Steam Valves
Meeting Todays'
Safety, Reliability and Performance Standards

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Valves

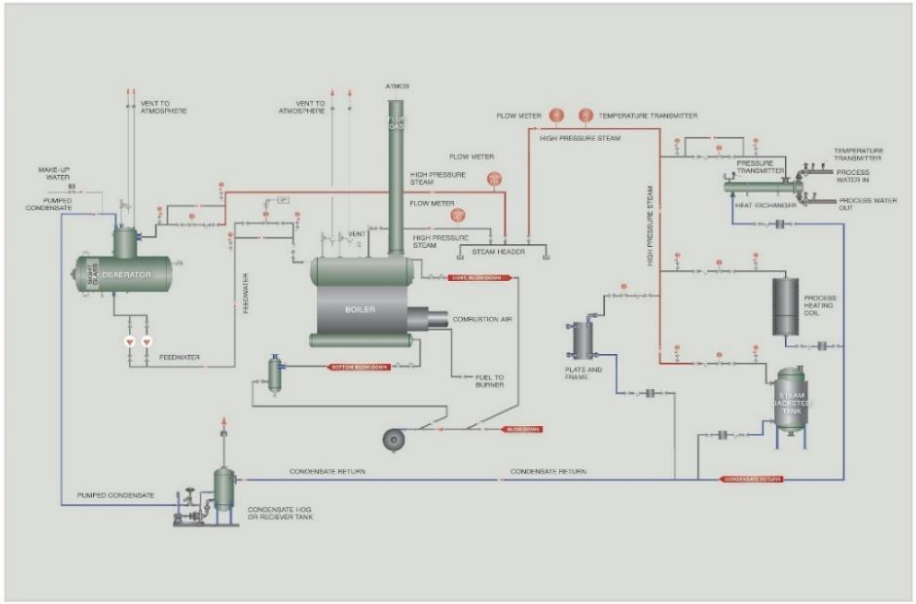
- “A device that controls the flow of a fluid”
- Controls the following;
  - Flow
  - Pressure
  - Temperature
  - Direction
- On/off, regulate, modulate, or isolate

Steam Valves Overview

- Can be one of the largest contributors to the following;
  - Operational problems
  - Lost efficiencies
    - (wrong valve, oversized or poorly design, manufacture)
- Selected correctly for the application
  - Maintained properly
  - Valves should last at least the life of the plant

Steam Valve Safety

- Knowing the maximum pressure and temperature rating in the system
- Materials need to be selected by the safety valve setting protecting the system – not operating pressure



Steam Valve Safety

- Need to the following;
  - Pressure
  - Temperature

Examples;

- 100 psig @ 338 F
- 150 psig @ 366 F

Steam System Safety

- Steam safety
  - Know the codes
    - B31.1
    - B31.3
    - Pressure vessel
    - Boiler codes

Steam Valve Safety

- Does the steam system have a warm up valve?
- Do your valves need help in opening or closing?
- How to warm up the system slowly

Reliability in Steam Systems Today

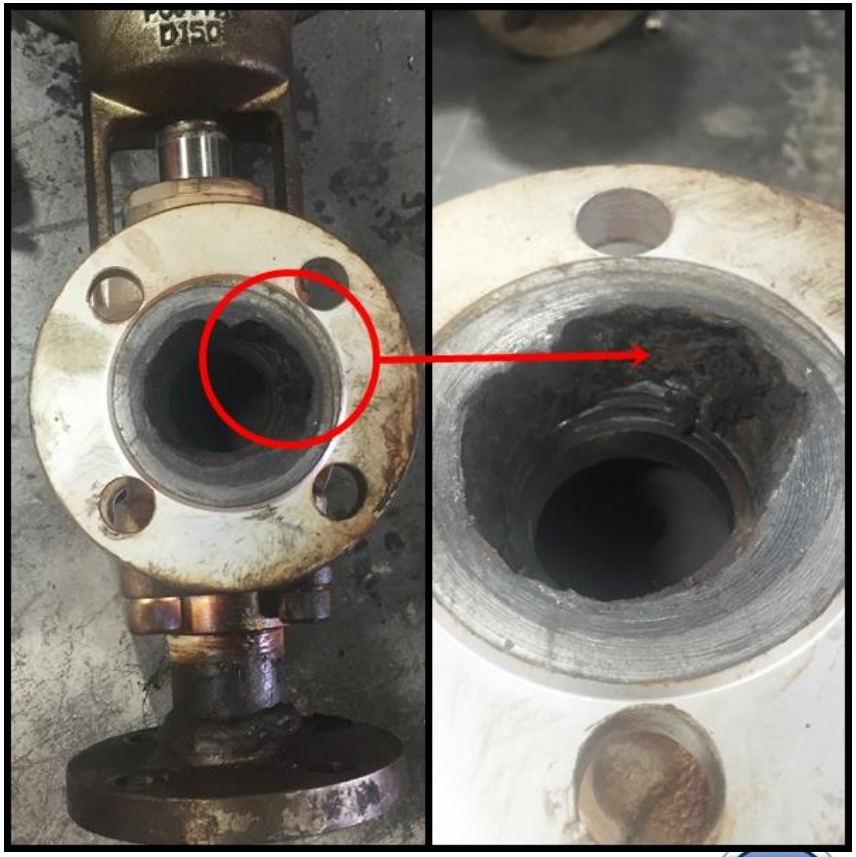
- When purchasing a product a valve – how long do you want the valve to last?
  - 1 year
  - 3 years
  - 5 years
  - 15 years
  - 30 years

- 250 psig steam pressures or less – all products and components need to operate and perform for 15 years without failure
- Today's steam operation – we cannot afford premature failures
- Steam valves should last the life of the plant

Reliability

- Root cause analysis has to be part of the program.

- Using resources to accomplishing root cause analysis



Know the Internal Leak Rates for Valves

- All valves are designed to meet a defined internal permissible leak rate standard
- American National Standards Institute (ANSI) or FCI
  - Six permissible leak rates or classes numbered
- Identifying the permissible internal leak rate
  - Top priorities when choosing the correct steam control or isolation valve

Shut off Standards for Leak Rates

- Class I = No testing
- Class II = .5% of full rated valve capacity
- Class IV = .01% of full rated valve capacity
- Class VI = ML per min vs. port size

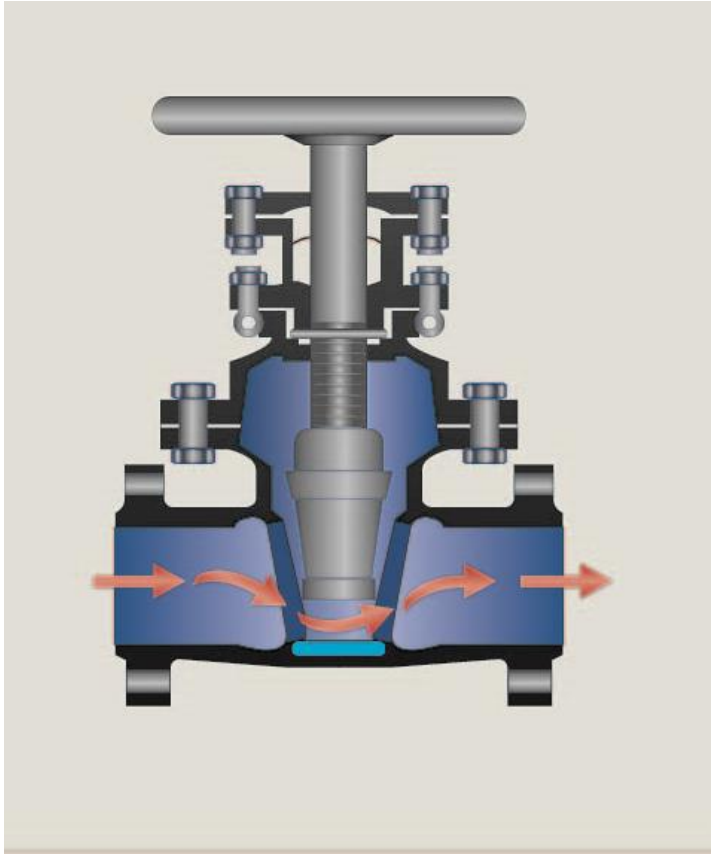
- Or the API standard.
  - Two bubbles per min

Steam Valve Types

- Gate
- Globe
- Ball
- Butterfly
- Check

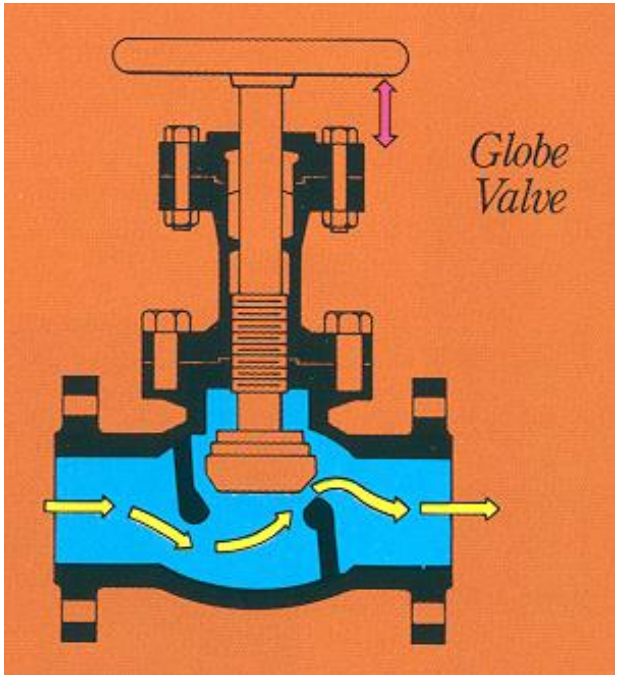
Gate Valves

- Linear-motion, general service valve
- On-off, non-throttling service
- Referred a “stop, block valves”



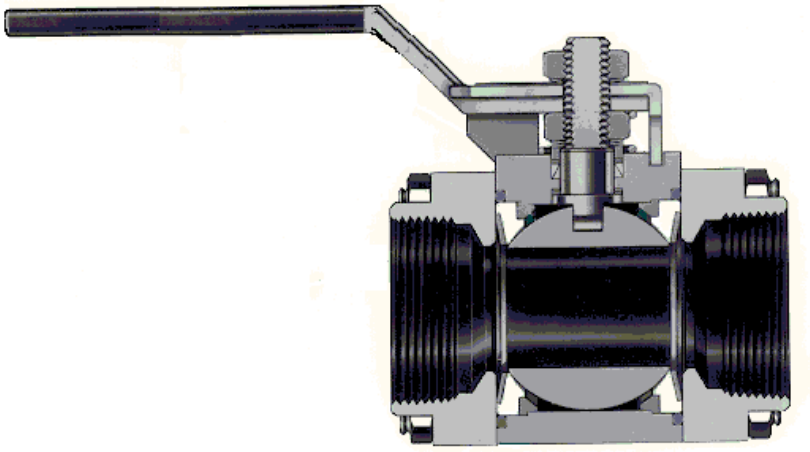
Globe Valves

- Globe valves affect closure by the plug, having a flat or convex bottom, lowering onto a matching horizontal seat located in the center of the valve
- Flow passes from the inlet through the port to the outlet, creating a backpressure and pressure-reducing effect
- Inherent high pressure drop makes globe valves ideal for controlling pressure.



Ball Valves

- Simple device
- Quarter turn
- Able to achieve a very low leakage rate
  - Typically, Class VI

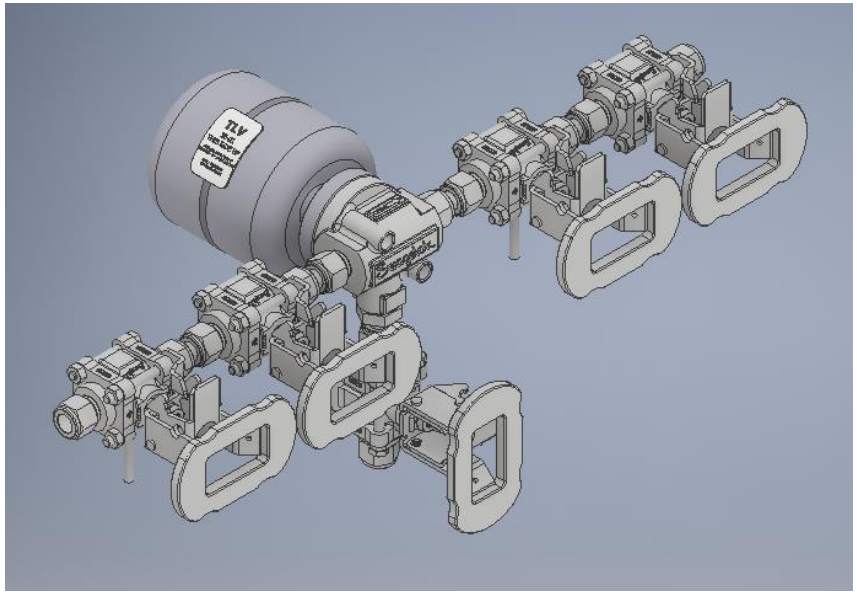


Ball Valves

- Very versatile
- Withstand pressures up to 10,000 psi
- Temperatures in excess of 450°F
  - Depending on their body and seat materials
  - Soft-seated valves are typically limited to this temperature
  - Metal-seated valves can handle much greater temperatures

Ball Valves

- **Positives:**
  - Full-port design available
  - Quarter-turn actuation
  - Positive shutoff
  - Less costly actuation vs. linear valves, easy to repair
  - Lock out / tag out
- **Negatives:**
  - Full-port design
  - Standard valve does not offer fine control

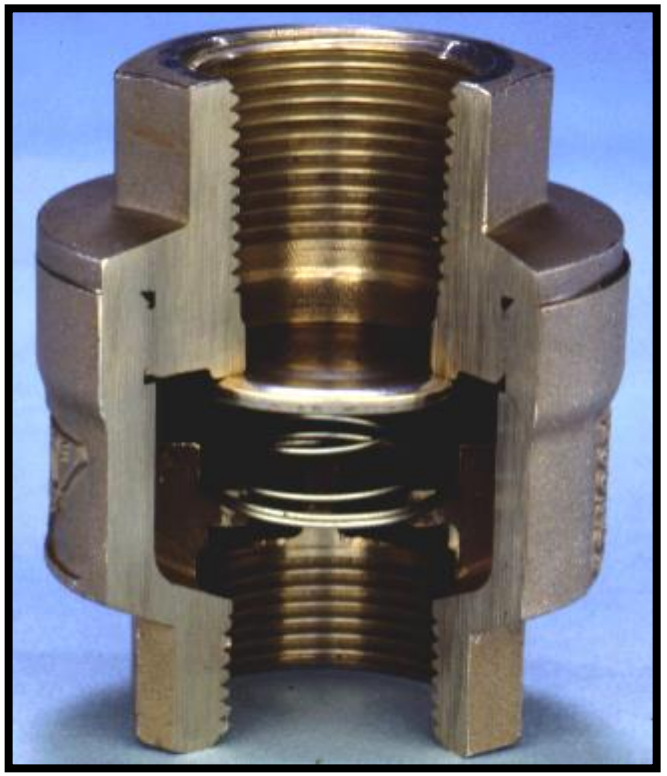


Butterfly Valve

- Butterfly valve is a simple device that uses a flat plate (disc) to control the flow of fluid
- Butterfly valves are of the quarter-turn variety
- Butterfly valves can be designed to a Class VI shutoff

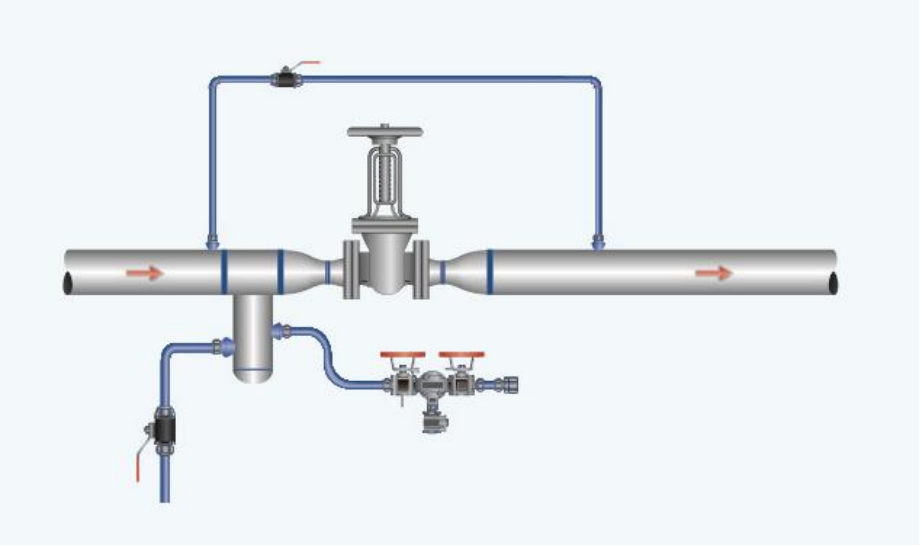
Check Valves

- Swing check
- Disc check
- Piston or lift check
- Ball Check



Warm Up Valves

- 3” or larger isolation valves
- Warm up valve is usually 1” or ¾”, but are selected to provide the correct amount of flow for a slow warm up time frame of the steam system



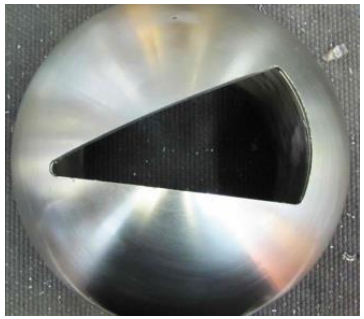
Typical Warm Up Valve Installation

Test Valves

- Process applications
- Critical steam traps
- Easy to check condensate drainage from process equipment

Types of Steam Control Valves

- Linear valve
  - Globe
  - Cage trim valve
- Rotary globe valve
- V – ball



Valve Actuators

- Pneumatic
- Electric
- Manual

Steam Valve Selection to Meet Steam Demands

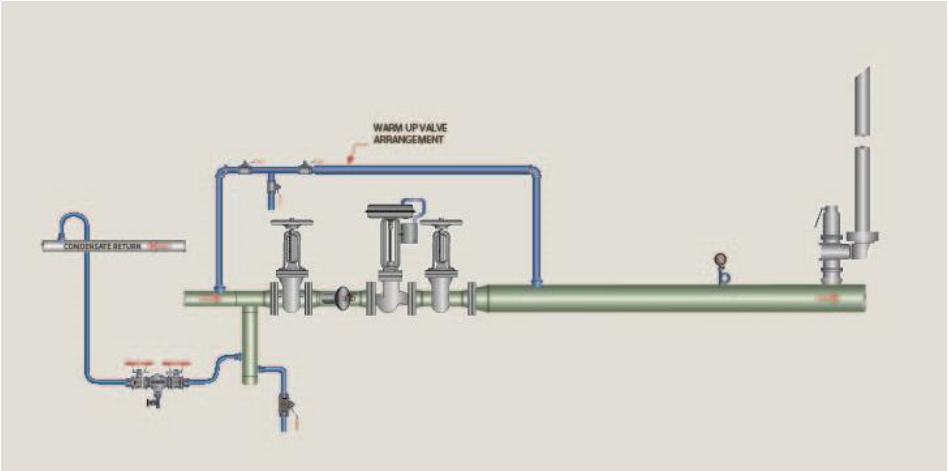
- 20 to 1 turndown for regulating valve
- 30 to 1 turndown for a standard globe valve
- 40 to 1 turndown for a cage trim control valve
- 70 to 1 turndown for V-ball design

CV

- By definition, the CV is the flow in gallons per minute of water (at 60°F) through the valve with a pressure drop of 1 PSI across the valve. By accounting for densities, temperature, and pressure relationships, the (CV) coefficient is used in gas flow. The CV has the same numerical value in the English and Metric systems

Control Valve Installation Best Practices

- 85 Dba or lower (specify)
- Horozontial plane
- Strainer ahead of all control valves
- Drip let pocket ahead of the valve
- Expand the pipe after the steam control valve

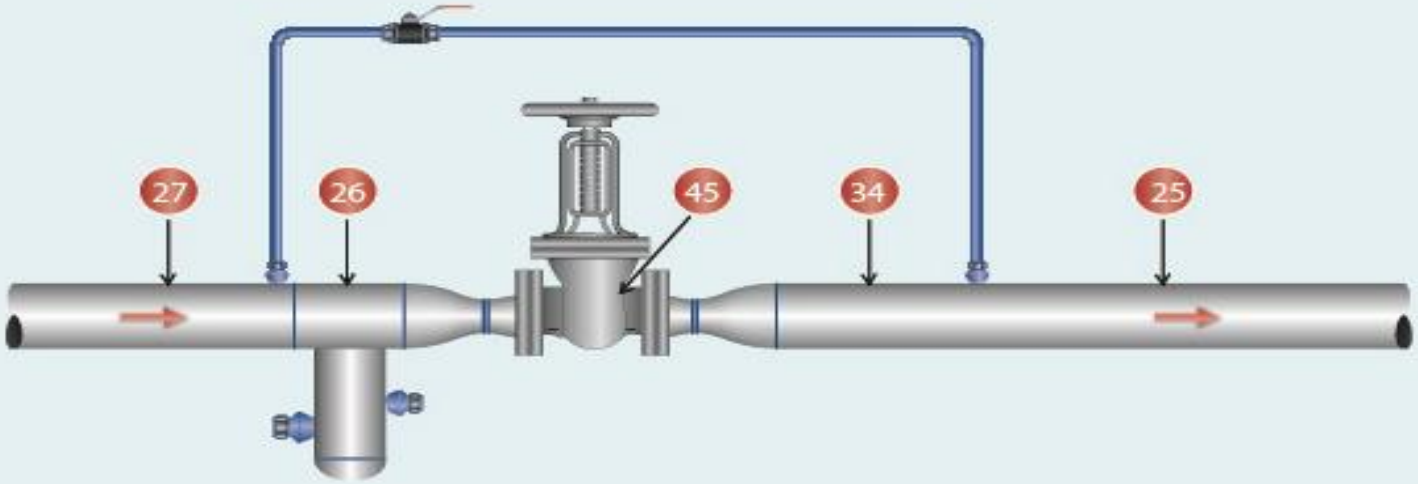


Ultrasound Testing Steam Valves

- Positives:
  - Fast and easy
  - Highly accurate
  - Can detect many other defects in the system
- Negatives:
  - Training is required
  - More experience with using high frequency ultrasound = higher accuracy

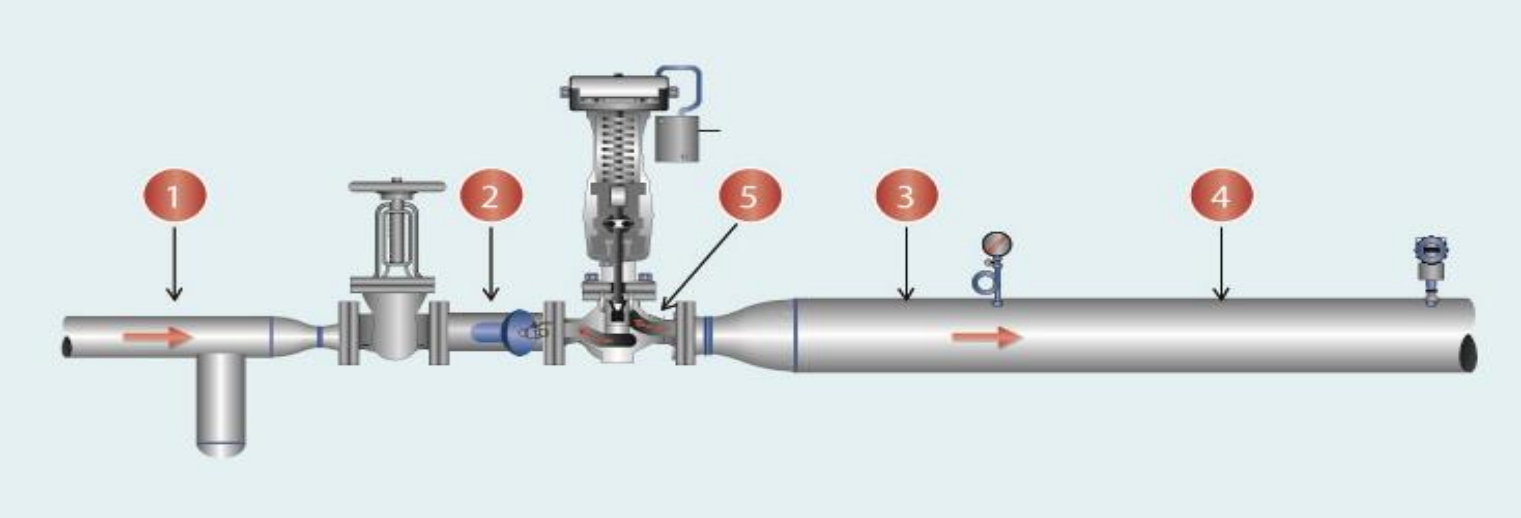
Isolation Valves Testing

- Higher level of ultrasound at the outlet of the valve indicates the valve is leaking



Steam Control Valve Testing

- There are two ways to test a control valve:
  - Checking the steam control valve for leakage
  - Determining the breakaway point or flow on a steam control valve at its opening



Steam Valve Installation Best Practices

- Know the internal leak rate of the valve
- Always install in a horizontal position
- Use newer valve technologies
- Know the DB levels at operation
- Control valves
  - Strainer ahead of the valve
  - Steam line drip pocket ahead of the steam valve
  - Pneumatic actuation

VALVES

- Condensate line drip pocket
- Strainer
- Pneumatic actuation
- Pneumatic positioning
- DBA level
- Enlarge the discharge piping
- Heat transfer = 10 pipe diameters
- Valve positioning

Successful Valve Operations

- Team effort
- Valve assessments
  - Having correct safety equipment
  - Having the correct SOP to do the work
  - Having the correct equipment
  - Doing the correct documents
- Positive end result….

Swagelok Steam Services

- Steam System Training
- Steam Trap Station Testing Training
- Steam System Assessments
- Steam Hose Assessments
- Steam Valve Assessments
- Steam System Physicals
- Steam System Performance Balancing
- Steam System PID Updates
- Steam Quality Testing

Thank you for time

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