DIGITAL SOLUTIONS

PHAST™

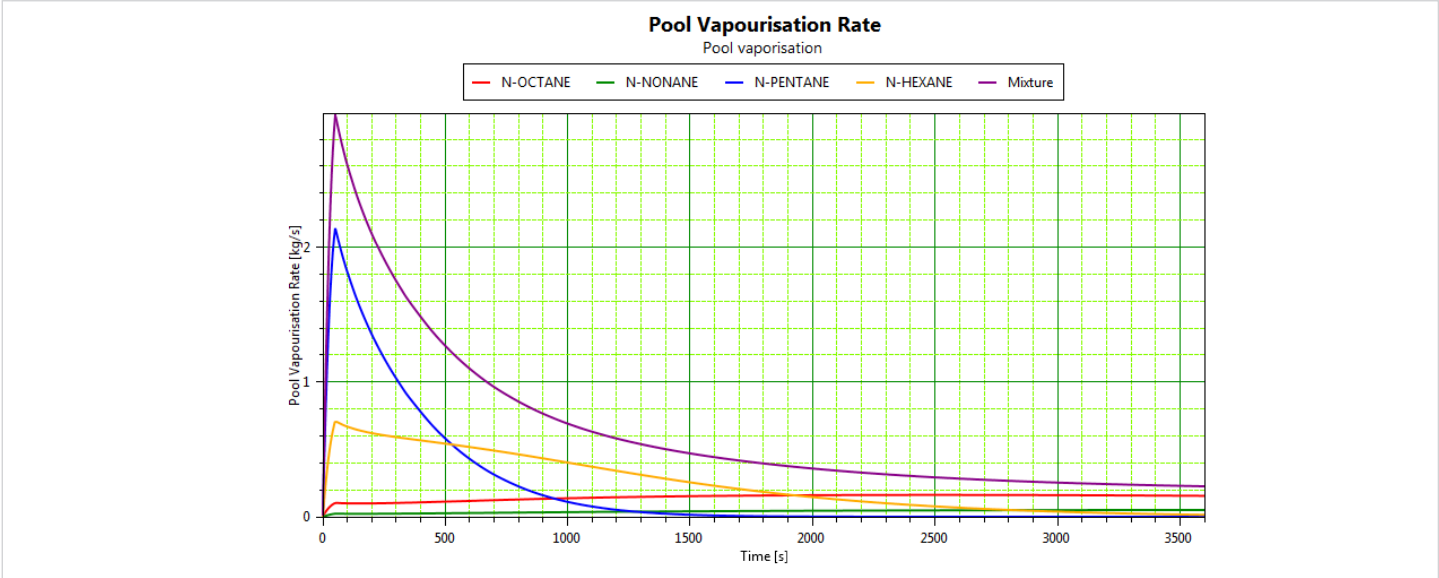
Multi Component Extension

The Phast Multi Component extension provides improved consequence and risk results for mixtures compared with the traditional "pseudo-component" approach. Multi Component modelling, as currently implemented in Phast, comprises enhancements to the physical property system and consequence models.

The Multi Component extension supports the core steady-state discharge models, and dispersion modelling via the UDM, currently limited to clouds which do not rainout. The latest release of Phast now includes a standalone multi component pool vapourisation model. Time-varying releases and a more complete treatment of dispersion, including rainout, are planned for future releases.

The multi component modelling is based on a more rigorous calculation of mixture properties and phase equilibria. In common with many other similar software packages, Phast has used a "pseudo-component" (PC) approach for mixtures, where the thermodynamic behaviour and properties of a mixture are treated as a pure component, whose properties are averaged from its constituent components.

The improvements in results will vary from case to case, but since risk and consequence analyses are used as the basis for decisions resulting in large investments, it is important that you have confidence that the results are as accurate as current technology allows. In this respect multi component modelling is widely recogniszd as a key enhancement, and Phast is one of the first applications to include this capability for risk and consequence analysis.



Modelling Overview

A typical plant hazard analysis will usually involve several hazardous streams and often these streams contain mixtures of chemicals. Modelling this requires calculation of mixture thermodynamic properties such as densities, enthalpies, entropies, fugacities and phase equilibrium conditions.

Rigorous thermodynamics is a standard feature of models used in process plant design and process simulation. However, models used in hazard and risk analysis often make simplifying assumptions to avoid the use of rigorous multi component thermodynamics. The pseudo-component approach assumes the mixture has a static composition, behaving like a single component with properties calculated using a simple averaging equation.

The accuracy of this approach varies greatly according to component volatility, mixture composition and the consequence model itself. Two-phase discharge is an example of a calculation which can be strongly affected by accuracy of thermodynamics. The composition and properties of the two phases can be very different from those predicted using the simple pseudo-component approach, affecting the accuracy of the release rate calculations.

Historically, a common justification for the use of simplified thermodynamics is that hazard and risk assessment do not require the same level of accuracy as process design. In addition, the integration of rigorous thermodynamics might affect the speed and robustness of the consequence calculations. However, you often make important decisions based on such calculations and we believe multi component technology is an invaluable tool to help you maximize the accuracy of your risk assessment.

BENEFITS INCLUDE

- Multi Component property system based on equations of state with intuitive definition of process streams
- Improved source term modelling of two-phase mixtures for many of the Phast discharge models including catastrophic rupture, leak, line rupture, relief valve and disc rupture
- Improved phase composition calculation accuracy for dispersing clouds comprising mixtures
- Calculate vapourization rates of multiple components for a mixture vapourising from a pool

KEY FEATURES

- Integrated multi component property system with built-in chemical database and flash calculator
- Supports most frequently used equations of state including Redlich-Kwong, Soave-Redlich-Kwong and Peng-Robinson
- Reports showing mixture composition as release expands from storage to atmospheric conditions
- Graphs of phase composition during dispersion
- Standalone Multi Component Pool Vapourization Model