



DATASHEET

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# AVEVA™ Offsites Management

Inventory, movement and blend management for refinery offsites and terminal operations

AVEVA Offsites Management provides accurate, reliable and accessible inventory and movement information, movement automation and off-line/on-line multi-blend optimization which helps to lower product cost, reduce giveaway and increase operational and business performance.



## Summary

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Consistent and accurate refinery inventory information is important for optimal planning, scheduling, and material loss management. From smart instrumentation to off-sites inventory management and blend optimization solutions, AVEVA offers a wide range of proven technologies and services to optimize tank farm and terminal operations.

### Business Value

Increased automation and information management reduces quality giveaway, avoids reprocessing and improves accounting accuracy. Results are reduced product cost and faster time to cash, while at the same time increasing customer satisfaction.

Inventory management and movement automation improves planning, scheduling and operational efficiency, reducing the risk of contamination, reprocessing and demurrage. Mass balance reconciliation and inventory information enable more accurate yield accounting and stock loss control. Results are lower cost of tank farm operations, higher asset utilization, more accurate inventory accounting, improved cash flow management and increased customer satisfaction.

Unique off-line /on-line multi-blend optimization technology offers the opportunity to maximize overall blend production profit against the true, long-term operational constraints of the refinery. On-line blend control and optimization reduces re-blends, minimizes giveaway and component costs, while ensuring products meet quality and regulatory agency specifications.

## Offsites experience and best practices captured

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AVEVA Offsites Management solution is based on an integrated, comprehensive set of software application modules, designed to automate and optimize oil movement and blending operations.

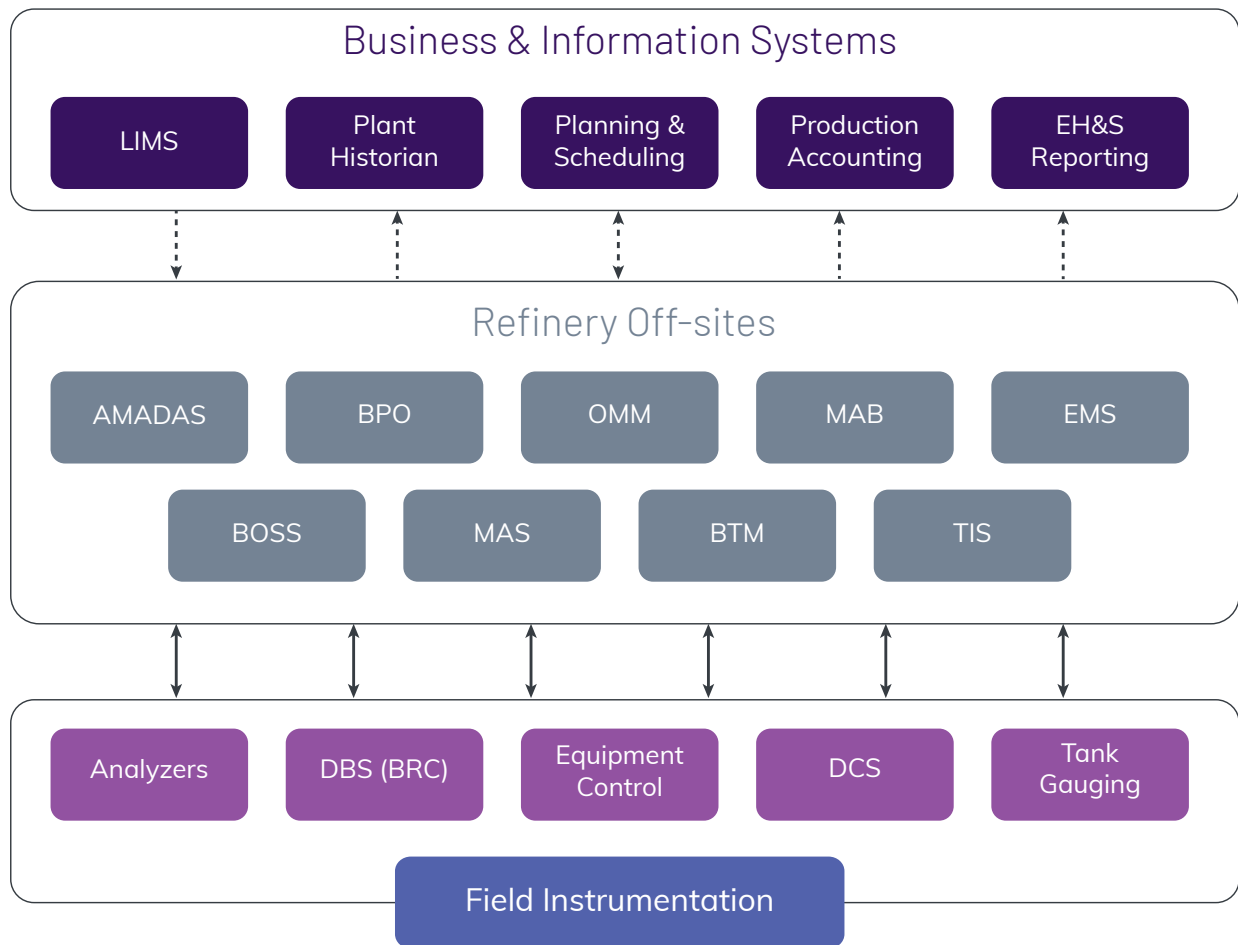
AVEVA Offsites Management captures the experience and best practices of more than two decades of Refinery offsites and terminal project engineering along with many successful installations. It is designed to integrate with your existing plant systems and to support your current workflows. The standard software approach additionally offers rapid deployment, functional extensibility and long-term sustainability at the lowest cost of ownership.

# Modular, scalable off-sites

Hundreds of man-years of off-sites project engineering experience are manifested in this sophisticated suite of tools designed for the real world of Refinery offsites or for petrochemical terminal planning and operations.

- **Tank Inventory System (TIS)** for tank inventory calculations and information management
- **Order and Movement Manager (OMM)** for order management and movement monitoring
- **Movement Automation System (MAS)** for movement line-up and execution automation
- **Material Accounting Balance (MAB)** for physical and book inventories reconciliation
- **Batch Tracking Manager (BTM)** for pipeline system batch interface tracking
- **Emission Monitoring System (EMS)** for real-time tank emission calculations
- **Blend Optimization and Supervision System (BOSS)** for off- and on-line control optimization
- **Blend Planning Optimizer (BPO)** for multi-blend planning and improved on-line
- **Digital Blender System (DBS)** for base regulatory, ratio, and sequential control
- **Analyzer Management and Data Acquisition System (AMADAS)** for on-line analyzer validation

Open industry standards allow integration with your existing plant and business systems, maintaining and improving the return on investment in existing assets and systems.





# Tank farm inventory and movement management

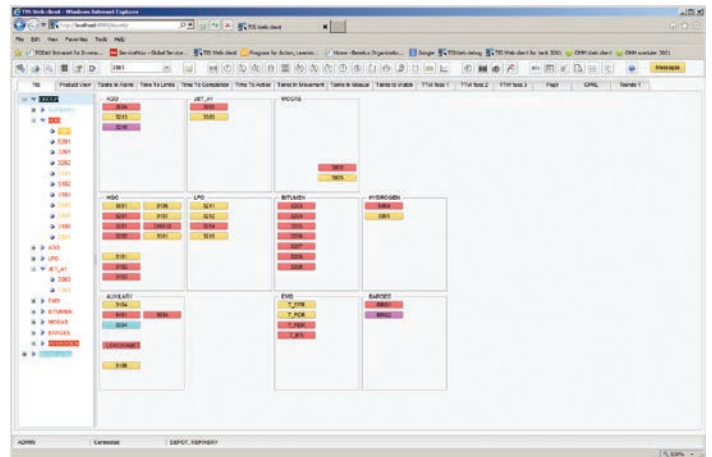
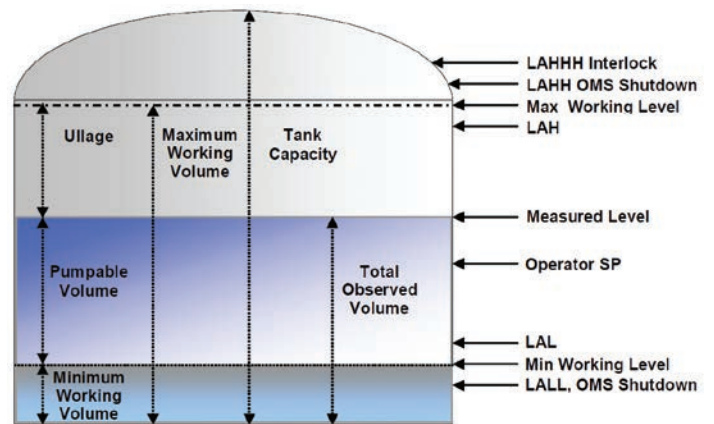
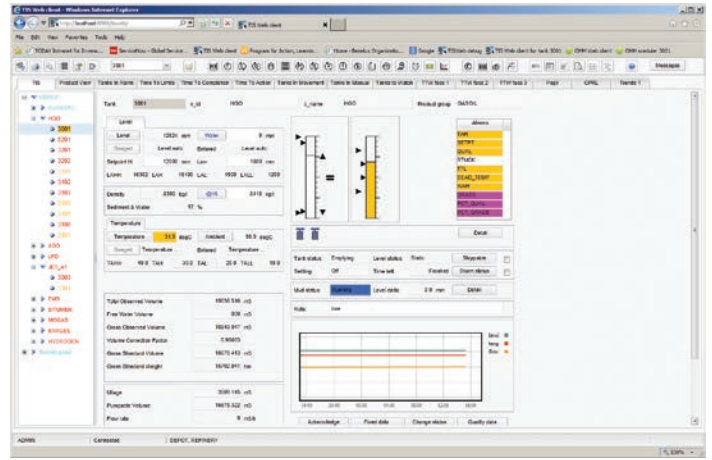
## Tank Inventory System

The Tank Inventory System (TIS) provides a uniform approach for managing tank inventory information and single-window interface to all major gauging systems (e.g., Varec, Saab, L&J, Enraf). TIS calculates, displays, and historically archives all level, volume, temperature, quality, operating state, and alarm data related to a tank and its contents. TIS provides information to the operator to safely operate the tank, and to all other AVEVA Offsites Management modules and external operational and decision support systems.

TIS stores strapping tables, performs American Society for Testing and Materials/ American Petroleum Institute (ASTM/API) table volume and density corrections, estimates flow rate from level changes, continuously updates Time-to-Completion and Time-to-Limits, provides level and tank operational states and alarms, and generates standard tank detail, pool, and midnight inventory reports.

TIS can provide the necessary tank data for optional on-line Environmental Protection Agency (EPA) tank emissions monitoring, calculation, and reporting.

Accurate online tank status data managed by the tank information system is the foundation for closed loop movement and blend control and optimization within the Refinery Off-sites. All additional functional modules leverage TIS information through the common application architecture. All modules are empowered to ensure efficient, reliable and secure movement and blending operations specifically for oil and petrochemical products.



## Order and Movement Management

The Order and Movement Management (OMM) system provides a convenient and consistent tool for the translation of business orders into process movements to be executed by the Operations staff. Orders can be downloaded electronically or manually entered and broken down into discrete movements.

The OMM system tracks in real-time, recording the history of each movement and order. Volume and time are updated continuously to complete the calculations. Movement data are validated using all available meters and gauges.

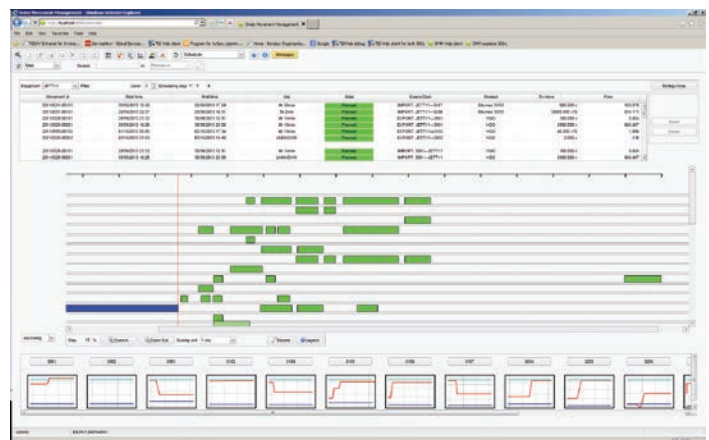
The system is used by Planning and Operations to schedule, set up, monitor, and historize all tank farm movements. It handles all receipts, transfers, rundowns, and shipment orders (for any tank/unit/transport sources and destinations), as well as blending and other complex operations. Accounting uses the movement history data for mass balance reconciliation and for improved billing accuracy.

Terminal management functions are included with the user interface and database structure to handle truck, rail, and vessel transport equipment with configurable time sheet logging for demurrage tracking. Docks management is facilitated with Estimated Time of Arrival (ETA)/lay date/lay day visibility and drag-and-drop berth assignment in a real-time Gantt chart. OMM can also be used to manage ownership of “comingled” product in leased tankage in independent terminals.

Standard order and movement level reports are included with the package and custom reports can be developed as necessary.

An optional Product Composition Tracking (PCT) module manages all incoming and outgoing flows to calculate material compositions of any tank. An optional Tank Quality Integration (TQI) module can calculate any quality of the aggregate product using linear or nonlinear models. All data are stored in AVEVA Offsites Management database for use in all oil movement and blending applications.

Release Order #	From	To	CK	Status	To move	Moved	Product	Start date	ETOK	Creator	Transporter
(3) 20120229-001	TK011	TK003	TY	Finished	1,200.000	965.037	BEHZ	02/29/2012	02/29/2012	OMH	
--	01	TK011	TK003	TY	Finished	1,200.000	84.627	BEHZ	02/29/2012		
--	02	TK003	TK000	TY	Finished	1,200.000	762.616	BEHZ	02/29/2012		
--	03	TK011	TK000	TY	Finished	1,200.000	116.285	BEHZ	02/29/2012		



## Movement Automation System

Complete automation of movements are achieved with the Movement Automation System (MAS). MAS performs automatic and optimal path selection, checks equipment availability, verifies product compatibility, and executes the movement sequential control logic using expert system technology and a site-specific knowledge base.

Tank farm topology is configured in a graphical object-oriented environment. This allows immediate updates to reflect the ever-changing physical configuration of tank farms. Each movement category is assigned a state diagram, movement operations, and movement calculations.

## Mobile Extension for the Movement Automation System

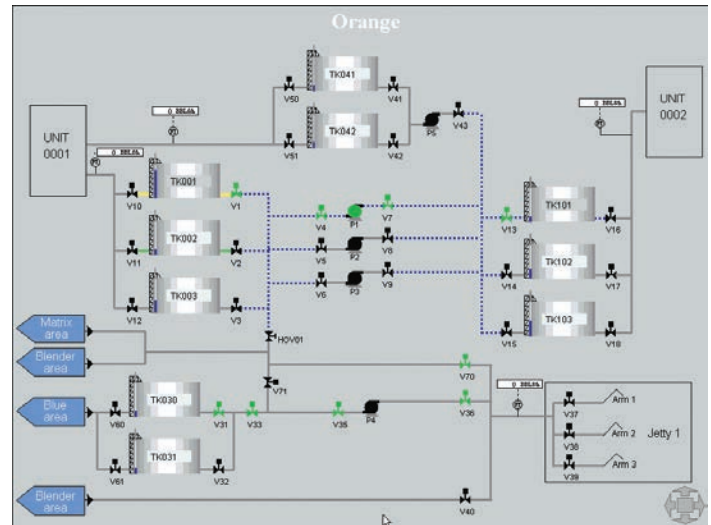
The Mobile Extension to the Movement Automation System (MobileMAS) closes the collaboration gap between the field and control room operators. Today, typical verbal synchronization is error prone due to misunderstandings in communication, mix up and lack of verifications, leading to operator errors and false control system status.

MobileMAS delivers a mobile tool for field operators that contains all of the field procedures involved to prepare the line setup for movements and communicates updated equipment status in real-time to the control system using mobile handheld devices and wireless technology. Setting up MobileMAS is easy. Field procedures are automatically generated and deployed to the handheld devices.

MobileMAS enforces line up sequences and equipment identification by radio frequency identification (RFID) location tags deployed, so operators are certain they are at the right piece of equipment. Any equipment status change confirmation entered as new status by the operator is communicated with the scanned equipment identifier to the control system. Any field to control room operator verbal communication and potential control room operator errors are eliminated.

The control system is automatically updated with accurate equipment status information, which is a step change in status accuracy of manually operated equipment.

MobileMAS supports a wide range of rugged mobile handheld devices to accommodate even the most stringent hazardous or environmental requirements. MobileMAS is built on the Wonderware® InteltraTrac® technology. MobileMAS handheld devices are ready to support operator inspection rounds leveraging Wonderware InteltraTrac, the industry-leading mobile workforce and decision making support system for remote data collection, event tracking, procedure execution and validation.





## Material Balance

The Material Balance (MAB) module provides the material balance for a single site or over multiple sites. Based on a chosen period defined by the user MAB takes the starting inventory, the quantity moved over the period and the ending inventory and calculates a balance. Any imbalances are clearly indicated, and the user interface allows for quickly zooming in to the root cause.

Fixing imbalances is done by correcting invalid data, changing the reported inventory or material moved and/or entering transactions to book against the error.

The views and calculations of the material balance accounting module provide the extra information an accountant can use to make booking decisions. Finally, the MAB software can report the consolidated and checked dataset.

## Batch Tracking Manager

The Batch Tracking Manager (BTM) module is capable of tracking batches, mainly in large pipelines which contain multiple batches at a given time. BTM can determine the exact location of batches in a pipeline and model the interface between batches of different products adjacent in a pipeline.

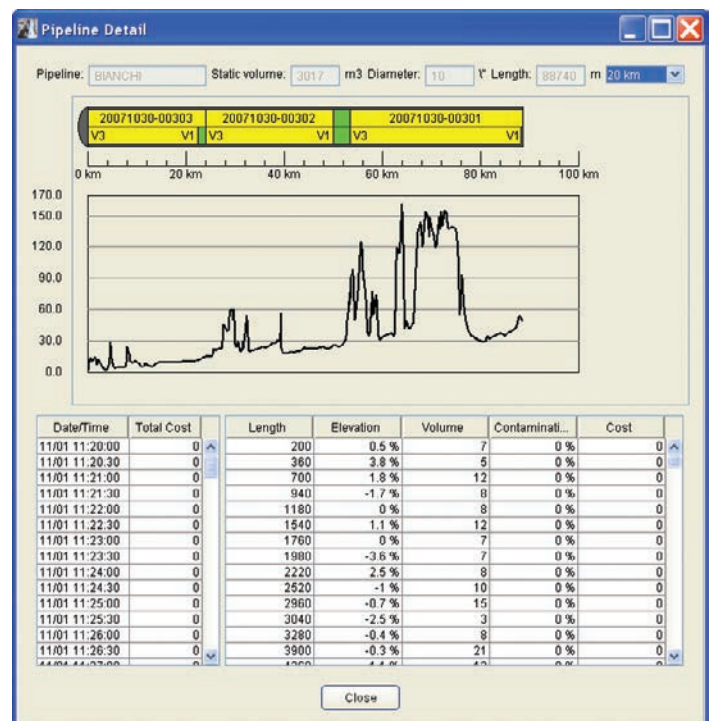
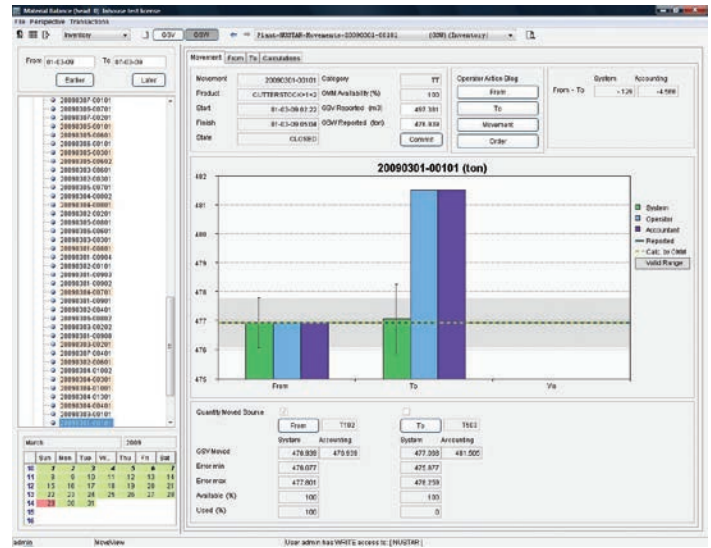
BTM can inform the operator about batches and batch interfaces at defined positions of the pipeline. The operator or other modules can be informed which batch is currently passing a pipeline location, what the next batch will be and how much time it takes for the next batch to reach a pipeline location.

## Emission Monitoring System

The Emission Monitoring System (EMS) module performs real time tank emission calculations according to the AP42 standard of the EPA.

From a tank gauging system or the Tank Inventory System (TIS) the EMS receives tank data such as level, temperature and volumes and continuously calculates the emissions for each tank.

The emission calculations comprise of breathing losses, expellation losses, evaporation losses and total emission. The results of the emission calculations are stored in the AVEVA Offsites Management database for emissions audits and for creating reports.



Tank	Validity	Breathing lbs	Evaporation lbs	Expellation lbs	Total lbs
TK107	0.714	0.33	0	0	0.33
TK109	0.714	1.193	0.003	0	1.196
TK110	0.714	0.771	0	0	0.771
TK1103	0.714	0.028	0	1.771	1.799
TK111	0.714	0.30	0	0	0.30
TK112	0.714	0.007	0	0	0.007
TK201	0.714	7.625	0.001	0	7.626
TK202	0.714	7.117	0.001	0	7.118
TK203	0.714	7.186	0.002	0	7.189
TK204	0.714	7.774	0	0	7.774
TK205	0.714	0.003	0	0.151	0.154
TK206	0.714	0.003	0	0	0.003
TK207	0.714	0.027	0	0	0.027
TK2301	0.714	0	0	0	0
TK301	0.714	0.014	0	0	0.014
TK302	0.714	0.002	0	0	0.002
TK303	0.714	0.015	0	0	0.015
TK304	0.714	0.025	0	0	0.025
TK306	0.714	0.014	0	0.041	0.054

# Blend control and optimization

## Blend Optimization and Supervisory System

The Blend Optimization and Supervisory System (BOSS) provides off-line blend setup, validation, pre-blend optimization, and continuous, online optimal control. BOSS supervises and adjusts the operation of the Foxboro Digital Blender System or a 3rd-party blend ratio system to ensure that blend specifications are met in an economically optimal manner, subject to all operational constraints.

BOSS minimizes product cost, quality giveaway, and/or recipe deviation, subject to:

- All pump, line, and tank constraints
- Header and final tank/batch specifications
- Component inventory/ullage
- Integrated tank/batch specification points

Equipment-specific expert operator advice is provided in the event of any operational infeasibility. An optional, automated pump selection feature can be used to optimally balance component delivery capacities.

BOSS can be applied to any fuel product or crude inline blenders and handles traditional tank-to-tank, tank-to-pipeline/ship, and continuous rundown operations with both controlled and “wild” component streams. Tank swings and component changes are accommodated.

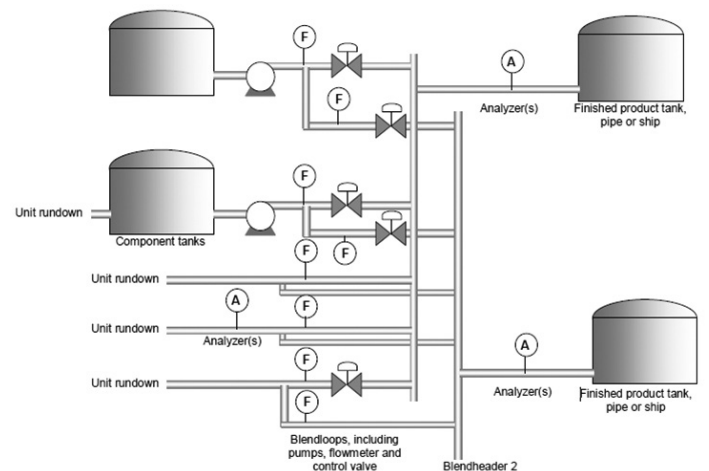
BOSS can also simultaneously optimize multiple, parallel blend headers that produce different products from shared components. The package includes a library of standard conventional, RFG, and CARB blend models and provides a convenient software framework for the addition of site-specific, custom models. Blend model predictions are biased using online analyzer (or lab) header feedback and used directly if analyzer signals fail validation. Component property feed-forward can be provided from lab sampling, online analyzers, and/or OMM component tank quality integrations.

Course	Component	Opt	Price	Actual	Min	Max	Loss	Pump	Oiling	Alarm	Linexp
T4137	PLATRAFF	12.36	12.79	13.47	12.93	20.99		1 P13			
T4138	ALKY	48.13	48.17	24.48	25.19	188.83		2 P13, 2 P14	18883		
T4006	LCCO	12.30	12.70	13.40	12.76	35.43		2 P13			
T4120	HOMC	44.46	44.49	48.07	16.89	72.21		4 P13			
T4247	ALKY	0.00	0.00	3.40	0.00	0.00		8 P13, 8 P14	19248		

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**Advice**

- Infeas, RON header below minimum
- Infeas, RON tank below minimum
- Decrease minimum ratio of T4126 (PLATRAFF)
- Use larger loop(s) for T4138 (HOMC) or add a second loop
- Decrease master flow minimum
- Use larger pump for T4138 (HOMC)
- Decrease minimum volume for T4063 (ALKY)





## Blend Planning Optimizer

The Blend Planning Optimizer (BPO) module provides multi-period, multi-blend offline planning and online optimization. Unlike other blend planners developed as completely independent software products, BPO is truly an extension of BOSS, with a consistent user interface, database, models, biases, objectives, constraints, and solver engine. In addition to providing traditional offline planning capability, BPO also runs online to continuously update and improve the multi-blend plan and rigorously enforce current and future inventory constraints.

BPO generates optimal recipes, rates, and start times for a series of blends. The optimization is subject to inventory constraints forecast across the planning horizon, considering component rundowns, imports, and exports, as well as product tank mixing, certification, and lifting time constraints. In the event of infeasibilities, current blend constraints are prioritized.

In the offline mode, BPO allows the user to generate and store a series (monthly and/or weekly) of blends to be executed by BOSS. In the online mode, BPO runs in concert with BOSS, using online measurements to fully exploit the potential for economic optimization – without compromising the multi-blend plan by ignoring long-term inventory constraints.

## Analyzer Management and Data Acquisition System

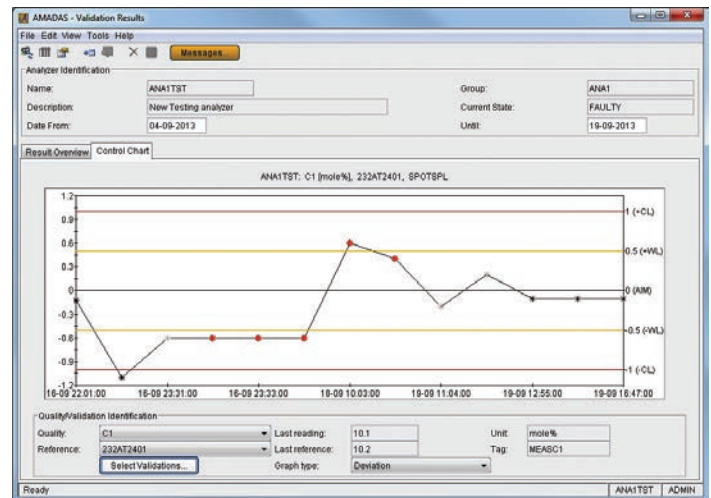
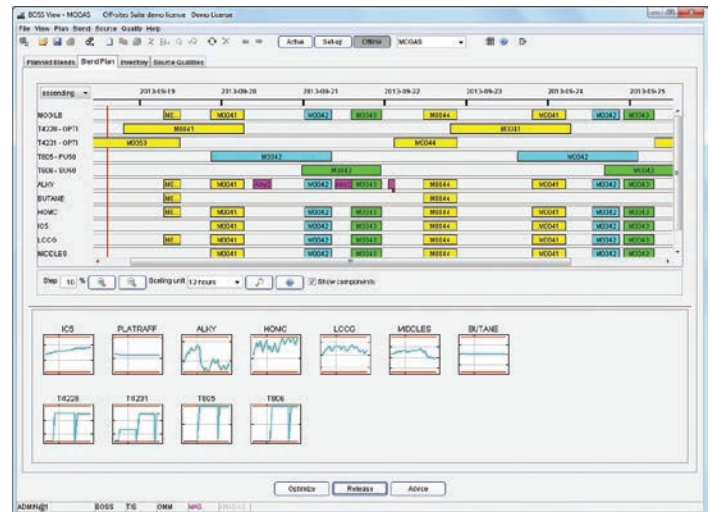
Online blend control & optimization is most profitable when products can be certified for customers and regulatory authorities using online analyzers. This requires a rigorous and auditable statistical quality control program.

The Analyzer Management & Data Acquisition System (AMADAS) is specifically developed for this purpose, incorporating applicable EPA and EU guidelines for waiver applications. The package can, of course, be used throughout the refinery for all online analytical systems.

AMADAS interfaces to both online analyzers and the refinery laboratory information system (LIMS) to statistically assess and validate analyzer performance and manage maintenance activities. All performance data and maintenance work orders are archived into the Refinery Off-sites relational database.

AMADAS provides a key component of online certification programs:

- A high-frequency online analyzer based statistical improvement in pushing property specifications
- Eliminates delays and inventory hold between blend completion and certification



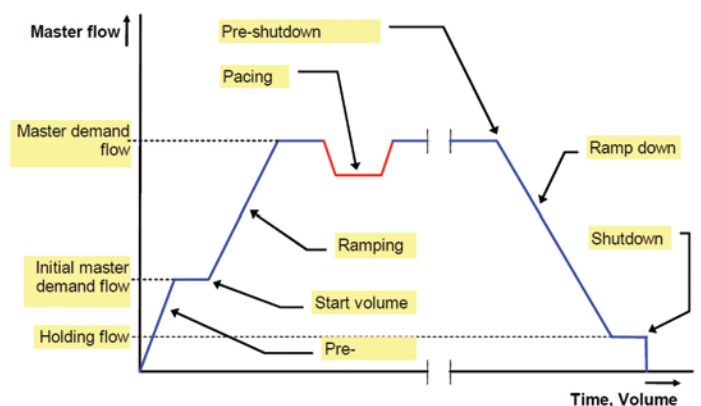
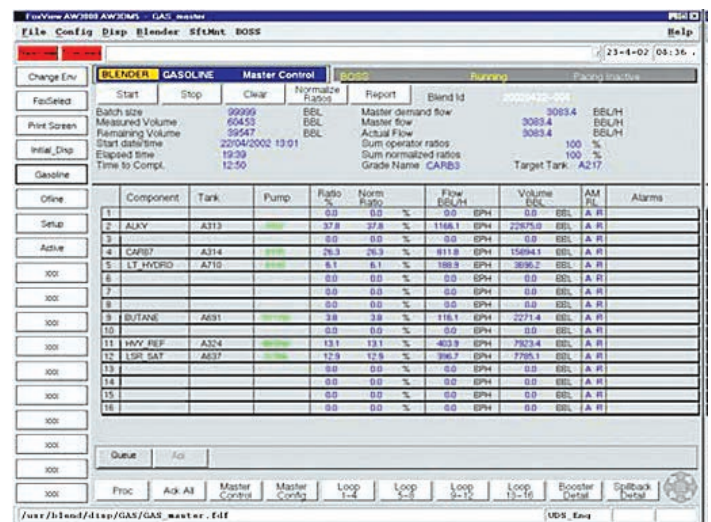


## Digital Blender System

The Digital Blender System (DBS) is a standard Foxboro® EVO™ DCS application for the base regulatory, ratio, and sequential control of in-line blenders. DBS includes a complete set of operator displays for the creation and stand-alone execution of blend orders. When operated with BOSS, blend orders, start/stop commands, and optimal recipe updates are downloaded automatically.

DBS automatically opens valves, starts pumps, ramps the total blend rate, and regulates the individual component loops to achieve the pre-set recipe.

The system will initiate pacing if one or more components cannot be delivered to recipe at the target rate. When the pre-shutdown volume is reached, the system ramps the blender to the shutdown rate, and then stops the blend when the final volume is reached. DBS can also handle continuous in-line blending operations with rundown “wild streams.”



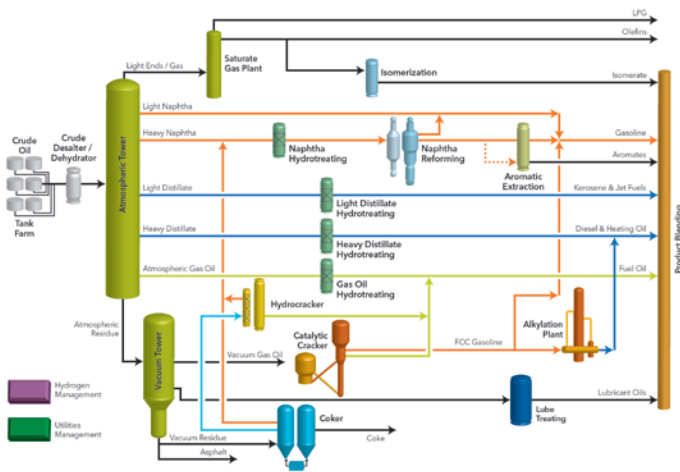
# Overall refinery optimization

AVEVA Offsites Management is designed to help achieve greater agility and responsiveness by integrating complex, disparate software applications — in both the supply chain and enterprise layers — to enable collaborative work processes. Collaboration is critical for rapid response to unplanned events and emerging opportunities. This is achieved using a wide range of integrated applications across AVEVA's Engineering, Asset Performance, Monitor & Control, and Operate & Optimize portfolios; with domain, industry and business process consulting.

## AVEVA Offsites Management integration with ROMEo Online Process Optimization

AVEVA offers a solution that integrates the rigorous simulation and optimization power of ROMEo Process Optimization with planning LP technology and off-sites management applications.

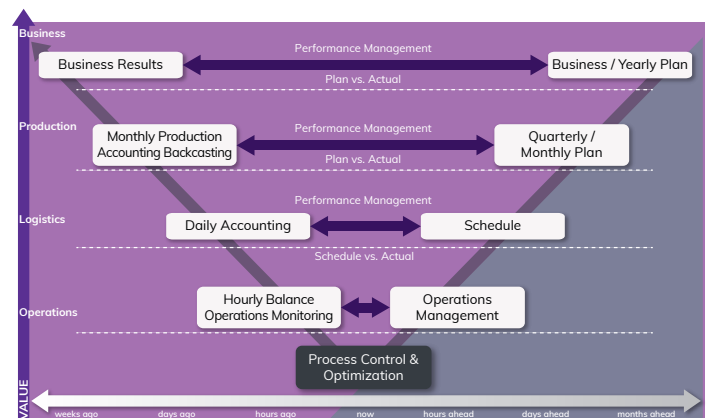
Integration of the AVEVA Offsites Management solution with process optimization software improves the refinery process optimization results by using accurate crude composition data as real-time input from off-sites crude feedstock inventory and blending operations.



## Production Accounting

AVEVA™ Production Accounting increases the accuracy and reliability for receipt, shipment and process data, identifies gross errors, corrects inaccuracies and reduces or eliminates losses. This is done by measuring process streams, tank inventories, and capturing material movements throughout the facility each day.

One of the key differentiators of AVEVA Production Accounting is integration with the Off-sites Tank Inventory System and Order and the Movement Manager. This allows data that was normally inputted manually to be automatically transferred into the Production Accounting software for reconciliation



For more information about AVEVA Offsites Management, visit [sw.aveva.com/operate-and-optimize/continuous-process/refinery-off-sites](https://sw.aveva.com/operate-and-optimize/continuous-process/refinery-off-sites)