IDEAS Release Notes

IDEAS 2024R1

ENGINEERED SUCCESS

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SECTION 1 RELEASE SUMMARY

This document contains Release Notes for the IDEAS™* Process Simulation Software package. All information in this document refers to IDEAS build number 2024R1, released by ANDRITZ on July 10, 2024.

IDEAS 2024R1 brings forward the essential updates to the core of the simulation platform along with new features and objects, highlighted in the following.

Core Platform:

Stability and performance of the core application is enhanced with many bug fixes and feature refinements. IAPWS steam-water thermodynamic calculations are upgraded for robustness.

Pulp & Paper:

Steady state and dynamic versions of Bleach Tower and Digester objects are fortified with the inclusion of higher fidelity reaction kinetics, solver improvements, better error handling framework and user interface improvements.

Mineral Processing:

- Ore breakage parameters and appearance matrix formulations are defined globally for uniform access of all the size reduction objects in the model. A new Breakage Curve Fitter object is introduced for tuning of breakage parameters.
- Component records essential for modelling the lithium extraction process is introduced.

Long-distance pipeline:

A moving control volume formulation is implemented for closely tracking the batches of fluids along the length of a pipeline. More accurate methods for locating leakage regions in pipeline segments with varying configuration such as different diameters, resistances, etc., is implemented.

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SECTION 2 NEW FEATURES AND OBJECTS

2.1 LITHIUM-BASED MODELING

Given the ongoing and huge potential lithium-based modelling projects, additions are made to the IDEAS component record database to serve the lithium-based equilibrium calculations in Hydro-metallurgical processing stage of Lithium extraction process.

2.2 ENHANCED IAPWS STEAM TABLE IMPLEMENTATION

The implemented IAPWS Steam Table in IDEAS is further enhanced with critical fixes to align property evaluations more closely with the established standards of steam-water property assessment.

The models now run seamlessly, while switching between IDEAS and IAPWS with the IDEAS correlations offering quicker computations with relatively lesser accuracy, whereas IAPWS correlations, while slower in processing, delivering heightened precision in property evaluations. It gives the user the flexibility to prioritize either speed or accuracy based on specific needs and preferences.

2.3 BLEACH TOWER OBJECTS

Feature Additions:

1. **Improved Kinetic Equations**:

- Overhauled the existing kinetic equations governing peroxide consumption and the Extraction stage.
- Adopted superior forms of kinetics to bolster the object's robustness to ensure more accurate and reliable simulations.

Conceptual Enhancements and Bug Fixes:

1. **Refined Kinetic Equations**:

- Rigorously scrutinized every kinetic equation across all towers to ensure alignment with established literature and conservation laws.
- Implemented numerous critical fixes to maintain consistency and enhance the reliability of kinetics within the system.

2. **Enhanced Algorithm Stability**:

- Implemented proactive checks and exception handlers within the RK5 algorithm to gracefully handle edge cases such as bad inputs, timeouts, and suspended states to ensure smoother operation and improved reliability.

3. **Robust Input Validation**:

- Strengthened input validation mechanisms with comprehensive checks to handle unfiltered data seamlessly.
- Informative warnings now alert users to potential issues to facilitate smoother operation and troubleshooting.

4. **Improved User Experience**:

- Elevated the aesthetics of the object by refining dialog boxes and introducing additional dialogs and connectors.
- General enhancements aimed at improving user experience to make user interactions more intuitive and user-friendly.

2.4 BREAKAGE MATRIX ENHANCEMENTS

The breakage matrix, also known as the “appearance matrix”, shows the progeny distribution of larger particles which have undergone size reduction. This matrix is integral for the population balance of the particles. The breakage parameters which essentially govern the generation of the breakage (appearance) matrix primarily depend on the material properties of the ore.

In the earlier design, users were tasked with entering parameters individually for each size reduction object within the process. This approach allowed for local variation, resulting in different breakage matrices for identical ore components across various size reduction objects. This inconsistency represented a significant limitation of the previous design.

The new design addresses this challenge by standardizing the matrix generation process. It introduces a framework in the PSD Data object that links parameters directly with the ore component, establishing a global design standard. This standardization ensures uniformity throughout the process, regardless of the mill type, streamlining breakage matrix usage and ensuring consistency by employing the same breakage parameters across the entire operation.

Furthermore, a new Breakage Curve Fitter object is added to the Material Properties library to enhance user flexibility. This tool allows users to fine-tune breakage parameters to achieve custom matrix configurations. Additionally, users can seamlessly copy these custom matrices to their desired size reduction objects with the click of a button, which further enhances the efficiency and customization capabilities.

2.5 PIPELINE TRANSIENTS IMPROVEMENTS

1. Batch Tracking

Accurate tracking of interfaces between flowing fluids with different properties is crucial in multiphase pipelines, including hydraulic and slurry transportation systems. A scientifically rigorous batch tracking algorithm is implemented in the Pipe with Valve object in the Pipeline Transient library to track the movement of mineral slurries accurately. The algorithm adopts a hybrid approach, combining zone-based hydraulic calculations with batch-based interface tracking. This algorithm is designed to:

- Locate distinct materials: Monitor the position and extent of each fluid within the pipeline, enabling accurate predictions of interface locations and filling levels.
- Incorporate material properties: Account for individual fluid characteristics like viscosity, density, and concentration during pressure drop calculations, leading to improved flow modeling and control.

Highlights:

- Flexibility: Handles pipelines with diverse fluids and varying properties.

- Accuracy: Incorporates material-specific properties of different fluids in the pipe for enhanced pressure drop predictions.
- Dynamic tracking: Adapts to changing flowrates and accommodates transient flow behavior through continuous batch creation and removal.

2. Conceptual Enhancements & Bug Fixes

- Addressed a critical issue with the zone mass balance, ensuring accurate accounting for all possible flow configurations.
- Rectified inconsistencies in the implementation of valve boundary conditions, aligning it with characteristic solutions for more precise results. This eliminates the need for an additional zone dedicated to valve accounting.
- Conducted extensive reviews and fixed bugs related to inlet and outlet boundary conditions, particularly addressing density discrepancies to ensure consistency.
- Introduced Hydraulic Grade Line (HGL) and Elevation profiles to the plotter, facilitating visualization of terrain and detection of slack flow. Additionally, included a Slack Flow Connector to alert users about potential slack flow in pipes.
- Enhanced the node solver algorithm by refining the definition of negligible flow, leading to improved convergence.
- Resolved issues with elevation profile interpolation and resistance fitting.
- Incorporated an input field allowing users to bypass internal friction factor calculations and define custom friction factors as needed.

3. Leak Locator Object

Long-distance pipelines often consist of series of pipes with varying diameters, lengths, and roughness to accommodate elevation changes. The current framework of the gradient intersection method for leak localization assumes a uniform diameter and roughness for the entire length. However, this oversimplification can introduce inaccuracies in the estimation of flow characteristics, particularly in systems with complex geometries and heterogeneous materials. To address this limitation, the Gradient Intersection Method was modified by integrating the effects of varying diameters and roughness through the concept of equivalent friction factor.

A scientifically sound method for modifying the gradient intersection method to account for the influence of varying pipe diameters and roughness, thereby enhancing the accuracy of leak localization is incorporated into a separate object named “Leak Locator” to simplify the leak localization framework. By integrating the concept of equivalent friction factor, the object ensures a more accurate representation of the hydraulic characteristics of the entire pipeline. This, in turn, enables the precise localization of leaks using the gradient intersection technique, while maintaining the integrity of the head vs. length profile.

SECTION 3 IDEAS PLATFORM ENHANCEMENTS/BUG FIXES

This section details the feature enhancements / bug fixes available in the IDEAS platform for version 2024R1.

1. Moved the Dialog items and Icons from the Tools Menu to the Block / H-Block structure tab.
2. Multiple connections can now be selected on a worksheet and the Line Type changed for all selected connections.
3. Fixed crash when animation is *on* at the start of the simulation.
4. Fixed crash when a dialog table clone was deleted from a notebook.
5. Fixed crash when a simulation was *paused* on a dialog change and then *stopped* instead of *resuming*.
6. DeltaTime variable is updated in the application at the time it is changed and not at the time the simulation run starts.
7. Corrected the behavior with scientific format showing unnecessary zeros after decimal in the parameter data of dialog tables.
8. The *All Objects* cursor is now allowing multiple selections.
9. Resizing data/text tables, popup menu, or switch dialogs in the dialog box of a block is now disabled.
10. Esc key now works with Clone tool cursor.
11. The Trace Editor is now updating to the new number of traces when the number of traces changes.
12. Fixed crash or Unhandled Error message when *add tab* and then *delete tab* happens in the dialog block structure.
13. In the Find object window, when one clicks on the Find Object option, the table which has the list of search details often disappeared; this has been fixed.
14. When copying an Hblock from one model to another one, the new Hblock ID is kept as low as possible.
15. From Schema view in the database, it is now possible to select multiple fields and right click to apply a command to all the selected fields like cut, copy, and clear.
16. The red border of an Hblock connector is now resizing properly based on the name of the connector.
17. F1 shortcut added to access IDEAS Help menu.

SECTION 4 IDEAS OBJECTS – BUG FIXES AND IMPROVEMENTS

4.1 OBJECT FIXES

Conversion Table_c <Tools>

- Added provision to change the number of points in the table as per user need using Data table resize option in Conversion Table_c Object.
- Added the Dialog item to display the Index value of the Input X. This provides the user with the information about the location of the input X in the data table.

Conveyor Constant Speed <Macro Unit Ops>

Added temperature outlet display in Conveyor Constant speed object.

Crusher <Mineral Processing B>

Corrected the signs of the coefficients of Anderson/White Classification function.

Data Collection <Tools>

- Object is now correctly saving the values based on user-defined frequency and also considering worksheet time step.
- Hidden the frequency dialog when StoreIn connector is used as the frequency dialog has no relevance in this case.

DBD Exchange object <Tools_Utilities>

Added a place holder to display the status of Import/Export progress.

Dialog Box Data Exporter <Dynamic Data Exchange>

Added a new option “Write Values Directly to Objects” in the SendTo tab under Export Data options which can help the user to read/write values directly to and from Parameters/Tables in IDEAS. A detailed explanation of the option is available in IDEAS Help.

Discrete_Cont. Executive <Executives>

Revamped the synchronization algorithm to improve synchronization even at the finer time steps. Added display fields for time elapsed from the start of simulation and time spent during the simulation pause.

Flotation Machine <Mineral Processing-B>

- Made corrections to the steady-state flotation mass balance solving algorithm to handle edge cases like no solids in the feed, zero froth height, and no aeration effect.
- The object is now standardized to display the critical parameters based on user’s choice. The interface is now more intuitive in tracking relevant parameter changes.

Global Mass Balance <Tools>

Fixed the issue with "&" not appearing if used in the title of Check box, Radio Button dialog items.

HX Unit <Heat Exchangers>

Added a tolerance input field in “Solve Two Sides Input” tab used in the calculation of heat transfer rate and formatted temperature cross-over check.

Max2_C <Tools>

Added a feature to calculate the maximum of an array based on the input range.

Phase Separator <Macro Primitives>

Added protections for the negligible mass flow rates to ensure the consistency in the output stream properties.

PID Controller <Analog Controls>

Added Description Dialog to PID Controller object in Analog Controls library.

Plotter I/O Scan <Plotters>

Added OLE/COM functionality to Plotter, I_O-Scan object in order to export data to excel.

PSD Data <Material Properties>

A new tab is added for the user to provide the parameters for the breakage models used to generate the breakage matrix as per the new global design.

Pump Centrifugal w/Motor <Pumps & Compressors>

- The pump elevation pop-up menu allows the user to specify the elevation of the secondary inlet of the pump.
- Made changes to update the StatusOut connector value at every simulation step irrespective of whether the Update Continuously button is checked or not.

Reaction Rx <Macro Unit Ops>

- Rate constant table in Reaction Rx object was set to accept values up to fixed two decimal places (neglecting smaller values of more than two decimal places). The cell is changed to general decimals which accepts all decimal values (with 'e' representation for smaller values).
- Added a check on the outlet concentration to pass only positive values such that the downstream object is not affected.

Steady-State Bleach Tower <Pulp Mill-B>

Conceptual Enhancements & Bug Fixes

- Kinetic and chemical consumptions are revalidated and corrected for all tower types as per standard literature.
- Proactive checks added at multiple levels in the object to prevent any form of model freezing.
- Handled suspended state by preserving last step values.
- Functionality of American and Metric radio button was corrected.
- Improved the object interface for better user experience.

New Feature addition

- A new first-principles-based kappa reduction kinetics, using peroxide as a reactant, is added to EOP tower. The user is provided with handles such as reaction rate constant, activation energy and reactant concentration orders.
- Peroxide consumption is stoichiometrically dependent on the amount of change in lignin due to the reaction; the user is also provided with a handle to alter the stoichiometry.
- All the extraction towers such as Eo/Eop tower have been added with alkali-based (E tower kinetics) kappa reduction kinetics. User is provided with the kinetic parameters such as reaction rate constant and activation energy for tuning purpose.
- Added display dialogs for inlet and outlet brightness in the object (for all tower types).

Steady-State Digester <Pulp Mill-B>

PT flash with the Vapor Pressure for the separated liquid phase from the bulk returns gaseous composition. Added an extra 1 kpa to the Vapor Pressure used in the PT flash call for the liquid phase to avoid flashing.

Protections to Steady State Digester

- Timer check to exit iterations
- Exception handlers in adjusting levels
- Protections to temperature to keep it below saturation temperature
- Pointer check on snapshot load/Retrieve
- Minimum zone height protection
- Chip level limited to liquor level

4.2 NEW IDEAS OBJECTS

Breakage Curve Fitter <Material Properties>

The new **Breakage Curve Fitter** object is developed to enhance user flexibility. This tool allows users to fine-tune breakage parameters to achieve custom matrix configurations. Users can now seamlessly copy these custom matrices to their desired size reduction objects with the click of a button which further enhances the efficiency and customization capabilities.

Plotter++I/O scan <Plotters>

The new **Plotter++, I/O Scan** object plots the data for up to twenty (20) time-associated inputs. The user can drag the variable connector to define the no. of connections. This object also helps to store the data, and the output connectors allow the data generated in one simulation to be used as input to another simulation.

PSD Balance Checker <Tools>

The new **PSD Balance Checker** object is developed to help the user in quantitative investigation of the mass balance of the components with Particle Size Distributions (PSDs) processed/handled by the objects in the worksheet. The insights given by this object can contribute to improving the functioning of objects designed for components with PSDs.

4.3 OTHER IDEAS FIXES

Component Records

Diss Organics: Modified the component properties to align with the wood properties.

Added the following lithium component records with physical and chemical constants, and enthalpy and Gibbs free energy correlations for the following components: Li2SO4_s, Li2SO4_aq, LiOH_aq, LiOH_s, and Li2CO3_aq. Also, added Enthalpy and Gibbs free energy correlations to Li2CO3_s.

IDEASExcelInterface.dll

Corrected the crash behavior that occurred when clicking the Import Single Scenario button in the Scenario Importer object if characters like % were present in the variable name in the Excel syntax.

4.4 EXAMPLES

Modified the *Bleach* example to align with the latest developments on the Bleach Tower Steady State object.

SECTION 5 CONTACT US

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