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An ISO 9001 company

BECK® ELECTRIC ACTUATORS

FOR INDUSTRIAL PROCESS CONTROL

REFINERY AND PETROCHEMICAL INDUSTRIES

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Increasing Business Pressures Necessitate Control Improvements

Energy costs represent a major portion of a refinery or petrochemical plant's operating expense. As such, poor valve and damper control is increasingly impacting plant profits. Additionally, environmental regulations continue to mandate lower emission levels. Poor control caused by imprecise or duty-cycle limited actuators can no longer be tolerated. Beck actuators have been used for over 70 years in heavy manufacturing to improve control, increase reliability and reduce cost. Beck's unique motor and gear design is perfectly suited to the demanding furnace, heater, and boiler applications in today's plants.

Valve and Damper Actuation is Key to Control and Efficiency

In spite of the critical role of control valves and dampers, their performance is often ignored. In many cases, valve and damper actuator problems are addressed only after a serious failure occurs.

Valve and damper actuators are a leading source of control problems. Pneumatic actuators are inherently susceptible to stick/slip response, excessive dead time, inconsistent performance with changing conditions, and performance degradation over time. As a result, pneumatic actuation simply cannot provide the level of control performance provided by Beck electric actuators. Similarly, conventional electric actuators are poorly suited for active control since most are limited by motor duty-cycles, provide less accurate positioning capabilities, and are less reliable—especially in the harsh operating conditions for which Beck actuators are designed.

Many Boilers & Heaters are Benefiting from Beck Actuators ... and the Number is Growing

Investments in advanced control instrumentation and logic are necessary, but are only as effective as the precision, repeatability and responsiveness of the valves and dampers. Plants that understand the importance of the final control element replace poorly performing pneumatic and traditional electric actuators with Beck actuators.

Beck actuators have been used to improve valve and damper performance in over 1,000 electric utility boilers. The same type of improvements are now increasingly being realized in refineries on process heaters and boilers.

Why do Beck actuators improve control and eliminate the inherent problems associated with pneumatic and conventional electric actuators?

- **Instantaneous Response --**

  A Beck actuator responds to a modulating controller demand signal instantaneously, regardless of changing loads and conditions. Therefore, Beck actuators will not stick or slip like pneumatic actuators, thus eliminating dead time and position overshoot.

- **Precise, Continuous Performance --**

  Beck actuators track the controller demand signal closely under closed-loop conditions, with resolution unmatched by pneumatic and typical electric actuators. This eliminates limit cycling and ensures tight, stable process control.

- **Consistent Performance --**

  Beck drives provide consistent control over time with virtually no maintenance requirements.

- **No Air Problems --**

  Beck drives eliminate the dependence on costly and unreliable air systems, thus eliminating problems like freezing and contamination.

- **Designed for Environmental Extremes --**

  Weather, dust, dirt, and temperature (-40 to 185° F.) conditions do not affect performance.

- **Unmatched Ruggedness --**

  The extreme ruggedness and quality of Beck actuators simply ensures that they outlast and outperform other actuators.

All Control Applications Benefit from Beck Actuators

Regardless of whether the equipment is a gas-fired heater, a waste gas boiler, or a blending valve in the tank farm, Beck provides distinct advantages over other actuator alternatives. Control—especially where process flows might vary, or where external disturbances exist—can be optimized based on the actuator's ability to track a demand signal closely without modulation restrictions or performance inconsistencies. Improving final control element positioning, while eliminating dead time and overshoot, always results in better process control. Loops not only perform better, but are also easier to tune, stay tuned longer, and are more tolerant of varying conditions.

In addition to control advantages, Beck actuators are more rugged and reliable than either pneumatic or other electric actuators. The Beck cast aluminum housing is rated Type 4X and meets hazardous location requirements typical for refinery and other petrochemical environments. Furthermore, Beck's low current draw motor saves energy by replacing inefficient compressed instrument air.

Contact a Beck Sales Engineer at 215-968-4600 to find out more about the best actuators for your installations.
Visit our website at www.haroldbeck.com.
E-mail: sales@haroldbeck.com

Beck is a Plant-wide Solution for Both Modulating and Open / Close Applications

Refinery and Chemical Plant Applications

Combustion / Fuel Valves, Fan (ID, FD) and Stack Dampers on the following:

- Crude Oil Distillation Inlet Heater
- Catalytic Cracker Inlet Heater
- Catalytic Reformer Naphtha Feed Heater
- Thermal Cracker Residue Feed Heater
- Coker Drum Input Heater
- Hydrocracker Reactor Feed Heater
- Sulfur Furnace Heater
- EDC and Olefins Cracking Furnaces
- CO / Waste Gas Boiler
- Coal / Pet Coke Fired Boilers
- Once Through Steam Generators (OTSGs)

Additionally, the following applications should be considered for all three sectors of oil and gas:

- Tank Farm / Product Metering Valves
- Ethanol Blend Valves
- Crude Oil Blend Valves
- Crude Tank Mixers
- Pipeline Pump Speed Control Couplings
- Process System Control Valves
- Natural Gas Supply Line Valves
- Boiler Feedwater Valves
- Oilfield Dump Valves
- Flare Gas Valves / Wellhead Vapor Recovery Unit (VRU) Valves
- Wellhead Shut-in Valves
- Wellhead Gas Lift Valves
- Pipeline Shut-off Valves
- Remote Pipeline Valves
- Compressor Station Pump Valves

Hazardous Location Actuators

Most Beck actuators are available rated for use in hazardous locations, allowing for utilization in refineries on heaters and gas valves, as well as other hazardous areas. Contact Beck's Sales Dept. or visit www.haroldbeck.com for more details.

Beck Hazardous Location Models

Group 57 Quarter-turn Valve Actuator*

- Class I, Div. 1, Groups B, C & D

Group 11 Rotary Valve & Damper Actuators*

- Class I, Div. 2, Groups A, B, C & D
- Class II, Div. 1, Groups E, F & G
- Class II, Div. 2, Groups F & G
- Class III, Div. 1 & 2
- ATEX Zones 2 & 22

Group 31 Rotary Actuators*

- Class I, Div. 1 & 2, Group D
- Class II, Div. 1, Groups E, F & G
- Class II, Div. 2, Groups F & G
- Class III, Div. 1 & 2
- ATEX Zones 2 & 22

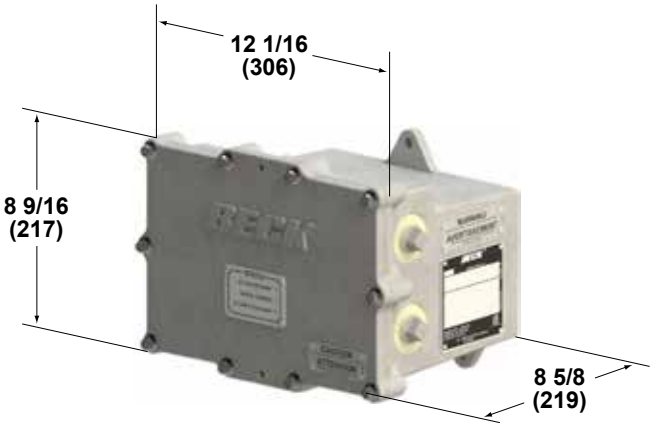
Group 29 Linear Valve Actuators*

- Class I, Div. 1 & 2, Groups C & D
- Class II, Div. 1, Groups E, F & G
- Class II, Div. 2, Groups F & G
- Class III, Div. 1 & 2
- ATEX Zones 2 & 22

*Some ratings may not apply to some models—consult factory for details.

Backup Power Unit (BPU)—Fail-to-position response

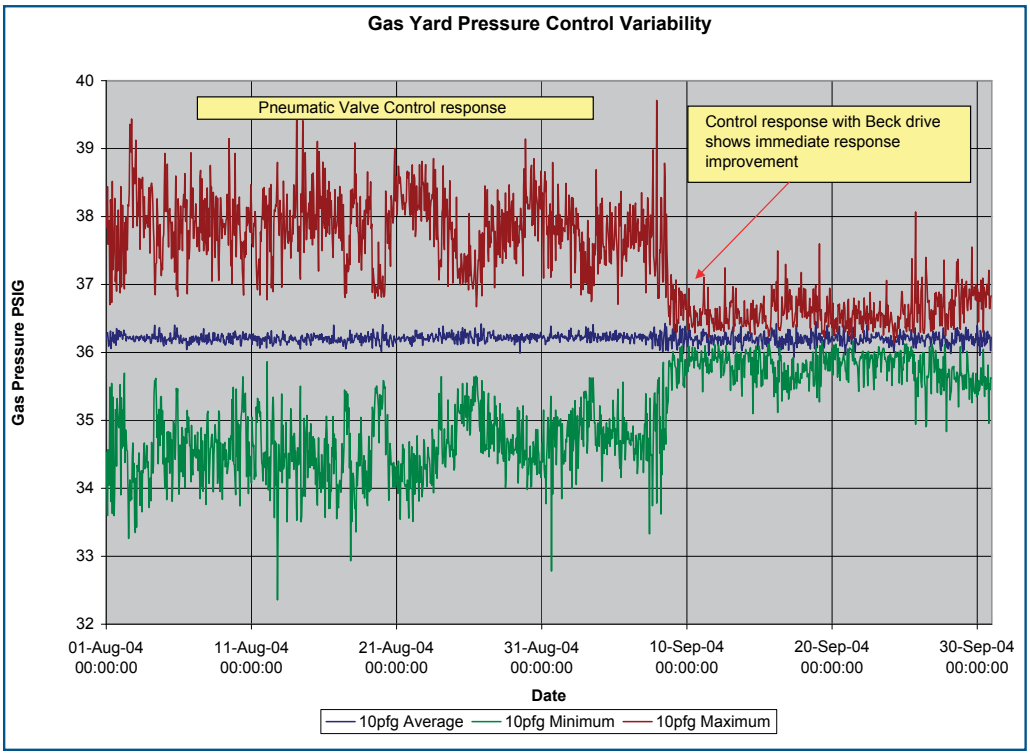
The BPU provides short-duration, backup power for Beck actuators. It is designed to either provide power for fail-to-position actuator response or to maintain normal actuator operation for a short period.



- 1 Amp., 120 Vac maximum supply capability
- Up to ~2.5 minutes backup time
- Power discharge switch (Control Switch S1)
- Temperature rated -40º to 60º C. (-40º to 140º F.)
- Available approvals:
  - > Class I, Div. 1 & 2, Groups C & D
  - > Class II, Div. 1, Groups E, F & G
  - > Class II, Div. 2, Groups F & G
  - > Class III, Div. 1 & 2
- Weatherproof enclosure: Type 4X, IP66 & IP68 (3 meters/48 hours)
- External status indication lights
- Self-contained—mounts anywhere in any orientation
- Maintenance-free—uses ultra capacitor technology, no battery replacement is required
- Auto charge and recharge
- Power status relay outputs

In addition to being the benchmark among damper actuators, Beck actuators also offer superior performance for valve control. The example below shows the dramatic improvements caused by replacing pneumatic actuators with Beck actuators for gas valve pressure control. The valves control the flow of by-product refinery gas that is blended with natural gas and burned in utility-operated boilers supplying steam and power to the refinery. This refinery gas historically has significant contamination, creating stick / slip in valves positioned by pneumatic actuators.

This graph shows historical pressure variability data; including average pressure as well as high and low pressure extremes over time. Note that pneumatic actuators controlled gas header pressure to +/- 2.0 lb and resulted in several pressure control alarms. Replacement with Beck actuators resulted in an immediate reduction in gas header pressure variability down to +/- 0.5 lb, and all pressure control excursions were eliminated.



Field Proven Results

Continually, boiler (as well as heater and furnace) owners make the investment in Beck actuators and realize the long term benefit. Following are a series of data charts that were generated by just one such Beck actuator user.

Figure 1A

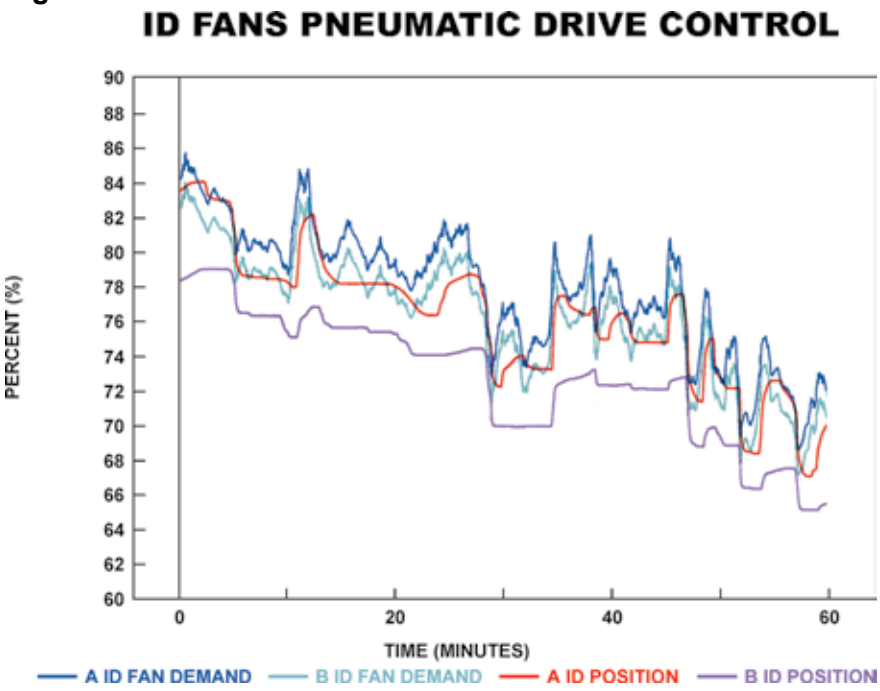


Figure 1A shows data for a boiler with dual ID dampers modulated with pneumatic actuators. Both dampers' actuators receive the same demand signal which is shown biased for clarity. The corresponding damper responses are shown as well. Neither damper actuator could follow the signal closely enough to provide good furnace pressure control. Additionally, although dampers, damper actuators and the controller demand signal are identical, the actuators performed differently from one another. This highlights not only poor response, but the typical inconsistent response of pneumatic actuators as well.

Figure 1B

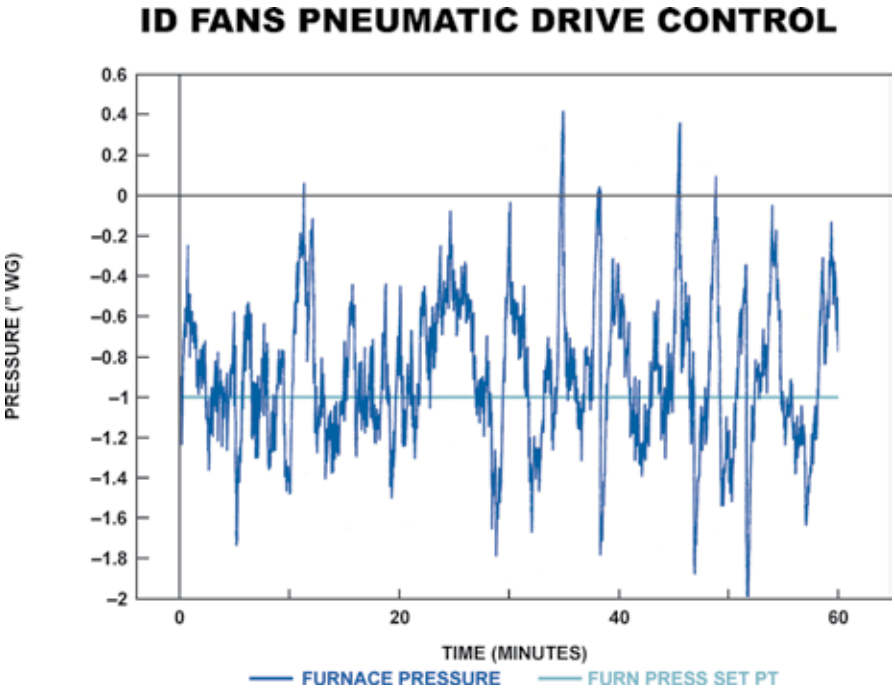


Figure 1B shows the resulting furnace pressure control with the pneumatic actuators in place. Note the following: 1) The pressure control is poor with a wide band of variability; 2) the furnace pressure occasionally goes positive; 3) the control setpoint is set at –1 inch of water column. Compare these results to Figure 2B after Beck drives were installed.

Figure 2A

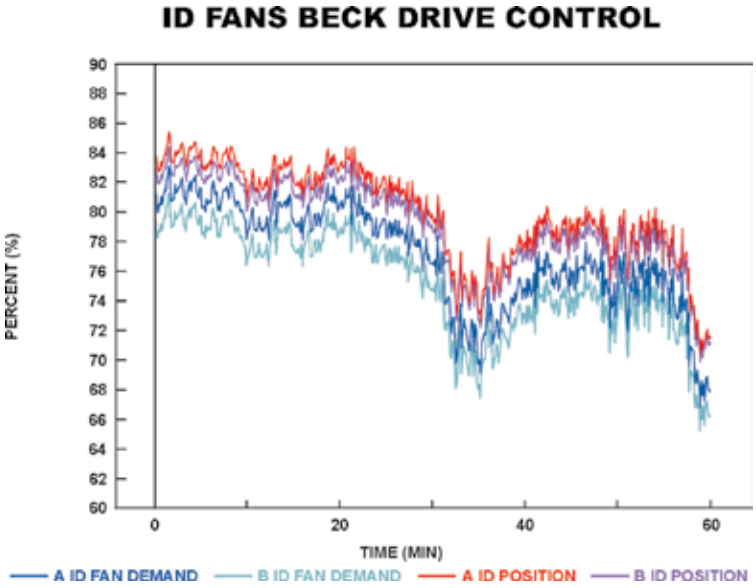


Figure 2A shows the response of the two ID dampers after Beck Electric Actuators were installed. As in Figure 1A, biases were added to all the signals for the sake of display clarity, but the two demand signals are identical and the position signals actually overlay the demand. Note how closely the damper position tracks the demand, allowing for optimal furnace pressure control.

Figure 2B

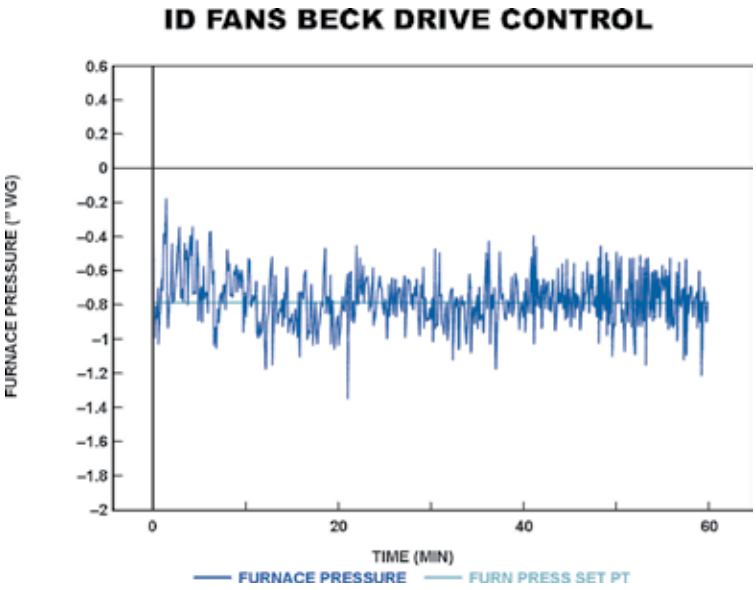


Figure 2B shows the furnace pressure control after the Beck actuators were installed. It is easy to see at a glance how much tighter the control results are compared to Figure 1B; however, it is also important to note the following: 1) Furnace pressure no longer makes positive excursions; 2) the loop setpoint has actually been moved from –1 in WC to a more efficient –0.8 inches WC; 3) this data was collected after the Beck actuators were installed, but before any tuning or other changes were made.

Figure 2C

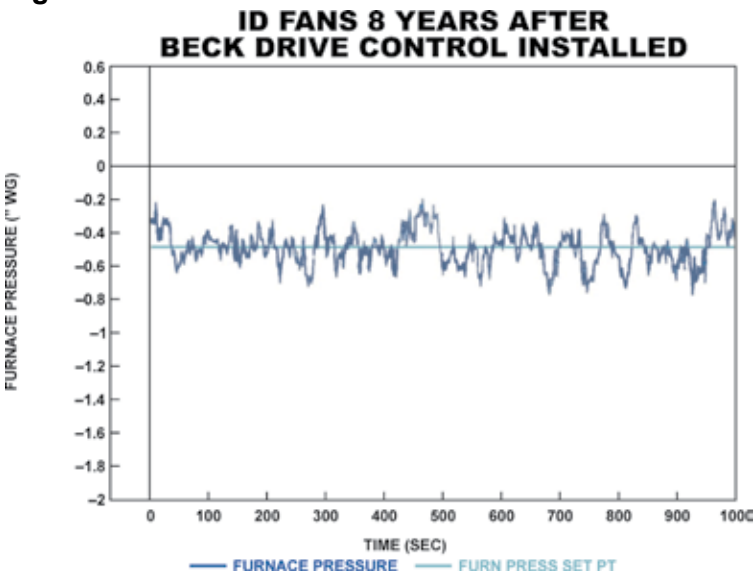


Figure 2C shows data collected on the ID dampers eight years after the Beck actuators were installed. Clearly, performance is still excellent. Further control improvements over the years allowed the furnace pressure setpoint to be moved from –0.8 inches WC to –0.5 inches WC; further accentuating the need for excellent damper control.

GENERAL SPECIFICATIONS

Actuator Power	
Models 11	120 Vac, single-phase, 60 Hz (50 Hz Optional) (208, 240, 380, 415, 480 & 575 Vac, 60 or 50 Hz Optional)
Model 14 & 29	120 Vac, single-phase, 60 Hz (50 Hz Optional) (240 Vac, single-phase, 60 or 50 Hz Optional)
Model 31	120 Vac, single-phase, 60 or 50 Hz
Model 57	12–30 Vdc (12–48 Vdc; 208, 240, 380, 415, 480 or 575 Vac; 100–264 Vac Optional)
Output Torque/Thrust	
Model 11	Up to 1,800 lb-ft (2 440 N•m)
Model 14	Up to 4,000 lbs of thrust (17 800 N)
Model 29	Up to 6,100 lbs of thrust (27 134 N)
Model 31	Up to 30 lb-ft (41 N•m)
Model 57	Up to 120 lb-ft (163 N•m)
Operating Conditions	
Models 11, 14 & 29	–40° to 185° F (–40° to 85°C) 0 to 100% relative humidity, non-condensing
Model 31	–40° to 150° F (–40° to 65°C) 0 to 100% relative humidity, non-condensing
Model 57	–58° to 185° F (–50° to 85°C) 0 to 100% relative humidity, non-condensing
Input Signal Options	4–20 mA or 1–5 Vdc
Communication Interface Options Models 11, 14 & 29, Option 9 only	HART, Modbus RTU, Modbus TCP (Ethernet), Foundation Fieldbus, Profibus PA, local pushbutton/LEDs and DB9 Serial Commands
Model 57	HART, Modbus RTU, Modbus TCP (Ethernet), local pushbutton/LEDs, DB9 Serial Commands and Wi-Fi
Position Feedback Signal	4–20 mA or 1–5 Vdc (Vdc not available with Option 9)
Action on Loss of Input Signal	Stays in place (all models) or moves to a preset position (configurable with some models)
Action on Loss of Power	Stays in place
Enclosure	Type 4 or 4X (depending on specific model). Models approved for use in Hazardous classified locations are also available—contact a Beck Sales or Application Engineer for details.
Backup Power Unit (BPU)	Up to ~2.5 minutes backup time. Available with some models—contact a Beck Sales or Application Engineer for details.

HART COMMUNICATION PROTOCOL

Modbus MEMBER

Made in USA

BECK®

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