PROBLEM SOLVING IDEAS

MARCH 1993 ◆ Pages 40–41

CONTROL
FOR THE PROCESS INDUSTRIES

More on Large Pressure Drop Stability

In the February 1993 issue of CONTROL, several Problem Solving Ideas were proposed to help control the stability of a large pressure drop across a control valve. The problem involved a 300-psi (lb./sq.in.) steam flow from a drum pressure that reaches 2600-psi when the boiler is operating at full capacity. Here is another response with ideas on how to stabilize the lower pressure control.

From the description given, the valve is an auxiliary steam valve which draws steam from the drum and supplies it to various demand points in the power plant at a reduced pressure.

For this type of service, high turndown capability and controllability are critical attributes for the control valve. A standard control valve is severely limited in both these respects. In this instance, it is most probably the inability of the existing valve to control the flow exactly at the demand evel that results in unsteady flow rate, which, in turn, causes swings in pressure downstream.

This can be cured with the right flow characteristics, such as those afforded by an "equal percentage" control valve—that is, a valve where a given percentage change in stroke represents the same percentage change in C_v. Turndown capability for these valves is typically 30:1. (See Figure 1). These valves can be made to give good controllability at low C_v operating conditions which are probably encountered in this particular instance when pressure drop is maximum.

In addition, velocity control is critical in severe service applications such as this to minimize erosion and vibration that can cause not only poor controllability, but also result in severe mechanical damage. Velocity control can be achieved by using a drag control valve which features a tortuous flow path, effectively incorporating a large number of stages of pressure reduction. Figure 2 shows an example of such a tortuous flow path in a disk from a disk stack which acts as the flow control element. For this application, 22 stages of pressure reduction are recommended in order to keep trim exit velocity head below 70-psi.

Sanjay V. Sherikar
Manager, Research and Development
Control Components, Inc.
Rancho Santa Margarita, Calif.

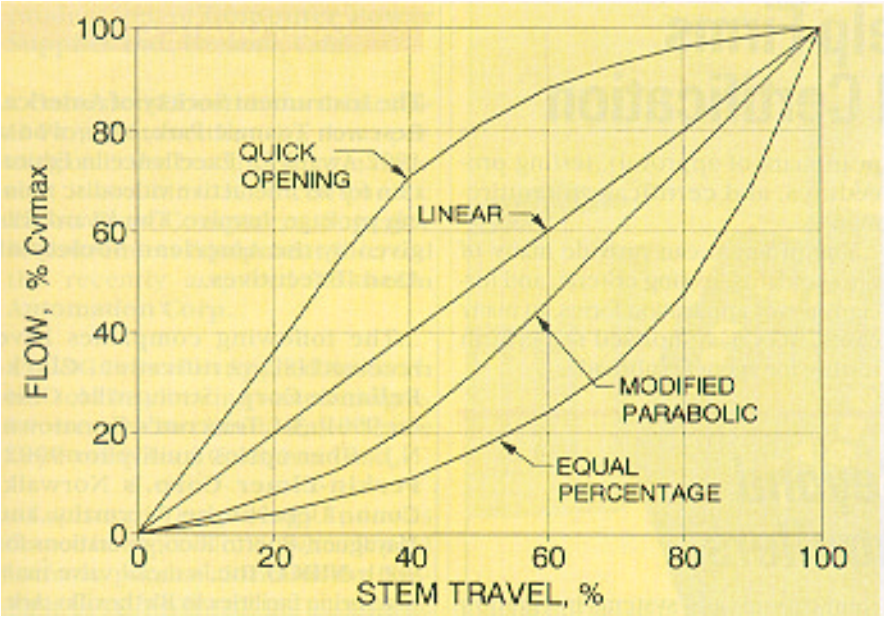

Figure 1. *Commonly used flow characterizations of control valves.*

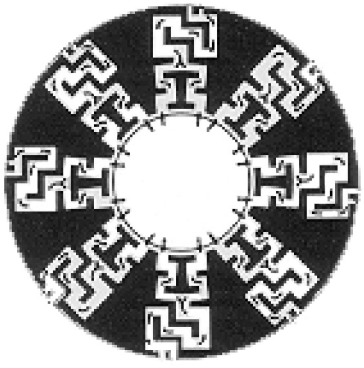

Figure 2. *Typical multi-stage tortuous flow path in a disk. Several such disks assembled as a stack form the flow control element with the required flow capacity and characterization.*