Honeywell unveiled UniSim® Design Suite R450, the latest major release of Honeywell’s process simulation technology. UniSim Design Suite is part of Honeywell’s family of simulation software and engineering solutions for process simulation, design, analysis, performance monitoring, optimization and business planning for the oil and gas, refining, petrochemical, chemical and power industries.

Included in UniSim Design® Suite R450 are several products for process/equipment design and simulation, conceptual design of heat exchanger networks using pinch technology, as well as in-depth thermodynamic studies.

### Features & Benefits

#### Easy-to-Use Tool
- Same platform for steady-state and dynamic simulation.
- Customizable process variable trends.
- Easy access to controllers through facplates.
- Scenario building and automation capabilities.

#### Performing Technology
UniSim Design Suite technology is:
- Robust.
- Scalable.
- Stable.
- Accurate.
- Fast.
- A true Life-Cycle simulation platform.

#### Customer-Centric
Leveraging in-house process, control and software development expertise, we bring to market features:
- Developed with users.
- For the users.
- Adopting best practices & workflows recommended by the users.

#### Increasing Efficiency
Through elimination of manual data entry and automation of:
- Engineering workflow tools between products.
- Scenario automation capabilities.
- Documentation customization and generation features.
- Short-cut key usage.

#### Minimizes CAPEX
Through design optimization with:
- Built-in optimizers.
- Incorporated industry standards.
- Equipment sizing and rating calculations.
- Accuracy of prediction.
The new features and enhancements available in this major release are the result of on-going input from, and collaboration with UniSim Design users, coupled with Honeywell’s commitment to simulation solutions. Summarized in this document are some of the key new UniSim Design Suite features and enhancements in this release.

Safety System Design Tools
With UniSim Design Suite R450, Honeywell is commercializing and making available to the wider process design user community an internal UOP tool, called UniSim PRS. This is a standalone tool for sizing and rating PSVs, BDs and surrounding pipes which utilizes UniSim Thermo. UniSim PRS has been used over the past five years to validate the relief devices in all UOP plant assets.

The UniSim Blowdown Customize option has been further enhanced. In addition to the flowsheeting and event scheduling capabilities; the 2D heat loss models for vessels and vessel heads; and the implementation of the API 521 6th edition fire method, introduced with UniSim Design R442 in November 2015, the new features now introduced include:

- Control valve and PSV modelling
- Multiple feeds into pressure vessel
- Settle-out facility
- Stress calculations
- Choke flow calculations
- Beggs-Brill calculation implementation
- Solver and thermo enhancements

New & Enhanced Unit Operations
The Pump unit operation has been enhanced to support the evolving technology for multiphase pressure boosting. Multi-phase pumps (MPPs) are particularly important for flow-assurance for sub-sea and deep-water operations. The user can impose the manufacturer curves in terms of DP vs Total Flow or Power vs Total Flow for different Gas Volumetric Fractions (GVFs). The MPP unit operation is supported in both steady-state and dynamics.

The Amines Fitter and Amines unit operation is introduced with UniSim Design Suite R450. These were developed to allow the user to make use of amines performance data obtained from external sources (specialist packages or plant data) within the UniSim Design flowsheet. The Amine fitter (grey-box model) fits amine operational data for use by the amine model unit operation. The Amine model unit operation is a new object in the UniSim Design flowsheet environment to represent the amine contactor and regenerator flowsheet.

The new Hydraulic Turbine unit operation models a Kaplan hydraulic turbine. The user can impose the Hill performance curves in terms of head vs. flow and efficiency vs. flow. This development is important for modelling low-head, high capacity hydroelectric power generation processes.

The Pipe Segment unit operation has been enhanced to include the hydrate and ice formation predictions and the sand erosion velocity calculation. So, it is no longer necessary to configure separate utilities for these calculations.

The Valve unit operation has been enhanced to allow for different actuator opening and closing times. This gives users more flexibility for process...
and compressor control design.

**Thermodynamics Enhancements**

It is now possible to import CALSEP PVTSim and PVTSim Nova data into UniSim Design’s PVT environment, at the click of a button. The **PVT Regression Import tool**, automatically imports the PVT data, creates a stream on the flowsheet, and attaches a phase envelope to it. The tool automatically maps streams with PR78 and SRK property packages and allows the manual selection for other property packages. This tool reduces engineering effort and eliminates errors with manual PVT data entry.

For **super-critical regions**, it is now possible to handle stream data with more flexibility. The user can:

- Specify where the supercritical region lies or allow the simulator to calculate it.
- Override the calculated supercritical phase as vapor or liquid for certain properties (i.e. density, viscosity, thermal conductivity)
- Enable stream level alerts when operating in the supercritical region or when the supercritical region is overridden.

Over 100 **refining properties** are now available in UniSim Design. Those can be propagated throughout the flowsheet. They include, but are not limited to:

- RON, MON, RVP, Conradson carbon rate, carbon to hydrogen ratio, cetane index, refractive index, yield
- Aniline, cloud, freeze, pour, smoke, softening, wax congealing and flash points
- X-ring UV and IP391 aromatics, Cx asphaltenes, olefins, naphthalenes, naphthenes, n-paraffins, paraffins, polynaphthenes, mercaptans.

A **Crude Assay Import Facility** allows the user to import assay databases from Microsoft Excel files in the new UniSim Crude environment and map them into components and pseudo-components. The same components and pseudo-components can be shared by different assays / blends.

Blend **mixing rules** are now available as user properties. Apart from the new pre-configured mixing rules, it is possible for users to enter custom mixing rules, leveraging their proprietary data within the simulation environment.

The UniSim Design Suite R450 thermo socket has been updated to be **CAPE-OPEN 1.1 compliant**, and now also supports the CAPE-OPEN standard’s edit and save/persistence features.

This development allows customers to use 3rd party or in-house developed thermodynamic properties within UniSim Design, for example to model specialty chemical processes. In addition the workflow for adding and configuring the CAPE-OPEN unit operation and thermo sockets has been enhanced to improve usability.

The link to the **DIPPR Database** was improved to
allow for review of imported components and classification of components into families.

For the Peng-Robinson property package, both the API 9A1.3 and 9A1.5 methods appear now as water solubility options, for engineering efficiency purposes. In addition, the water solubility coefficients are exposed and modifiable by the user. It is now possible to include non-hydrocarbon components. It is also possible to select which components to include in the water solubility calculations and which to exclude.

Flexible treatment for water solubility with PR.

The UniSim Design implementation of the PPR78 Equation of state was previously limited to eight molecular groups covering alkanes and mono-aromatics. The model has been expanded to over thirty groups and these are added to the PPR78 predictive mixing rule.

Heat Exchanger Design

Honeywell offers the most complete portfolio for heat exchanger design. Since the release of UniSim Design Suite R443, Honeywell resells the HTRI Xchanger Suite modules, bundled together with the respective UniSim Heat Exchanger modules. HTRI is the market leader in heat-exchanger design; they maintain the UniSim Heat Exchangers and develop their own software products.

With the UniSim Design Suite R450 release, Honeywell begins to integrate the HTRI XSimOp modules with UniSim Design. HTRI XSimOp is now a model available for selection in the UniSim Design heat exchanger unit operation. This enables the usage of the new HTRI technology in simulation. The new engine solves faster than its embedded Xist and UHX STE technology predecessors.

Below is a list of the available product bundles:

<table>
<thead>
<tr>
<th>Software Option</th>
<th>Products Included</th>
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<tbody>
<tr>
<td>UniSim HTRI UHX Air Cool Bundle</td>
<td>HTRI Xca, UHX CPE</td>
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<tr>
<td>UniSim HTRI UHX Fired Heater Bundle</td>
<td>HTRI Xf, UHX FPH</td>
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<tr>
<td>UniSim HTRI UHX Plate Bundle</td>
<td>HTRI Xp, UHX PHE</td>
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<tr>
<td>UniSim HTRI UHX Plate-Fin Bundle</td>
<td>HTRI Xf, UHX PFE</td>
</tr>
<tr>
<td>UniSim HTRI UHX Shell-Tube Bundle</td>
<td>HTRI Xst, Xte, Xpe</td>
</tr>
<tr>
<td>UniSim HTRI Spiral Plate Modeler</td>
<td>HTRI Xsp</td>
</tr>
<tr>
<td>UniSim HTRI Vibration Modeler</td>
<td>HTRI Xvb</td>
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<tr>
<td>UniSim UHX Feedwater Modeler</td>
<td>UHX FWH</td>
</tr>
<tr>
<td>UniSim UHX Pipeline Modeler</td>
<td>UHX PPL</td>
</tr>
<tr>
<td>UniSim HTRI UHX Heat Exchanger Full Suite</td>
<td>All items listed above</td>
</tr>
<tr>
<td>UniSim HTRI Shell-Tube Simulator Bundle</td>
<td>HTRI XSimOp Shell-Tube, UHX STE</td>
</tr>
</tbody>
</table>

Available bundle options for Heat Exchanger Design.

Productivity Tools

It is now possible to generate H&MBs and PFD equipment summaries in UniSim Design. There are two buttons configured in the workbook view to automatically generate the H&MBs and the equipment summaries which can be placed on the flowsheet by showing the respective workbook table. The flowsheet and respective tables may be copied as bitmap files and pasted as required. In addition the workbook tabs may be printed as datasheets in .pdf format. This functionality allows for easier generation of PFDs and stream reports.
The USE-IT tool is now supported for the Windows 10 operating system and both 32- and 64-bit versions of Office 2013 and 365. The object browser now allows accessing deep level sub-flowsheets.

The Case Scenario Manager has an improved parallel workflow for Dynamics: it displays the differences between all the specified variables. Also, it is possible to do a 3-way comparison among the Master, Changed and Common Ancestor Cases. Cases as big as 50 MB can be compared in as little as a couple of minutes, to identify the source of changes and to propagate changes to the desired case.

**Flowsheet Optimization**

There have been several enhancements to the flowsheet optimization functionality of UniSim Design. These are listed below:

There is a new solver option for the optimizer: the NOVA solver. This proprietary solver is the best available solver in the market for online, real-time optimization purposes. It is well suited for solving hundreds of thousands of equations with up to a thousand degrees of freedom, so can be applied to solve problems for processes across all industries.

The NOVA solver available as an Optimizer option.

The calculation order analysis tool has been enhanced to allow for the display of the calculation levels in one view. There is also an option to display the solver calculation order after the calculations have been completed. This way it is easier to understand the calculation sequence, when analyzing simulation results.

There have been enhancements to the Adjust function. The adjust group uses the previous iteration values to speed up convergence. The direction of the initial step size can be specified by the user.

In the Adjust-Recycle manager, a new variable list is included: the 'Independent SpreadSheet OldValue Opers'. The program detects cells which hold strings with "OldValue" in their formula. It is possible to change the tolerance for each of these listed variables through the Adjust-Recycle manager.

The sparse continuation solver has been improved with the usage of the Inside-Out column solver. This feature improves the convergence of columns.

The I/O solvers were previously formulated for two phase separation with total aqueous phase draw if found on any stage. So, the non-aqueous second liquid phase could not be separated. The I/O solver can now handle non-aqueous VLLE in the condenser, removing this separation limitation, important for refining and chemical applications.

**Other Enhancements**

The CAPE-OPEN unit operation can now read/write to a spreadsheet unit operation.

There have been improvements in the Tag Browser feature of the OPC client.
UniSim® Design Suite
Honeywell’s UniSim Design Suite, is part of the UniSim software family of online and off-line process design and optimization applications. Giving users the power to determine process workflows, equipment sizing and rating requirements, UniSim solutions help you capture and share process knowledge, improve plant profitability and maximize returns on investments in simulation technology.

UniSim Design Suite offers:

- An integrated steady-state and dynamics environment to easily re-use, update and transition the process models throughout a project or plant asset lifecycle.
- A user-friendly interface which helps engineers to easily access and visualize the process information and identify trends.
- Built-in industry standards that minimize the need for literature search when sizing and rating equipment.
- Integration with 3rd party specialty technologies which allow for the best technical solution for process simulation.
- Interfacing capabilities with process historians, DCS & safety systems, and other advanced applications that maximize the benefits for green-field, brown-field and revamp projects.

UniSim Design Suite Support Services
This product comes with worldwide, premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers improve and extend the usage of their applications and the benefits they deliver, ultimately maintaining and safeguarding their advanced applications.

Honeywell provides a complete portfolio of service offerings to extend the life of your plant and provide a cost-effective path forward to the latest application technology. Honeywell services include:

- Standard and Customized Training
- Consulting
- Model Building
- Engineering Studies
- Custom Thermo/Unit Operations

For More Information
Learn more about how Honeywell’s UniSim Design Suite can improve process design, visit www.hwll.co/uniSimDesign or contact your Honeywell Account Manager or authorized distributor.

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