<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 - 15:00</td>
<td>Conference Registration</td>
<td></td>
</tr>
<tr>
<td>08:30 - 09:15</td>
<td>Welcome &amp; UniSim Design Suite R450 Review</td>
<td>Vicky Athanasiou - Honeywell</td>
</tr>
<tr>
<td>09:15 - 10:00</td>
<td>Integration of a New HTRI Shell and Tube Model into UniSim Design</td>
<td>David Gibbons - Heat Transfer Research Inc.</td>
</tr>
<tr>
<td>10:00 - 10:30</td>
<td>Coffee Break</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>10:30 - 11:15</td>
<td>Production Optimization by UniSim Dynamic Models Online</td>
<td>René la Rivièrè - Shell</td>
</tr>
<tr>
<td>11:15 - 12:00</td>
<td>Hardware-in-the-loop Simulation of Fuel Gas Supply Systems</td>
<td>Prof. Rainer Scheuring - TH Koeln</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hans-Christian Haarmann-Kühn - TGE Marine Gas Engineering</td>
</tr>
<tr>
<td>12:00 - 13:00</td>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>13.00 - 13.45</td>
<td>Underground Gas Storage Depressurization Modelling with UniSim Blowdown Customize</td>
<td>Libor Capla - RWE</td>
</tr>
<tr>
<td>13.45 - 14:30</td>
<td>Embedding proprietary models into Unisim Design: Casale approach to tackle Nitric Acid process simulation</td>
<td>Andrea Guarino &amp; Stefano Ravasio - Casale Group</td>
</tr>
<tr>
<td>14:30 - 15:00</td>
<td>Coffee Break</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>15.00 - 15.45</td>
<td>Increased Front End Loading – Enables smarter project execution</td>
<td>Henrik Billington &amp; Wim van Wassenhove - BPT</td>
</tr>
<tr>
<td>15.45 - 16.45</td>
<td>UniSim Productivity Tools and Best Practices</td>
<td>James Martin - Honeywell</td>
</tr>
<tr>
<td>16.45 - 17.00</td>
<td>Closing Remarks</td>
<td>Vicky Athanasiou - Honeywell</td>
</tr>
</tbody>
</table>
Your Presenter For This Session

• Vicky Athanasiou is the Global Product Manager for Process Design for Honeywell Process Solutions.

• Vicky has a Science Bachelor degree in Chemical Engineering from Massachusetts Institute of Technology, in Cambridge, Massachusetts, USA; a Masters degree in Biomedical Engineering from Imperial College of Science, Technology and Medicine, in London, UK; and an MBA in General Management from London Business School in London, UK.

• Vicky has 14 years of working experience in process simulation for process design and operator training simulation systems and 6 years in commercial roles including sales support, sales and marketing.
Honeywell’s Process Design Offering

• Process Engineering focuses on the design, operation, control, and optimization of processes.
• It encompasses a vast range of industries:
  - Oil and Gas
  - LNG
  - Industrial Gases
  - Refining
  - Biofuels
  - Petrochemicals
  - Chemicals
  - Power, and
  - Other process industries

Honeywell’s Process Design offering is tailored to **increase engineering effectiveness** and **optimize process designs**
Solution Throughout the Plant Lifecycle

**UniSim® Design Suite**
- UniSim Design and Options
- ExchangerNet
- ThermoWorkbench
- Heat Transfer Modeling Suite

**UniSim® Competency Suite**
- Operator Training using UniSim Design models
- Control Execution Environment

**UniSim® Optimization Suite**
- Layered optimization solution integrating UniSim Design models
- Gain updating and RTO
- Planning and Scheduling

UniSim Design is the simulation engine underpinning
The Simulation Lifecycle Approach

Concept Selection → FEED → Detailed Engineering → Construction & Commissioning → Operations → Expansion → Operations

Modelling Tool → Modelling Tool → Modelling Tool

Tighter design
Investment Decisions

Controllability
Early APC
Improve Procedures
Operator Training

Asset Monitoring
RTO
De-bottlenecking
Operator Tools
UniSim Design – Recent Press Release

• Honeywell Launches New UniSim® Design Suite Release 450:
  

Honeywell Launches New UniSim® Design Suite Release 450

New software offering expands capabilities for effective engineering and process design.

HOUSTON, Sept. 1, 2016 – Honeywell (NYSE: HON) Process Solutions (HPS) announced today the launch of UniSim Design Suite Release 450 – the newest version of its proven process modeling software that helps industrial manufacturers increase their engineering effectiveness and optimize their process designs. Honeywell’s UniSim Design Suite is used by over 250 companies worldwide in the oil and gas, refining, petrochemical, chemical, and power industries.

“Long-term relationships and feedback from its users has been essential to making UniSim Design Suite Release 450 one of Honeywell’s most powerful and useful engineering simulation solution,” said Mike Brown, global director, Honeywell Process Solutions business. “Since its launch more than a decade ago, we’ve listened to feedback to ensure that new features are focused on customers’ real-world concerns. The latest innovations introduced with UniSim Design Suite Release 450 are a prime example of that.”
The UniSim Design Suite Offering

- Training
- Consulting
- Custom Thermo/Unit Operations
- Model Building
- Steady State and Dynamics Studies
### UniSim® Design Suite Product List

#### Plant Design and Simulation Products
- UniSim® Design (steady-state)
- UniSim® Dynamics Option
- UniSim® Flare
- UniSim® Blowdown Customize
- UniSim® PRS
- UniSim® Spirally-Wound Tube Bundle Module
- UniSim® Gasifier
- UniSim® 3rd Party Options

#### Equipment Design and Simulation Products
- UniSim® HTRI UHx Air Cool Bundle
- UniSim® HTRI UHx Fired Heater Bundle
- UniSim® HTRI UHx Plate Bundle
- UniSim® HTRI UHx Plate-Fin Bundle
- UniSim® HTRI UHx Shell-Tube Bundle
- UniSim® HTRI XSimOp Shell-Tube Bundle
- UniSim® HTRI Spiral Plate Modeler
- UniSim® HTRI Vibration Modeler
- UniSim® HTRI UHx Heat Exchanger Full Suite
- UniSim® FeedWater Heater Modeler
- UniSim® Process Pipeline Modeler

#### Conceptual Design Product
- UniSim® ExchangerNet

#### Physical Properties Product
- UniSim® ThermoWorkbench
## UniSim® 3rd Party Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiflash</td>
<td>(KBC) used for properties, black-oil translation, and as a PVT engine</td>
</tr>
<tr>
<td>Xchanger Suite</td>
<td>(HTRI) for heat exchangers design and rating</td>
</tr>
<tr>
<td>Cleopatra Link</td>
<td>(Cost Engineering) for cost estimation purposes</td>
</tr>
<tr>
<td>PIPESIM</td>
<td>(Schlumberger) for pipeline simulation</td>
</tr>
<tr>
<td>Amines Option</td>
<td>(Schlumberger) for amine treating process simulation</td>
</tr>
<tr>
<td>PIPESYS Option</td>
<td>(Schlumberger) for pipeline simulation</td>
</tr>
<tr>
<td>DIPPR</td>
<td>(Design Institute for Physical Properties) for properties of pure compounds</td>
</tr>
<tr>
<td>Predict SW</td>
<td>Honeywell’s corrosion prediction software for refinery sour water environments</td>
</tr>
<tr>
<td>OLI Electrolytes Option</td>
<td>(OLI Systems) for electrolyte system modeling</td>
</tr>
<tr>
<td>Pro-M</td>
<td>(MSE) for compressor design</td>
</tr>
<tr>
<td>OLGAS Option</td>
<td>(Schlumberger) for steady-state pipeline simulation</td>
</tr>
<tr>
<td>GAP and Resolve</td>
<td>(Petroleum Experts), for overall O&amp;G field simulation</td>
</tr>
<tr>
<td>Blackoil Option</td>
<td>(Schlumberger) for upstream fluid modeling</td>
</tr>
<tr>
<td>COMOS</td>
<td>(Siemens) for engineering workflow</td>
</tr>
<tr>
<td>MySEP</td>
<td>(Kranji Solutions) for separators and scrubbers design</td>
</tr>
<tr>
<td>AXSYS</td>
<td>(Bentley) for engineering workflow</td>
</tr>
<tr>
<td>OLGA</td>
<td>(Schlumberger) for multi-phase dynamic pipeline simulation</td>
</tr>
<tr>
<td>Dortmund Databank</td>
<td>Leading databank of VLE data for the process industries</td>
</tr>
<tr>
<td>PVTSim Nova</td>
<td>(CALSEP) For fluid properties and experimental PVT data simulation.</td>
</tr>
</tbody>
</table>
Licensing Options

- **Standalone**
  - License is associated to a given hardware (local PC or dongle)

- **Network**
  - License is associated to a given server, allowing access from anywhere in the network

- **Tokens**
  - License is associated to a given server, allowing access from anywhere in the network.
  - It provides the ability to Shift usage amongst products over term of contract, increasing usage flexibility

- **Hybrid Approach**
  - Combination of Token and Network Licenses giving SIGNIFICANT commercial advantage

Flexible licensing and product selection to meet the customer needs!
Training Options

Public

- At Honeywell’s Automation Colleges worldwide
- Regularly scheduled, visit www.automationcollege.com
- Based on standard training content
- Available for different products, markets and levels
- Maximum 12 attendants

Customer Specific

- At Honeywell’s Automation Colleges or customer premises worldwide
- Available on demand
- Based on standard training content, but can also be customized to match customer needs
- Available for different products, markets and levels
- Maximum 12 attendants
UniSim Design Links with Other AS Products

UniSim Operator Competency Suite
Lifecycle Simulation
Operator Training

Profit Suite
Embedded APC in UniSim
Direct link with Profit Suite

Predict-SW
Corrosion Prediction

RPMS
RPMS Link

UniSim Design

Uniformance Sentinel
Asset Performance Calculation

Real-time Optimization
Gain Update
## UniSim Compatibility with HYSYS

- UniSim Design can read and save Aspen HYSYS cases, based on the compatibility table on the right. It allows opening and saving HYSYS cases from within UniSim Design.
- Usually, the read/save compatibility of a new version will be available in UniSim within about 6 months. E.g. HYSYS v9.0 compatibility will be available in the next UniSim Release 450 in August 2016.
- Honeywell is committed to maintain XML compatibility.

<table>
<thead>
<tr>
<th>UniSim® Design Version</th>
<th>Reads Aspen HYSYS cases saved in …</th>
<th>Saves as Aspen HYSYS…</th>
</tr>
</thead>
<tbody>
<tr>
<td>R350</td>
<td>HYSYS 2004 and earlier</td>
<td>HYSYS 2004</td>
</tr>
<tr>
<td>R350.1.1</td>
<td>HYSYS 2004 and earlier</td>
<td>HYSYS 2004</td>
</tr>
<tr>
<td>R350.5</td>
<td>HYSYS 2004.1 and earlier</td>
<td>HYSYS 2004.1</td>
</tr>
<tr>
<td>R360</td>
<td>HYSYS 2004.2 and earlier</td>
<td>HYSYS 2004.2</td>
</tr>
<tr>
<td>R360.1</td>
<td>HYSYS 2004.2 and earlier</td>
<td>HYSYS 2004.2</td>
</tr>
<tr>
<td>R370</td>
<td>HYSYS 2006 and earlier</td>
<td>HYSYS 2006</td>
</tr>
<tr>
<td>R370.1</td>
<td>HYSYS 2006 and earlier</td>
<td>HYSYS 2006</td>
</tr>
<tr>
<td>R380</td>
<td>HYSYS 2006 CP1 and earlier</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R380.1</td>
<td>HYSYS 2006.5 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R390</td>
<td>HYSYS 2006.5 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R390.1</td>
<td>HYSYS v7.1 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R400</td>
<td>HYSYS v7.2 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R410</td>
<td>HYSYS v7.3.0.1 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R430</td>
<td>HYSYS v8.2 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R440</td>
<td>HYSYS v8.6 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
<tr>
<td>R450</td>
<td>HYSYS v9.0 and earlier*</td>
<td>HYSYS 2006 CP1</td>
</tr>
</tbody>
</table>

Compatibility is intended for one-time migration, not interoperability!
Customer List (Partial)
Why Do Customers Normally Buy UniSim Design?

- Among the reasons provided by our current customers, we can highlight:

| Best-in-class customer support | • Our support engineers have been supporting both Hysys and UniSim Design for more than 8 years on average. They are responsive, knowledgeable, experienced and with a solid process engineering background. |
| Robust technology | • Our customers have confirmed that UniSim Design is faster, more robust with significantly fewer bugs than our competitors. |
| Exciting New features | • Developed with users, for the users, implementing best practices from major users. |
| Joint Development | • Ability to develop joint programs to address customer specific needs and requirements. |
| Flexible commercial approach | • Honeywell understands customer needs, and proposes tailored and flexible approaches, aligned with customer expectations in terms of products, budget and contract length. |
| Rock-solid financial performance | • Honeywell financial performance and balance sheets are regularly published and audited. |
Case Study - Linde

Challenge:

• Deploy Linde’s Intellectual Property easily and safely across all the offices worldwide.
• Use a commercial simulation tool that can be aligned with Linde’s process design workflow specificities

Solution Applied

• UniSim Design Suite
• Joint Development Program

Key Results

• Increased efficiency, by improving access and maintenance of Linde’s Intellectual property to the 500+ users worldwide.
• Increased Reliability and efficiency by using a commercial software together with the aligned development provided by the Joint Development program
Case Study - Shell

Challenge:

• Standardize on a single software simulation provider for all Oil & Gas Exploration and Production applications
• Smoothly integrate Shell’s intellectual property to the simulation environment

Solution Applied

• UniSim Design Suite
• Joint Development Program

Key Results

• Confirmed usage by 3,000+ engineers worldwide
• Increased Reliability and efficiency by aligned development goals provided by the Joint Development program
New Features and Enhancements in R450

- UniSim PRS
  R450
- UniSim Blowdown Customize Enhancements
  R450
- UniSim Flare Enhancements
  R450
- Multi-Phase Pump
  R450
- Amine Fitter and Amine Unit Op
  R450
- Pipe Segment Unit Op Enhancements
  R450
- Valve Unit Op Enhancements
  R450
- UniSim-HTRI Heat Exchanger Integration
  R450
- PVT Regression Import Tool
  R450
- Super-Critical Regions Handling
  R450
- Refining Properties and Mixing Rules
  R450
- Crude Assay Import Facility
  R450
- Productivity Tools
  R450
- Flowsheet Optimization
  R450
- Other Enhancements
  R450
Contacts

**Product Director**
John Roffel  
Tel: +1 519 640 6569  
Cell: +1 519 872 1896  
john.j.roffel@honeywell.com

**Product Manager**
Vicky Athanasiou  
Tel: +39 039 216 5258  
Cell: +39 345 410 5989  
vicky.athanasiou@honeywell.com

**Technology Manager**
Matt Lor  
Tel: +1 403 509 1334  
Cell: +1 403 616 5623  
matthew.lor@honeywell.com

**Sales Queries – Americas**
Peter de Jonge  
Tel: +1 403 509 1349  
Cell: +1 403 463 1215  
peter.dejonge@honeywell.com

**Sales Queries – EMEA**
Michael Brodkorb  
Cell: +34 600 911 895  
michael.brodkorb@honeywell.com

**Sales Queries – APAC**
Aditya Behl  
Tel: +91 2067676948 x26948  
Cell: +91 9881191776  
aditya.behl@honeywell.com

**Technical Support Helpdesk**
unisim.support@honeywell.com  
unisim.supportportal.com

**Marketing Communications**
lamya.bousrih@honeywell.com  
marty.israels@honeywell.com

**Additional Product Information**
UniSim PRS

- Tool originally developed by UOP and used to validate relief devices on all UOP plant assets
- For sizing, rating, and validation of PSVs and RDs and surrounding pipes
- Implements API Sizing for:
  - External Fire
  - Blocked Outlet
  - Flow Known
  - Tube Failure
  - Storage Tank Vent (non-fire)
- Checks for non-compliance, provides guided assistance for rating, and allows for existing design validation
- Produces relief scenario reports and datasheets

UniSim PRS was originally developed by UOP, who are technology licensors, plant asset operators, and users.

UniSim PRS follows API/NFPA/ASME code requirements for pressure vessels and storage tanks and CGA code requirements for portable containers.

It can be applied to the Oil & Gas, Refining, Petrochemical, Biofuel, and Chemical Industries.
UniSim Blowdown Customize Enhancements

Enhancements to Blowdown Customize 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

- This tool has been co-developed with a major oil company
- The software is compliant with the industry standard: API 521 6th Edition & its fire method
- It allows for blowdown flowsheeting and scheduling, 2D heat transfer in vessel walls & heads, incorporates the API 521 fire method and is based on non-equilibrium calculations
- It has been extensively validated with proprietary and publicly available data and is in good agreement with real data for O&G assets
UniSim Flare

- Steady-state tool for designing, rating and debottlenecking flare system piping from the relief valve to the flare tip.
- Scenario automation allows to examine varying loads from different flare headers.
- Now supported on the .NET platform
- Higher performance (3-11x for large models)
- New scenario automation capability
- UI allows to easily view results from multiple scenarios, without the use of 3rd party tools
- Enhanced reporting capabilities
- Compatible with Aspen Flare System Analyzer cases for easy migration

UniSim Flare originated from the same IP as Aspen Flare System Analyzer

- This product complies with industry standards API520/521.
- UniSim Flare has been enhanced to significantly improve the calculation speed, enable scenario automation, and improve visualization of results
- It can be used for flare design for the Oil & Gas, Refining, Petrochemical, Biofuel, and Chemical Industries
Multi-Phase Pump

- The pump unit operation has been enhanced to support the evolving technology for multiphase pressure boosting.
- Multi-phase pumps 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 VGFs.
- The MPP unit operation is supported in steady-state and dynamics.

- The MPP and WGC functionality was developed in collaboration with an IOC who designs, develops and owns subsea operation assets.
- Honeywell offer the MPP and WGC as part of our core offering for UniSim Design (steady-state) and UniSim Dynamics Option.
- UniSim Design Suite is the only process simulation software with MPP and WGC support.
- MPP & WGC are applicable to the O&G Upstream market.

Building on multi-phase transport Capabilities!
Amine Fitter and Amine Model Unit Operation

- Developed to allow the user to make use of amines performance data obtained from external sources (specialist packages or plant data) within the USD flowsheet.
- The Amine model unit operation is a new object in the UniSim Design flowsheet environment to represent the amine contactor and regenerator flowsheet.
- The Amine fitter (grey-box model) fits amine data for use by the amine model unit operation.
- Helps customers complete the flowsheet for their process faster.

**Typical problems the amine unit operation could help with are:**

a. Given an amine flow to calculate residual acid content in gas
b. Given the acid gas specifications to calculate an amine flow
c. Given the lean amine specs to optimize the regeneration duty

- Amine units can be found in O&G, Refining, Petrochemicals and Chemical processes.
Pipe Segment & Valve Unit Operation Enhancements

**Pipe Segment Unit Operation:**
- The Pipe Segment unit operation has been enhanced in steady-state to include the following calculations:
  - hydrate formation
  - ice formation
  - the sand erosion velocity calculation.
- It is no longer necessary to configure separate utilities for these calculations, which improves engineering efficiency.

**Valve Unit Operation:**
- The Valve unit operation has been enhanced to allow for different actuator opening and closing times in dynamics.
- This gives users more flexibility when designing process and compressor controls.
UniSim – HTRI Heat-Exchanger Integration

- Heat exchanger modules are used for the design, rating and simulation of heat exchangers.
- With USD R450, the new HTRI XSimOp Shell-Tube module is integrated in UniSim Design.
- Native exchanger unit operation with alternate model selection.
- This enables the usage of the new HTRI technology in simulation.
- The new engine solves faster than the embedded Xist and UHX STE technology predecessors.

- UniSim Heat Exchangers (UHX) originated from the same IP as Aspen HTFS (now Aspen EDR).
- Today, Honeywell offers the widest portfolio of modules for heat exchanger design.
- UHX technology is maintained and extended by HTRI, the market leader in heat-exchanger research and technology.
- Honeywell resells the HTRI Xchanger Suite and XSimOp products, as an alternative to HTRI membership.
- Heat exchanger design applies across all process industries.

Honeywell Offers the broadest portfolio for heat-exchanger design!
PVT Regression Import Tool

- Tool to import CALSEP PVTSim and PVTSim Nova export files in .txt format into UniSim Design (PVT environment).
- Automatically imports streams with PR78 and SRK thermo properties.
- Allows for manual selection of properties if other than PR78 or SRK.
- In addition, it automatically creates a stream on the flowsheet & attaches a phase envelope to that stream.

- The PVT Regression Import Tool:
  - reduces engineering effort and
  - eliminates errors with manual data entry.
- CALSEP is the market leader in PVT simulation with the PVTSim and PVTSim Nova products.
- This tool is applicable to the O&G Upstream/Midstream process simulation and flow-assurance.

Reduces engineering effort and eliminates manual entry errors!
Super-Critical Regions

- With USD R450, streams in super-critical regions may be handled with more flexibility, at steady-state.
- For the PR and SRK fluid packages.
- The user can:
  - Define the supercritical region himself or allow the simulator to calculate it.
  - Override the supercritical phase as vapour or liquid for certain properties (i.e. density, viscosity, thermal conductivity).
  - Enable stream-level alerts when operating in the supercritical region or when the user has overridden the supercritical region.

This enhancement was requested by UniSim Design users.
- By assigning individual fluid properties to be handled as gas or liquid, it is possible to get better predictions for the overall fluid behaviour.
- The flexible super-critical region handling is important for the O&G upstream, Pipe Reinjection, Carbon Dioxide Compression, Urea, and Polymer processes.
Refining Properties:

- Refining properties are configured in the UniSim Design. 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

Mixing Rules:

- Blending mixing rules are pre-defined and are available in UniSim Design as user properties.
- It is also possible for the user to enter Custom Mixing Rules and leverage proprietary data within the simulation environment.
Crude Assay Import Facility

- The crude assay import facility allows crude assays to be read into the UniSim Crude environment and mapped into components and pseudocomponents.
- Assay data are read from MS excel files.
- The same components and pseudocomponents can be shared by different assays.
- The assays are propagated in the flowsheet environment.

- The crude assay import facility makes it easy to import and manage crude assays.
- This functionality increases engineering effectiveness, eliminates room for manual data entry, and makes it easier to model crude storage facilities and refining processes.

Users can now import hundreds of assays with a few clicks!
Productivity Tools

**H&MB and PFD Generation**
- It is now possible to generate H&MBs and PFD equipment summaries in UniSim Design.
- Buttons configured in the workbook view for H&MBs and equipment summaries generation.
- The flowsheet and respective tables exported as bitmap files.
- The workbook tabs may be printed as datasheets in .pdf format.
- This functionality allows for easier generation of PFDs and stream reports.

**Case Scenario Manager**
- The Case Scenario Manager has an improved parallel workflow in dynamics:
  - It can display the differences between all specified variables.
  - It can also do a 3-way comparison of the Master, Changed and Common Ancestor Cases.
  - Cases over 50MB can be compared 1-2 minutes, to identify the source of changes and to propagate changes to the desired case.

Easier than ever documentation generation & case comparison!
Flowsheet Optimization

Optimizer - Nova Solver Option

- The NOVA solver is now available as an option in the Optimizer.
- 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.
- It can be applied to solve problems for processes across all industries.

Adjust Function Enhancements

- 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.

Adjust-Recycle Manager Enhancements

- In the adjust-recycle manager, a new variable list is included: the ‘Independent Spreadsheet OldValue Opers’.
- The program detects cells with “OldValue” strings.
- The tolerance can be modified for each of the listed variables through the Adjust-Recycle manager.

Enhancements to flowsheet optimization and calculation visibility
Other Enhancements

**Other Unit Operation Enhancements**
- **New Hydraulic Turbine Unit Operation:**
  - Models a Kaplan hydraulic turbine in dynamics.
  - 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.

**Other Thermo Enhancements**
- **DIPPR:** The link to the DIPPR database now allows the review of imported components and the classification of components into families.
- **Peng-Robinson EOS:** There are enhancements to related to water solubility:
  - Now two water solubility options are available: the API 9A1.3 and the 9A1.5 methods.
  - The water solubility coefficients are exposed and modifiable by the user.
  - Non-hydrocarbon components can be included in water solubility calculations.
  - The user can select which components to include in the water solubility calculations and which to exclude.
- **PPR78 EOS:** It 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 rules.

**Other Solver Enhancements**
- **Calculation order analysis tool:** It is now easier to understand the calculation sequence:
  - Calculation levels displayed in one view.
  - Option to display the solver calculation order after the calculations have been completed.
- **Sparse continuation solver:** Improved with the usage of the Inside-Out column solver, improving the convergence of columns.
- **I/O solver:** Can now handle non-aqueous VLLE in condensers, which is important for refining and chemical applications.

**Additional Unit Op, Thermo and Solver Enhancements**