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ARCHITECTURE ENGINEERING INTERIORS

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From Experience

Design Considerations for Pressure Control in Liquid Systems

Maintaining optimal pressure within a liquid system is crucial for ensuring all the users are getting required flow, which helps prevent process upsets. Flow and pressure are interrelated in a pressurized system.

Proper pipeline and component sizing are essential for effective pressure control in a liquid system. Oversized or undersized piping can lead to inefficient operation and pressure instability. For preliminary pipe line sizing, designers frequently defer to fluid velocity rules of thumb. (See our past From Experience on "Linear Speed of Liquids.")

For liquid process lines, a flow rate of 5 feet per second is typically targeted as a rule of thumb. (See Experience in Brief for rules on pipeline sizing.)

When sizing a system, it is also important to consider the distribution piping going to various end users. Overall water demand will change and fluctuate as equipment comes on and offline. It is important to understand how these changes in demand can affect overall system pressure and therefore flow through the branch piping. Modeling the piping system using simulation software such as PIPE-FLO® allows the user to understand how changes in demand in one part of the system affect flow rates and pressures in other parts.

The example on the following page shows the simulation of simple water system with three user points (Tank 1, Tank 2 and Equipment 1 – Spray Nozzle). In scenario 1, we have sized the piping based on thumb rules without any pressure control in place. The Equipment 1 spray nozzle was not able to get enough pressure to operate and flow to Tank 1, and Tank 2 received higher than expected inflow flowrates. In scenario 2, we have addressed the

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EXPERIENCE IN BRIEF

Quick flow estimates
gpm=20 x d^2, for schedule 40 piping at 7 fps
gpm=12 x d^2, for sanitary tubing at 5 fps
and gpm = F/500

Quick pipe diameter estimate
$d=(gpm/20)^{0.5}$, for schedule 40 piping at 7 fps
$d=(gpm/12)^{0.5}$, for sanitary tubing at 5 fps

Where:
gpm = gal/min
d = inside pipe diameter in inches
F = lb/hr

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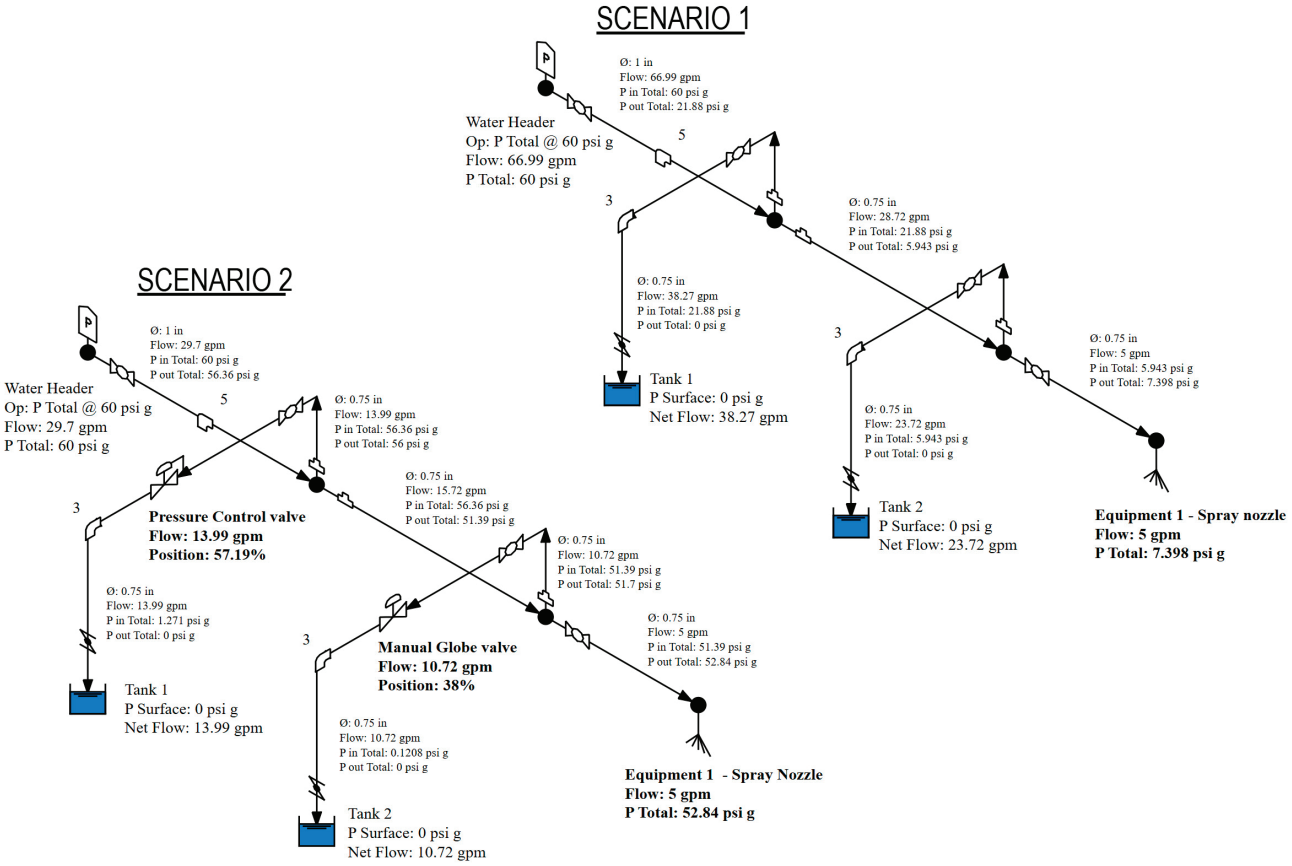
pressure issue at the spray nozzle with back pressure control valve in Tank 1 feed line and a manual globe valve in Tank 2 feed line. By installing these pressure control devices, Equipment 1 spray nozzle was supplied at a sufficient pressure to operate while meeting the flow requirements to Tank 1 and Tank 2.



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CONTACT US

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