Fire & Air: The Damper Series

By Kent Maune and Michael Knipple

Life Safety Actuators

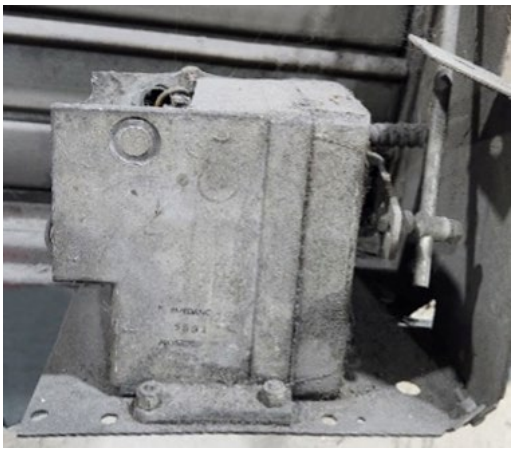
Introduction

The history of fire and smoke damper actuators began in the mid-20th century, as increasing larger commercial and institutional structures relied on centralized HVAC systems. These HVAC designs penetrated walls and ceilings, creating pathways where fire and smoke could travel to other compartments. To create compartmentation, dampers utilizing basic, non-motorized gravity operated designs such as fusible links and spring-loaded mechanisms were installed in these penetrations.

The 1970s saw the introduction of early motorized actuators for standard commercial dampers, but a major shift occurred in 1978 when Belimo began producing direct coupled actuators specifically for fire dampers in the European market. This innovation was followed by the development of integrated, reliable actuators designed to operate under extreme fire conditions, leading to the current, technologically advanced models available from companies like Belimo, Honeywell, Barber Colman, and Siemens.

The Rise of Motorized Actuators (1970s–1990s)

- **Motorized dampers**: The 1970s saw the introduction of motorized fire dampers that utilized a fuse rod to release and close the damper blades. initially these units used a standard commercial actuator or stall motor. These damper designs were tested to UL standards but did not require the actuator to function under fire conditions; the fusible rod would disconnect the actuator, and an external spring would close the damper.



”The history of fire and smoke damper actuators began in the mid-20th century, as increasing larger commercial and institutional structures relied on centralized HVAC systems.”

- **First specialized actuators:** In 1978, Belimo began manufacturing specialized actuators specifically for the European fire and smoke damper market.

- **UL 555 and UL 555S**: ULAs motorized dampers became more common. UL developed actuator requirements which were included in their standards for both fire dampers (UL 555) and smoke dampers (UL 555S).

- **Technological improvements:** These early motorized actuators were limited and often did not need to withstand fire conditions themselves. The actuators for fire and smoke dampers were not yet required to be tested under fire conditions by UL. In 1979, UL issued the 3rd Edition of UL555 introducing requirements for motorized fire dampers along with releasing the 1st Edition of UL555S addressing requirements for smoke dampers.

Modern Era (2000s–Present)

- **Integrated designs:** Companies like Belimo, Honeywell and Siemens began to design and build specialized, integrated actuators that could perform reliably in fire and smoke scenarios, per UL555 and UL555S requirements.

- **Specific standards**: Newer actuators are designed to meet evolving UL 555 and UL 555S standards, are tested to withstand extreme temperatures (e.g., 350°F), and are built to exceed requirements for cycle life.

- **Increased reliability**: Modern actuators are designed for a much higher level of reliability and integration, with features like high-strength, enhanced electronic components, corrosion-resistant materials, and direct-coupling designs that have become an industry standard.

- **New product development**: This era has seen the invention of new actuator technologies, such as the commonly used FSNF spring-return life safety damper actuator introduced by Belimo in 2002.

- **Industry-wide changes**: The evolution of these actuators has made it easier to replace old components with modern, more reliable parts, though this can sometimes require the damper manufacturer to re-list the combination.

The Future (2030+)

- **Evolving Codes and Standards**: As building technologies and HVAC system design continue to develop, along with focus on occupant safety and comfort, the Codes and Standards will evolve to address these improvements. Next generation life safety actuator designs are also evolving to provide the additional value that technology advancements offer, ultimately raising the level of occupant and property protection and safety.

"Modern actuators are designed for a much higher level of reliability and integration..."

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