

Aspen Unified™





Overview

Aspen Unified is the next-generation planning, scheduling, yield accounting and movements solution from AspenTech, the world's leading provider of planning and scheduling solutions. **Aspen Unified enables companies to increase margins and save time** by automating routine work and optimizing business processes for better efficiency across the value chain.

Planning, scheduling, yield accounting, inventory movements and dynamic optimization are supported in one consistent web-based environment with an intuitive look and feel, flowsheet environment, common models, data components and powerful integration. This reduces the gap created by inefficiencies in implementing optimal plans for operations. Adaptive technologies such as advanced process control (Aspen DMC3™) and dynamic optimization (Aspen GDOT™) pass changing model parameters and constraint information back to Unified planning and scheduling.

This feedback, along with predictive maintenance from Aspen Mtell® and AI/first principles Hybrid Models in Aspen HYSYS®, further enable moving operations closer to the optimal plan.

Benefits of Aspen Unified

Increase margins significantly

- Align plan, schedule and execution
- Enable agile and robust decision-making
- Prevent errors by sharing data
- Enable more profitable integration between refining and chemicals units
- Allow companies without scheduling models to adopt scheduling easily by leveraging existing planning models

Reduce emissions

- Model CO₂ and other GHG emissions plus emissions trading/taxation schemes
- Set limits on CO₂ to ensure compliance with sustainability targets
- Understand effects of feedstock and operational changes on sustainability metrics
- Model bio feedstocks and track certification of bio products
- Accurately report emissions for audit and compliance purposes

Save up to 1,000 staff-hours per year

- Save up to 200 staff-hours per year by reducing time and effort on model maintenance and management with new and improved workflows
- Save up to 1,000 staff-hours per year per scheduler by automating first-pass feasible schedule creation with Aspen Unified Scheduling – Crude Schedule Optimization (AUS CSO)
- Train new users much faster

Reduce total cost of ownership up to 75%

- Deploy on a server or in a public or private cloud: typically 25-50% less expensive than powerful desktop computers
- Lower hardware costs with a device- and platform-agnostic solution
- Save IT cost on software upgrades using a centralized cloud or server installation

“Our adoption of Unified PIMS increased gross operating margin by 1%.”

– *Planning Expert, North American Olefins Producer*

“Unified enables our successful 2030 energy transition strategy.”

– *Dietmar Steinschorn, Advisor LP Tools, OMV*

“Our use of Aspen Unified Scheduling – Crude Schedule Optimization is expected to greatly improve our schedulers work-life balance.”

– *Scheduling Manager, Large US Integrated Refiner*

“Our Unified servers cost 24% less than our PIMS-AO and APS servers.”

– *Sergio Vazquez, Global Margin Optimization Advisor*



CHALLENGE

SOLUTION

Siloed systems are difficult to maintain and can result in lost opportunities.

Miscommunication between different groups in the plant, such as planners, schedulers and operators, can lead to errors resulting in margin leakage.

Aspen Unified simplifies these problems by combining models and data into one source.

- Production planning and scheduling can use the same master data (e.g., streams, components, etc.), submodels (e.g., yields) and assay data.
- Companies without scheduling models can more easily adopt them using their Aspen Unified PIMS™ models, enabling higher margins, more stable operations and agile responses to unplanned events.
- Synchronize operational constraints from APC/Aspen GDOT with planning and scheduling in real time to ensure that models reflect actual plant conditions.
- Easily collaborate in a web-based environment.

As plant operations and conditions change over time, models need to be updated to stay accurate.

- Ensure higher accuracy with Hybrid Models that combine first principles with AI.
- Leverage validated and reconciled data to make better planning and scheduling decisions.

Users want an easy-to-use, intuitive interface and workflows.

With the prevalence of digital technology, users expect software to be easy to use and understand, with minimal training to be effective.

Aspen Unified combines an intuitive user interface, modern web-based architecture and data visualization tools for faster, more powerful analysis.

- Faster to learn and train new users—expected savings of at least two staff-weeks per new user trained.
- Manage cases more intuitively with drag and drop, parent-child cases, copy/paste and automated case set creation.
- Scheduling case management and comparison streamline analysis.
- Better understand results through flowsheet and data visualization.

CHALLENGE

Technological advances are not used to full potential, including **artificial intelligence** and cloud computing.

SOLUTION

Aspen Unified uses the latest hardware to deliver unmatched speed and allows you to keep working while the model solves. Running hundreds or thousands of cases is now possible in minutes rather than hours. Users can keep working while cases run, enabling faster interaction with results and better data analysis.

- **AVA™, the Industrial AI platform in Unified PIMS**, guides planners in interpreting results and making better business decisions.
- **Aspen Hybrid Models™** utilize Industrial AI to improve model accuracy and increase margins especially for reactor yields.



Increase Profits and Reduce Carbon Emissions through Integration

Technology: Aspen Unified

Key Capabilities

- AspenTech's proprietary solver for complex refinery and chemical process problems is consistently proven more robust and reliable than any other commercially available solver (such as FICO XSLP)¹.
- AVA, the AI-powered advisor, provides guidance in core workflows.
- Continuity for legacy solutions ensured through automated and streamlined migration tools.
- Simplified user interface enables new users to learn the tools faster than ever.
- Multi-user enterprise environment improves security and change tracking of business-critical, economic decision-making data.
- Dynamic reports, which automatically update with new results, are shareable with others via a quick URL link.
- Integrated platform provides common data (e.g. materials, properties) and model library to streamline model updates and prevents costly errors.
- Cloud deployment options: on-premises, virtual private cloud, or hybrid.

Key Benefits

- Enable better business results.
- Analyze more scenarios with speeds up to 100 times faster and cloud-enabled parallel processing.
- Predict and optimize the tradeoff between emissions and profits.
- Save money and time with easy software deployment and upgrades, a centralized infrastructure and automated model migration.
- Train new users up to two times faster.

¹ AspenTech regularly evaluates the best commercial and academic non-linear solvers to see how they compare to the AspenTech proprietary non-linear solver.

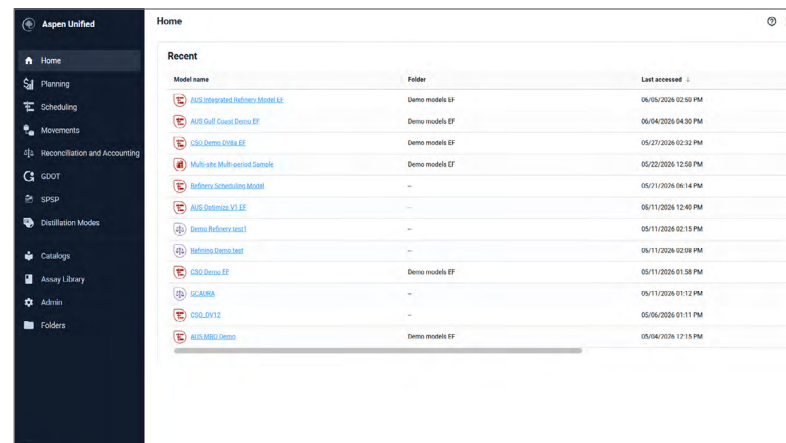
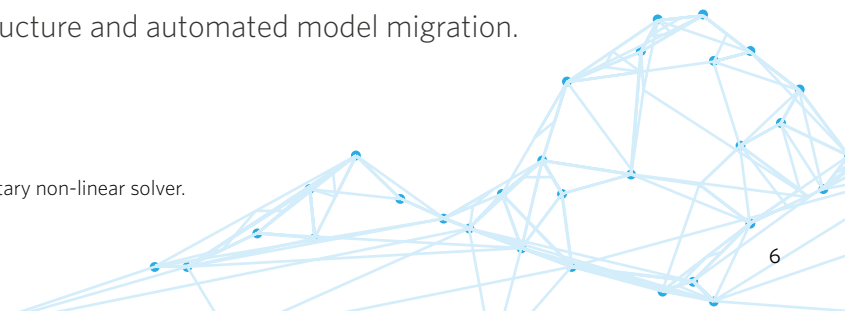


Figure 1. Aspen Unified home page, with apps and recent models.



Production Planning

Technology: Aspen Unified PIMS (AUP)

Key Capabilities

- AVA, the AI-powered advisor, leverages Industrial AI on multisite and single site models to provide better understanding of the plan by guiding common work processes and providing deeper insights.
- Flowsheet interface to build, edit, visualize and understand your planning models and results.
- Automatic pricing and sensitivity analysis tools.
- Streamlined model management workflow including check in/out, live sharing and change tracking.
- Easy plug-and-play integration with business intelligence tools such as Microsoft Power BI.
- Automatic import and conversion of existing PIMS-AO models to AUP.
- Automated data imports from third-party sources via flexible web APIs.
- Advanced users have access to mathematical details of the matrix if required.
- Diagnostics enable fast and guided troubleshooting of rare infeasibilities.
- Aspen Hybrid Models utilize Industrial AI to improve model accuracy, especially for nonlinear processes like reactor yields.

Key Benefits

- Enable better business decisions with the proprietary AspenTech solver.
- Increase margins significantly².
- Save time each day with automation tools.
- Solve up to 100 times faster with cloud-enabled parallel processing.

²Contact AspenTech for a benefits estimate

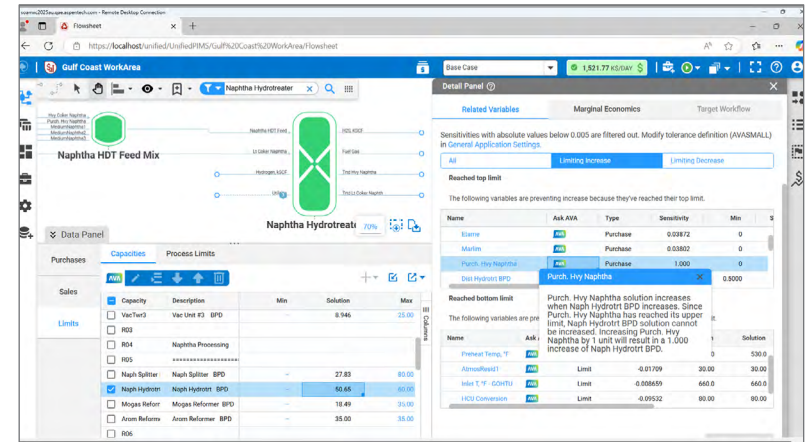


Figure 2. AVA within Aspen Unified PIMS, showing increase in naphtha hydrotreater rate.

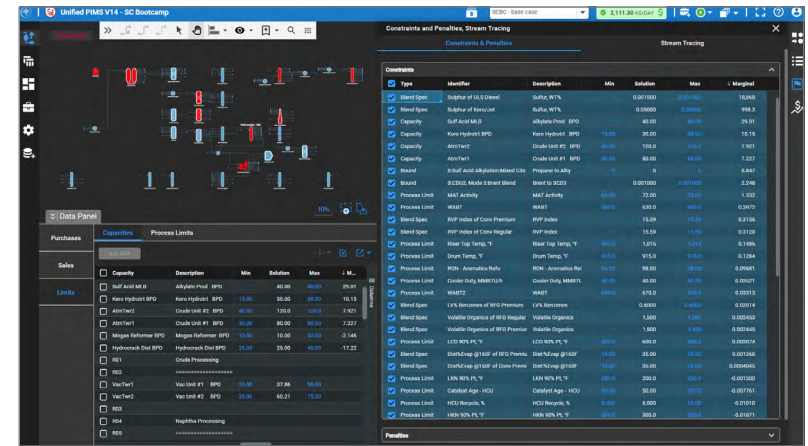


Figure 3. Flowsheet with constraints panel in dark mode.

Production Scheduling

Technology: Aspen Unified Scheduling (AUS)

Key Capabilities

- Full refinery and olefins scheduling, including chemically integrated refineries.
- Integration across Unified allows import of the plan from Aspen Unified PIMS to enable higher margins in scheduling and execution workflows.
- Enable collaboration across teams with true multi-user scheduling.
- Improved Gantt chart including revolutionary case management for easily comparing scenarios.
- Improved flowsheet enabling building, editing and visualizing the model.
- Comparison of plan vs. schedule vs. actual trends.
- Automate the reconciliation of yesterday's schedule with plant data.
- Automate other tasks with provided logic and custom scripts.
- Directly compare two options (cases) in the schedule.
- Automated crude schedule generation and multi-blend optimization — both as layered products requiring AUS and a separate license.

Key Benefits

- Increase margins up to 3%.
- Increase productivity significantly.
- Enable more stable refinery operations by reducing changes.

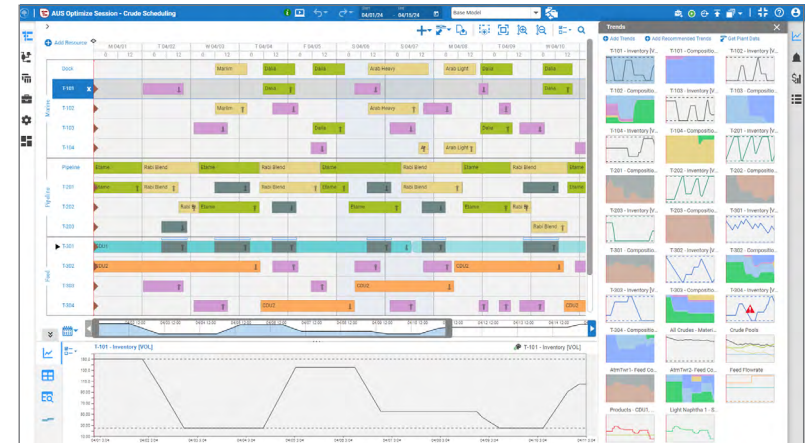


Figure 4. Aspen Unified Scheduling Gantt chart home screen with stock chart panel. The above Gantt chart shows blending and shipping events scheduled over a 10-day period. The bottom chart details the corresponding inventory levels for the same scheduling period.

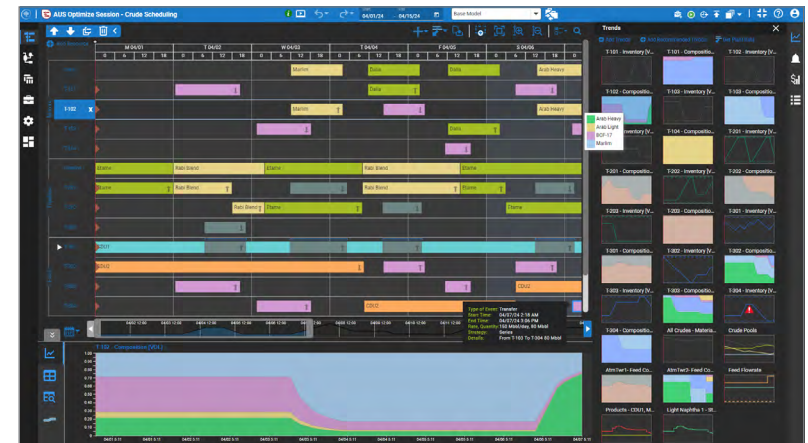


Figure 5. Aspen Unified Scheduling crude composition chart in dark mode.

Production Scheduling Optimization

Technology: Crude Schedule Optimization (CSO)

Key Capabilities

- Replaces manual, spreadsheet-based scheduling, reconciliation and crude blending workflows with constraint-driven economic optimization.
- Generates crude schedule by optimizing receipts, storage and crude distillation unit (CDU) operations using crude and product information from the optimal planning solution.
- Balances crude quality, pricing, crude blending limits and unit capacities.
- Instead of manually evaluating multiple scenarios, CSO generates an optimized 30-day crude schedule within minutes.

Key Benefits

- Improve refinery margins through optimized crude allocation.
- Reduce scheduler manual workload enabling faster response to market volatility.
- CSO uses the most economically advantageous crude slate, allocating crude receipts optimally across available tanks and processing units using all pertinent information from the optimal plan.
- Improved operational stability over short and medium time horizons.
- Reduces last-minute changes and provides a smoother execution plan for operations teams.

Note: Requires AUS. Layered application accessible from within AUS.

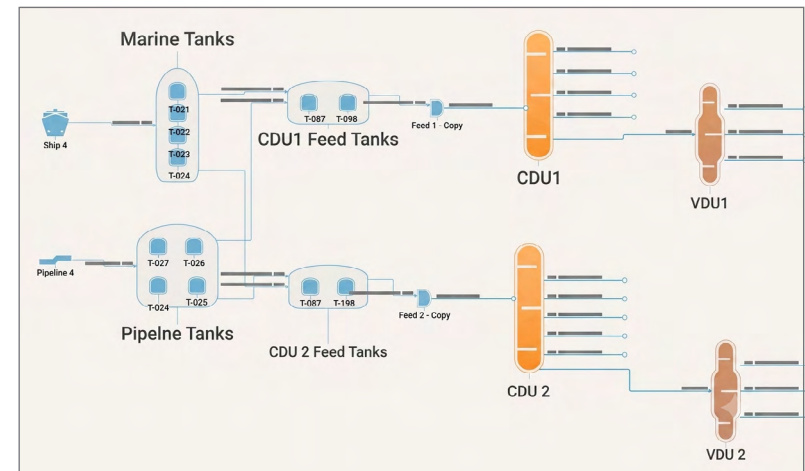


Figure 6. Example layout of crude distillation units in the AUS flowsheet.

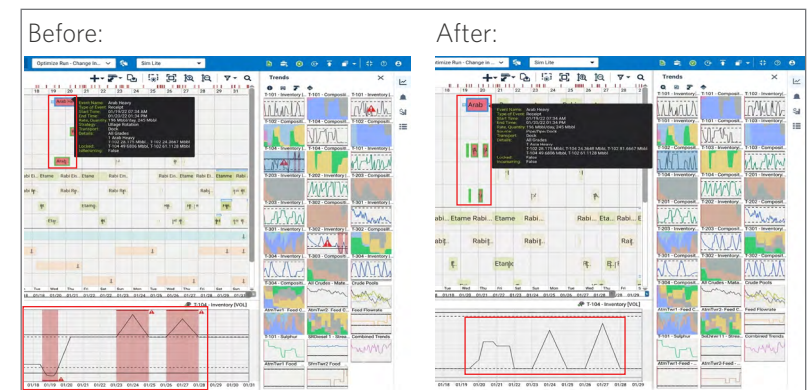


Figure 7. Crude Schedule Optimization Gantt chart and stock charts showing "before and after". After a crude marine receipt delay, note the first image shows highlighted red inventory violations. After running CSO, the second image shows the same delay with automatic changes to the green transfer events in the center of the image.

Production Scheduling Optimization

Technology: Multi-Blend Optimization (MBO)

Key Capabilities

- Generates optimal recipes and blend schedule to meet product demand and specifications.
- Improves multi-period and multi-blend optimization by considering and optimizing all blending events over the horizon, typically 7-30 days.
- Considers and optimizes quality correlations within set constraints for all relevant events such as blends, shipments, receipts, and transfers.
- Allows custom specifications based on geography and regulations.
- Supports tank-to-tank blending.

Key Benefits

- Reduces blend quality giveaway.
- Decreases demurrage, inventory holding costs and component stockouts by making the right blends on the first attempt.
- Increases collaboration with planners and schedulers through native integration with AUP and AUS.
- Improves visibility of current and predicted tank volumes and properties.

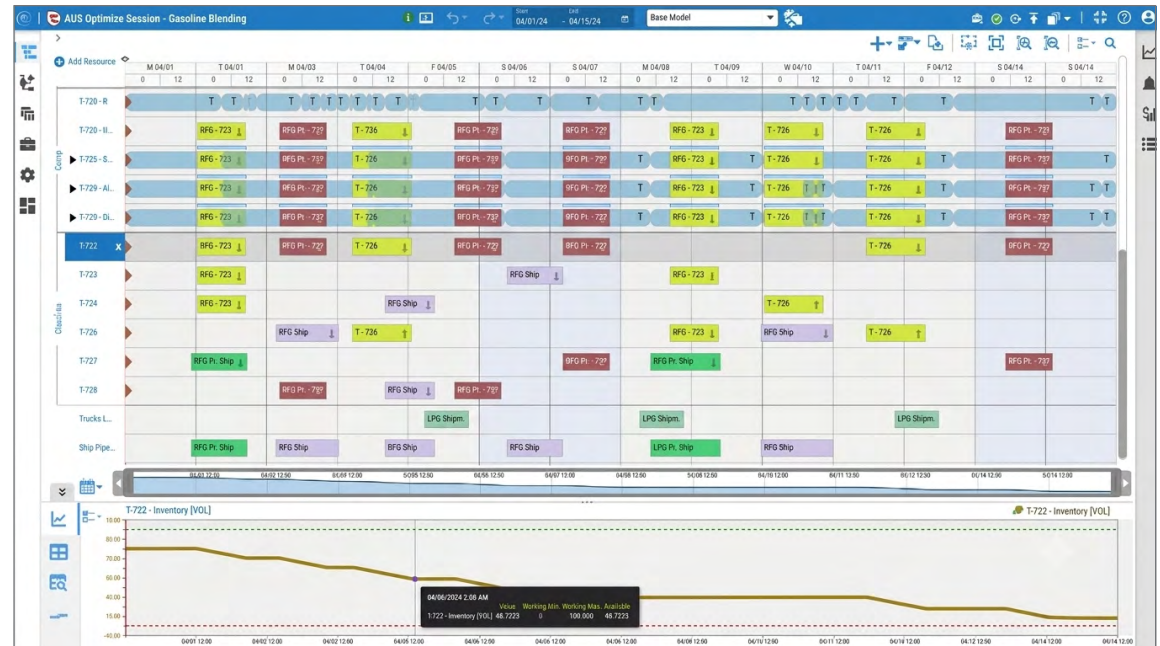


Figure 8. Gasoline Blending Gantt chart and stock chart in AUS MBO.

Note: Requires AUS. Layered application accessible from within AUS.

Value Chain Optimization

Technology: Aspen Unified Multisite for PIMS™ available in AUP

Key Capabilities

- Optimize supply, production, demand, sourcing and transportation across multiple refineries and terminals (depots) in a region.
- Integrated workflow with single-site planning in AUP.
- AVA, the AI-powered advisor, enables better understanding of the plan for multisite models by guiding common work processes and providing deeper insights.
- Integrate Petroleum Supply Chain Planner (PSCP) distribution models with Aspen Unified PIMS/Aspen Unified Multisite for PIMS.
- Visualize planning results using maps, graphs and tables.
- Easily link and send data such as constraints or inventories from individual models to the global model.
- Evaluate business opportunities such as entering new geographic markets, creating new products, using new terminals and more.

Key Benefits

- Increase margin by selecting optimal production locations and feedstock sourcing—gain \$0.10-\$0.50 per barrel or up to \$50M per year.
- Reduce supply cost by optimizing freight and inventory usage.
- Reduce cost of rush shipments and demurrage from better planning.
- View the entire value chain to reduce disruptions from unplanned events, like hurricanes or typhoons.

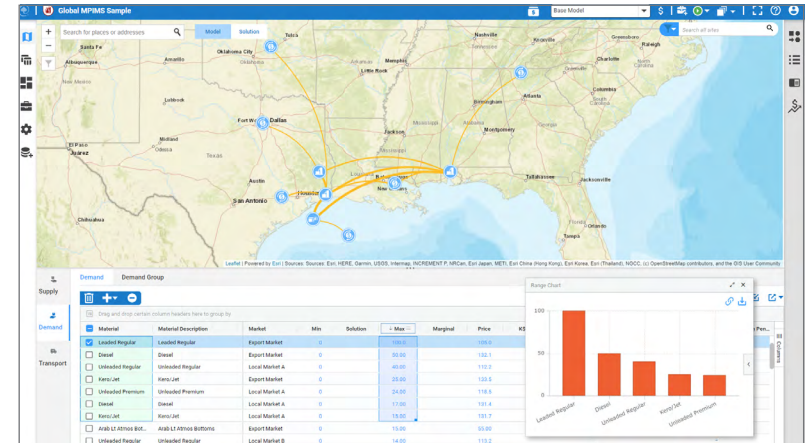
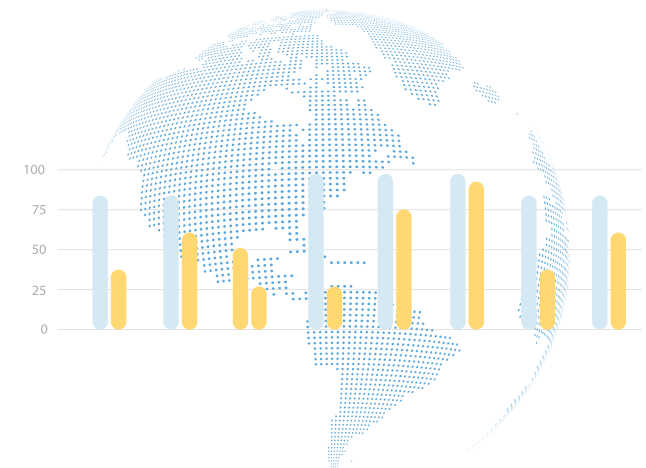


Figure 9. Aspen Unified Multisite for PIMS map and graphing



Production Accounting

Technology: Aspen Unified Reconciliation and Accounting™ (AURA)

Key Capabilities

- Complete tasks more easily with intuitive workflows, close the balance faster with the cutting-edge Smart Solver and easily interpret results with advanced visualization and powerful dynamic reports.
- Simultaneous mass and volume balance automatically resolves lab-measured density errors to increase reconciliation accuracy while lowering sampling costs.
- Automate CO₂ emissions data collection and aggregation from multiple sources for compliance and reporting.
- Web-based model configuration through flowsheet interface.
- Integrate plan and schedule data to highlight Plan vs Actual in AURA.
- Flow composition tracking reports offers visibility into stream and composition across a user-defined range of cases.
- Tight integration with Aspen Unified Movements enables direct tank data import. This capability streamlines material balance workflows and ensures more accurate and reliable tank data for reconciliation.
- Diagnostics enable review of reconciliation issues in a clear and structured view.
- Streamlined migration from legacy tools such as Aspen Operations Reconciliation and Accounting (AORA).

Key Benefits

- Reduce material losses and increase margins with fast, efficient mass and volume balance.
- Empower key stakeholders to make better decisions based on validated and reconciled production data.
- Save deployment time and effort during model implementation and maintenance with a library of standard objects and calculations, and the streamlined AORA-to-AURA migration tool.

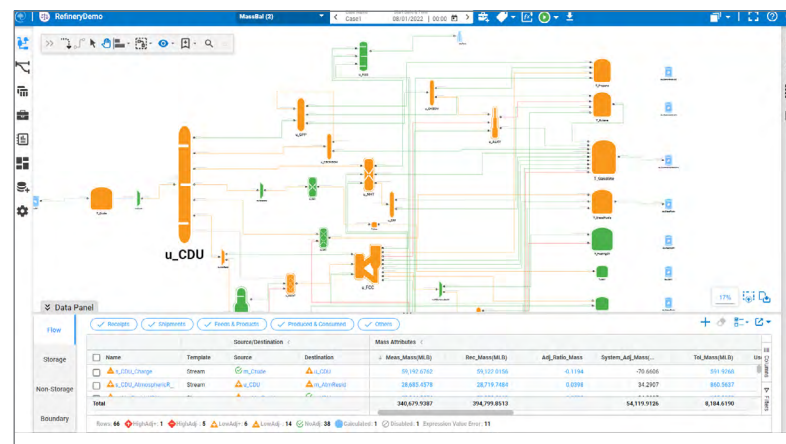


Figure 10. Flowsheet model view.

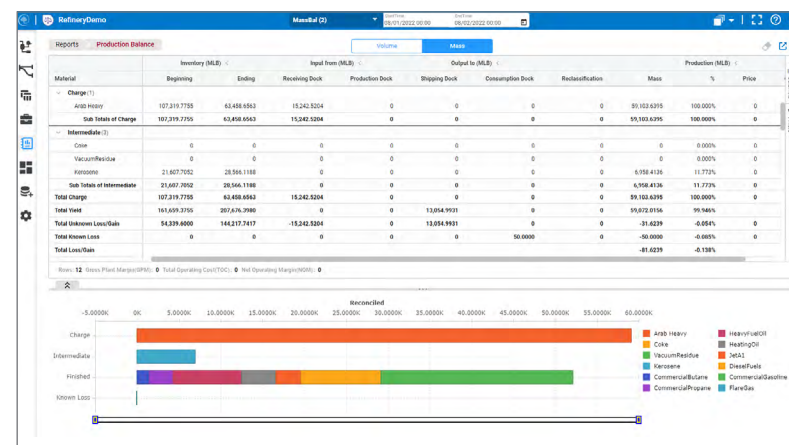


Figure 11. Dynamic reports include minimal configuration.

Tank & Movements Operations

Technology: Aspen Unified Movements™ (AUM)

Key Capabilities

- Monitoring Agent performs near-real-time calculations to capture tank levels and movement cutoffs, identifying discrepancies early for accurate material balance monitoring, tracking and reporting.
- Visualize data with powerful tools, allowing users to modify and track manual overrides, troubleshoot with live data trends, view color-coded operations Gantt charts and access out-of-the-box reports.
- Reduce maintenance and IT resources with a unified server for AUM, AURA and AUP, enabling seamless connectivity to multiple databases and process historians.
- Reuse AURA model objects, calculations and configurations to create AUM models.
- Order Management aggregates data from multiple associated movements and displays real-time calculations updated during each monitoring cycle. Users can plan, monitor and manage multi-movement operations with better visibility and clearer execution context.

Key Benefits

- Reduce margin loss from product giveaway/downgrades and stock loss by \$0.10-0.15/barrel.
- Achieve faster time to value and low total cost of ownership.
- Single version of truth: complete view of past, present and future movements.
- Streamlined data flows from Scheduling-Operations-Accounting reduces manual effort and enhances decision-making.

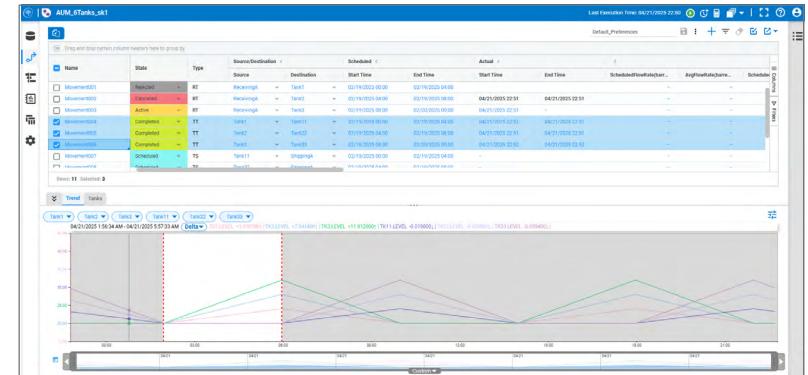


Figure 12. Movements & live data historian Trends.

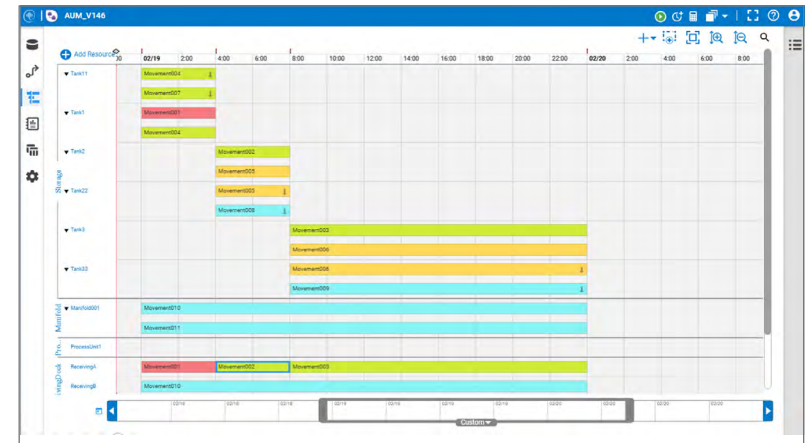


Figure 13. Gantt view of operation activities.



About Aspen Technology

Aspen Technology, now part of Emerson, is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in asset-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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