scale experiment to develop Shell Code for Overpressure Prediction in gas Explosions (SCOPE)



Large-scale jet fire experiment



Modelling Escalating Accident Scenarios and the Use of Risk-reducing technology for Explosion safety (MEASURE) JIP



Hydrocarbon pool fire experiment supporting methylcyclohexane validation



Large-scale CO<sub>2</sub> experiment





Hydrogen jet fire analysis

**Shell FRED is a part of Gexcon’s X-Suite range of safety software and can be used in conjunction with Shell Shepherd (QRA tool) and Shell PIPA (pre-incident planning tool).**

You can request a webinar recording where you can learn how Shell FRED has been validated for materials such as hydrogen, ammonia, CO<sub>2</sub>, methylcyclohexane, and methanol, making Shell FRED a reliable tool to assist decision-making in projects and operations.

Please scan this QR code to visit the webinar page.



**Gexcon**

World-leaders in the field of safety and risk management and advanced dispersion, explosion and fire modelling.

**Shell**

An international energy company that aims to meet the world’s growing need for more and cleaner energy solutions in ways that are economically, environmentally and socially responsible.

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