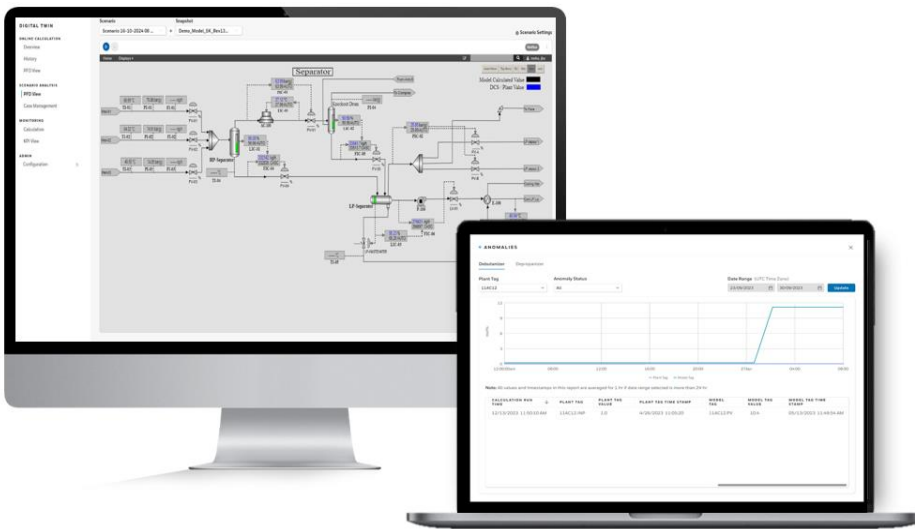# Honeywell

HONEYWELL
PROCESS DIGITAL TWIN

Honeywell Process Digital Twin (HPDT) is an easy-to-use, powerful computation and visualization software that provides operations teams with a replica of the current plant operations for monitoring process performance, predicting properties by soft sensing, conducting scenario analysis and troubleshooting in a virtual environment without any disruption to the process. Using the intuitive interface and calculation tools, customizable dashboards and customizable reports in HPDT, cross-functional teams of all experience levels can quickly access the near real-time information needed to better understand the true operating state and behavior of their process units, uncover suboptimal or potential high risk operational conditions, and/or determine the operating adjustments needed to safely and optimally bring operations to the desired state. Powered by a real time data connection to the first principles-based models and AI and ML capabilities to fine tune models, HPDT provides engineers with a near real-time snapshot of the past, current, or future state of their operations to make faster, more informed decisions that drive profitability and sustainability.

CHALLENGES

Cyclical market dynamics, integrated supply chain disruptions, feedstock quality variability, increasing regulatory requirements, and shifting workforce dynamics are requiring companies to constantly adapt to change. With an increase in the rate of operational changes, production teams need to make optimal planning decisions and operational adjustments even faster. Operations teams can no longer operate in silos and rely on traditional planning and optimization tools and practices to get the job done. These tools are often difficult to maintain, require experienced personnel or extensive training to use, and/or access to these tools are often limited to a few users. At the same time many of the real-time optimization tools and process models engineers rely upon today do not offer fast, accurate, or up-to-date information needed to make decisions.

THE SOLUTION

Honeywell Process Digital Twin (HPDT) is a software solution that process engineers, planning teams, and operations teams often utilize to monitor, troubleshoot, and optimize unit operations. HPDT ingests, cleanses, calculates, contextualizes and visualizes near-real time process data in a customizable, graphical interface. The operational data is fed into the same first principles-based models that are used to design the plant. The model outputs are organized into dashboards, Process Flow Diagrams (PFD), scenario analysis tools, and reports to help engineers:

- Seamlessly monitor unit performance in near real-time
- Close online measurement gaps in the field with soft sensing
- Quickly troubleshoot and perform root-cause analysis with anomaly detection
- Understand the impact to operating parameters by conducting scenario analysis
- Close the loop by integrating with advanced process control (APC) systems*

future roadmap

Steady State and Dynamic Process Digital Twin: Systematically tuned digital replica of physical plant based on actual operating conditions.

Data Preprocessing & Reconciliation Routines: Pre-defined calculations to improve data quality and accuracy of Process Digital Twin.

Real-time Performance Management: Enables informed decision making by providing near real-time KPIs, soft sensor calculations for key property prediction in near real-time, model and calculation monitoring rolled up into intuitive, customizable dashboards and trend charts for unit performance monitoring and asset management.
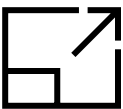
Scenario Analysis (What-if): Powerful what-if analysis tool to understand the impact of changes in a safe virtual replica of physical plant with ability to go back in time and run simulations faster than real time and playback scenarios. Scenario analysis can now be conducted in the PFD view tab allowing users to quickly visualize the cause and effect of changing operating parameters.

Customizable Anomaly Calculations: Ability to add, edit or remove default anomaly calculations to fit the needs of operations analysis.

Browser-based Access, Customizable Graphics & Reporting: Role-based access and flexible UI facilitate broader utilization by cross functions at all experience levels.

Extensible Capability for Bring your Machine Learning: For on-premises deployments, externally trained ML models in python scripts can be utilized to predict properties independently or in conduction with first principles models.

AI/ ML For Improved Model Accuracy and Faster Execution: Leverage AI and ML models for auto correction of the process digital twins to current operating conditions and automated generation of reduced order models for faster execution. * *future roadmap*

Updates to LP and APC/PWO models:
Improve consistency across planning, operation, and optimization functions. *future roadmap*

Flexible Deployment: Process Digital Twin can be deployed on the cloud as a SaaS offering or on on-premises.

USE CASES

Honeywell Process Digital Twin is often utilized in Upstream Oil & Gas, Gas Processing, Refining and Petrochemical, Chemical, Renewable Fuels, and Metals and Mining operations. Some example use cases:

Near-Real Time Performance monitoring

- CCR Platforming and other process units: Yield monitoring against theoretical yields, performance gap evaluations, Pinning margin prediction, tube wall temperature monitoring for heaters, compressor performance monitoring including molecular weight based on changing feed
- Shell and tube heat exchanger fouling rate monitoring
- Packinox exchangers dynamic lift monitoring and optimization.
- Column performance including flooding predictions and monitoring
- Continuous mass balance reconciliation and gross error detection including data quality metrics * *future roadmap*

Optimization Scenario Analysis (What-if)

- CCR Platforming: unit yield and throughput improvement by optimizing individual reactor inlet temperatures, H2/HC ratio and reactor pressure.
- Crude unit: Naphtha minimization/Diesel maximization for constantly varying crude blends.
- Naphtha and Aromatic complexes: Maximization of aromatic precursors in reformate for aromatics production put improvement through optimizing individual reactor inlet temperatures, H2/HC ratio and reactor pressure.
- Naphtha and Aromatic Complexes: Maximization of aromatic precursors in reformate for aromatics production
- Reducing the impact of processing slurry feed on crude distillation units

Soft Sensing for Property Prediction

- Polymer Units: Molecular Weight Distributions, Melt Flow Index, % Insoluble Prediction, Wide Spec Production Minimization during Grade Transitions
- Gas Processing Plants: Dew Point Prediction for Mixed Gas Streams
- LNG Plants: Mixed Refrigerant (MR) Composition prediction (including optimization) with changing feeds, dew point, and freeze point predictions

BENEFITS

Improve Efficiency

- Data-driven decisions via powerful and fast what-if scenario analysis

- Real-time prediction of key properties via soft sensing capabilities

- Set operational targets based on actual plant capabilities

- Align LP and APC to plant capabilities and constraints*

- Empower cross-functional twins to make informed decisions*

future roadmap

Improve Margins

- Improve yields of desired products

- Operate closer to actual constraints

- Optimize maintenance spend and reduce unplanned shutdowns

- Process varying feedstocks with minimal disruption or impact to process

- Reduce utility usage

Reduce Operational Risk

- Gain insights on process and key equipment constraints

- Enable predictive maintenance through anomaly detection of performance degradation

- Perform faster root-cause analysis for troubleshooting

WHY HONEYWELL?

Building upon a longstanding process design and simulation heritage combined with leveraging a world-class process simulation software Honeywell UniSim Design, HPDT is designed with the data pre-processing capabilities, intuitive, flexible user interface, Honeywell UOP process modeling know-how, and out-of-the-box connectors for OT applications combined with AI and ML to unlock more value out of simulation and plant data by democratizing the use of online simulation across all functions and skill levels.

For more information

To learn more about Honeywell Process Digital Twin, visit our website or contact your Honeywell Account Manager.

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