Honeywell

BLENDING & MOVEMENT | BLEND OPTIMIZER

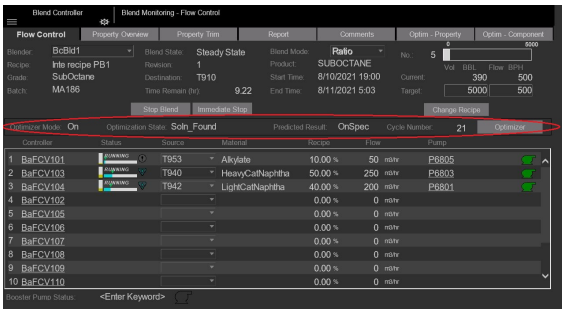
PRODUCT INFORMATION NOTE

Honeywell's Blend Optimizer (BO) is designed specifically for on-line blend reformulation and optimization. It controls and optimizes the operation of in-line blenders which produce a wide variety of products such as gasoline, distillate and fuel oils. BO can also be applied to crude oil or chemical blending applications.

Key Capabilities

Blend Optimizer is part of Honeywell's Blending Suite within the Blending and Movement solution. BO provides property control and optimization for in-line blending processes which add several streams together in a common header at a ratio specified by the blend recipe. BO provides the following key capabilities:

- Powerful Blend Optimization
- Flexible Blending Objectives & Control Modes
- Comprehensive Blend Optimization Model based on customer data and rules
- Blend Quality Monitoring
- Multi-Blender Optimization
- Support of Continuous Rundown Blends
- Flexible Reporting
- Offline Optimization
- OPC Compliancy and XML Support
- Operator-Focused User Interface



Blend Optimizer integrates with Honeywell's Blend Controller or other in-line blend controllers.

Benefits

- **Reduced property giveaway** through ensuring that all quality specifications are met, while minimizing property giveaway for selected properties
- **Optimal use of components** through use of an objective function that minimizes cost while meeting all quality requirements
- **Lower product inventory** by reducing touch-ups and re-blends and supporting on-line blend certification
- **Lower component Inventory** by supporting use of unit rundown streams and providing optimal component usage for property correction
- **Lower number of touch-Ups and re-blends** by ensuring that the blend is on-specification for all properties the first time

These key capabilities are described below:

Powerful Blend Optimization

BO uses a powerful, state-of-the-art non-linear optimizer which executes at every control interval to adjust the blend recipe based on analyzer feedback. The problem statement for the optimizer is contained in the recipe information, which includes:

- Recipe target values for each component
- Component limits (percent/volume)
- Component weighting factors
- Property limits
- Property weighting factors
- Target blend flow and volume
- Component blend values (typically lab data)

Flexible Blending Objectives & Control Modes

Since the blending goal(s) can change from blend to blend depending on factors such as component availability, component and product value, equipment availability, etc., BO supports several blending objectives shown below. These blending objectives can also be combined in different combinations to ensure that the ultimate blending goal(s) can be achieved:

Property Control	Minimize property off-specification deviation. An Off-Spec Ratio can be used to increase the cost of off-specification properties.
Minimum Cost	Minimize the cost of the blend based on component costs.
Minimum Giveaway	Minimize property deviation from the high or low specification limit, based on property costs.
Minimum Distance	Minimize deviation from the target recipe, or from high or low component limits.
Composite	The objective function combines the Minimum Cost, Minimum Giveaway and Minimum Distance objectives into one. Each individual objective has its own weighting factor.

BO blending objectives can be combined to achieve the ultimate blending goal(s).

- In addition to these blending objectives, BO supports two blend modes:
    - **Instantaneous Property Control** – Blend qualities are maintained as close to the specified value as possible without making off-specification product; typically used for blending to a pipeline or ship.
    - **Tank Property Control** – Generally used if product is being blended to a tank, the basic goal in this mode is to create a blend tank full of product that is on-specification.

Comprehensive Blend Optimization Model

BO's Blend Optimizer uses a model of the blending process to determine how to adjust the component feed recipes to meet the desired blending objectives. The blend model consists of a series of equations referred to as "blend laws" specified by the customer. Each blend law equation is used to estimate the value of a given property in the blended product, based on the fraction of each component being fed into the blender and the "blend value" for each component-property pair. In addition to the blend model, equipment constraints based on component flow limitations, and component constraints based on recipe limits, rate of change limits and component volume limits, ensure that the optimized recipe doesn’t violate flow controller limitations, or component recipe limitations. Finally, to ensure the blend model is as accurate as possible, model offsets are added to the blend model by comparing the model property estimates with analyser readings.

Blend Quality Monitoring

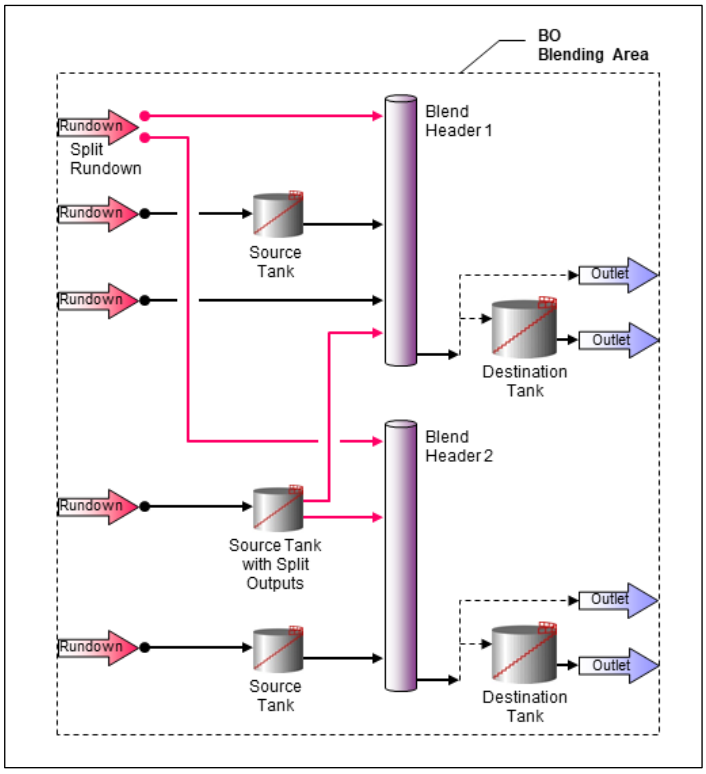
BO continuously monitors the quality of the material in each piece of equipment in the BO blending area to ensure that the most accurate quality information is used for property control and optimization. The equipment material quality is calculated from the material quality in the connected streams such as the rundown stream for a source tank and the blender stream feeding a destination tank.

This stream quality data can come from one of six prioritized sources:

- Analyzers
- Lab Results
- Blending Instructions Quality (Note: Blending Instructions is the application that sends recipe information to BO)
- Tank Quality Data
- Manual Entries
- Model Estimate

Multi-Blender Optimization

BO supports large optimization problems such as the optimization of multiple, simultaneous, or interactive blenders with rundown streams. Blenders using shared components may be jointly optimized. An example of a multi-blender configuration supported by BO is shown below:



BO supports optimization of complex, interacting blending configurations

Continuous Run-down Blends

BO supports the use of component streams coming directly from process units which are outside BO's Blend Area. In this case, the incoming material flow rate often fluctuates, and the blending unit is responsible for dealing with all the material that is transferred to it from the upstream process. BO handles this situation by using the rundown material quality and flow rate information in the blend optimization calculations.

Flexible Reporting

BO produces several reports that are useful for analyzing blend results as shown below.

Optimization Report	Displays blend optimization summary information for the current blend.
Blend Report	Provides a comprehensive report of all of the BO configuration and blending instruction settings used by BO for the blend, along with the blend optimization calculation results for each Blend Optimizer execution cycle.
Cycle Report	Displays the component, additive and property data from the last Blend Optimizer execution cycle. It includes the data used in the blend optimization calculation, along with the calculation results.

Off-line Optimization

Blend recipes and blend instructions may be checked offline before the blend is actually started using the BO Offline Optimizer. The Offline Optimizer supports "What if" scenarios that may be used to:

- Check the feasibility of different blend operating scenarios based on existing operating and configuration data;
- Test blend property control tuning parameters.
- Test and make adjustments to blending instructions prior to their use in online BO. These updated blending instructions may be transferred back to the blending instructions database for use.

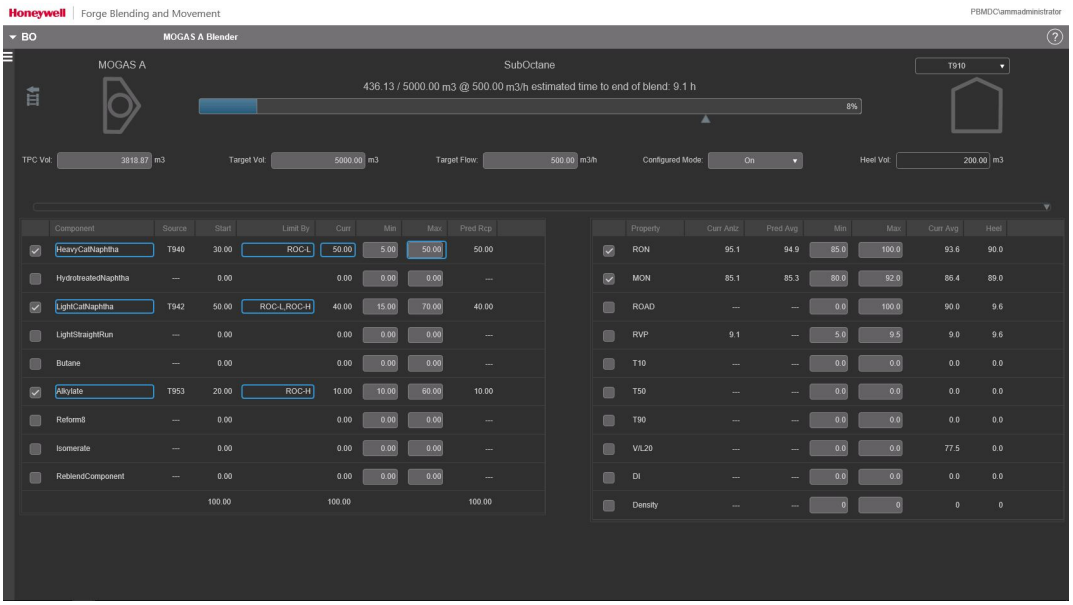
The Offline Optimizer uses a specialized Microsoft® Excel® workbook with an Excel add-in as the interface to the BO optimization engine.

OPC Compliancy and XML Support

BO operates in conjunction with any industry standard OPC compliant control system. BO interfaces to other third-party applications, such as blend planning applications, via industry standard XML files. This minimizes or eliminates the need to modify an existing blend control system.

Operator-Focused User Interface

BO's user interface has been designed specifically for operators to ensure that their effectiveness is maximized and includes an overview of blending operations and easy drilldown to specific details of a blender so that an operator can quickly diagnose and respond to any blending issues. In addition, BO provides guidance to operators to assist them in addressing blending issues.



BO's user interface improves operator effectiveness

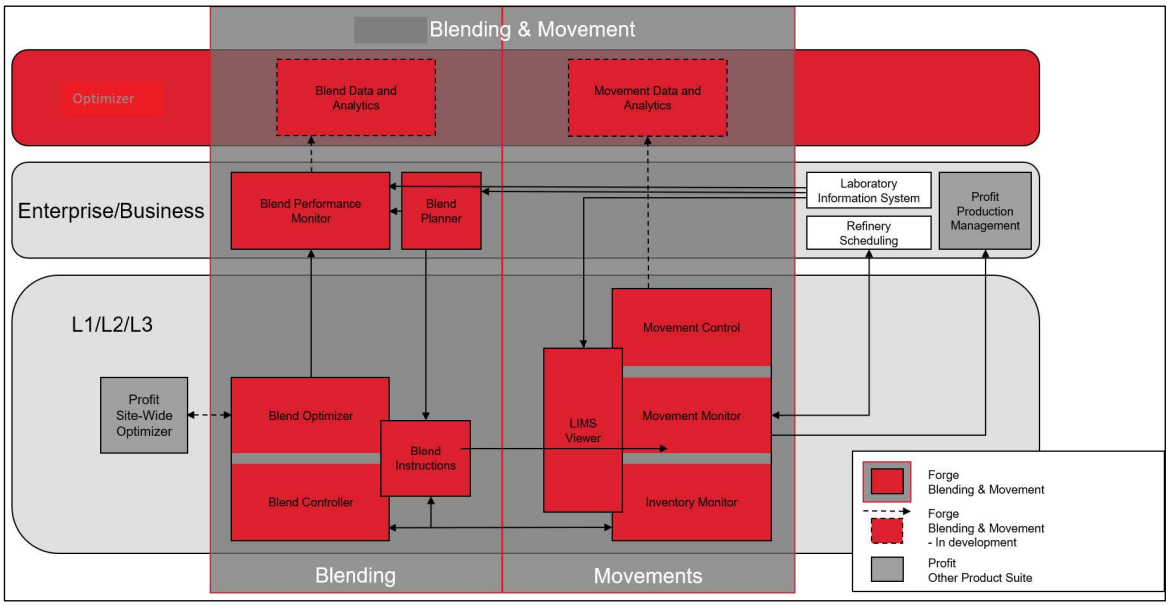
Integration with Honeywell Applications

BO is a key component of Honeywell's Blending Solution, which is part of the Blending and Movement Management suite. Other components of Honeywell's blending solution are:

- **BLEND** - Offline multi-period blend planning and event-based scheduling
- **Blending Instructions** - Interface for management and transfer blend recipes / instructions
- **Blend Controller (BC) & Experion® Blend Controller (EBC)** – Advanced ratio control of in-line blending.
- **Blend Performance Monitor** - Collect, store and manage blend performance metrics

Together, these components form the Honeywell's Blending solution, a set of integrated tools to deliver optimum in-line blending.

BO accepts recipes in XML file format from Honeywell's **BLEND** multi-period blend planning and scheduling application leveraging the **Blending Instructions** application.



BO is a key component of Honeywell's Blending Suite and integrates with other Honeywell applications

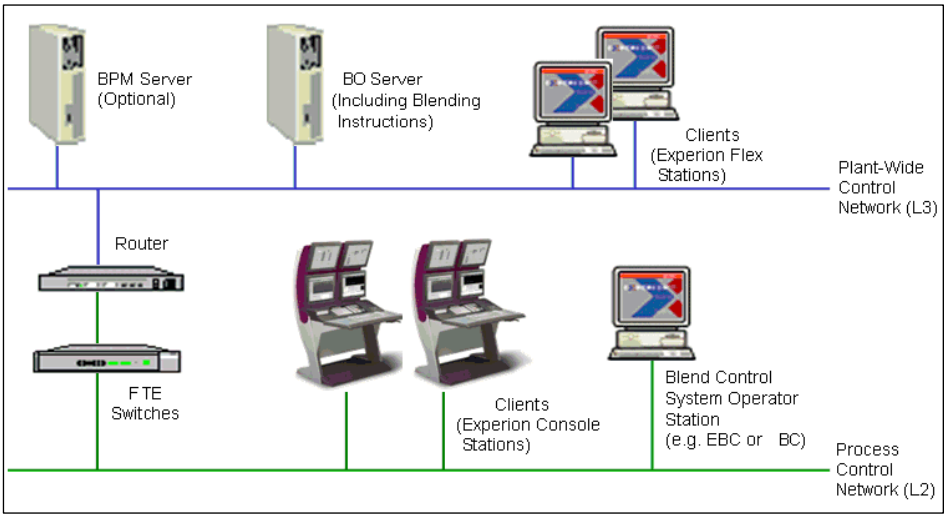
The **Blending Instructions** application is used to specify how a blending operation is to proceed in the field. Each set of blending instructions contains data that uniquely describes a blend and its associated property model. **Blending Instructions** provides facilities for creating, editing, copying and deleting blending instructions that are, in turn, used by BO users to define blending operation requirements and ensure that the settings match the physical blending process in the field. These facilities may also be used to define blending operation requirements for field personnel.

Honeywell's **Blend Controller (BC) and Experion® Blend Controller (EBC)** provide advanced ratio control of in-line blending in Experion PKS control systems. While BO can integrate with other ratio control applications, when used with **BC or EBC**, there is additional integration provided that enables control of the BO application and monitoring of key BO information from the BC and EBC operator displays.

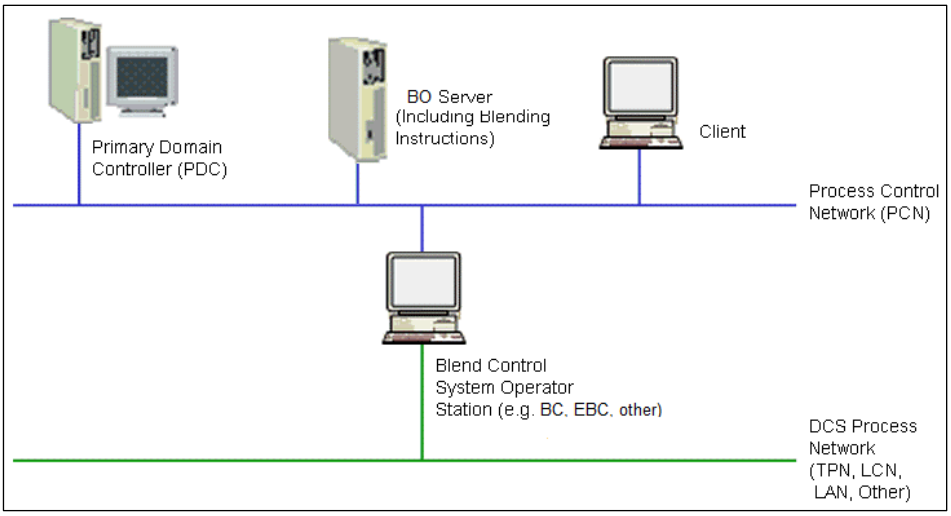
BO blend data is collected, along with data from other sources, by Honeywell's **Blend Performance Monitor** application, where actual blend data is compared to planned performance. BO blend data is integrated into a data historian, such as Uniformance PHD, via the **Blend Performance Monitor** application for blend reports and archiving.

System Requirements and Architecture

BO is designed to operate within the Experion PKS environment or with Legacy and third-party systems. The following illustrations show the sample hardware architectures for both these configurations. Contact Honeywell for the latest list of supported Experion PKS releases.

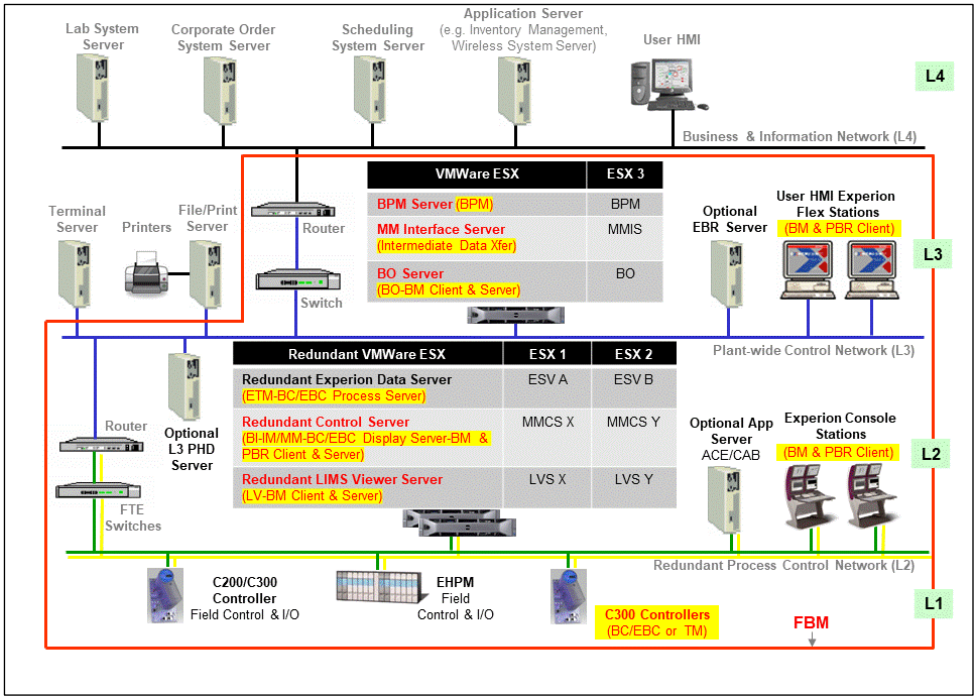


Sample BO Architecture for Experion Controller-based Systems



Sample BO Architecture for Legacy and Third-party Systems

BO is installed on its own server as illustrated. This server runs Windows Server 2019 (64-bit) and SQL Server 2019 (64-bit). The BO Server typically requires one Intel Xeon E-2124, 3.3GHz, 4 Core or faster processor with at least 16GB RAM and 2 x 1TB hard disk space. For specific Honeywell computer platforms and supported software that meet these requirements, please contact your Honeywell representative.



Sample Blending and Movement solution architecture

Support Services

This product comes with worldwide, premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers to improve and extend the usage of their software and the benefits they deliver, ultimately maintaining and safeguarding their advanced software.

Training Services

Training courses addressing BO implementation, use and maintenance are available through Honeywell's Automation College (www.automationcollege.com). On-site courses are also offered upon request.

For More Information

Learn more about Honeywell's Blend Optimizer can optimize your blending process, visit www.honeywellprocess.com/software or contact your Honeywell Account Manager.

Honeywell Connected Enterprise

715 Peachtree Street NE
Atlanta, Georgia 3030
Honeywell

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PIN-02-23-ENG |
February 2023

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