Self-Cleaning Ball Valve - Best practices for Installation and Operation

1. General

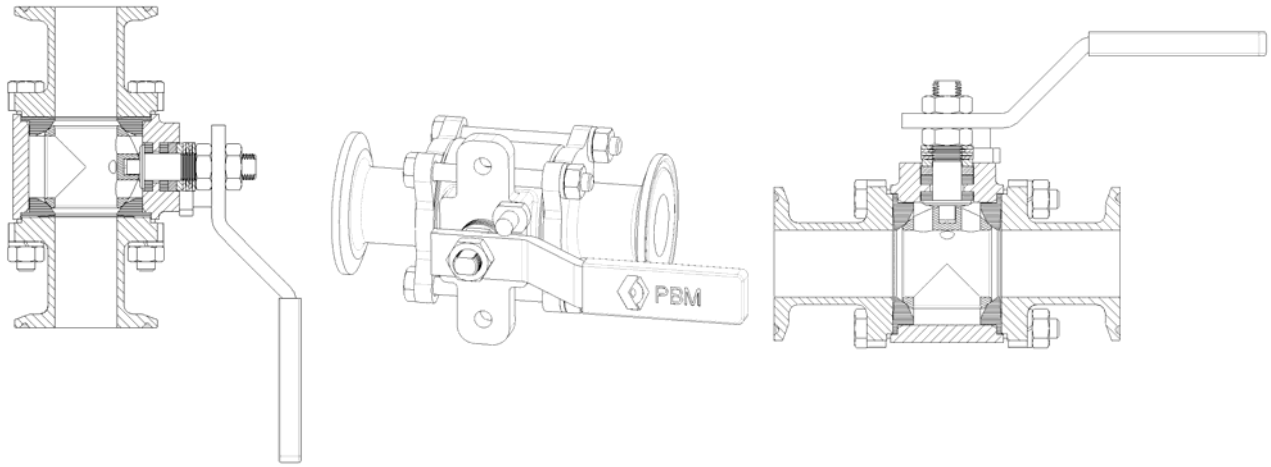
PBM's self-cleaning ball valve design allows full CIP/SIP access to all valve internals in the full open position. This allows first the process and then the cleaning solution and rinse solution to flow freely throughout the body cavity when the vale is in the open position. With proper cleaning protocols, this allows the valve to be fully cleaned without the need for disassembly of the valve.

2. Installation / Orientation

The cleaning function of the self-cleaning ball will operate in any orientation, but as with any ball valve, installation orientation will affect the amount of rinse solution that may remain in the valve after a cleaning cycle.

The ideal orientation which will result in nearly zero volume is with the flow stream vertical. This allows the body cavity to drain downstream when the valve is cycled.

If vertical orientation is not possible, the valve may be installed with the flow stream horizontal. If possible, the stem should be installed in the horizontal position as well. This reduces the holdup volume on average 60% when compared to a horizontal flow stream - vertical stem installation. Holdup volumes are given in a table at the end of this document.



BEST	BETTER	GOOD
Flow Vertical Stem Horizontal	Flow Horizontal Stem Horizontal	Flow Horizontal Stem Vertical

3. Flushing Variables

Flushing protocols should be designed based on the specific media being processed. Many variables must be considered including media viscosity, media solubility, flushing time, temperature, flowrate, and the ability to cycle the valve during the flush.

Media Characteristics - Most low viscosity (less than 200 cp) water soluble liquids will flush quite well using common flush protocols described below. When the media is more viscous or non-soluble, higher flow rates or valve cycling may be required to clean the cavity. Media containing solids present special problems, as the solids can pack into corners where flushing becomes difficult or impossible.

Flushing Protocols - ASME BPE gives guidance on factors to be considered when setting up a clean-in-place (CIP) protocol. These recommendations transfer well to other industries assuming the same level of visual cleaning performance is desired. The ASME BPE recommendations for cleaning protocols for piping sytems are summarized below.

Flowrate of rinse / clean cycle
Temperature of clean / rinse cycle
Pressure of clean / rinse cycle
Duration of clean / rinse cycle
Surface finish of piping/valves
Concentration of cleaning fluids
Level of cleanliness desired
Method of cleaning validation

4. Recommendations

Based on over a decade of experience in self-cleaning ball applications, a good starting point for cleaning fluid velocity is 5 ft/sec. This velocity will provide enough turbulence to clean low viscosity fluids from the body cavity. The choice of duration and temperature is very process dependent. Low viscosity media can often be flushed clean using warm water (130°F) water in a minute or less. As the viscosity increases, longer times and higher temperatures may be required.

Surface finish of the valve and piping will affect protocol variables. It is easier to clean a polished system than a non-polished system.

With higher viscosities, it will become necessary to cycle or at least partially cycle the valve during the cleaning process. Heavy media like toothpaste or ketchup will partially clean due to the flow stream alone, but will require the extra turbulence caused by cycling the valve to fully clear the cavity. Speed controls on the automation may be required to achieve an optimal cycle time of 3 seconds / 90° turn.

PBM's Sales and Engineering staff are available to provide additional guidance and suggestions based on existing applications.

Holdup Volume Data for Series 8 and 9 Valves (mL)

Size	Horizontal Flow Vertical Stem	Horizontal Flow Horizontal Stem	Vertical Flow Horizontal Stem	Vertical Flow Horizontal Stem Flats Closed**
½"	0.6	0.2	0.3	0
¾"	1.6	0.7	0.6	0
1"	4.2	1.8	0.3	0
1-1/2"	19	8.2	3.9	0
2"	42	17	8.6	0
2-1/2"	92	42	11	0
3"	106	40	15	0
4"	243	85	4.1	0
6"	800	295	5.0	0

**** - Zero holdup volume implies cavity Is fully drainable. Fluid surface tension on interior surfaces will retain some volume.**

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