Honeywell unveiled UniSim® Design Suite R460, 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, biofuels, petrochemical, chemical and power generation industries.

Included in UniSim Design® Suite R460 are several products for general process flowsheeting, physical properties, conceptual design, heat-exchanger and safety system design, rating and simulation:

- **Plant Design, Simulation and Optimization Products**
  - UniSim® Design (steady-state)
  - UniSim® Dynamic
  - UniSim® Case Linker
  - UniSim® EQ
  - UniSim® Optima

- **Physical Properties Products**
  - UniSim® Thermo Workbench
  - UniSim® Ammonia
  - UniSim® Block Dr
  - UniSim® OL Electrolytes
  - UniSim® OLI Corrosion Analyzer

- **Conceptual Design Products**
  - UniSim® ExchangerNet
  - UniSim® ExchangerNet Operations

- **Heat Exchanger Design, Rating, and Simulation Products**
  - UniSim® HTFI Uni Air-Cool Bundle
  - UniSim® HTFI Uni Heat Exchanger Bundle
  - UniSim® HTFI Uni Plate Bundle
  - UniSim® HTFI Uni Plate-Fin Bundle
  - UniSim® HTFI Uni Shell-Tube Bundle
  - UniSim® HTFI XSim®Ss Shell-Tube Bundle
  - UniSim® HTFI Spiral Plate Module
  - UniSim® HTFI Vibration Module
  - UniSim® FlowWater Heater Module
  - UniSim® Process Pipeline Module
  - UniSim® HTFI Uni Heat Exchanger Full Suite

- **Safety System Design, Rating, and Simulation Products**
  - UniSim® Flore
  - UniSim® BlockSim Customize
  - UniSim® Pressure Relief System

**FEATURES & BENEFITS**

- **Easy-to-Use Tool**
  - Object-oriented, PFD-style, graphical user interface.
  - Customizable process variable trends.
  - Easy access to controllers through faceplates.
  - Scenario building and automation capabilities.

- **Performing Technology**
  - UniSim Design Suite technology is:
    - Robust.
    - Scalable.
    - Stable.
    - Accurate.
    - Fast.
    - Multi-purpose simulation on the next-generation platform.

- **Customer-Centric**
  - Leveraging process, control and software development expertise, we bring to market features:
    - Developed w ith users.
    - For the users.
    - Adopting best practices w orkflows recommended by the users.

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

- **Minimizes CAPEX**
  - Through design optimization w ith:
    - Built-in optimizers.
    - Incorporated industry standards.
    - Equipment sizing and rating calculations.
    - Heat Exchanger Network optimization.
    - Accuracy of prediction.
In addition, there are modules that are specific to the O&G, Refining, and Power Generation industry verticals and those are listed below:

- **UniSim Design Suite R460** – Vertical-Specific Product Options.

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.

**New Products**

With UniSim Design Suite R460, Honeywell is introducing the following new licensed options:

- **UniSim EO (Equation Oriented)** – is the flowsheeting environment under which equations are solved simultaneously to reach solutions faster, making it suitable for both design and optimization applications. An integral part of the UniSim EvOlation platform, the UniSim EO environment leverages Honeywell’s proprietary NOVA solver. This solver is well suited for solving hundreds of thousands of equations with up to a thousand degrees of freedom, so it can be employed to simulate sizeable processes across all industries, for offline and online applications. The UniSim EO environment currently supports forty (40) unit operations.

- **UniSim Refining Capabilities** – is the product option which unlocks the crude assay management import capabilities, allows refining properties to be propagated and calculated across the flowsheet, and enables the equation oriented environment. This product option is required for modeling refining processes (with or without conversion units).

- **UniSim Refining Reactors** – are unit operations built within the UniSim EO environment that represent generic, rigorous, kinetic refining reactors, and are suitable for simulation and optimization. They help predict yields and assess the impact of feed changes to the process and product pool. The following modules are currently available:
  - UniSim Hydrocracker
  - UniSim Hydrotreater
  - UniSim Catalytic Reformer
  - UniSim Isomerization Reactor
  - UniSim Alkylation Reactor

The refining reactor modules can be easily calibrated with few variables to any technology licensor’s process, using engineering data (internal calibration) or real plant data (external calibration, leveraging the data reconciliation utility in UniSim Design). Also, in conjunction with the LP vector generation utility, the refining reactors may be used to generate LP vectors for use in scheduling and planning tools.

- **UniSim Optimize** – was UniSim SQP Optimizer in previous releases; it has been re-branded to reflect the fact that does not only include the SQP optimizer, but also the NOVA and MINTLP optimizers and the data reconciliation utility. These four tools are needed to carry out optimization exercises.

- **UniSim Case Linker** – was USO Base Install in previous releases; it has been renamed to reflect

**Re-branded Products**

The UniSim Refining Reactors have been validated against publicly available and Honeywell proprietary pilot plant data. They have been designed and tested with the help of Honeywell UOP refining experts.

Hydrocracking Unit Modeling within the UniSim EO Environment
its function (i.e. links dynamic cases which are distributed into separate models and/or CPUs and gives basic simulation control functionality) and also to distinguish it from the USO Base Install product offered through the UniSim Competency Suite, which is a different product and which enables instructor scenario building capabilities.

Thermodynamics
The **Cubic Plus Association (CPA) method** has been implemented as a new property package. This equation of state can represent a variety of complex phase equilibria, including mixtures containing alcohols, glycols, organic acids, water, and hydrocarbons. It is applicable to flow assurance, gas processing, and alcohol separation modelling.

The **binary interaction parameters (BIPs)** for light hydrocarbons and gases found in natural gas (C1-C10, N2, H2, O2, CO, Ar, CO2, He, H2S), have been tuned to match recent literature, for the PR and SRK equations of state.

The **flash** now includes VLL and LL options to handle separation cases where more than one liquid phases may occur. As a result, the flash speed of convergence has improved.

Extended the **Jaubert's Method for BIP estimation** (PPR78 mixing rule) to **Hypothetical Components** in the Peng-Robinson fluid package and greatly improved the speed of BIP estimation.

**Derivatives of fugacity and interfacial tension** are now calculated and exposed for use by extensions.

The **Crude Manager** has been **integrated with the Oil Environment**, to improve user experience with entering and managing crude assays and oil characterization data.

**Unit Operations**
There are now forty unit operations supported under the **UniSim EO environment**. Unit operations that are newly supported with the USD R460 release include:

- Pump
- Compressor
- CSTR Reactor
- PFR Reactor
- Distillation column (tray section, reboiler, condenser, pump-around)
- Hydrocracker
- Hydrotreater
- Catalytic Reformer
- Alklyation Reactor
- Isomerization Reactor
- 2-phase separator
- 3-phase separator
- Heat exchanger
- Heater
- Cooler

The **Pipe Segment unit operation** has been enhanced to include an option to calculate kinetic energy or not. This option allows consistency of results between steady-state simulation and safety system design tools.

The **Controller unit operation** execution step can optionally be set to time units (seconds), instead of multiples of execution rate. This enhancement increases the flexibility of control system design, in conjunction with UniSim Dynamics.

**Safety System Design**
Several enhancements and new features are available with USD R460 for **UniSim Flare**. The following reflect new functionality:

- Cases are now saved in a compressed file format: .usf. This greatly reduces the file size and allows to build plant-wide
models (i.e. flare systems of entire refineries).

- Acoustic fatigue in pipes is implemented per the API 521 industry standard.

The following items reflect GUI enhancements:

- It is now possible to copy/paste unit operations on the PFD.
- The table views may be exported to excel with a user-defined name.
- From the Group Editor, it is possible to select multiple sources.
- Tail pipes can be visually distinguished from other pipes (lighter grey color vs darker grey color).

In addition, the ability to load older UniSim Flare and Aspen Flare System Analyzer cases (.ufnw, .fnw, fnwx) continues to be supported.

Tailpipe distinction from other pipes on the UniSim Flare PFD.

For the UniSim Pressure Relief System (PRS) manufacturer databases have been expanded to include additional manufacturers’ models, for rating. The Pressure Relief Valve (PRV) database includes six (6) additional manufacturers’ models. The Rupture Disk (RD) database includes ten (10) additional manufacturers’ models and is complete. In addition, datasheets generated by the tool are now customizable to incorporate the customer’s logo. Finally, the scenario summary generation is enhanced to generate relief data, importable by UniSim Design. Thus, we have closed the loop of relief valve & rupture disk data transfer between UniSim Design, UniSim PRS, and UniSim Flare.

For the UniSim Blowdown Customize product, event-base scheduling is now possible for blowdown scenarios. In addition to time-triggered events which was possible with earlier releases, events may now be triggered when process variables reach a specific value (i.e. start blowdown when the pressure vessel reaches ambient temperature).

Engineering Workflows
We have closed the loop of pressure relief data transfer between UniSim Pressure Relief System and UniSim Design, though OLE (excel interface file) with USD R460. Sizing information can be easily transferred for multiple relief valves and rupture disks at the same time from UniSim PRS into UniSim Design.

The link between UniSim Design and Dortmund Databank’s DDBSP product has been enhanced to be bi-directional and to transfer additional VLE data. The data are communicated between the two tools, via OLE. When importing DDBSP VLE data, the data are imported directly into the UniSim Regression Tool for parameter optimization.

The integration with Cost Engineering’s Cleopatra Enterprise has been progressing. It has been enhanced to work with the latest software releases and to communicate additional I/Os. The link is bi-directional. The workflow follows:

- UniSim Design sends sizing information per unit operation to Cleopatra.
- Cleopatra uses the sizing information for its cost engineering calculations.
- Cleopatra reports back into UniSim Design the costing information per equipment.
- UniSim Design displays sizing information at the unit operation level and in an equipment summary format; in addition, UniSim Design displays the total cost of the project and reports it in the UniSim Design environment.

Productivity Tools
Preliminary Engineering Design (PED) sizing calculations are available in UniSim Design. It is currently possible to size vessels (tanks, separators, 3-phase separators), heat exchangers, pumps and compressors. Sizing data is visible at the unit operation level through the “Sizing and Cost” tab or as summaries through the Sizing Center for all supported equipment.

There is a new Production Allocation Utility available in UniSim Design. This utility helps track specific compounds from source to product(s). It gives visibility about the contribution of each feed to the overall production, thus it is particularly
Productivity Tools enable engineers to get insights into the processes they model and to carry out tedious tasks more efficiently, without room for manual entry errors. New in USD R460 are the Preliminary Engineering Design (PED) Sizing and the Production Allocation Utility. PED sizing, allows users to easily derive preliminary designs of their processes. The Production Allocation Utility allows to track compounds across a process and optimize production.

Useful for process optimization exercises (i.e. make decisions on which oil wells to operate to achieve specific oil & gas production rates). The utility supports mole, mass, and (ideal) liquid volume basis (absolute flow or %) production allocation. Multiple utilities may be configured to track multiple components, for multi-variable optimization exercises.

There have also been significant enhancements to the Data Reconciliation Utility, which is licensed under the UniSim Optimize option.

- The new Nova SQP solver greatly improves the performance & robustness of this utility.
- The user may select which datasets to use for the reconciliation.
- The datasets may optionally be pushed to calculate derivatives and gradients by perturbation.
- It is possible to visualize on the graphical user interface (GUI) the master and runtime lists of fitting parameters, the DCS tags, the data reconciliation streams and the data sets.

**GUI Enhancements**

The user is given the choice to use the original fonts or the “truetype” fonts (which are larger) in UniSim Design.

The option is settable through the user preferences. This was a development that was requested by a customer, concerned with ageing workforce and impaired vision.

It is now possible to “pin” the PFD to the background, so that other object windows appear in front of it, but still get to see the PFD.

**Solvers**

Significant enhancements have been made to the Column Sparse Continuation Solver (CSCS). The Sharp model has been implemented. This model improves convergence for multi-component, multi-stage columns as well as difficult cases with multiple 3-phase stages.

**Reactor solvers** are enhanced to handle cases where reactors, in combination with the reactor feed conditions may cause singularities. For example, the solver can now handle and solve correctly, a flowsheet containing an equilibrium reactor whose feed composition is zero for both reactants and products. In addition to the robustness and numerical improvements of the solver, optimization of memory allocation/de-allocation is achieved and convergence speed is greatly improved.

Finally, there have been a couple of improvements to the Calculation Order Analysis Tool:

- the cumulative/total time for each object is reported and
- the filter dialogue is improved.

GUI Enhancements with USD R460 - “Pin” the PFD
UniSim® Design Suite

Giving users the power to determine process work flows, equipment operation and implementation requirements, UniSim Design Suite products help 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.

Honeywell’s UniSim Design Suite, is also the core of a number online and off-line process design, optimization, and operational monitoring and training solutions, as follows:

- **UniSim Competency Suite** to plan, deploy and manage a structured program to develop and maintain operator competency
- **UniSim Optimization Suite** to integrate Profit Suite, Honeywell’s comprehensive advanced control and optimization technology, with UniSim Design models for APC design and pre-tuning.
- **Uniformance Sentinel** to monitor processes and equipment in real-time; enables industrial facilities to predict and prevent asset failures and poor operational performance.
- **Honeywell UOP CPS** to monitor, predict, and improve plant performance; this is a cloud-based service.

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.

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

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