Static Spray Ball & Supply Tubes

Installation, Operation, and Maintenance (IOM) Manual

Application

Static spray balls and supply tubes are used within process tanks, equipment, and vessels to deliver solutions for Clean-In-Place (CIP) operations.

Operating Parameters

The maximum operating pressure of static spray balls is 70 psi – pressures above this experience spray atomization, which negatively impacts cleaning performance.

The exact recommended flow rate and pressure requirements of a spray ball is unique to each unit. The flow rate and pressure rating of a spray ball can be found etched on the spray ball – if the spray ball does not have this information etched, provide the identification # to Sani-Matic to confirm operating parameters.

Verify that the CIP supply system can be controlled to deliver the proper flow and pressure, considering process line friction losses and vertical head loss, prior to installation. If the pressure at the spray ball is either too low or too high, it may result in poor coverage and cleaning performance.

Safety Precautions

1. **Do not exceed max pressure rating of the static spray ball.**
2. **Do not loosen or remove any clamps on the supply tube while the spray ball is operating.**
3. **Do not open any tank, vessel, or equipment manways or opening when the spray ball operating.**
4. **During installation, inspection, or removal – lockout supply pump(s) and other equipment in-line with the spray ball and supply tube to prevent accidental operation during maintenance.**
5. **Use protective gloves when removing spray ball and clearing debris from the unit.**
6. **Use only Sani-Matic replacement parts.**

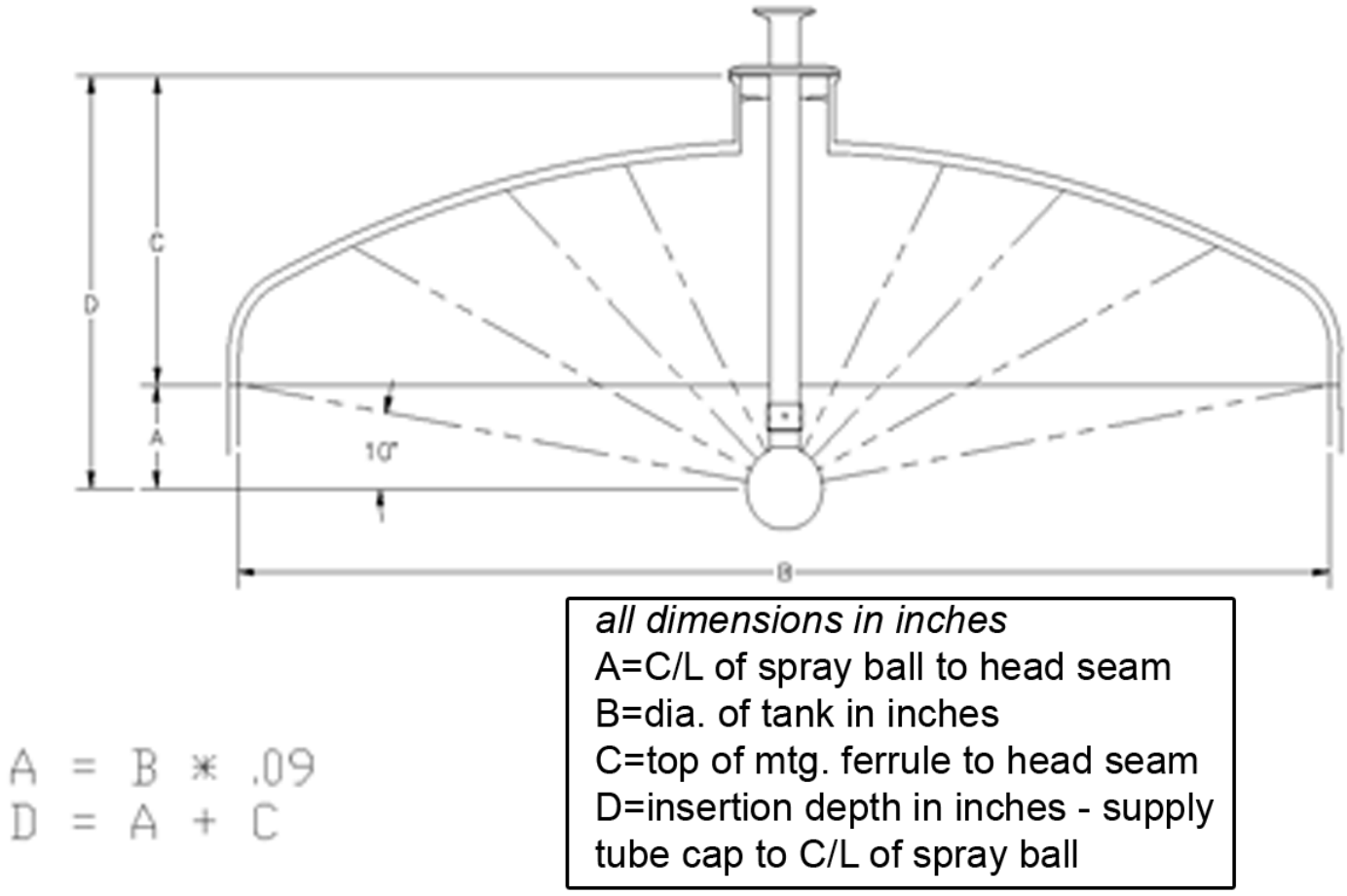

Figure 1: Recommended Installation Height for SB1 and SB5

Installation & Operation

Recommended Mounting Location

Spray balls are typically located in the center of the vessel; however, this may vary per application. The depth to install the spray ball in the tank is dependent upon several factors. The primary considerations are the diameter of the tank and the depth of the head. The diagram above demonstrates the recommended installation for an upward spray pattern (model SB1). The installation of the spray ball at the proper depth ensures that the spray pattern is most effectively and evenly distributed for maximum coverage of the surfaces.

Spray balls with 360° coverage (model SB5) may be installed as described above. However, other specially designed spray balls and models SB2 (two balls mounted to a tee assembly) and model SB4 (downward spray) may require other considerations. Please consult with Sani-Matic for recommended location.

Preventing Spray Shadowing

If there are components, such as shafts, agitators, or baffles inside a tank, the spray from a single spray ball may be blocked from contacting the surface (spray shadowing). The recommended solution is to install two static spray balls, so that the shadow effect is eliminated by the second spray ball – see Figures 2 – 4 below.

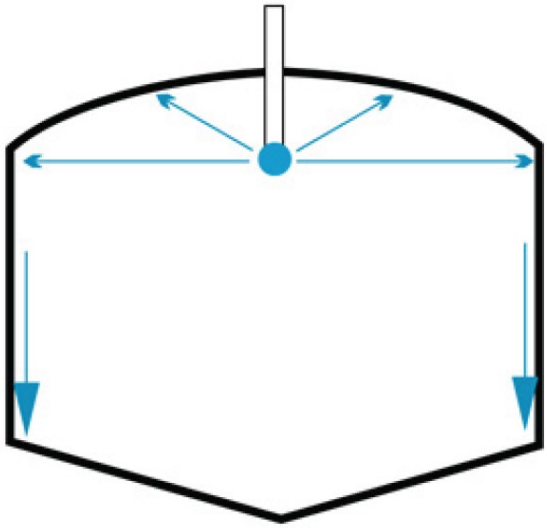

Figure 2: Spray pattern in an open tank.

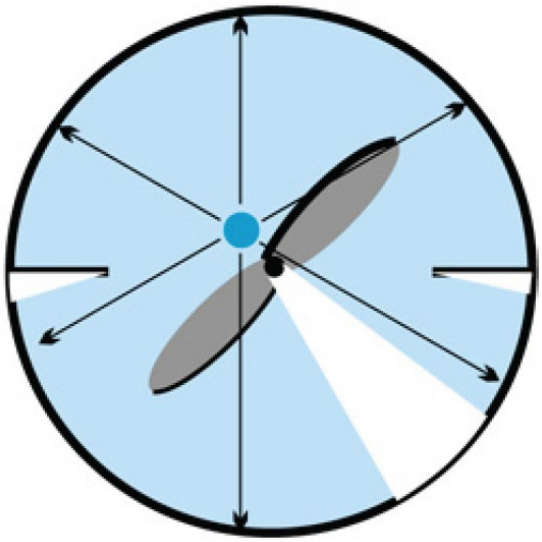

Figure 3: Spray shadowing effect in a tank with an agitator.

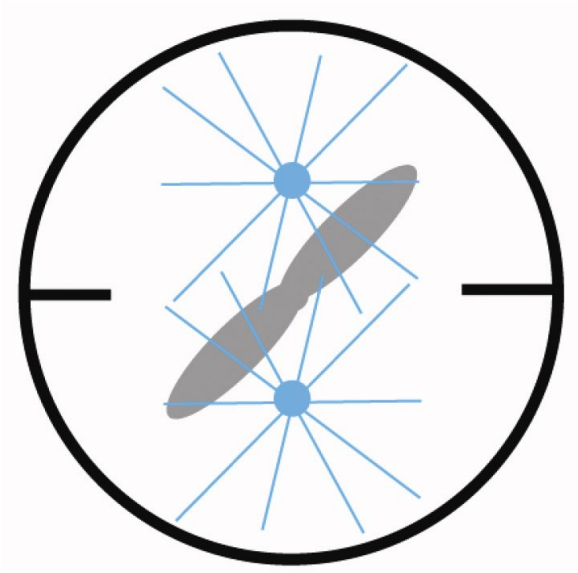

Figure 4: Two spray balls installed to eliminate shadowing.

Method of Installation

Two methods of installation are recommended for the proper placement of the spray ball within the tank. The "Removable" options is recommended as it allows for removal, inspection, and maintenance of the spray ball.

Removable – This consists of a tank inlet adapter that has a clamp cap welded to the tube and which in turn clamps to a tank port. The clamp ferrule at the outer end of the tube connects to the CIP supply line. Generally, the spray ball recommended for this arrangement is one of a smaller diameter than the tank port through which it is installed, unless the spray ball can be installed by reaching into the tank.

Permanent – This consists of a supply tube that is permanently welded through the top of the tank. The tube should be mounted in place with weld collars inside and outside to provide rigidity to the assembly and a proper sanitary radius within the tank. The interior welds need to be ground to a proper finish to match the interior of the tank.

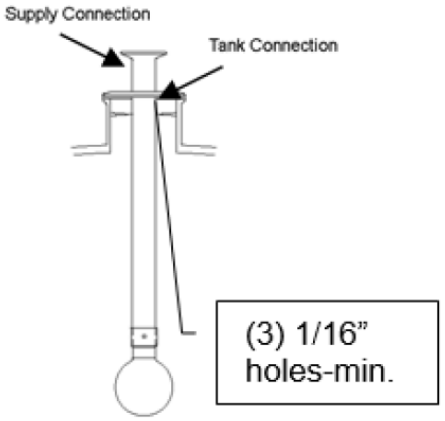

Figure 5: Supply Tube Holes for Cleanout of Inlet Fitting

Supply Tube

Hole Location for Spray Ball Attachment - Sani-Matic static spray balls are typically supplied with a slip connection, allowing the spray ball to be removed for inspection and cleaning. The slip connection is designed to allow flow between the collar and the inlet pipe to assure that area gets cleaned during CIP. Sani-Matic manufactured supply tubes are designed to ensure this flow. The inlet pipe needs to be carefully cut and drilled at the required distance from the end to ensure this solution bypass.

Hole Size – Each Sani-Matic spray ball is provided with a pin to attach the spray ball to the supply tube. The diameter of the pin varies according to the diameter of the supply tube. It should be slightly oversized for ease of pin insertion and to allow some solution to bypass to clean the orifice. Align the spray ball on the pipe to mark both sides of the hole prior to drilling. After drilling, the hole should be deburred on both the ID and OD.

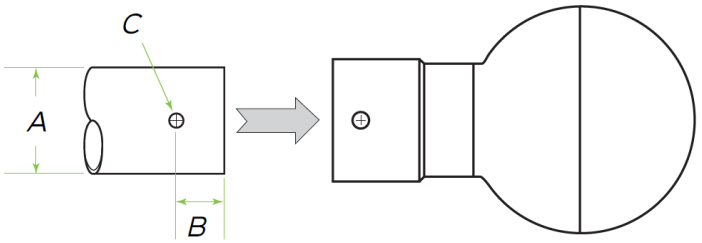

Figure 6: Supply Tube Hole

Inlet adapters and supply tubes should be polished ID / OD to the same finish as the vessel they are installed in, or a minimum of 32 Ra to meet sanitary requirements.

Also note that the supply tube must have at least (3) 1/16" holes drilled below the cap to clean the tank inlet fitting, and that the inlet tube must be welded to the cap with a 1/8" radius minimum to prevent a sharp inside corner that can trap residue.

Table 1: Supply Tube Hole Information

Tube A (OD)	Distance B	Drill Diameter C
1/2"	3/16"	5/64"
3/4"	3/16"	9/64"
1"	5/16"	9/64"
1 1/2"	11/16"	13/64"
2"	15/16"	13/64"

Static Spray Ball Drainage
Static Spray Balls left in the process equipment during processing must drain completely to prevent contamination and to comply with sanitary practices. If a spray ball is mounted horizontally, it must be specified prior to purchase to ensure that a hole is drilled at the bottom of the spray ball for such drainage in a horizontal position.

Operation
Even when a spray ball is protected by a strainer there may be debris in the supply line downstream of the strainer in a new installation. All CIP supply lines must be thoroughly flushed prior to the spray ball installation to rinse out all metal shavings and other debris. Also, the spray ball should be inspected and cleaned, if necessary, after first use as well.

The spray ball should be connected to the CIP supply by sanitary tubing or by a flex hose, design and fabricated for this application. If the spray ball has a directional spray pattern, it also must be installed in the correct orientation. Sanitary spray balls may be left in place during processing if the system was designed accordingly. However, if the process operations would plug the spray ball or the spray ball might be otherwise damaged during processing, it should be removed following CIP.

Maintenance

The spray ball should be periodically inspected and cleaned of any particulates, if necessary. Even when there is a strainer in-line, there is a possibility of debris plugging the spray ball holes. If inspection of a vessel indicates residue after CIP, it may be caused by plugged holes in the spray ball. Also, an increase in CIP supply pressure or a reduction in flow rate would indicate plugging as well.

Spare spray ball clips are recommended to ensure that the spray balls are properly secured with the correct style design and size of clip. Spare spray balls may also be kept on hand; however, they should be labeled so that spray balls are always replaced by the correct type and flow rate.

Figure 7: Static Spray Ball Clip

Verifying Spray Effectiveness

Visual Inspection
After each CIP cycle, the process equipment should be visually inspected to verify that the CIP program cleaned the vessel thoroughly. If areas of the tank indicate incomplete cleaning or coverage, corrective action should be taken accordingly.

(a) Verify that the spray ball is still in place.
(b) Check the spray ball for plugged holes, and clean as necessary.
(c) Verify that the spray ball is the correct one for the application.
(d) Verify that the correct flow and pressure were obtained at the spray ball. If any flow restricting orifices are used to control the flow, verify that the correct restrictors are in place.

Instrument Verification and Documenting Performance
Additional instrumentation may be employed to verify and/or document that the CIP cycle performed as designed. A flow meter and pressure transmitter can document that the proper flow and pressure of CIP reached the spray ball. These parameters should be verified at start-up and compared with subsequent CIP cycles to ensure that proper flow and pressure are always achieved.

Riboflavin Testing

In critical cleaning applications, a test protocol involving a fluorescing agent such as riboflavin may be used to verify that all areas of the vessel receive proper coverage. Consult Sani-Matic for further information on this testing.

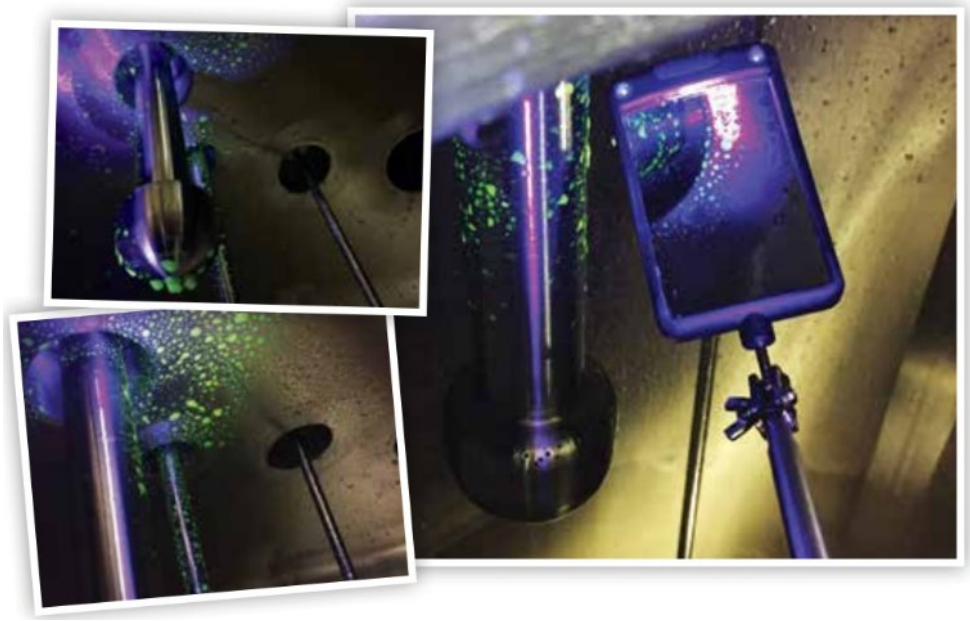

Figure 8: Riboflavin Testing

Troubleshooting

Table 2: Troubleshooting

Problems	Solutions
Equipment not being cleaned by spray ball(s)	1. Confirm spray ball is attached to supply tube. 2. Confirm adequate supply flow and pressure is provided. 3. Confirm adequate CIP time, temperature, and chemical type and concentration. 4. Confirm that no shadowing within tank is occurring (e.g., agitator shaft shadowing with only one spray ball). 5. Confirm no damage to spray ball has occurred- if dented, cracked, or damaged, replace immediately.
Spray Ball Clogged	1. Inspect spray ball for plugged holes and clean out any obstructions. 2. Install strainer upstream of spray ball to prevent further clogging.
Design Flow or Pressure to Spray Ball not being achieved	1. Confirm supply pump is adequate for flow and pressure. 2. Confirm no obstructions or blockages exist in the supply line.

Hygienic Component Solutions Catalog

For latest technical, part number, and spare parts information, see our latest catalog:

Hygienic Component Solutions Catalog