Belimo Energy Valve™
Power Control

- Measures Energy
- Controls Power
- Manages Delta T

Belimo Energy Valve Power Control

AHR EXPO INNOVATION AWARDS 2014
WINNER BUILDING AUTOMATION
BELIMO Aircontrols (USA), Inc.
BELIMO BAS Data Logging Energy Valve
Power Control

- **Expanded Size Range**
  - Sizes from ½” through 6”
  - Flow ranges from 1.65 GPM to 713 GPM

- **Powerful New Features**
  - Linear BTU/hr control
  - Maximum Power (P’max)

Power Control is a feature that is added to the Energy Valve™ in 2014.
Power Control

Agenda

- **Power Control**
- Maximum Power ($P'^{\text{max}}$)
- Applications
Power Control Definition

What is Power Control?

- A control algorithm that creates a Linear relationship between control signal and BTU/hr output

- Power Control maintains a coil power set point regardless of pressure and temperature fluctuations
Power Control

- Power Control allows the controller to deliver exact energy to the space
- 0 to 10 VDC = 0 to 100% BTU/hr Capacity

Example: 83 Ton AHU
83 Tons ~ 1000 kBTU/hr coil

3 VDC = 300 kBTU/h
7.5 VDC = 750 kBTU/h
Without Power Control - Standard Control

Power Output Fluctuates Due to DAT Delay Response

<table>
<thead>
<tr>
<th>Minutes</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
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<tbody>
<tr>
<td>SWT °F</td>
<td>45</td>
<td>46</td>
<td>47</td>
<td>47</td>
<td>48</td>
<td>48</td>
<td>47</td>
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<tr>
<td>Flow gpm</td>
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<td>100</td>
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<td>140</td>
<td>160</td>
<td>140</td>
<td>120</td>
<td>100</td>
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<tr>
<td>Power kBTU/hr</td>
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<td>400</td>
<td>480</td>
<td>490</td>
<td>560</td>
<td>560</td>
<td>540</td>
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Increase in supply water temperature takes time to recover.

Energy Valve Power Control
With Power Control – Energy Valve

Power remains stable regardless of SWT changes

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Increase in supply water temperature has no effect on power
Power Control is Pressure and Temperature Independent.
Precise temperature control for temperature critical applications.
Field Test - Busch Gardens, Florida

Application

- Timbuktu 4D Cinema
- Energy Valve in Pressure Independent Mode
- Energy Valve using Power Control
Bush Garden Test – Without Power Control

1. Supply Water Temperature (SWT) increases by 1.4°F
2. Discharge Air Temperature (DAT) increases by 2°F
Bush Garden Test – Without Power Control

3. Power output fluctuates

![Graph showing temperature, flow, and power output over time.]

- Supply water temperature [°F]
- ΔT [°F]
- Valve Position %
- Flow GPM
- Flow set point
- Discharge Air temperature [°F]
- Power kBTU/hr
Bush Garden Test– with Power Control
Bush Garden Test— with Power Control

1. Supply Water Temperature (SWT) increases
2. Discharge Air Temperature (DAT) remains constant
Bush Garden Test – with Power Control

3. Power output remains constant

Faster Response - No Loss of Occupant Comfort
Power Control

Agenda

- Power Control
- **Maximum Power (P’max)**
- Applications
Maximum Power (P’max)

- Energy Valve can be reprogrammed to a specific load.

Simple, Programmable Maximum Power
Simple Load Application

1. Select the Valve Flow

2. Set Maximum Power to Coil BTU/hr capacity

Simplify Valve Selection - Simplify Implementation

Energy Valve Power Control
Maximum Power Control

- During high demand days, the utility companies may call for a reduction in energy consumption (Load Shedding).
Power Control

Agenda

• Power Control
• Maximum Power (P’max)
• Applications
Power Control Applications

- **Temperature Sensitive Applications**
  
  Provide Precise control in Temperature and Pressure independent operation

- **Simple Load Application**
  
  Simplify Valve Selection
  Simplify Design Implementation

- **Load Shedding**
  
  Simple, Programmable & Repeatable Load Reduction
Energy Valve Power Control