Reconsidering Mechanical Devices for Partial Stroke Valve Testing

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Users have been employing methods of “partial stroke valve testing” (PST) long before anyone heard of ISA 84.01, IEC 61511 or the now ubiquitous term of “smart positioner”. These methods were typically the result a craftsman in a valve shop making unique (“one off”) modifications of the valve/actuator mounting hardware to prevent the valve from full closure. This might consist of something as rudimentary as a removable dowel pin stuck through a valve stem, hitting a welded travel stop inside a mounting bracket. Very crude, but effective for what it was.

Over time, and with the development of the aforementioned standards, more complex methodologies developed. Because the standards addressed Safety Instrumented Systems, the newer generation methodologies for accomplishing PST were predominately developed by control systems engineers. Those engineers addressed this problem by using the same thought processes used to develop automated control valve packages: “If I want this control valve to do something I need to add controls to make it do that something.” This became a default way thinking. The unfortunate result of this line of thinking were increasingly complicated PST methods adding substantial cost and intricacy to what may already have been a fairly sophisticated system.

This paper poses the question: Why take an already complicated control system and make it more complex to solve the problem of making it more reliable? Is there a simpler, less complex solution that will result in an acceptable methodology for PST?

There is a new generation of purpose built, mechanical PST devices that provide a simpler, less complex, less costly and, in many views, a safer and more reliable solution to PST.

The author will explore the theoretical vs. “real world” (actual) characteristics of automated valves with emphasis on pneumatically operated, quarter turn ESD valves. These valves are not necessarily smooth acting and/or repeatable. The result is that controls-oriented PST methodologies may tend to give false indication of “failure” causing undue maintenance and down time.

We will explore an old idea in a new way, by reconsidering what many may think of as “old technology”, but what may actually be a better technology for many PST applications—the mechanical methodology.

The end result will be a challenge to conference attendees to examine their thinking and engineering process. Why “jump” to a default way of thinking (“add more controls”) before considering a simpler, perhaps more reliable, mechanical solution?

Our hope is that attendees will leave the session with an appreciation for the practical benefits of PST using mechanical methodologies to save time, cost and decrease complexity of their systems.

KEY WORDS: Safety Instrumented Systems, ISA 84.01, IEC 61511, Partial Stroke Test Devices, Probability of Failure on Demand (Average) PFDavg, Emergency Shutdown Valve