



ProSimPlus

**Steady-state simulation and optimization
of processes**

The alternative in process simulation.

To design more competitive units, to operate very integrated processes closer to their limits, to face new regulations (environment, safety,...), engineers cannot be satisfied with simple models anymore. They need a powerful but easy-to-use tool to simulate the behavior of their plants, to quickly test new configurations and to get the optimal solution without necessarily being a modeling expert.

ProSimPlus is a process engineering software that performs rigorous mass and energy balance calculations for a wide range of industrial steady-state processes.

It is used in design as well as in operation of existing plants for process optimization, units troubleshooting or debottlenecking, plants revamping or for front-end engineering analysis.

- ◆ **Full unit operations library including complex models** (three-phase and reactive distillation, plate-fin heat exchangers, rate-based column, etc)
- ◆ **Capability to model highly non-ideal systems**
- ◆ **Unrivalled convergence methods**
- ◆ **Easy-to-use and open software**
- ◆ **Solution widely used by world's leading oil, chemicals and engineering companies**



ProSim

Software and Services for Process Simulation

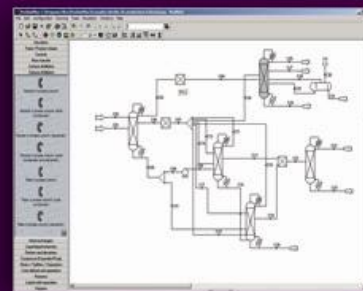
The ability to accurately model a wide scope of real-world processes

The solutions obtained with simple models provided by most of the simulators are probably already implemented. It is now necessary to go further and to use sophisticated models able to represent all the complexity of the actual plant behavior.

ProSimPlus provides over 70 unit operations among which the common operations and the more specific ones:

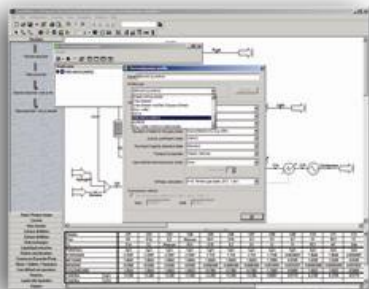
- Several types of chemical reactors (CSTR, PFR, etc) with a wide library of chemical reaction models: instantaneous, equilibrated, kinetic controlled, complex reactions...
- Three-phase and reactive distillation columns
- Multi-stage separators for liquid-liquid extraction
- Multi-stage separators with transfer models - non equilibrium stage (optional)
- Multi-fluid heat exchangers (plate-fin heat exchangers)
- Solid treatment equipments (crystallizer, filters, hydrocyclone,...)

ProSimPlus has functionalities to perform the sizing of most equipments: columns (packing, plates,...), heat exchangers, separation vessels, etc. When necessary, it is possible to create custom unit operations easily or to use modules written in other environments (MS-Excel, VB, etc).



Alcohol production flowsheet

One of the richest thermodynamic libraries available on the market



Thermodynamic model selection

The quality of a simulation rests above all on a good representation of the thermodynamic behavior of the system and one cannot hope to represent a highly non-ideal system without the adequate models.

ProSimPlus can model complex systems thanks in particular to:

- **A wide set of thermodynamic models selected for their reliability and their robustness:**
 - Equations of state: Soave-Redlich-Kwong, Peng-Robinson, Lee-Kesler-Plöcker, BWRS, etc...
 - Activity coefficient models: NRTL, UNIQUAC, UNIFAC, etc...
 - Combined models: MHV2, PSRK, etc...
 - Electrolytes: Edwards, UNIQUAC Electrolytes, ULPDHS, etc...
 - Specific systems: Amines, Sour-Water, Water-Steam, etc...
- **A database of over 1 700 components** based on AIChE's DIPPR® database, enriched with data from research projects led by ProSim's thermodynamics experts.

ProSimPlus allows the configuration of a specific thermodynamic model suited to each process combining the different properties calculation methods available. Additionally, it is possible to use several thermodynamic models within the same flowsheet.

The open architecture of ProSimPlus makes it possible to integrate new thermodynamic models and private databases of components or binary interaction coefficients.

ProSimPlus gives results, without time-consuming convergence tests

ProSimPlus is particularly effective in the solution of complex simulation problems: processes with highly non-ideal mixtures, processes with numerous recycling loops or very large flowsheets. The fast convergence is ensured by specific algorithms based on the **simultaneous modular approach**.

This development, unique in the world of simulators, comprises in particular:

- Automatic determination of the calculation sequence: it is not necessary to provide the tear streams nor to initialize streams as in other simulators
- Simultaneous treatment of recycling and constraints through proven methods
- A multivariable control approach in which it is possible to impose one or several process output by simultaneously adjusting one or several selected parameters
- An optimization module based on a non-linear approach (SQP) for the optimization of the operating conditions according to user defined specifications
- At each unit operation level, a **fast and reliable convergence** using the specific algorithm relevant to the equation system to be solved (Newton, Gear...) and a generalized use of analytical derivatives



A software very quickly adopted by users

Unit	Flow	Temp	Pressure
Distillation 1	1000 kg/h	100°C	1 bar
Heat Exchanger 1	2000 kg/h	150°C	1 bar
Separator 1	500 kg/h	100°C	1 bar

Simulation report explorer

No software, regardless of power, will bring payback if it is not used, however only very few companies can maintain an expert in simulation.

ProSimPlus use is very intuitive. Users who are accustomed to another simulation tool are surprised how easy to learn ProSimPlus is and how fast they can progress with the software. As for beginners, they do not need long and expensive training to become fully operational.

The graphical interface of ProSimPlus provides a large set of functionalities: fully configurable table summarizing the streams characteristics, on-line help, unit systems management, generation of results under HTML (simulation reports), MS-Excel (mass and energy balances), .BMP or .EMF (flowsheet), for a simple and fast exploitation of results.

ProSimPlus is also the only process simulator available in French and English languages.

A software used and approved in many industries

ProSimPlus is the result of many years of research carried out in particular by the *Laboratoire de Génie Chimique of Toulouse* (UMR 5503 CNRS/INPT/UPS). Additionally, the intensive use for several years in industries such as oil exploration and production, refining, gas treatment, petrochemicals, chemicals, pharmaceuticals, fine and specialty chemicals or nuclear energy, allowed the full validation of the software.

An increasing number of engineering firms, equipment suppliers (turbines, compressors...), as well as many universities or chemical engineering departments also rely on ProSimPlus.

