AVEVA™ Simulation & Learning Innovations

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AVEVA™ Process Simulation

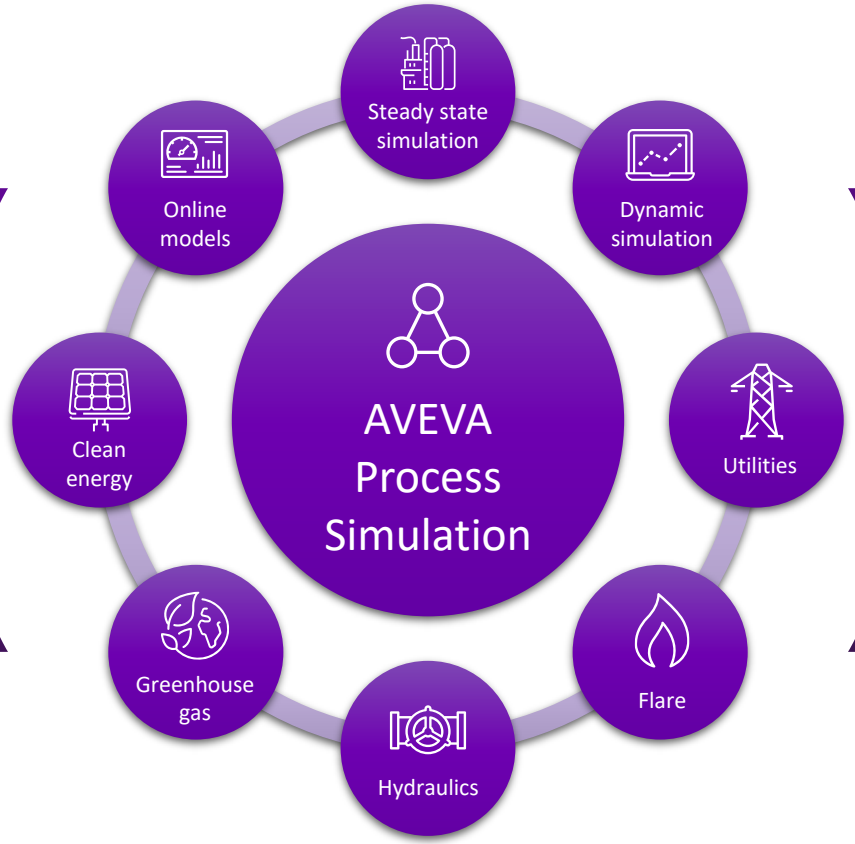
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A Unique Solution

AVEVA Process Simulation brings a transformational approach





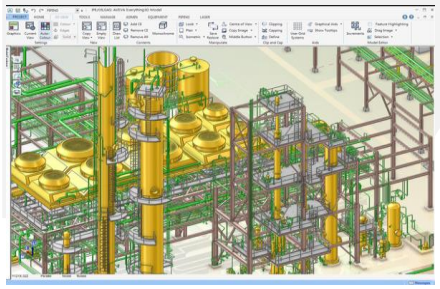
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Two Types of Digital Twin

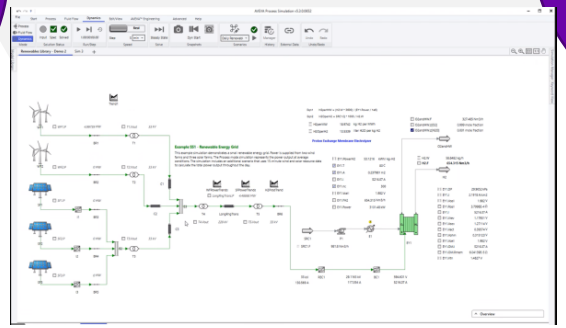
Same process model for Engineering and Operations for **Lifecycle Simulation**

3D Engineering Data
A repository for all engineers to collaborate keeping all data in one place.



Engineering Digital Twin

Process Simulation
Single lifecycle simulation that perform multiple purposes



Operating Digital Twin

Live Plant Data (PI)
A repository of historical data that explains how the plant is actually operating



Reduced Engineering Hours
Multi Discipline Collaboration
(Transformed Work processes)

Cross Sell with Unified Engineering

Operational Insight
Improved Operations
(Efficiency and GHG Emissions)

Cross Sell with PI System

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AVEVA™ Process Simulation 2022.2 New Features

Relative CapEx for Pump, Compressor, HX, Drum, and Column

Objectives/Background

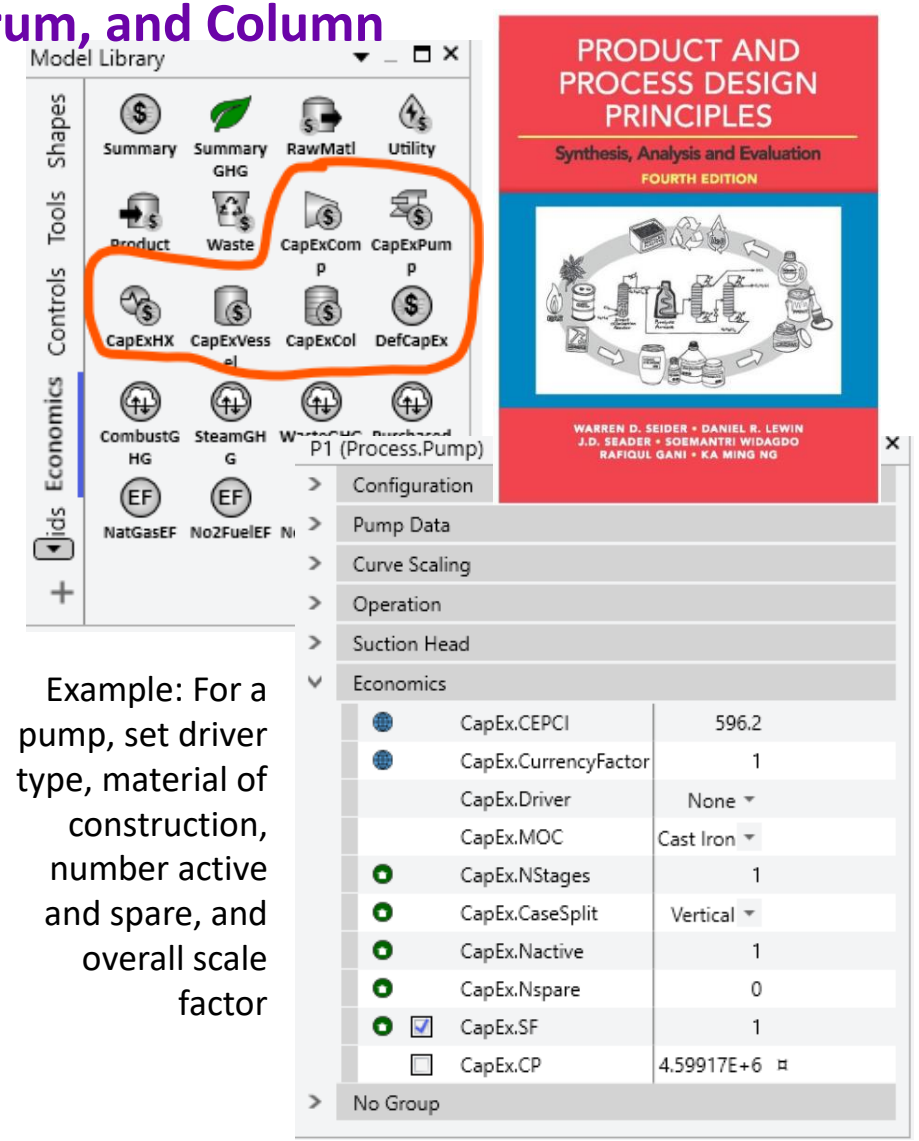
- Determine the relative capital cost of Pumps, Heat Exchangers, Vessels, and Columns with extending models in the Economics Library for process design comparison (Preview)

Solution

- Extend existing models with CapEx submodels using Shift + Drag + Drop or through the right-click menu
- Set Global Chemical Engineering Plant Cost Index (CEPCI)
- Use CurrencyFactor to convert between USD and local currency
- Override cost with known cost to calculate a scale factor
- Piping, installation, citing, etc. Costs are included using Lang Factors
- Default model for other cost approaches

Delivery Plan

- Preview for AVEVA Process Simulation 2022.2



Example: For a pump, set driver type, material of construction, number active and spare, and overall scale factor

Pumps. Corripio, A.B., K.S. Chrien, and L.B. Evans, "Estimate Costs of Centrifugal Pumps and Electric Motors," Chem. Eng., 89, 115-118, February 22, 1982

Compressors. Garrett D.E. "Equipment Cost Estimating. In: Chemical Engineering Economics." Springer, Dordrecht. https://doi.org/10.1007/978-94-011-6544-0_2 (1989)

Heat Exchangers. Armando B. Corripio, Katherine S. Chrien, and Lawrence B. Evans, "Estimate Costs of Heat Exchangers and Storage Tanks via Correlations" , Chem. Eng., January 25, 1982

Vessels. Mulet, A., Corripio, A. B., & Evans, L. B. "Estimate Costs of Pressure-Vessels via Correlations." Chemical Engineering 88(20): 145-152, 1981.

Columns. Mulet, A., A. B. Corripio, and L. B. Evans. 1981. Estimating costs of distillation and absorption towers via correlations. Chemical Engineering (Dec. 28):77-82.

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AVEVA™ Process Simulation 2023 Features

Batch Distillation

Objectives/Background

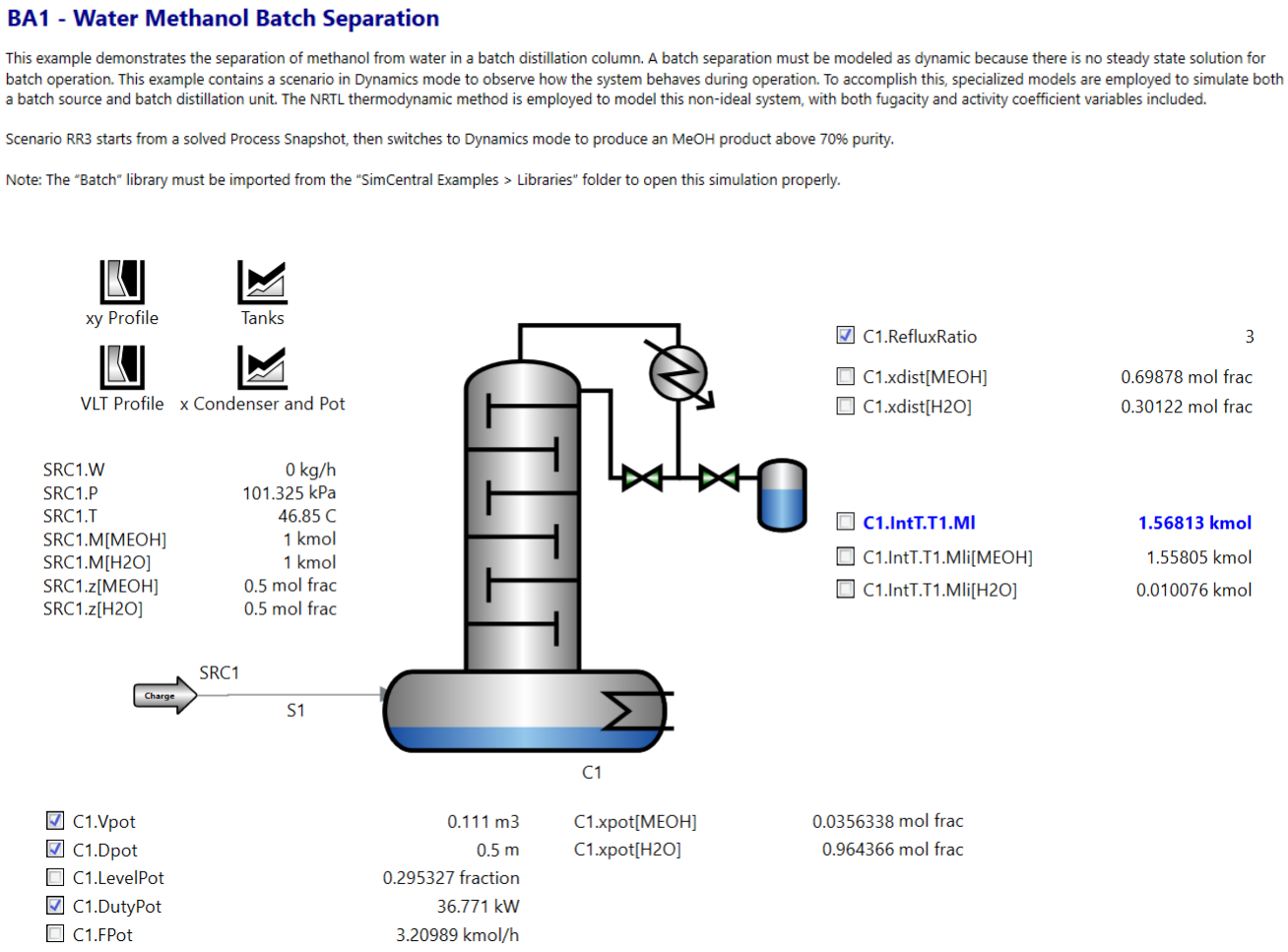
- Use the Process simulation and dynamic simulation to model an inherently dynamic process

Solution

- Example BA-1 is now documented
- Batch includes packing hydraulics
- Batch includes Tray Holdup

Delivery Plan

- AVEVA Process Simulation 2023



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AVEVA™ Process Simulation 2022.1 Features

Write to OSIsoft PI System

Objectives/Background

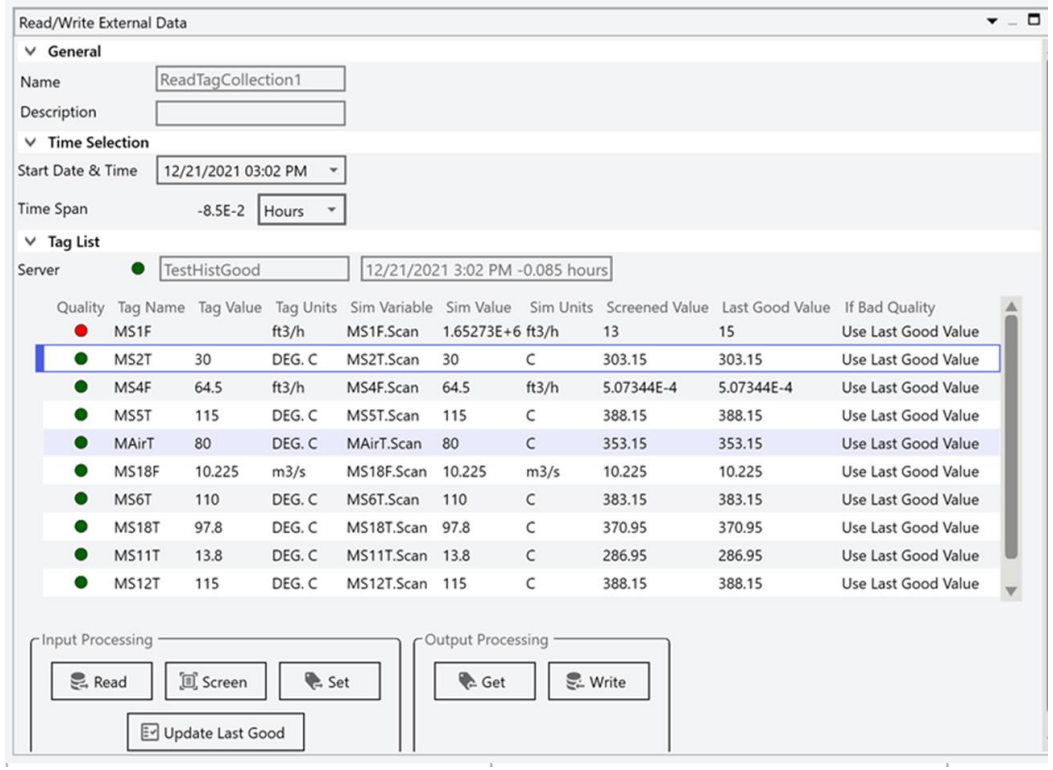
- Read data to perform performance calculations and write back KPIs and KOPs

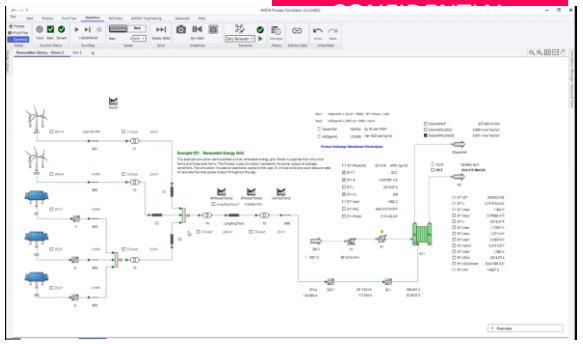
Solution

- *Read* and *Screen* PI data in the EDI Tag List
- *Set* simulation variable values after screening
- *Get* simulation variable values and view in EDI Tag List
- *Write* values to OSI

Delivery Plan

- Beta in Version 2022.1





Set ↑ ↓ Get



Read/Screen ↑ ↓ Write



PI System

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AVEVA™ Process Simulation 2022.2 Features

PI System Asset Framework Tag Search

Objectives/Background

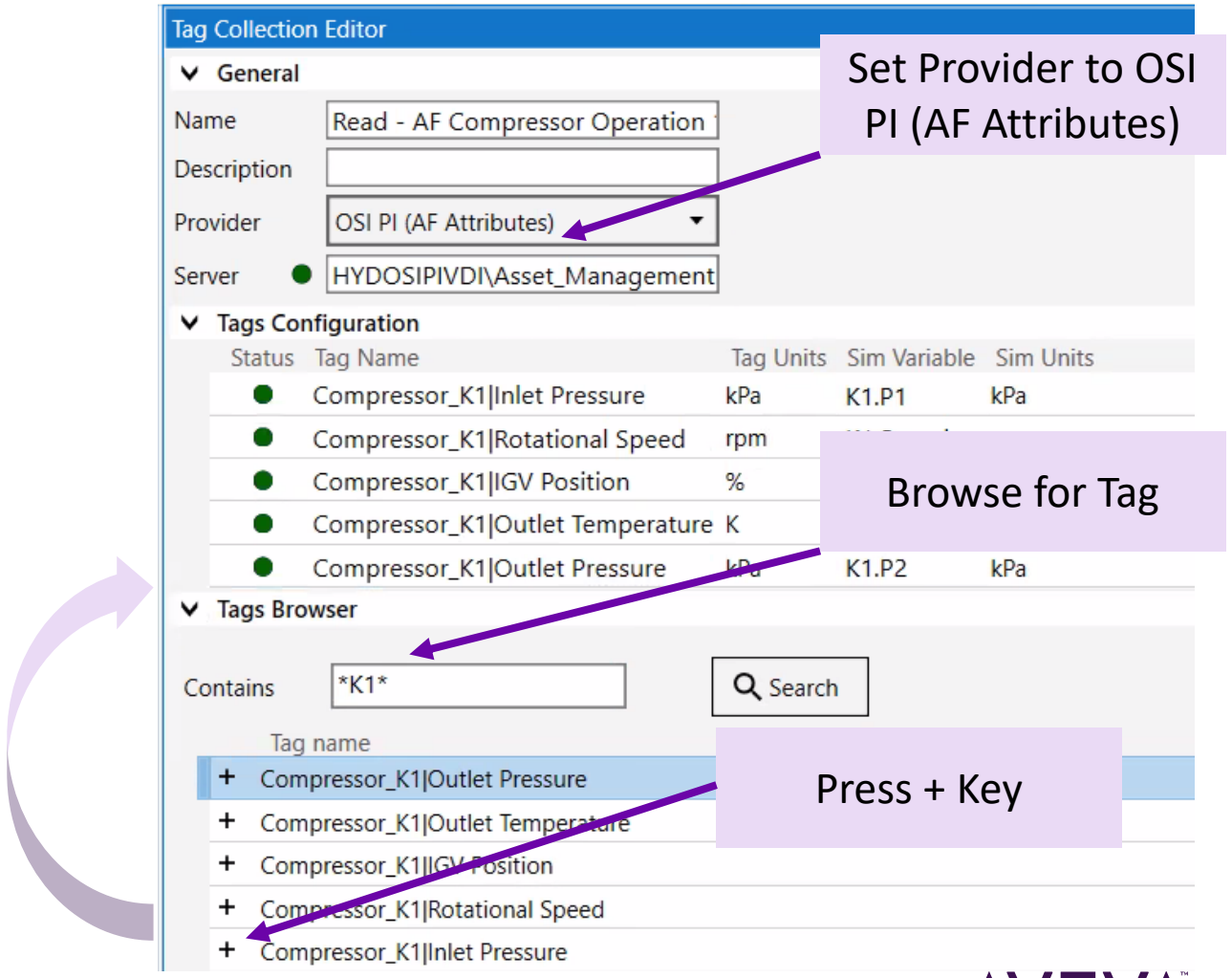
- Search for PI System plant data based on an Asset model template so that you do not have to look up instrument tags on a P&ID.

Solution

- Select Provider is “OSI PI (AF Attributes)”
- Enter characters with wild card to give search results
- Press Plus key to add the attribute to add it to the Tags Configuration
- Ener the corresponding Sim Variable and Sim Units

Delivery Plan

- First Release
- Separate Element Entry later release



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Asset Monitoring Project Delivery

Rotating Equipment Predictive Asset Optimization (PAO)

Objective

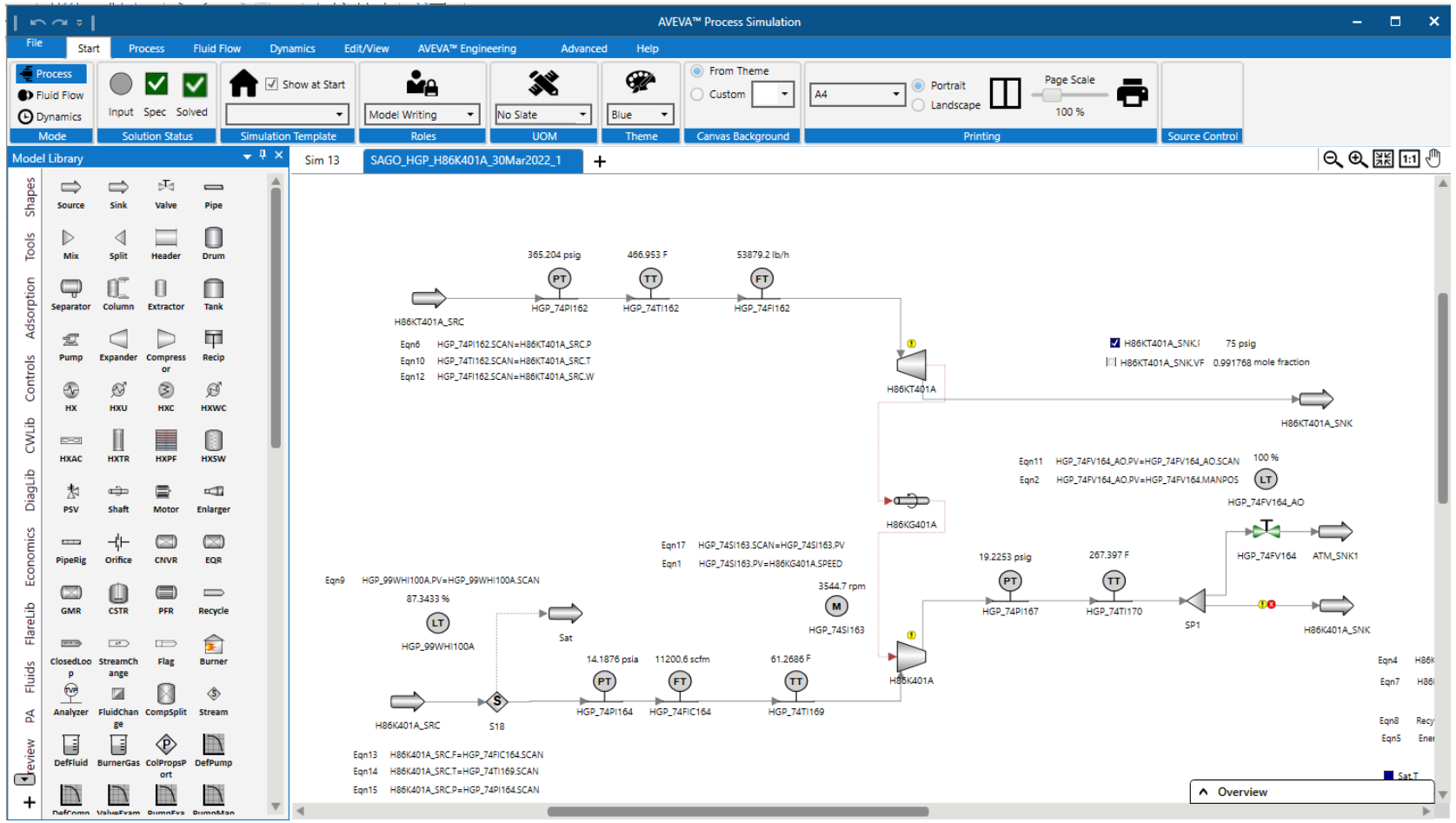
- Predict KPIs for rotating assets
- Visualize KPIs on a dashboard
- Backfill historical data.

Solution

- Process Models
- OSI PI Interface
- Optimizer for data reconciliation
- Real-Time System

Delivery

- Version 2023 (October)
- Project later this year for first 40 assets and later for 1000 assets



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AVEVA™ Process Simulation 2022.3 Features

Real-Time System Web Console

Objectives/Background

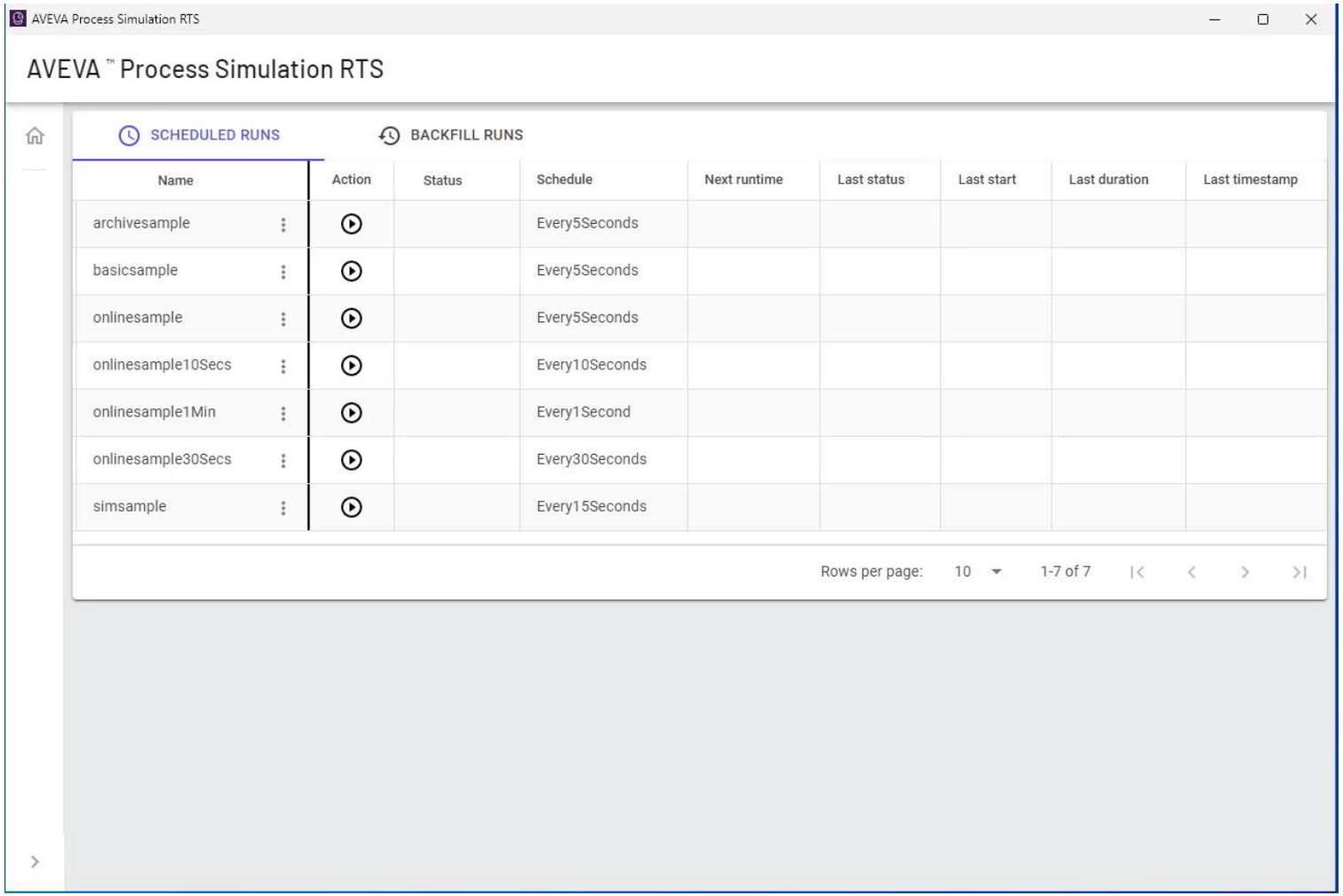
- Use this control panel prototype to stop and start sequence and backfill simulations using a web interface

Solution

- Runs in a web browser
- Shows schedule or backfilling status
- Event notification

Delivery Plan

- Version 2022.3
- In Tools folder under RTSCore



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AVEVA™ PRO/II Simulation

Innovations

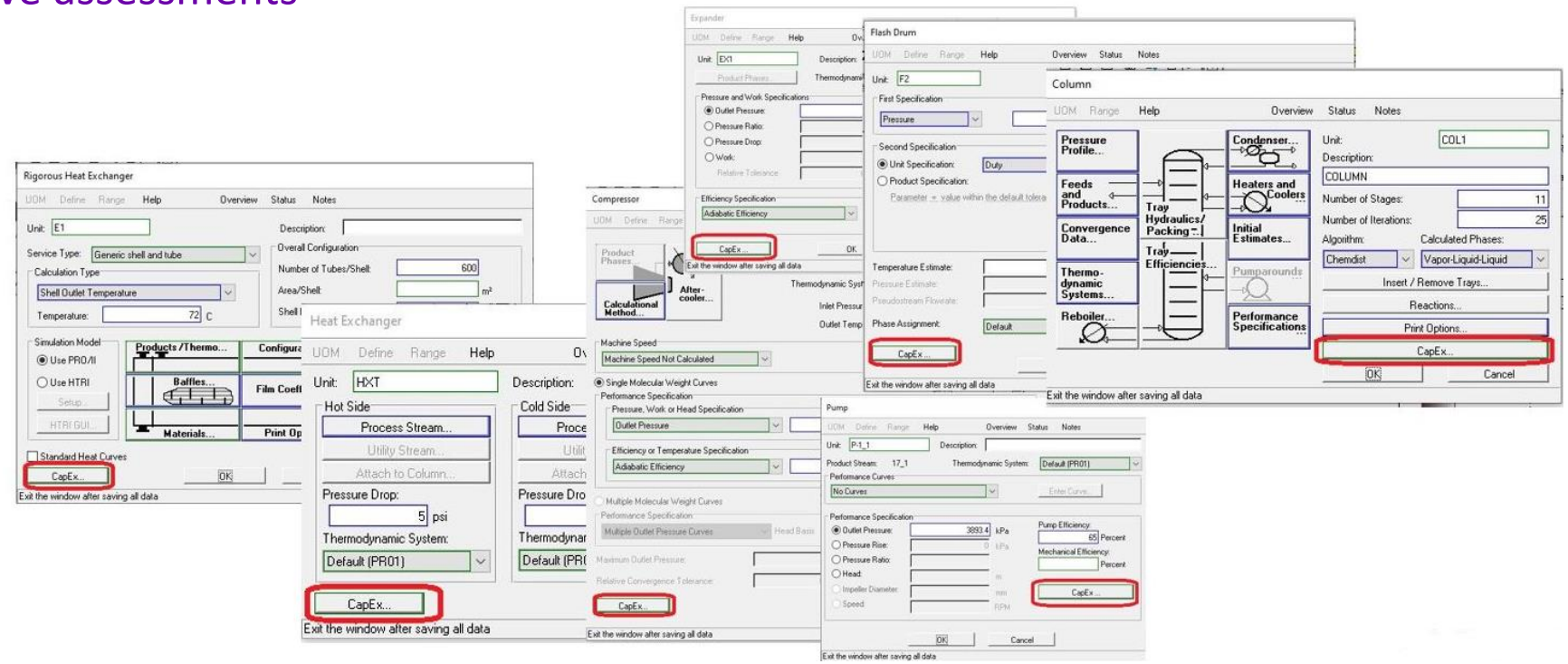
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CapEx Evaluation in Design

Capital cost estimation for selected unit operations
Design configuration comparative assessments

- CapEx functionality in:
  - Pump
  - Compressor
  - Expander
  - Rigorous heat exchanger
  - Simple heat exchanger
  - Flash (vessel)
  - Column



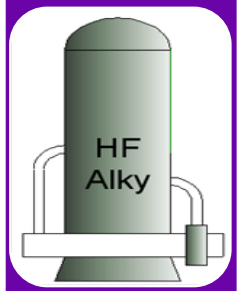
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PRO/II Refinery Reactors

New in Jan 2023 release

Refinery Reactor Model Portfolio



HF Alky

- Can model both UOP and Phillips HF alkylation processes
- Validated and implemented by ExxonMobil in RTO project



SF Alky

- Can model both DuPont Stratco (Effluent refrigeration) and ExxonMobil Auto refrigeration sulfuric acid alkylation processes



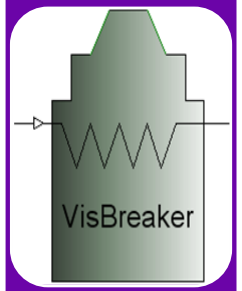
ISOM

- Model light naphtha isomerization processes



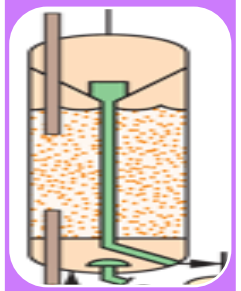
DCU

- Model delayed coker unit including coke drums and fractionator



VOM

- Model visbreaking unit including furnace, fractionator and blending



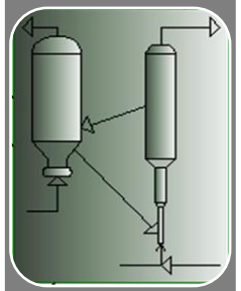
HDP/HCR

- Can model hydrotreating and hydrocracking of any feed type with a single reactor
- Both reactor model and feed



Reformer

- Can model Semi-Regen, Cyclic, or CCR.
- C8 Aromatics splitter and coke model
- Validated by GS Caltex and Thai Oil



FCC

- Can model any FCC unit with up to 20% vacuum bottom resid

Estimated Beta availability June 2023

Released with 2022 (July 2022)

Future

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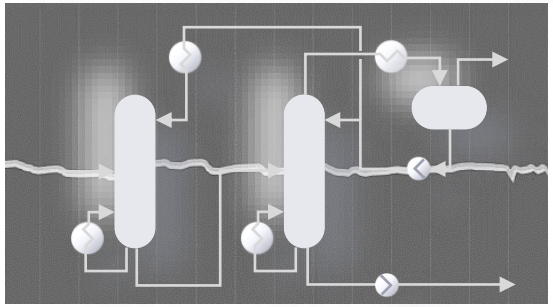
AVEVA™ Dynamic Simulation / OTS / Learning

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Dynamic Simulation and AI

Dynamic Simulation



Artificial Intelligence

Online Advisor

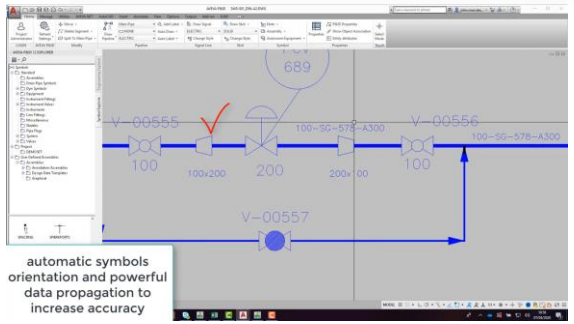


- AVEVA dynamic simulation is used to train AVEVA artificial intelligence agent to identify the optimal trajectory between two operating conditions.
- The AI tries different operations using parallel sessions of the model on the Cloud to identify the one which can be completed in less time, with less alarms and with lower emissions.
- The AI agent is finally used in the plant to advise the panel operator on the same operation.
- This could translate into higher production, safer operations, and low environment impact.
- Examples: Crude feed changeover, plant load change

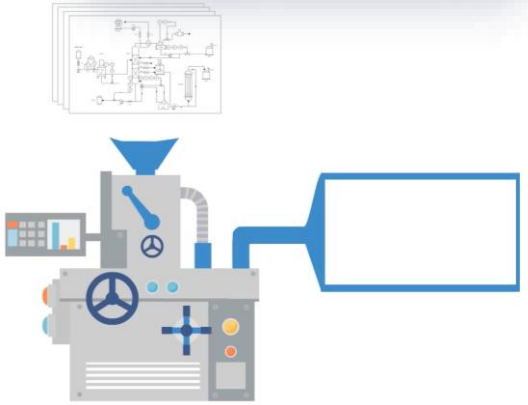
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Convert P&IDs and Engineering Data into Simulation

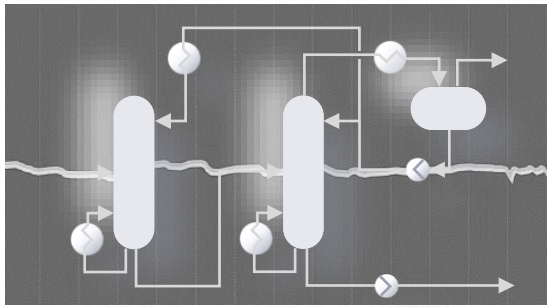
Intelligent P&IDs



Model Generator



Dynamic Simulation



- Convert intelligent P&ID's (as SVG or DEXPI format) into an equivalent dynamic simulation
- The tool also can import data from AVEVA Engineering database
- This can save up considerable time when developing a dynamic simulation
- This ensures the correct transfer of design data

This is an INTERNAL tool used in selected projects

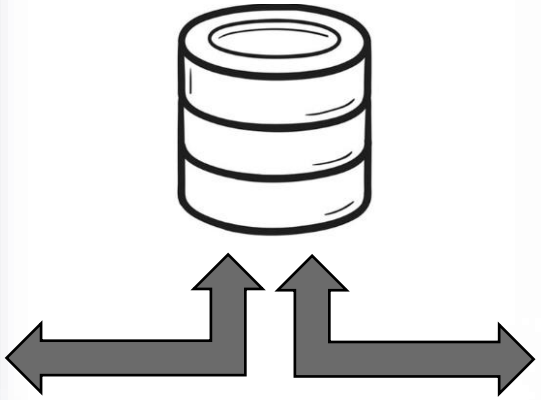
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AVEVA Plant Data Link

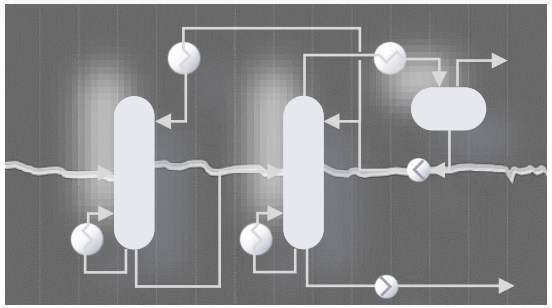
Plant



Plant Historian



Dynamic Simulation



- Plant Data Link enable read/write access to the plant operating data database.
- The initial version is compatible with AVEVA PI. In the future we will enable other plant historians.
- This allows the simulation to access and use historical or real time data
- Some examples:
  - Use the simulation as soft sensor for the plant
  - Use the simulation for look-ahead (we are developing the function to write to future tags in PI)
  - Recreate conditions which happened in the plant for offline troubleshooting
  - Compare simulation results with plant data

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ABOUT AVEVA

AVEVA is a global leader in engineering and industrial software driving digital transformation across the entire asset and operational life cycle of capital-intensive industries.

The company's engineering, planning and operations, asset performance, and monitoring and control solutions deliver proven results to over 16,000 customers across the globe. Its customers are supported by the largest industrial software ecosystem, including 4,200 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 4,400 employees at 80 locations in over 40 countries.

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