

SAFER TRACE™



**Engineering-Grade Chemical Emergency
Response Management Solution
for Risk Analysis, Prediction, and Evaluation**

Helping You Manage Chemical Risks and Meet Regulatory Requirements

TRACE™ is a powerful tool for chemical risk management. It is a comprehensive hazard assessment software for analyzing the impact of toxic, flammable and explosive chemical releases into the atmosphere. TRACE™ enables you to create a thorough and scientifically-sound analysis and then customize its results to meet your needs. From routine emissions to containment failures to explosions ... TRACE™ can provide you with the knowledge you need to deal effectively with risks and make decisions about complex safety issues.

TRACE™ can simulate toxic chemical releases using a set of sophisticated algorithms for modeling tank failures, pipe leaks, physical phenomena at the release source, dense gas modeling and Gaussian dispersion. In addition, the fire and explosion algorithms can produce thermal radiation and blast overpressure impact zones. The TRACE™ algorithms provide you with several options for graphically presenting results in context and with rich detail. Impact zones can be displayed on grids or custom graphics maps. Receptor, population and evacuation data can be used to create a plan of action in the event of an emergency.

TRACE™ can help you to address complicated modeling issues. This is accomplished within a sophisticated, user-friendly, graphical interface which organizes and simplifies the use of powerful modeling algorithms. An extensive chemical database and sophisticated models are seamlessly integrated into a user-friendly interface incorporating Windows-style icons and "Wizards".

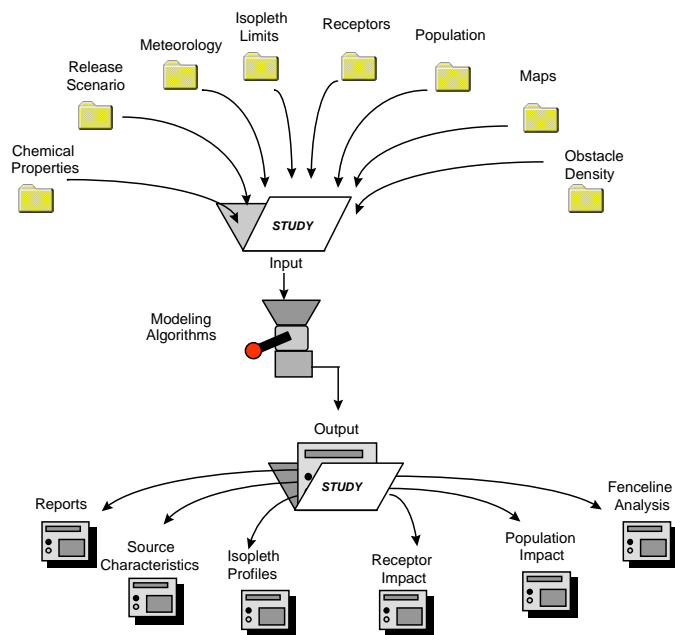
Due to its flexibility and power, TRACE™ can be used in a wide variety of applications:

- Accidental Release Modeling
- Hazards Identification
- Risk Management Planning
- Emergency Response Planning
- Human Response Modeling
- Regulatory Modeling Requirements
- Quantitative Risk Assessment
- Evaluation of Mitigation Systems
- Population Exposure Assessment
- Worst Case and Alternative Scenario Studies

As this list demonstrates, there are numerous situations in which TRACE™ plays a key role by providing realistic representations of potential hazards for planning purposes. In addition, TRACE™ can be used to meet regulatory requirements such as:

- OSHA PSM guidelines
- EPA RMP rule [CAA-112(r)]
- EEC Seveso Directive
- CEFIC Responsible Care Programs
- DHS CFATS
- SARA Title III

TRACE™ features a context-sensitive online help facility and Wizards to guide you through the input process. Default values appear on each input field providing a starting point for characterizing a modeling situation, which can then be refined and built upon. On the input screens, the user can choose the units for all variables (metric, English or user-defined).



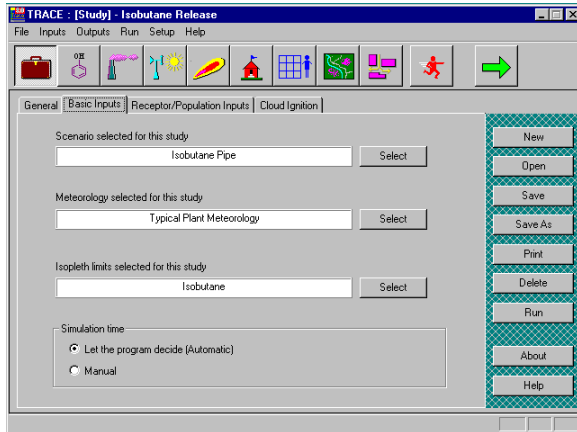
Inputs to TRACE™ models can include chemical properties, release scenarios, meteorological data, impact levels of concern, receptors, population data, and maps. TRACE™ provides expert assistance as you develop these inputs to ensure their validity. The chemical database contains physical constants and other data required for modeling calculations of over 700 chemicals. Several release scenario configurations are available to help you to characterize your unique situation and example scenarios are provided. Receptors can be set up with many attributes so that they can be used to study impacts in sufficient detail. Maps can be incorporated to provide context for modeling results. Population distributions can be set up graphically, clarifying complicated data and visually verifying that the data is properly entered.

Once you have developed an Input Case Study you submit it for a model run and it is transformed into an Output Case Study. When you review the Output Case Study you have many options for visualizing analysis results. These can include Reports, Source Characteristics, Isopleth Profiles, Receptor Impact, Population Impact and Fenceline Analysis. Graphical displays can be customized with a choice of colors, plotting formats, region of interest and axis scaling. Additionally, data pertaining to these plots can be transferred to a word processing, spreadsheet or a presentation program with the click of a mouse.

User - Friendly Interface for Input Data

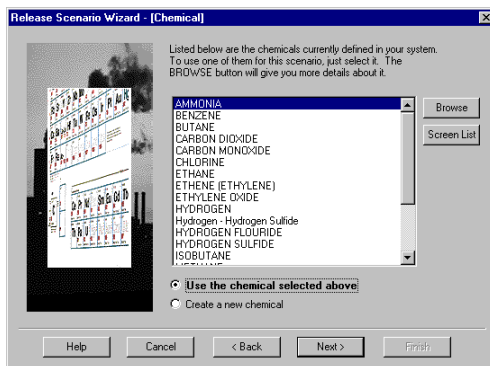
Case Study Concept

TRACE™ is designed around the concept of a Case Study. Within the Case Study, input components like release scenario, meteorology, isopleth limits, receptor and population data are included. Once the model is run, the Case Study is enhanced to include output information.



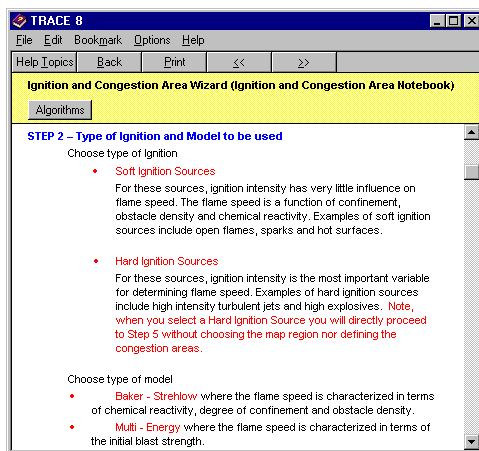
Use of Wizards

The input process is organized within a notebook format. New notebooks can be created by using "Wizards". A Wizard is a logical sequential set of screens which help you enter the necessary input information. This ensures that the required and correct information is provided for running the simulations.



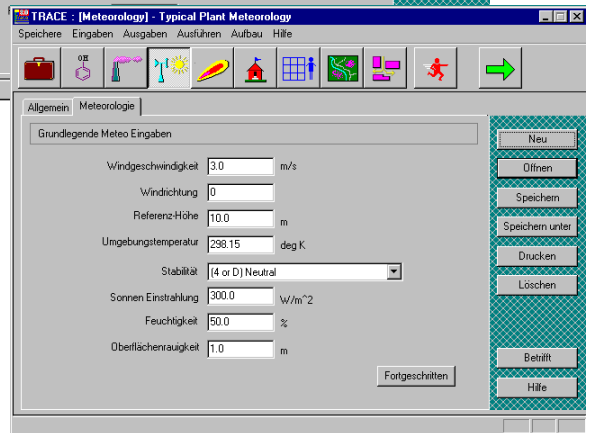
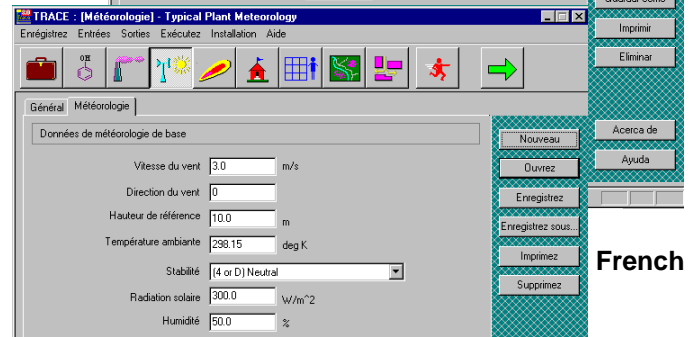
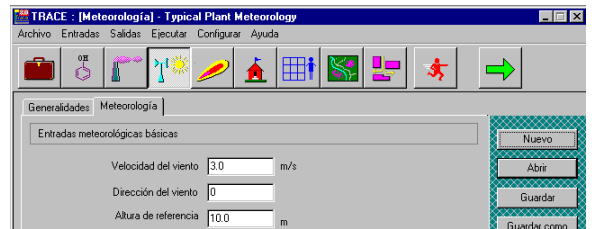
Context-Sensitive Online Help

An important feature of the input component is the context-sensitive online help facility. This provides guidance on the meaning and recommended value for each input variable. Each topic also contains hypertext links to other related topics and the relevant modeling algorithms.



Multi-Lingual Customization

Spanish



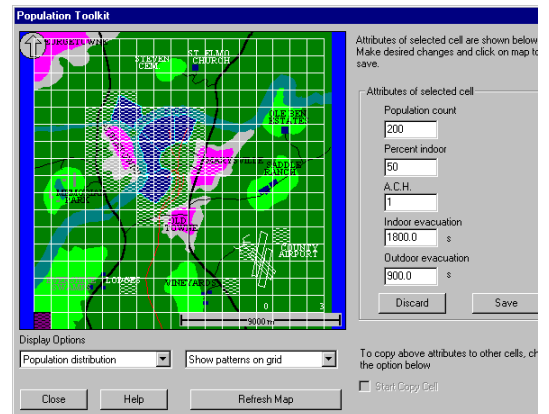
German

TRACE™ has been designed to be an international program. By selecting one setting on the Setup Menu you can display the entire graphical user interface in English, German, French, Spanish or Portuguese.

Graphical Input for Population Data

The Consequence Analysis enhancement to TRACE™ allows you to define the air changes

per hour, population distribution and evacuation time. An easy-to-use graphical interface assists you in specifying these attributes for grid blocks on a map.



Comprehensive Text and Graphical Output

TRACE™ Detailed Hard-Copy Printed Reports

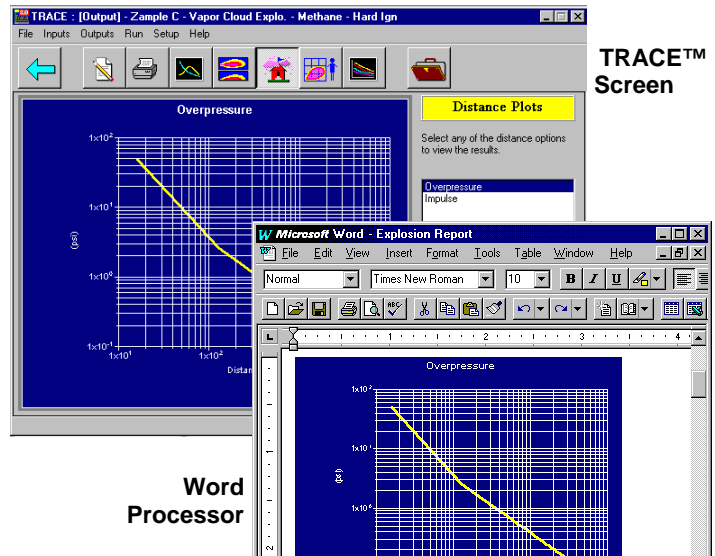
CONCENTRATION		
Isopleth limit (ppm)	Maximum isopleth distance (m)	Maximum isopleth width (m)
25.0	22217.7	515.0
50.0	14631.2	360.5
1000.0	1625.7	58.7

RECEPTOR IMPACT			
Downwind distance (m)	Peak meander concentration (ppm)	Dose (ppm-min)	Exposure time (s)
325.0	41081.7	7777599.0	7146.6
775.0	5187.3	711857.6	7272.6
3025.0	782.5	103521.1	7935.3
7525.0	179.0	29944.8	8919.3

TRACE™ produces summary and detailed hard-copy reports. These reports can be customized to include specific information of interest. Information regarding the inputs and

various outputs (release rates, source term, impact zones etc.) can be included in the reports. The reports can be saved and edited in widely used word processors.

Cut and Paste between Applications

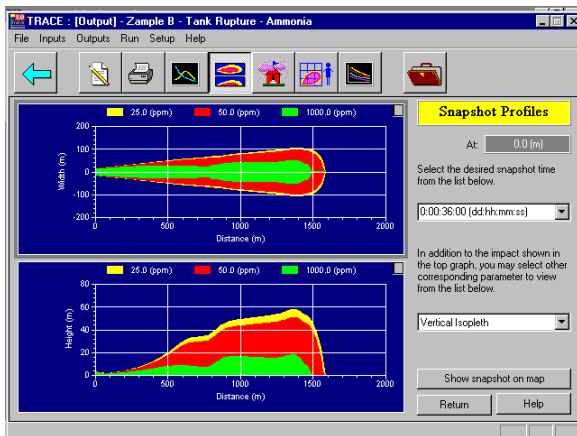


TRACE™ Screen

Word Processor

Horizontal and Vertical Cloud Displays

Snapshots and footprints are displayed as horizontal and vertical cross-sections at successive

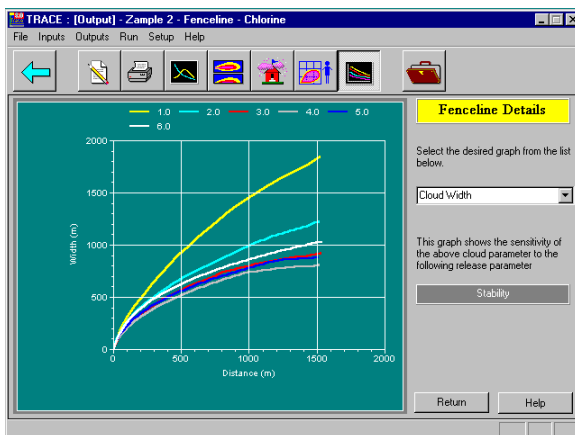


time intervals. Other parameters that can also be plotted as a function of downwind distance are the centerline concentration and concentration at a user-specified elevation (e.g. breathing-zone height).

Fenceline Analysis

The TRACE™ Fenceline Analysis allows you to study the effect of varying one parameter while keeping all other

variables constant. The parameters which can be varied include the aerosol/flash mass ratio, ambient temperature, averaging time, release temperature, spill rate, stability class, surface roughness and wind speed.

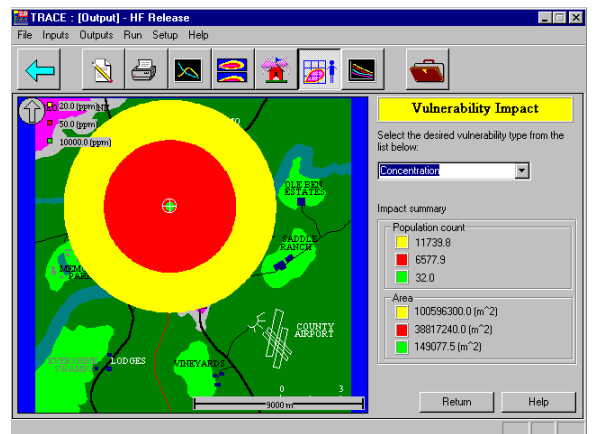


TRACE™ output capabilities allow you to design customized

graphical results. Frequently these graphical and text results are required in reports, presentations and also serve as inputs for other calculations. The TRACE™ outputs can be easily exported to a word processor, spreadsheet or a presentation program. This is accomplished with the click of the mouse.

Population Impact

The Consequence Analysis enhancement for TRACE™ is an add-on capability to evaluate consequences of an accidental release on the surrounding community. Detailed population exposure and human response modeling for toxic releases, fires and explosions using area-specific population data can be performed.

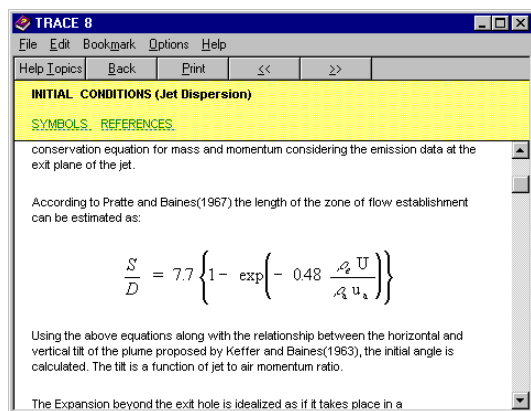


Sophisticated Modeling Algorithms

The powerful algorithms in TRACE™ are built upon a strong scientific foundation. These algorithms have been evaluated with actual field-test data. The TRACE™ algorithms include:

- **Multi-Component Modeling:** SAFER's multi-component liquid modeling capability allows users to create three types of chemicals: pure component, gas multi-component, and liquid multi-component. Mixtures with up to ten components may now be modeled using TRACE™. Users may choose to model either the component of interest, or the mixture as a whole. TRACE™ 9.1 is especially useful for hydrocarbon mixtures.
- **Release Rates:** Source calculations are available for time-varying release from a tank/pipe system or a steady release from a pipe. Release rate, temperature and composition are determined by algorithms with multiple configuration options.
- **Source Dynamics:** TRACE™ models phenomena such as flashing, aerosol dynamics, air entrainment and pool evaporation. TRACE™ can handle multicomponent pool evaporation for aqueous solutions and fuming acids. There is also a capability for modeling gas mixtures.

Extensive Online and Printed Documentation

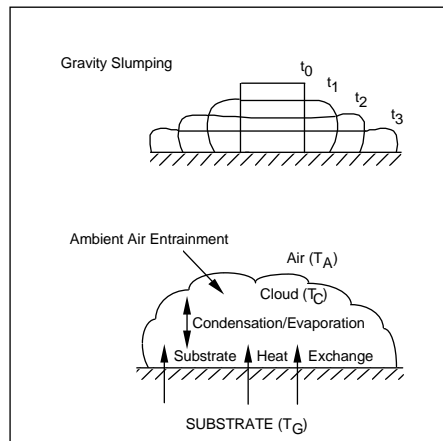


Online help and printed documentation with full technical details and references are provided with TRACE™.

- **Vapor Cloud Dispersion:** TRACE™ has the capability to model ground level or elevated releases in the form of high momentum jets, dense gas clouds or buoyant plumes. Special models have been created for hydrogen fluoride and titanium tetrachloride dispersion. Infiltration calculations are available for determining indoor and outdoor concentration differentials.
- **Fires:** TRACE™ evaluates thermal radiation variables from several fire-related scenarios. These include fireballs (BLEVEs), liquid pool fires, jet fires, flash fires and generic sources (user-specified shapes). The fires models account for the geometry of the source, the

source strength, view factor and atmospheric transmissivity.

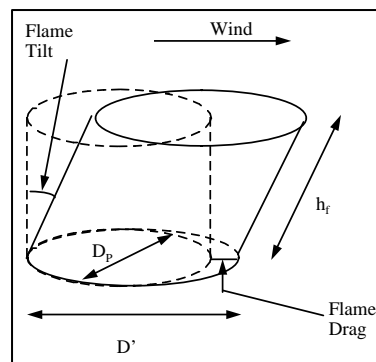
Atmospheric Dispersion of a Vapor Cloud



TRACE™ includes a dense gas dispersion algorithm accounting for gravity slumping and heating/cooling of the cloud.

- **Explosions:** The Baker-Strehlow and Multi-Energy methodologies can be used for modeling explosions. The algorithms account for type of ignition source, degree of confinement, congestion level, chemical reactivity and initial blast strength. Separate algorithms are also available for simulating pressurized vessel bursts.
- **Population Impact:** Within the Consequence Analysis enhancement to TRACE™, separate algorithms are available which evaluate the number of people impacted by a release. Different criteria like Concentration, Thermal Radiation, Overpressure Levels, Dose, Load and Probit effects can be used as the impact criteria.

Fire-Related Modeling



Leader in Chemical Risk Management Software

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SAFER Systems has authorized agents in many parts of the world. Contact your Regional Business Manager or our Worldwide Sales office for more information.

SAFER Systems is committed to providing you with high quality solutions to effectively manage the risks posed by hazardous chemicals. We continually enhance and refine the modeling technology behind our solutions. We also offer a Software Support and Upgrade Services Program through which you automatically receive software updates. As a result, your SAFER TRACE™ software capabilities are maintained to the most advanced, state-of-the-art levels of accuracy and performance.

In addition to SAFER TRACE™, we also offer SAFER Real-Time® which links fixed site/plant-specific dispersion modeling capabilities with real-time meteorological and sensor data measurements for effective emergency management and response. The SAFER Real-Time® system has been installed at over 200 locations throughout the world and is the acknowledged leader in its class. We also provide custom Engineering Services -- a cost-effective means to obtain detailed analysis performed by our engineering professionals on a per scenario basis.

SAFER Homeland Responder™, Hazmat Responder™, Real-Time®, and TRACE™, our core products, have been installed at over 500 locations around the world. Major corporations, governments, and many other organizations that manufacture, process, store or transport hazardous materials use SAFER Systems software. When you purchase SAFER TRACE™, you obtain the unique experience and wealth of knowledge that we have accumulated by designing, installing and enhancing our chemical emergency management solutions for the past 25+ years.

Technical Support

Technical support is a priority at SAFER Systems. We provide all users with comprehensive hard copy technical documentation containing information you need to effectively use TRACE™. For additional guidance, SAFER Systems offers a 24-hour emergency telephone support line. And we hold Users Meetings and customer workshops worldwide to update you regarding our latest technological advances and to help you utilize TRACE™ to its greatest potential.

Computer Requirements

The recommended minimum configuration for TRACE™ is as follows:

- Windows 2000 or Windows XP Professional
- Pentium 4
- 256 MB
- 1 GB Hard Drive