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Recommended Practice

Process Data Presentation for Control Valves

ISA-RP75.21 — Process Data Presentation for Control Valves

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Contents

1 Scope

The document describes a technique for the communication of process data and other special requirements among the parties involved to facilitate the selection of control valves, their actuators, and accessories. The technique includes, but is not limited to, such features as a process data envelope, a process schematic, a process piping configuration, and a process data worksheet, which may be used in combination or in part as appropriate to the specific application. Development and verification of design and actual process conditions at the final control element are more easily and thoroughly accomplished using a "standard format."

2 Purpose

The purpose of this document is to assure an adequate exchange of process conditions and other pertinent information between the process system designer or the person who specifies the control valve, and the control valve supplier. The technique is not intended for use on all normal applications, but it may be a useful tool for obtaining the process data needed. Several suggested extraordinary applications where very complete data is required are listed in Section 9.

3 Definitions

No new definitions are required for this document. Terminology used is consistent with ISA-S75.05, *Control Valve Terminology.*

4 Discussion

4.1 The success of any endeavor can be related to complete and unambiguous communication of information among the parties involved. The successful application of a final control element to a specific process is a function of such data interchange.

4.2 Process data reduction, that is, calculation of flow coefficient (C_V), flow characteristic, and control valve selection, etc., are beyond the scope of this document.

4.3 Process data presentation may be accomplished using four distinct, yet related, formats. These formats may be used individually or combined as appropriate.

a) Process data envelope

b) Process schematic

c) Process piping configuration

d) Process data worksheet

5 Process data envelope

5.1 The process data envelope is the plot of flow rate vs. the process variables that exist at the final control element. The process variables may be pressure, temperature, specific gravity, viscosity, etc. Further, the flow rate abscissa may be divided into segments with the indication of the approximate operating time anticipated in each segment. Special notes may be added to the plot pointing out other data for consideration.

Figure 1 shows an example of a process data envelope.

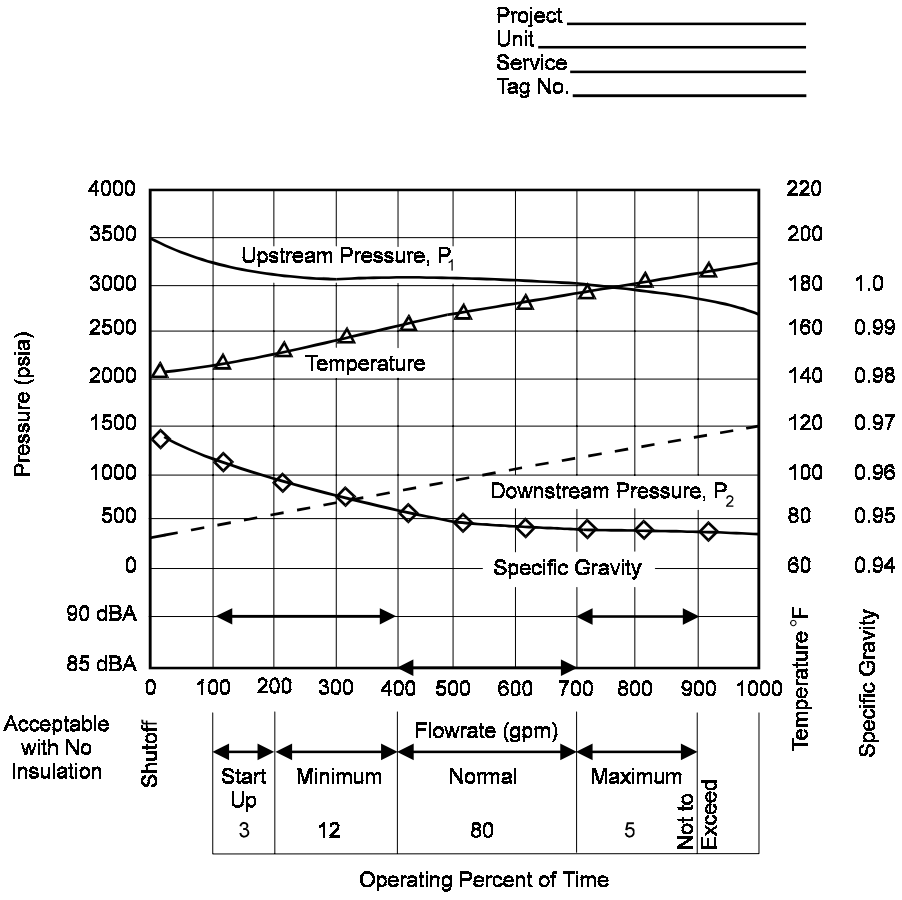

Figure 1 — Example of a process data envelope

6 Process schematic

6.1 The process schematic is a sketch of the process associated with a given system and its control elements. The process schematic may be a tool used to obtain the process data envelope. Basically, any final control element installation can be broken into five considerations:

a) source;

b) source-to-valve flow resistance and elevation change;

c) final control element (valve);

d) valve-to-receiver flow resistance and elevation change; and

e) receiver.

6.2 The process data at the final control element is obtained by working from the source and the receiver using the respective flow resistance at the process flow rates. Corrections for elevation changes and equipment losses must be included to obtain correct data adjacent to the final control element.

Figure 2 shows an example of a process schematic.

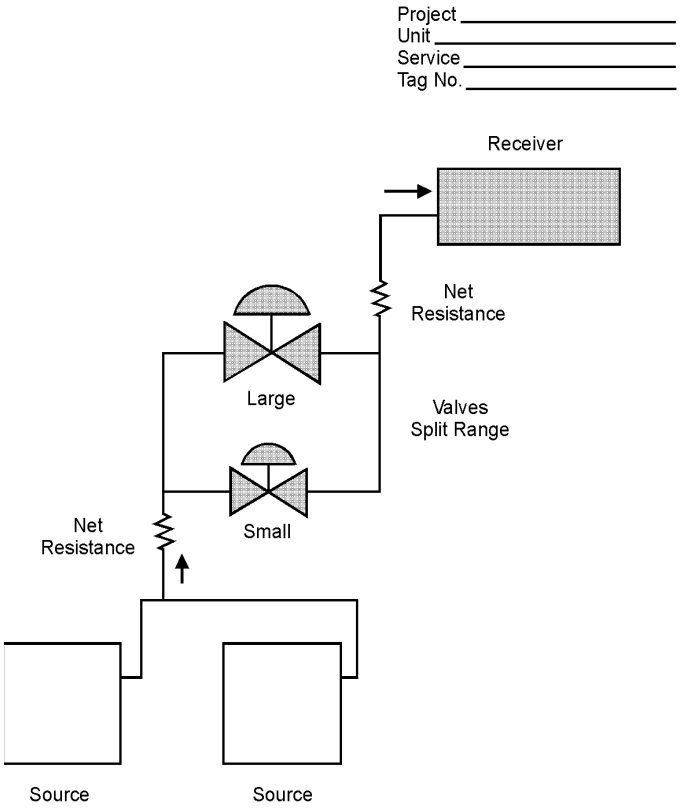

Figure 2 — Example of a process schematic

7 Process piping configuration

7.1 The process piping configuration is an isometric, or similar, sketch of the fittings, piping length, and schedule(s) adjacent to the final control element. The in-line piping configuration greater than 18 pipe diameters beyond the valve, in either direction, is considered to have negligible effect upon the performance of the valve.

7.2 A piping geometry correction factor and noise attenuation value can be determined from the process piping configuration information. Evaluation for a poor or undesirable piping arrangement adjacent to the final control element can also be made.

Figure 3 shows an example of a process piping configuration.

8 Process data worksheet

8.1 The process data worksheet is a tool to aid in making a more complete analysis of a particular valve application. Information at various flow rates, as related to the source, the receiver, and pressure changes, is developed and organized into a standard format. Other process data, as applicable, may be developed. The results of the worksheet provide most of the desired information to prepare the process data envelope.

8.2 The objective of the worksheet is to provide a method of developing process data at the final control element. The worksheet can be used in conjunction with the control valve data sheet and may assist in completing the needed data at flow and shutoff conditions. Many valve selections can be made satisfactorily by using only that information shown on the ISA-S20.50, Rev. 1, *Control Valve Data Sheet*, Second Printing.

Figure 4 shows an example of a process data worksheet.

9 Suggested applications

Process data presentation techniques are not intended for universal application. Suggested applications where any or all of these techniques may be used effectively are as follows:

a) Choked flow may exist at the valve under any operating conditions.

b) The process may have extreme temperature changes.

c) Situations at or near cavitation or flashing

d) Line fluid velocities are extreme.

e) Environmental conditions where retrofit or service becomes a major consideration

f) Critical or key control valve applications in a specific process

g) There is potential for excessive noise generation.

h) The process fluid is of high viscosity.

i) Liquids saturated with dissolved gases/two-phase flow

j) Erosion or thinning of the downstream piping, such as an elbow near the valve outlet

k) Pressure drop is extremely small.

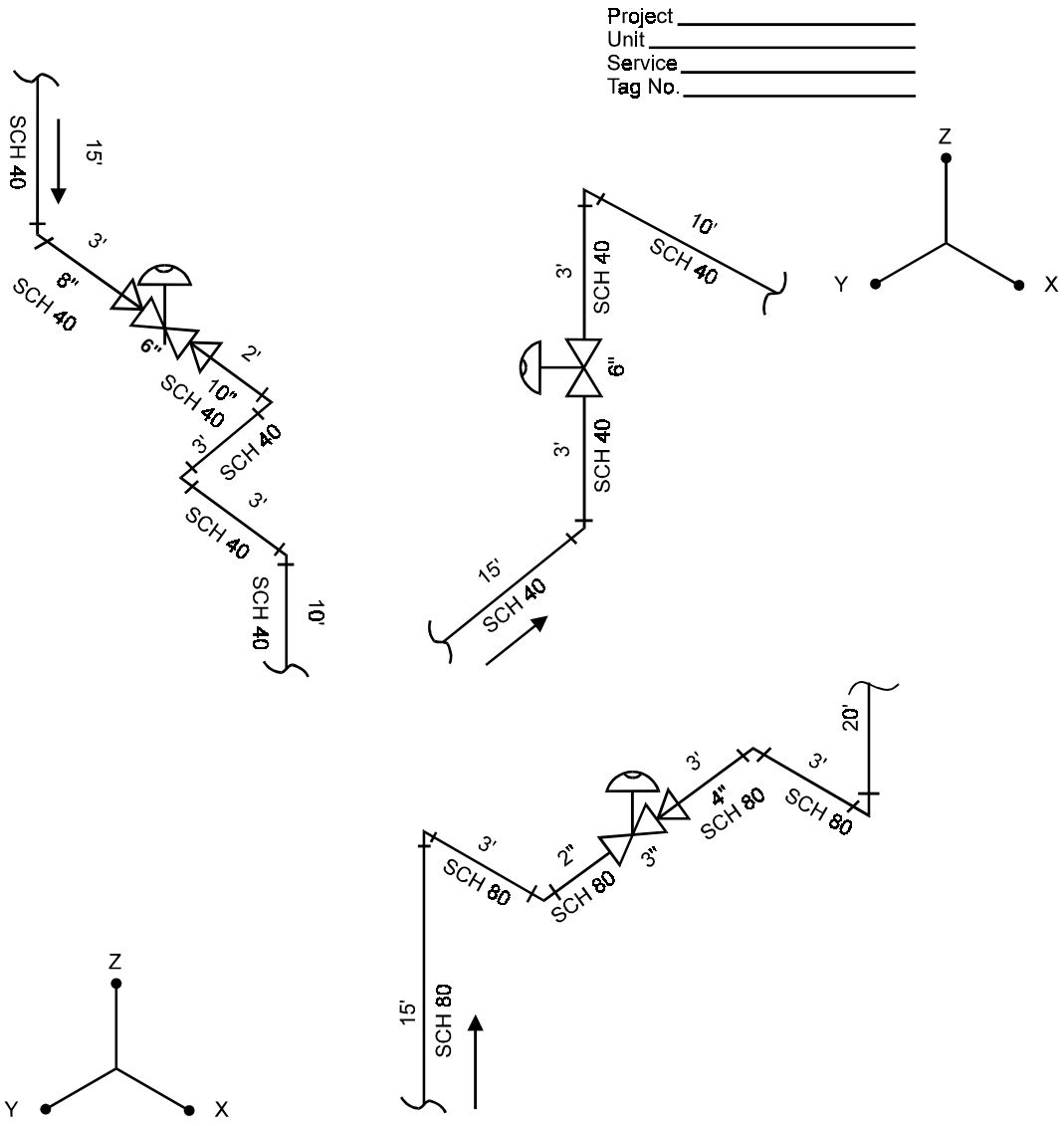

Figure 3 — Examples of process piping configuration sketches

PROJECT _____ DATA SH _____ OF _____
UNIT _____ SPEC. _____
P.O. _____ TAG _____
ITEM _____ DWG _____
CONTRACT _____ SERVICE _____
MFR SRL NO _____

	SERVICE CONDITIONS	UNITS	MAX FLOW	NRM FLOW	MIN FLOW	SHUTOFF
	FLOW RATE					
	SOURCE PRESSURE, ABSOLUTE					
SOURCE TO VALVE	PUMP, BLOWER, ETC					
SOURCE TO VALVE	ELEVATION CORRECTION					
SOURCE TO VALVE	LINE LOSS					
SOURCE TO VALVE	EQUIPMENT LOSS, 1					
SOURCE TO VALVE	EQUIPMENT LOSS, 2					
	VALVE INLET PRESSURE, ABS					
	RECEIVER PRESSURE, ABS					
RECEIVER TO VALVE	ELEVATION CORRECTION					
RECEIVER TO VALVE	LINE LOSS					
RECEIVER TO VALVE	EQUIPMENT LOSS, 1					
RECEIVER TO VALVE	EQUIPMENT LOSS, 2					
	VALVE OUTLET PRESSURE, ABS					
	INLET TEMPERATURE					
	SPEC WT / SPEC GRAV / MOL WT					
AT VALVE INLET	VISCOSITY / SPEC HTS RATIO					
AT VALVE INLET	VAPOR PRESSURE, ABSOLUTE					
AT VALVE INLET	CRITICAL PRESSURE, ABS					
AT VALVE INLET	REQUIRED C_v					
	RATED C_v					
	PERCENT TRAVEL					

NOTES, PROCESS DATA SCHEMATIC, PIPING CONFIGURATION, ETC.

Figure 4 — Process data worksheet

Annex A — References

ISA

S20.50, Rev. 1 Second Printing	Control Valve Data Sheet
S51.1-1993 (R)	Process Instrumentation Terminology
S75.01-1995 (R)	Flow Equations for Sizing Control Valves
S75.02-1993 (R)	Control Valve Capacity Test Procedures
S75.05-1983	Control Valve Terminology
ISA Handbook of Control Valves, 2nd Edition, J. W. Hutchison, Editor.	

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MISCELLANEOUS

Technical Paper No. 410, "Flow of Fluids through Valve Fittings and Pipe," (Crane Company, Chicago).

George E. Russel, *Hydraulics*, Fifth Edition, Henry Holt and Company, 1942.

Stephen S. Miller, "Sizing Steam Piping Using a Personal Computer," *Power Engineering*, March 1986.

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