PIPEPHASE® simulation software rigorously models steady-state multiphase flow in oil and gas networks and pipeline systems with the power and flexibility to model applications ranging from the sensitivity analysis of key parameters in a single well, to multi-year facilities planning studies for an entire field. PIPEPHASE covers the complete range of fluids encountered in the petroleum industry, including single phase, black oil, and compositional mixtures. The program may also be applied to single component stream or CO2 injection networks.
SimSci PIPEPHASE Features

**SUMMARY**

PIPEPHASE is the simulator of choice for the world’s leading oil and gas producing companies. The software combines proven solution algorithms with modern production methods and software analysis techniques to create a robust and efficient oil field design and planning tool with an extensive physical property data bank.

**BUSINESS VALUE**

- Increased overall assetwide production
- Improved well & flow line performance
- Improved pipeline & facilities design
- Integrated field development & planning
- Reduced operating costs
- Reduced capital costs
- Increased engineering productivity

**Applications**

The combination of multiphase flow analysis coupled with extensive thermodynamic property prediction capabilities makes SimSci™ PIPEPHASE suitable for a wide range of applications and industries, from single link to complex networks, including:

- Oil and gas gathering networks
- Natural gas transmission and distribution pipelines
- Sensitivity analysis
- Line sizing
- Field planning & asset management studies
- Steam injection networks
- CO2 pipelines
- Gaslift analysis
- Heat transfer analysis for heavy oil pipelines
- Hydrate prediction
- Aviation fuel systems

**Industries Served**

- Petroleum exploration and production
- Natural gas transmission
- Utility networks
- Complex downstream hydraulics
Pipeline Flow Analysis
PIEPEHASE provides a comprehensive set of industry standard empirical and mechanistic methods for analyzing multiphase flow phenomena in pipes. Coupled with extensive fluid models and a rigorous energy balance incorporating detailed heat transfer analysis capability, PIEPEHASE is a flexible tool for evaluating the complete range of fluid flow phenomena encountered in singlephase and multiphase pipelines.

Integration With Reservoir Simulation Software
Oil producers have a real, quantifiable problem managing and modeling their reservoirs and linking them to the surface. PIEPEHASE has the modeling capabilities needed to accurately manage and model reservoirs by developing an interface with reservoir simulators and enhancing PIEPEHASE technology.

Integration with reservoir simulation software also allows the simulation of the following:
- CO2 Sequestration
- Enhanced Oil Recovery of Depleted Fields
- Steam Assisted Gravity Drainage (SAGD)

Production Planning
The timestepping feature in PIEPEHASE makes it a flexible field planning tool. Reservoir depletion can be simulated with decline curves or by using a reservoir simulator to reflect actual field development strategy. Once a fieldwide network model has been built, the planning tool is created by setting up scenarios for future facilities’ expansion along with reservoir decline characteristics. The completed model provides a unique lookahead capability for the entire asset, incorporating the longterm effects of both reservoir decline and investment in new facilities.

Field-Wide Network Modeling
The robust, fieldproven network simulation capability in PIEPEHASE enables the user to model large networks of connected wells, pipes, and associated facilities. The detailed well bore model and extensive inflow performance (IPR) library, combined with a complete set of surface equipment modules, allows the user to configure the necessary details of a fieldwide oil and gas gathering (or injection) system, incorporating all of the interdependent components from the sandface to the downstream separation facilities.

Compatibility
PIEPEHASE Graphical User Interface (GUI) is designed for intuitive data input, and is coupled with a Results Access System (RAS) for the graphical representation of calculation results. PIEPEHASE contains a robust API (application programming interface) that allows access to calculated data, to change input data, control of the execution sequence, and custom report generation. Tools within PIEPEHASE such as case study, time stepping, and optimization use the API to interact with simulation data. The PIEPEHASE API can also link to CMG reservoir simulators, the PRO/II process simulator and the ROMeo online simulator.
SIM4ME Portal
The SIM4ME® Portal can easily link PIPEPHASE simulations with Microsoft Excel®, and provides an Excel interface to PIPEPHASE. It enables Excel users to interact with a PIPEPHASE simulation model without requiring knowledge of coding or simulation techniques.

SIM4ME Portal increases the return on investment (ROI) in a simulation model by extending the usage of a model. The simulation can be used by anyone who can use Microsoft Excel.

SIM4ME Portal allows the user to:
• Open a PIPEPHASE simulation using Excel
• Change defined attributes
• Run the simulation
• View results in Excel
• View the “Solution History”
• Create automated case studies in Excel
• Link data across multiple simulations

PRO/II & ROMeo Integration
PRO/II and ROMeo allow for the integration of PIPEPHASE simulations within each product. The PIPEPHASE unit operation in PRO/II allows PRO/II users to embed and save complex hydraulic models. Since it is a native PRO/II unit operation, it can be included or excluded from the calculation sequence, included in recycles, and PRO/II can manipulate PIPEPHASE variables. ROMeo can use compositions, temperatures, pressures and flows predicted by PIPEPHASE to reconcile the well flow rates for certain types of networks.

NETOPT
NETOPT® is a PIPEPHASE addon that optimizes simulation models using a nonlinear SQP optimization algorithm. NETOPT is a flexible & robust optimizer that can maximize or minimize an objective function or tune a simulation to measured data. NETOPT can be used to optimize any PIPEPHASE model, including these examples:
• Gaslift optimization
• Optimization of compressor size and placement in a gas network
• Optimization of pipeline size and insulation thickness
• Optimization of production rates by manipulating choke diameters

Upstream Optimization Suite
The Invensys Upstream Optimization Suite (UOS) is a set of integrated, decision support tools designed to provide sand facet to surface facility asset management. UOS unites the needs of the oil and gas production industry, current software standards, and SimSci technical expertise to deliver best in class solutions to real world problems.

PIPEPHASE — A steadystate, multiphase, fluid flow simulator that rigorously models oil and gas gathering and transportation networks.

NETOPT — A software tool that optimizes oil and gas production operations by the integration of a nonlinear SQP algorithm with PIPEPHASE, and links to reservoir simulators for integrated fullfield modeling.