



# INPLANT™

## Multiphase Fluid Flow Simulator for Plant Piping Networks

INPLANT is a rigorous, steady-state simulator for designing, rating, and analyzing plant piping systems. Engineers can quickly rate and analyze the safety of plant piping systems through INPLANT's updated Graphical User Interface (GUI). INPLANT also enables the design of new piping systems or the revamp of a wide variety of existing systems. Applications range from simple, single pipe sizing and rating calculations to large, multiphase fluid piping networks with complex, nested-loop topology. Relief system problems involving networks with single or multiphase fluids at high velocities or in critical flow can also be solved using INPLANT. Benefits include:

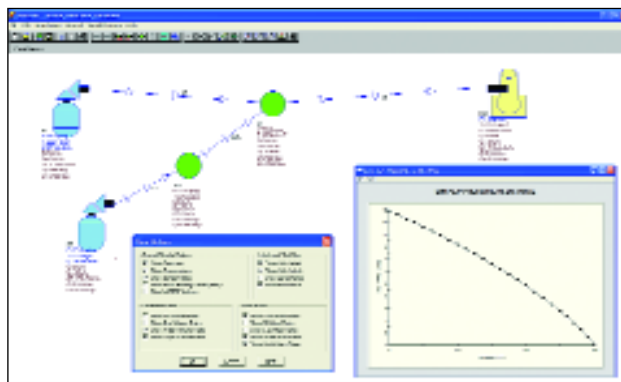
- Improved plant design and revamp
- Lower capital/operating costs (*typically by 5%*)
- Efficient safety and regulatory compliance
- Reduced piping costs
- Increased plant throughput
- Safer process plant operation

### APPLICATIONS

- Process piping
- Vacuum transfer lines
- Fire-water networks
- Utility distribution systems
- Steam systems
- Flare relief networks
- Vessel depressuring studies
- Single-link & relief system pipe sizing

### PROCESS PIPING SYSTEMS

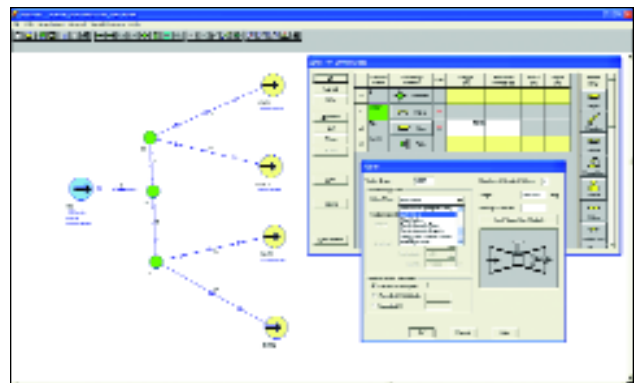
INPLANT will allow engineers to quickly identify the cause of poor hydraulic performance in process piping systems and will help find solutions. It solves pressure drop and energy balance equations while simultaneously performing rigor-



ous heat-transfer calculations for even the most complicated looped networks. Line capacities, line sizes, flow distribution in loops, required pump and compressor sizes, heat-transfer effects, Joule-Thomson effects, in-line flow patterns, vapor and liquid velocities, and preferential phase splitting at tees are all accurately determined.

### EQUIPMENT UTILITY PIPING SYSTEMS

The INPLANT program was specifically designed to rigorously solve looped networks with mixed boundary conditions. These advanced capabilities allow the user to easily monitor the performance of all utility piping networks in a plant. INPLANT calculates flow distributions within cooling water, steam, lube oil, and air systems. The program can accurately determine delivery pressures and rates for a given inlet pressure and vice versa.



### RELIEF SYSTEMS

INPLANT allows engineers to quickly and precisely reevaluate the adequacy of relief systems when there is a change in unit design or operation. This information is essential to avoid emergencies that may jeopardize the safety of the plant. The program accurately calculates required backpressures for all types of single and multiphase relief systems. If the required backpressures are higher than the maximum vessel pressure ratings, the program can automatically resize the discharge lines. INPLANT will also identify undersized relief valves and facilitate the selection of correctly sized replacements.

## RIGOROUS CALCULATION FEATURES

- SimSci's standard, industry-proven, thermodynamic and physical property methods and data libraries.
- Built-in library data for over 1,600 components.
- Comprehensive library of pressure-drop calculation methods, including those specially developed for high-velocity flow systems.
- Detailed heat-transfer calculations, including the ability to simulate multiple insulation layers on pipes in a variety of ambient media.
- Simultaneous, segment-by-segment, pressure-drop and heat-transfer calculation methodology.
- Simulation of both single and multiphase fluids.
- Fluids defined on a compositional/non-compositional basis.

## FLEXIBLE PIPE SYSTEM DEFINITION

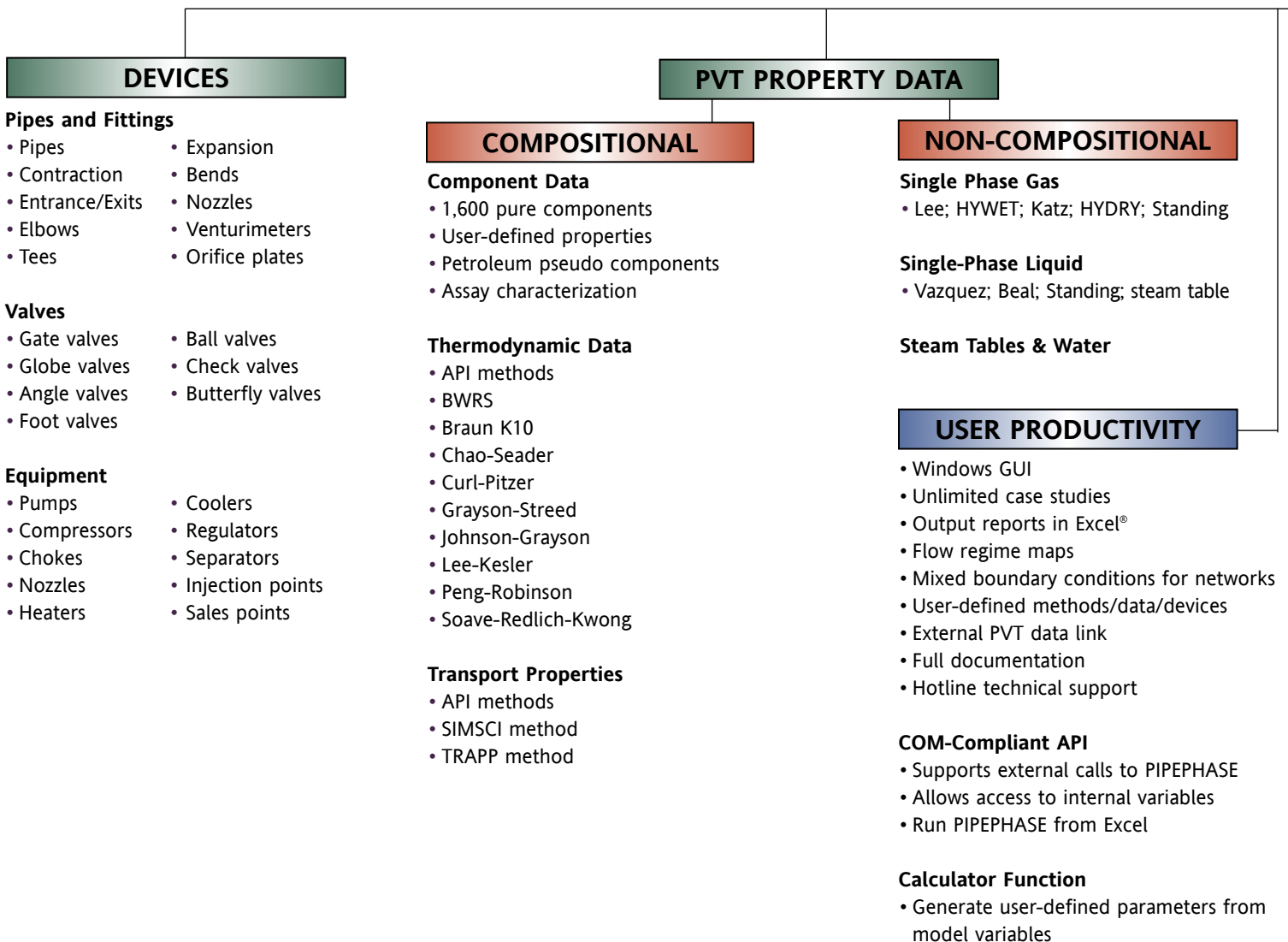
- Built-in library of pipe fitting and process equipment models.
- Single link or networks combined in any configuration, including loops.
- Optional flow rate or pressure definitions at sources and sinks.
- Extensive case study capability for "What-if?" analysis and revamp studies.

## RELIEF SYSTEM ANALYSIS

- Dedicated network algorithm for relief system rating and design.
- Rigorous modeling of critical/sonic flow pressure discontinuities.
- Relief valve sizing using API and DIERS/HEM methods.
- User-defined relief valve data for standard or balanced bellows devices.
- Design case transient vessel-depressuring simulation.
- Sizing of all or selected system piping, subject to Mach number and/or other constraints.

## BUILT-IN DATABANKS AND EQUIPMENT

There is no need to input component data, thermodynamic data or physical properties. INPLANT includes an exhaustive library of more than 1,600 chemical components. The program also integrates a data bank of the very latest pressure drop calculation methods to cover most industrial situations encountered, as well as many non-standard applications. INPLANT's comprehensive list of equipment includes all types of fittings, elbows and tees, as well as pumps, compressors, heaters, coolers, meters, regulators, and many more pieces of equipment.

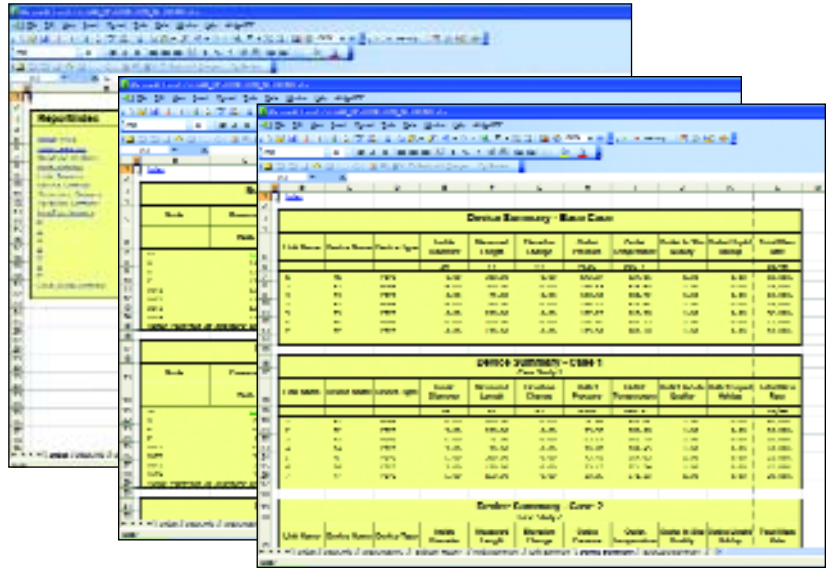


- Complete, on-line hypertext help system.
- Full, point-&-click pictorial laydown of nodes, links, and devices.
- Keyword readback and automatic network laydown of existing INPLANT input files.

- Operating System: Windows NT, Windows 2000, Windows 2003, or Windows XP. Proper installation requires administrator rights.
- Compiler To build User-Added Subroutines you need Compaq® Visual FORTRAN (CVF) 6.6b.

## WINDOWS GRAPHICAL USER INTERFACE

- Easy-to-use, graphical interface for new and experienced users.
- New problem set-up wizard.
- Color-coded input guidance system.
- COM compliant API.
- Output reports can be generated in Excel® spreadsheets.
- Output plot capabilities, including phase envelope and pressure/temperature versus distance graphs.



## HARDWARE REQUIREMENTS

Minimum recommended hardware and software requirements:

- Computer: Intel® Pentium® 4 processor
- RAM: 512 MB.
- Monitor: Super VGA or greater.
- Pointing Device: Microsoft or compatible mouse.

### PRESSURE DROP METHODS

#### Multiphase Fluids

- Beggs and Brill
- Moody
- Eaton
- Dukler
- Hagedorn and Brown
- Mukherjee and Brill
- Eaton-Flannigan
- Lockhart and Martinelli
- Dukler-Eaton-Flannigan
- Beggs and Brill High Velocity
- User-defined

#### Fitting Models

- Homogenous
- Chisholm
- User-defined

#### Single Phase Fluids

- Moody
- Hazen-Williams
- Panhandle B
- Weymouth
- American Gas Association
- User-defined

### CALCULATION MODELS

#### SINGLE LINK

- Pressure drops
- Velocities
- Heat transfer
- Phase equilibria
- Flow patterns
- Hydrate prediction
- Sonic velocity
- Critical flow
- Line sizing

#### NETWORK

- Same as single link plus:
  - Gathering systems
  - Distribution systems
  - Hybrid systems
  - Looped systems
  - Flare/relief/networks

#### PREFERENTIAL SPLITTING

- TUFFP
- Oranje
- Hong
- Proportional
- User-defined
- Straight through tees
- Dead end tees

#### VESSEL DEPRESSURING

- T,P profiles vs. time
- Composition, flow vs. time
- User-defined liquid engagement

## PROCESS ENGINEERING SUITE

The Process Engineering Suite (PES) is a consistent set of tools for engineering design and operational analysis. This integrated suite of software readily interfaces with other applications commonly used by process engineers, thus enhancing productivity in the plant lifecycle. PES can be used for oil and gas production, refining, petrochemicals, chemicals, pharmaceuticals, and polymer plant modeling.

**PRO/II®** General-purpose process flowsheet simulation and optimization.

**HEXTRAN®** Comprehensive heat transfer simulation and pinch analysis.

**DATACON™** Plant gross error detection and data reconciliation.

**INPLANT** Multiphase, fluid flow simulation for plant piping networks.

**VISUAL FLOW®** Design and modeling of safety systems and pressure relief networks.

## ABOUT SIMSCI-ESSCOR

SimSci-Esscor is a leader in the development and deployment of industrial process simulation software and complete performance solutions for a wide variety of industries, including oil and gas production, petroleum refining, petrochemical and chemical manufacturing, electrical power generation, mining, and engineering and construction. Supporting more than 750 companies in over 70 countries, SimSci-Esscor products and services enable clients to minimize capital expenditure, optimize facility performance, and maximize return on investment. SimSci-Esscor is brand of Invensys Process Systems, owned by Invensys, plc.

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