



# UniSim® Plate-Fin Exchanger Modeler

## The Challenge

The plate-fin heat exchanger is one of the key components of cryogenic process plants. Its ability to facilitate heat transfer with small temperature differences demands sophisticated modeling technologies to accurately represent its performance and behavior in a plant operation.

## The Solution: UniSim Plate-Fin Exchanger Modeler

Honeywell's UniSim® Plate-Fin Exchanger Modeler is a unique simulation tool in Honeywell's UniSim Design Suite. It performs detailed simulation of multi-stream plate-fin heat exchangers made from brazed aluminum, stainless steel or titanium. It can be used standalone by the thermal specialist for exchanger design or as an integrated product with UniSim Design for process simulation.

## Benefits

As a stand-alone program, UniSim Plate-Fin Exchanger Modeler can be used for both "first pass" calculations and detailed layer-by-layer analysis to evaluate new uses, revamps, process conditions and fouling cases. It can also perform full thermosyphon modeling, where one or more exchanger streams are subject to natural circulation, as well as cross-flow streams.

When integrated with UniSim Design, this advanced program enables engineers to rigorously model processes that use multi-stream plate-fin heat exchangers, such as LNG, ethylene, or air separation. It can be used to identify capital saving opportunities in the overall process configuration. Bottlenecks can be identified, process improvements modeled for various process operating scenarios.

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## Features

UniSim Plate-Fin Exchanger Modeler can perform a range of calculations plate-fin exchangers with either just two streams or multiple streams. It can deal with single or two-phase streams, involving sensible heating or cooling, boiling or condensation, or any combination of these. Streams can be pure components or multi-component mixtures.

### UniSim Plate-Fin Exchanger Modeler enables five basic calculation options:

**Simulation** – to determine the heat load, pressure changes and outlet conditions for each stream in the exchanger, based on user-specified exchanger geometry and inlet stream conditions.

**Layer by Layer Simulation** – for normal simulation on a layer by layer basis rather than on a stream by stream basis. It helps users assess the stacking pattern in which layers of the various streams are arranged.

**Thermosyphon** – to determine the performance of a user-specified exchanger with one stream operating as a thermosyphon. The exchanger can either be internal to a column or connected to it externally through piping. Users can specify either the head of liquid driving the thermosyphon flow and let the program calculate the thermosyphon stream flow rate, or vice versa.

**Design** – to produce a “first shot” design of a heat exchanger to meet a heat load requirement and pressure drop limits, based on user-specified stream information. It serves as a useful indication of what a specialized manufacturer would provide. A final design of a plate-fin exchanger must, however, come from a manufacturer, who can use proprietary finning, as well as specialized design and manufacturing techniques.

**Cross-flow Exchanger** – for simulating cross-flow designs of plate-fin exchangers with a limited number of cross-flow passes.

## Wide Range of Applications

UniSim Plate-Fin Exchanger Modeler supports a comprehensive list of overall geometry specifications, including:

- Stream entry and exit at any point along the exchanger
- Inlet and outlet distributors
- Internal re-distribution into otherwise empty layers
- Partial draw-off of a stream
- Nozzles
- Change of main fin type at points along the exchange length
- Exchangers in parallel
- Exchangers in series
- Internal and external thermosyphon reboilers
- Layer patterns, including allowance for double or triple banking
- Empty layers
- Performance evaluation with some streams switched off

The distributor model enables extensive pressure drop calculations for common layouts of inlet and outlet distributors, including single or twin-headed types and hardway. It checks for possible flow maldistribution problems and accounts for the impact of frictional, gravitational and accelerational effects on pressure change.

The heat transfer and pressure drop performance of the finning (plain, perforated, wavy/herringbone, or serrated (lanced or multi-entry), can be specified via the program input. It is optional for users to provide manufacturers' data. If such data is not available, then research-validated fin performance correlations provided in UniSim Plate-Fin Exchanger Modeler can be used.

## User-Friendly Input and Output Functionalities

Users are guided through the data input process which is displayed through a hierarchy tree and very easy to follow. Graphic representations based on user-specified configurations further enhance the modeling experience of UniSim Plate Heater Modeler users.

The comprehensive results are presented in both tabular and graphic format, including results summary, full results in details, specified duty, temperature/pressure profiles, along with many other profiles across the exchanger, stream details, as well as geometry information.