

Validation case of the ANSI control valve

Introduction

This validation case study demonstrates the verification and validation of the Flownex ANSI control valve element. The simulation of an ANSI control valve is stipulated by the ‘American National Standards Institute’ in the document ‘Flow Equations for Sizing Control Valves’ [1].

Validation Specification

The case is considered where two different fluids flow through two separate control valves, defined by flow coefficients determined as prescribed in the ANSI control valve capacity test procedures [2]. The valve openings are then varied to determine a range of flows through the valves. The two fluids used for the simulations are an incompressible fluid, with fluid properties similar to that of water, and a compressible fluid, with fluid properties similar to that of air. The valve used for the simulations is a *Nelprof*® Series 9000, full bore, ball valve [3].

Flownex model

The Flownex ANSI control valve element was used for the simulations, with the flow coefficient data supplied for the *Nelprof*® valve entered into the Flownex ANSI control valve database. The Flownex model assumes the valve geometry as illustrated in Figure 1.

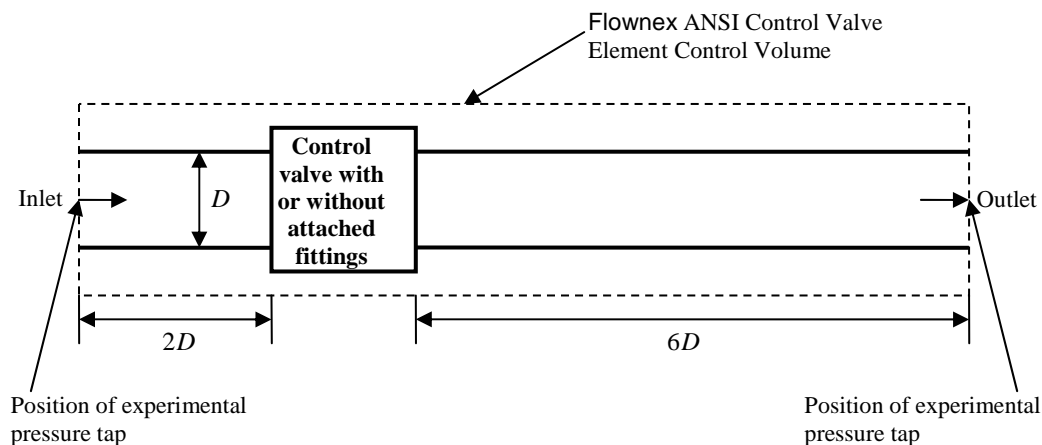


Figure 1: ANSI Control Valve Control Volume

Benchmark

Two benchmarks were used to compare the results. The first benchmark is a valve sizing and selection software package developed by Metso Automation, i.e. Neles [3]. The theory for control valves, as described in the ANSI document [1], was used as an analytical second benchmark.

Results

The Flownex (FNX) results were compared with the first (BNCH1) and second (BNCH2) benchmarks' results and illustrated in Figure 2 for the incompressible fluid and Figure 3 for the compressible fluid and acceptable agreement was observed for all the comparisons.

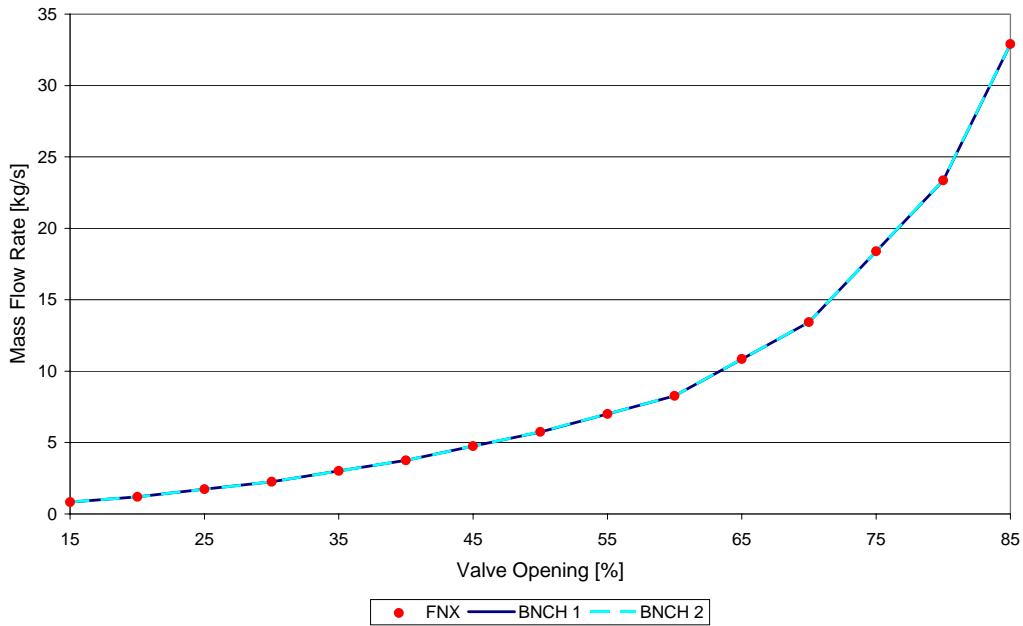


Figure 2: Results of Incompressible Fluid

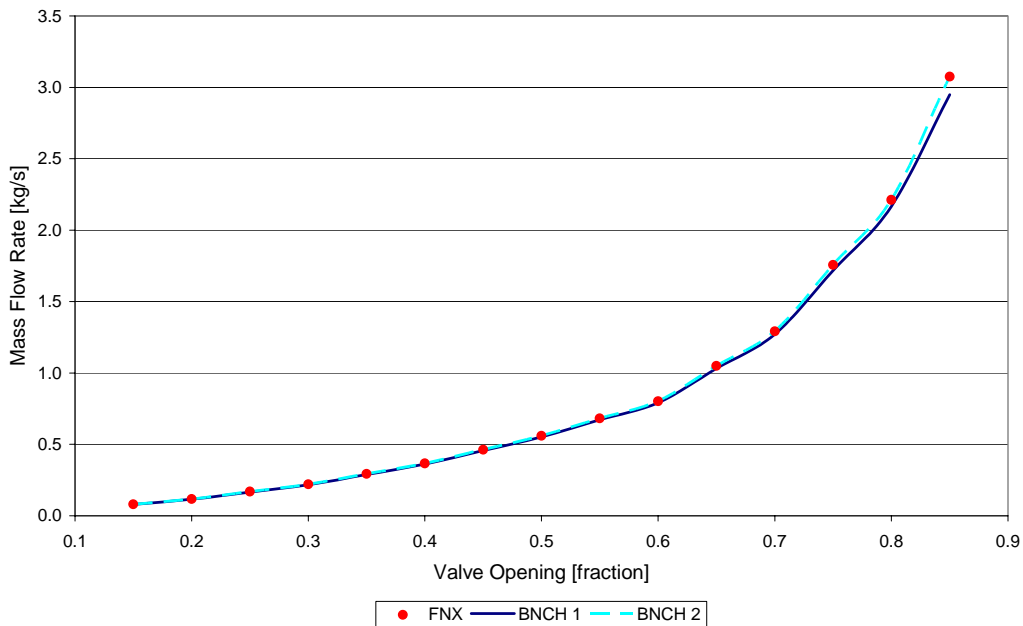


Figure 3: Results of Compressible Fluid

Conclusion

The Flownex simulation results compared very favorably with the Neles software and the ANSI control valve theory [1].

References

- [1] Flow Equations for Sizing Control Valves. ISA – 75.01.01-2002 (IEC 60534-2-1 Mod)
- [2] Control Valve Capacity Test Procedures. ANSI/ISA – 75.02-1996
- [3] Metso Automation website. 2005. Neles. www.metsoautomation.com Date accessed: Jan 2005.