Technical Data Sheet

Hybrid Cascade Control for Benchmark E

Hybrid Cascade Control enables Benchmark E electric boilers and Benchmark gas boilers to operate together as a single coordinated heating plant under the Edge X Controller platform. By continuously monitoring system demand, the controller intelligently stages, sequences, and coordinates connected boilers to maintain stable system temperatures and efficient plant operation.

Designed for applications requiring both electrification and high-capacity heating performance, Hybrid Cascade Control allows facilities to combine electric and gas boiler technologies while maintaining onboard centralized control of the entire plant. The system automatically responds to changing load conditions, distributes load across available equipment, and balances runtime across connected boilers to support reliable and efficient operation. Flexible energy-source prioritization allows operators to align plant operation with energy costs, available electrical capacity, decarbonization goals, and other facility requirements while maintaining heating performance.



Centralized Management
via Edge X Controller



Multiple Energy Sources,
Centralized Control, One Plant

Features

- Coordinates up to 16 Benchmark E and Benchmark boilers as a single plant
- Benchmark E with Edge X Controller serves as the plant manager
- Electric-first, gas-first, or runtime-based operating strategies
- Automatic staging and de-staging based on system demand
- Integrated lead/lag rotation for balanced runtime distribution
- Multiple cascade control methods, including BST Internal Setpoint (iBST) and BST Supply (sBST)
- Centralized BAS integration through BACnet® and Modbus®* communications
- Supports Primary-Variable and Primary-Secondary system configurations

*Available via future firmware update.

Coordinated Load Sharing Across the Plant

Hybrid Cascade Control treats all connected boilers as a single integrated heating plant. The Benchmark E manager continuously monitors system demand and automatically stages, de-stages, and coordinates connected Benchmark E electric boilers and Benchmark gas boilers to maintain the required setpoint and stable plant operation. Rather than operating independently, each boiler contributes only the capacity needed to satisfy current heating demand, helping improve overall plant efficiency and reduce unnecessary cycling.
As demand increases, additional boilers are brought online automatically. As demand decreases, boilers are returned to standby while maintaining stable supply temperatures and smooth plant operation. Integrated lead/lag control helps distribute runtime across available boilers to support long-term reliability and balanced equipment utilization.

Hybrid Cascade Control offers multiple cascade control methods that determine how the Edge X evaluates plant demand and stages boilers to maintain the desired setpoint. This flexibility allows engineers to select the control strategy best suited to the application and system design. The selected control method is applied across the entire plant, including both Benchmark E electric boilers and Benchmark gas boilers.

BST Internal Setpoint (iBST) - Average Outlet-Based Demand Evaluation

In iBST mode, Edge X evaluates plant demand using the average outlet temperature of active boilers.
The manager continuously compares the average outlet temperature to the plant setpoint and automatically stages or de-stages boilers as required to maintain demand. The manager sends a plant setpoint to Benchmark E boilers while coordinating gas boiler operation to maintain overall plant performance. Key benefits include:

- No supply header temperature sensor required
- Responsive staging based on active boiler performance
- Precise coordination across electric and gas boilers
- Continuous adjustment to changing load conditions
- Simplified demand evaluation using boiler outlet temperatures

BST Supply (sBST) - Supply Header-Based Demand Evaluation

In sBST mode, Edge X evaluates demand using the supply header temperature. The manager continuously compares the supply water temperature to the target setpoint and adjusts staging as needed to maintain the desired supply temperature throughout the plant. This approach allows the heating plant to respond directly to system-level conditions and maintain consistent delivery temperatures across varying load requirements.
Key benefits include:

- Control based on supply header temperature
- Direct response to system operating conditions
- Consistent header temperature control
- Suitable for applications utilizing supply water temperature as the primary control point

Lead-Lag & Runtime Management

Hybrid Cascade Control automatically rotates boiler operation to balance runtime across available equipment. Users can select run-hour-based rotation or prioritize a preferred energy source while still balancing runtime automatically within the selected strategy. This approach helps distribute wear across the plant while providing balancing operation within that group and flexibility to support energy cost, operating, or electrification objectives.

Available Strategies: 1) Run Hour Priority: 2) Electric-First Priority; and 3) Gas-First Priority.

Flexible Operating Strategies

Hybrid Cascade Control allows facilities to select the operating strategy that best aligns with energy costs, electrification goals, and plant requirements.

Electric-First Operation: Electric boilers are prioritized to satisfy demand before gas boilers are brought online. As demand increases beyond available electric capacity, Benchmark gas boilers are automatically enabled to provide supplemental heating capacity.

Gas-First Operation: Gas boilers are prioritized to meet system demand, with electric boilers brought online only when additional heating capacity is required. This strategy may be desirable in applications where gas is the preferred energy source or where electrical capacity is limited.

Runtime-Based Operation: Runtime-based operation balances usage across all available boilers by prioritizing units with the lowest accumulated runtime. This helps equalize operating hours and distribute wear across the plant.



As plant demand increases, Hybrid Cascade Control intelligently stages additional Benchmark E boilers and, when required, Benchmark gas boilers to maintain setpoint, optimize load sharing, and deliver reliable heating performance.

Application Flexibility & System Integration

Designed for a Wide Range of Hydronic Systems

Hybrid Cascade Control supports both Primary-Variable and Primary-Secondary hydronic system configurations, giving engineers the flexibility to apply hybrid plant control across a wide range of commercial heating applications. Edge X coordinates plant operation while adapting to the specific flow and control requirements of the system design.

Building Automation & System Integration

Hybrid Cascade Control integrates with building automation systems through BACnet and Modbus* communication protocols, enabling centralized monitoring and control of the entire heating plant. The Benchmark E manager communicates plant-level and unit-level operating data, providing visibility into system performance and facilitating integration into broader energy management strategies. Key operational parameters, plant status information, and unit-level data can be shared through a single interface, simplifying system integration and plant monitoring.

Configuration & Control Flexibility

Lead-Lag Runtime Rotation & Energy Source Prioritization: Hybrid Cascade Control automatically rotates lead and lag boilers based on accumulated runtime to support balanced equipment utilization and long-term reliability. Facilities can prioritize electric boilers, gas boilers, or runtime-based operation to align plant performance with energy and operating objectives.

Adjustable Staging Thresholds: Configurable Next On and Next Off thresholds allow users to tailor boiler staging and de-staging behavior to application requirements, helping optimize plant responsiveness, temperature stability, and efficiency across varying load conditions.

Minimum Valves Open (MVO) & Isolation Valve Management: Minimum Valves Open functionality allows users to maintain a predefined number of open isolation valves to support system flow requirements. Edge X also coordinates isolation valve operation as boilers are staged on and off, directing flow only through equipment needed to satisfy demand.

*Available via future firmware update.

Cascade Failsafe Operation: Configurable failsafe modes help maintain plant operation during communication interruptions or loss of external control signals. Alternatively, users can select standby operation or a userdefined constant setpoint to support continued operation when normal communication is unavailable.

Integrated Pump & Reserve Plant Control: Edge X coordinates primary pump operation with plant sequencing and can communicate with reserve equipment or reserve plants to provide supplemental heating capacity when required. These capabilities simplify system design while supporting reliable operation during peak demand conditions.

BAS Integration: Plant-level and unit-level operating data can be communicated through BACnet and Modbus protocols for centralized monitoring and control, simplifying integration with building automation and energy management systems.

System Scalability: A single Hybrid Cascade plant can coordinate up to 16 boilers, allowing the system to scale from smaller installations to large commercial heating applications while maintaining centralized control and sequencing.

AERCO®
A WATTS Brand

Heating and Hot Water Solutions

AERCO International, Inc. • 100 Oritani Drive • Blauvelt, NY 10913
USA: T: (845) 580-8000 • Toll Free: (800) 526-0288 • AERCO.com

© 2026 AERCO