BETE®

PERFORMANCE SPRAY ENGINEERING

HYDROWHIRL® STINGER (HWS2)

INSTALLATION, OPERATING, & MAINTENANCE INSTRUCTIONS

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1. INTRODUCTION

Congratulations on your purchase of a BETE HydroWhirl® Stinger (HWS2) series tank washing nozzle. HWS2 series nozzles are driven by liquid pressure only. There are no electrical parts, motors or gears of any kind, making for a simple yet effective product for cleaning tanks, drums, containers, and vessels. The HWS2 nozzle is a precision product which is designed to have a minimum service life of 300 hours under normal operating conditions (see Section 4). Environmental conditions such as high temperature or the presence of chemicals may shorten the lifetime of the nozzle.

2. SAFETY & PRECAUTIONS

2.1. Handling

HWS2 nozzles should be handled carefully, paying special attention to the slots, which have sharp edges and can cut. The use of work gloves when handling the nozzles is recommended.

2.2. Nozzle Connection

Prior to startup, check the nozzle connection to ensure it is securely attached to the pipe. If the nozzle is loose, it can detach from the pipe at a high velocity and cause personal injury or damage to nearby objects. Personnel should not be near the nozzle when it is starting up or running.

2.3. General Safety

Always follow the general safety rules, national regulations, and guidelines of the facility where the nozzle is being installed. In the event of conflicting directives between facility safety rules/guidelines and this manual, the facility safety rules/guidelines shall take precedence. If a conflict interferes with installation, use, or maintenance of the HWS2 nozzle, please consult your local representative or the factory.

2.4. Tanks Larger than 3500 ft3 (100m3)

For tanks with a volume larger than 3500 ft3 (100 m3) dangerous electrical charges of the liquid sprayed can occur. Additional safety precautions must be taken!

2.5. Cleaning Solution

Environmental conditions (temperature, pressure, atmosphere, etc.) must be maintained such that the cleaning solution will remain in liquid form prior to exiting the nozzle.

2.6. Tank Drain

When cleaning the tank, a drain large enough to accommodate at least the flow rate of the nozzle must be in operation in order to prevent the accumulation of liquid, which can cause an insulating condition to the impact of the droplets, preventing effective washing.

2.7 Sprayed Components

All components that could be charged by contact with the nozzle spray must be grounded.

2.8 Ignition Hazard

Running without liquid can cause damage to the rotational elements and in rare cases could create sparks.

3. INSTALLATION

3.1. Identifying Connection Type

There are two types of connections available for the HydroWhirl Stinger (HWS2) tank cleaning nozzles:

a) **Female threaded (NPT or G/BSP)**

b) **Clip-on (Tube)**

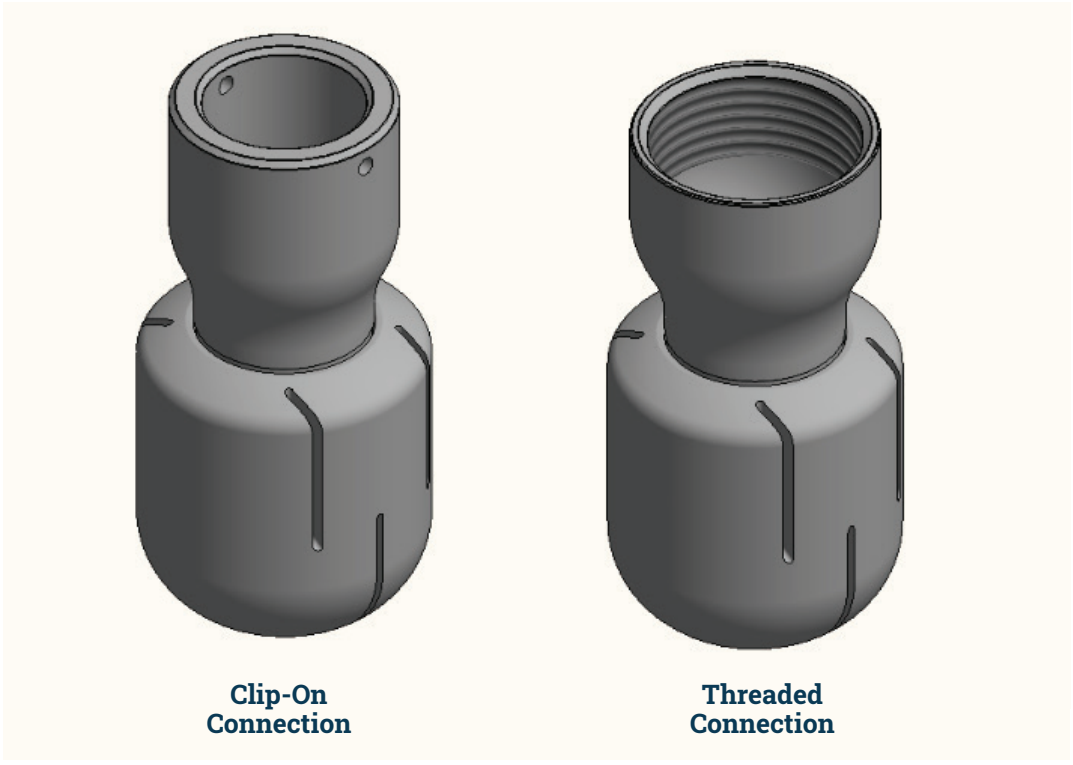


Figure 1 – Types of HWS2 Connections

3.2. Identifying Pipe or Tube Size

To identify the connection size required, simply measure the Outside Diameter (OD) of the connector pipe or tube in your application and refer to the table below. If you cannot identify your NPT pipe size, please refer to a trustworthy online resource or contact our applications engineering department via customer service for assistance.

Connection Type	Nozzle Number
1/8" Female BSP	HWS2-2.1
	HWS2-4
	HWS2-7.5
3/8" Female BSP	HWS2-10
	HWS2-12
	HWS2-17
1/2" Female BSP	HWS2-20
	HWS2-26
3/4" Female BSP	HWS2-20
	HWS2-26
1" Female BSP	HWS2-33
	HWS2-55
	HWS2-66
	HWS2-84

Table 1 - HydroWhirl S Available Connections

3.3. Preparing Pipe for Nozzle Installation

3.3.1. Clip-On Connection Tube Preparation

A hole of diameter E, located at a maximum distance D from the end of the tube will need to be drilled completely through the tube as shown in Figure 2. Values for diameter E and distance D are listed in Table 3 below.

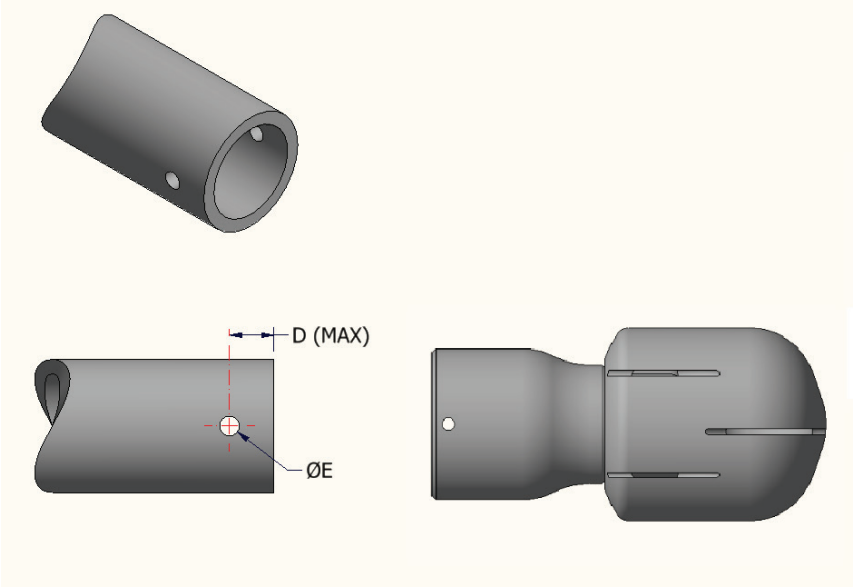


Figure 2 - Illustration for Hole Location for Clip-On Connections

Tube Clip - Connector Hole Dimensions						
Tube OD	ØE		Dimension D		Maximum Pipe Insertion Length	
	In	mm	In	mm	In	mm
1/2"	0.086	2.18	0.5	12.7	0.62	15.7
3/4"	0.086	2.18	0.5	12.7	0.62	15.7

Table 3 - Values of E and D for Clip-On Connections

3.3.2. Female Threaded Connection Pipe Preparation

The end of the pipe should be prepared with a male NPT or G pipe thread in accordance with ASME B1.20.1 for NPT threads or ISO 228 for G threads. Threads should be free of any debris or contaminants. Thread sealant or tape of any kind may not be used in a hygienic application as they will negate the clean thread design. A controlled flow of fluid from the thread inlet is standard for the clean thread design, do not overtighten to stop this flow. See 3.7.2 on page 10 for more information.

3.4. Piping System Grounding

The piping system feeding the HydroWhirl Stinger nozzle MUST be grounded in accordance with all applicable local, state, and government codes if used in any kind of explosive environment.

3.5. Piping System Filtration

For nozzles with flow rates > 3 GPM/11.35 LPM: Line strainer with a mesh size of 0.07 mm/200 mesh for HWS2-4 and smaller nozzle sizes.

For nozzles with flow rates < 3 GPM/11.35 LPM: Line strainer with a mesh size of 0.10 mm/150 mesh for HWS2-7.5 and larger nozzle sizes.

3.6. Piping System Purge

To avoid clogging or damaging the nozzle, prior to installing the nozzle, the piping system should be purged to ensure all contaminants or debris are removed. Large debris can lead to blockage of the filter and a loss in pressure to the nozzle. Proper filter maintenance is essential to nozzle performance.

3.7. Installing the Nozzle

3.7.1. Clip-On Connection Installation

1. Align pin holes in connector tube with pin holes on nozzle (Figure 4).
2. With the curved section of the connector pin up and to the right of the straight section (Figure 5), slide the straight section of the connector pin through the nozzle and the connector tube
3. Rotate the connector pin until it snaps into place around the nozzle
4. If the connector pin needs to be replaced, it must be replaced with the equivalent mode connector pin or the nozzle may become detached from the tube and cause damage to the vessel or components in the vessel.

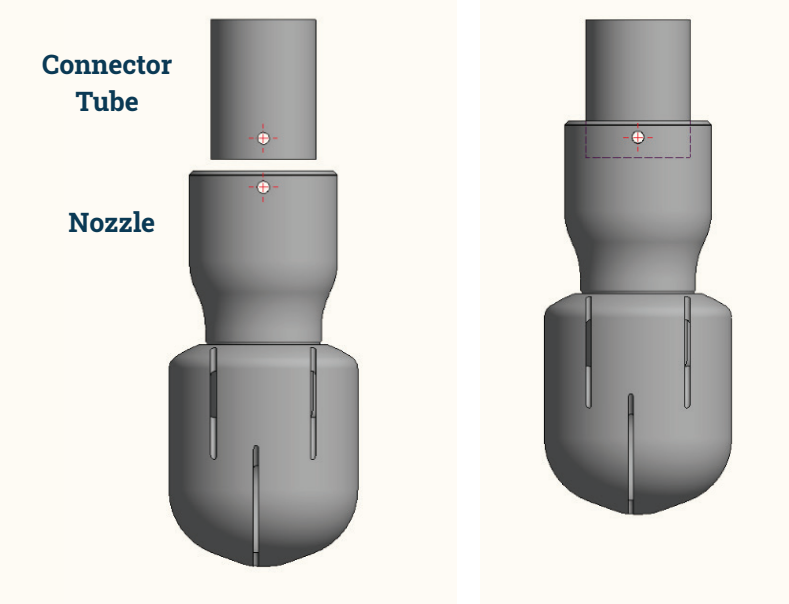


FIgure 4 - Preparation for Installation

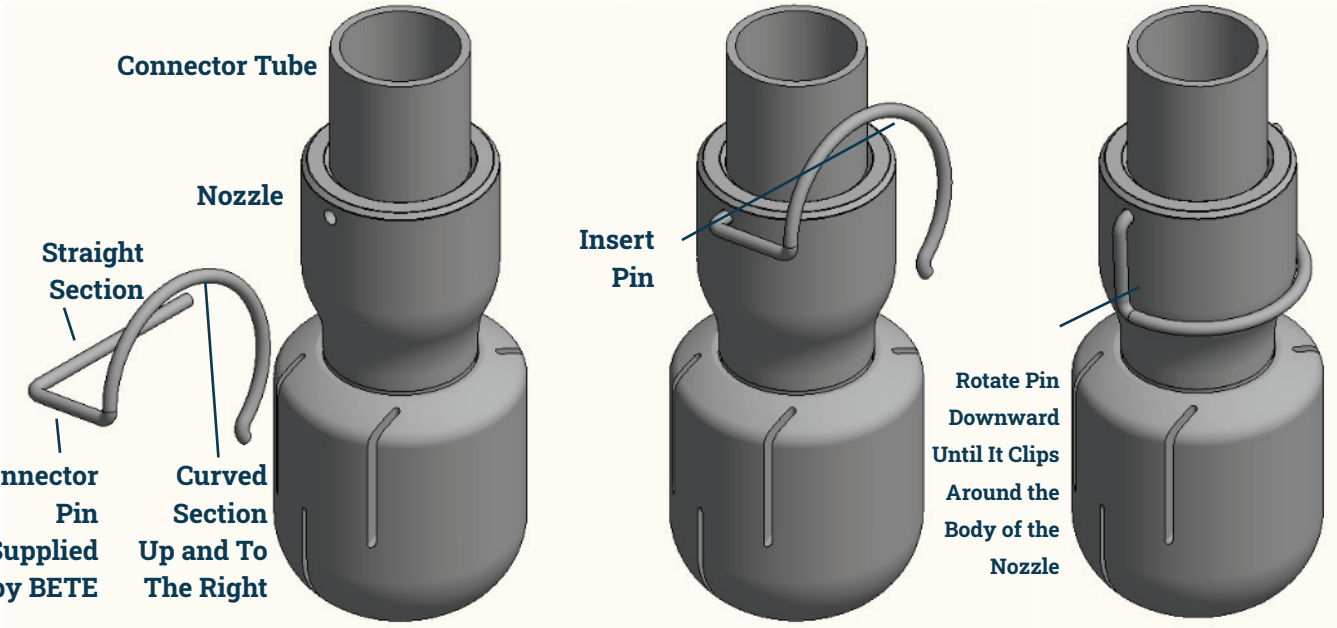
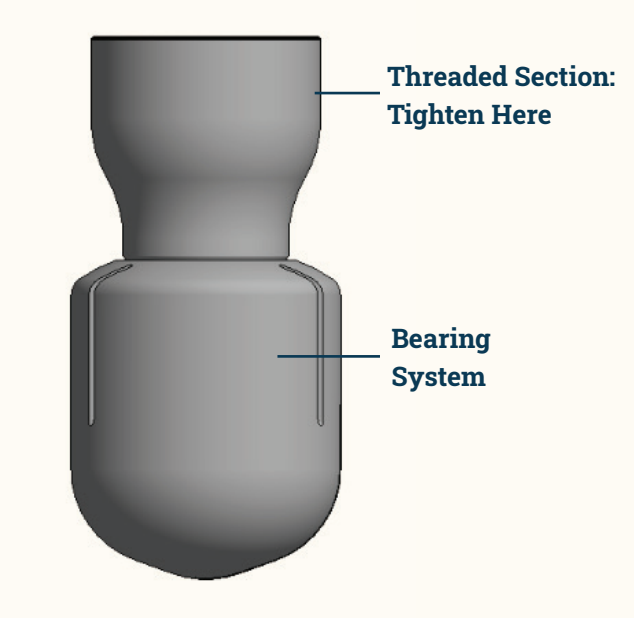


Figure 5 - Final Installation

3.7.2. Female Pipe Thread Installation

1. To properly install the HWS2 nozzle with a female pipe thread connection, the use of a strap wrench with a non-metallic strap or one's hand and a nitrile glove is required in order to make sure the surface of the nozzle is not damaged.
2. Using the strap wrench or by hand directly over the threaded section (see Figure 6), tighten the nozzle to the amount specified in table 5. Do not over-tighten.



HWS2 Special Self-Flushing Threads Recommended Torque			
Pipe Size	**Estimated Turns Past Finger Tight**	**Max ft-lbs**	**Max N-m**
1/8"	1/2 - 3/4	6	8
3/8"	1/2 - 3/4	20	27
1/2"	1/4 - 3/4	27	37
3/4"	1/4 - 3/4	39	53
1"	1/4 - 3/4	56	76

Table 5 - Maximum torque values for HWS2 special threads

4. OPERATION

4.1. Startup

For the nozzle to operate, liquid pressure drop must be present across the nozzle. Typically, pressure is generated by use of a pump or by supplying municipal water pressure and the nozzle is started by opening a valve upstream of the nozzle.

4.2. Nozzle Performance

Nozzle performance is measured by the flow rate of the nozzle. As the pressure-drop across the nozzle increases, so does the flow rate. The flow rates at various pressures are listed in Table 6. Flow rates for HWS2 nozzles with a clip-on connector generally flow slightly more than the values in Tables 6 and 7, due to the clearance between the nozzle connection and tube.

Female Connection Type	Nozzle Number	Spray Angles	Flow Rate (GPM) @ Differential Pressure (psi)						Maximum Free Passage	Coverage Dia @ 40 psi
			10	20	30	40	50	60		
			psi	psi	psi	psi	psi	psi	in	ft
1/8" FNPT, BSP 3/8" Tube Clip-On	**HWS2-2.1**	360°	1.09	1.51	1.83	2.10	2.33	2.54	.025	2
	HWS2-4		2.05	2.86	3.48	4.00	4.46	4.87	.039	7
	HWS2-7.5		3.84	5.37	6.53	7.50	8.35	9.12	.063	7
3/8" FNPT, BSP 1/2" Tube Clip-On	**HWS2-10**	360°	4.94	7.03	8.64	10.0	11.2	12.3	.024	8
	HWS2-12		6.22	8.64	10.5	12.0	13.3	14.5	.039	10
	HWS2-17		8.59	12.1	14.8	17.0	19.0	20.8	.079	10
1/2" FNPT, BSP	**HWS2-20**	360°	10.2	14.3	17.4	20.0	22.3	24.3	.039	10
	HWS2-26		12.9	18.3	22.5	26.0	29.1	31.9	.064	10
3/4" FNPT, BSP 3/4" Tube Clip-On	**HWS2-20**	360°	10.2	14.3	17.4	20.0	22.3	24.3	.039	10
	HWS2-26		12.9	18.3	22.5	26.0	29.1	31.9	.064	10
1" FNPT, BSP 1" Tube Clip-On	**HWS2-33**	360°	16.6	23.4	28.6	33.0	36.8	40.3	.031	11
	HWS2-55		27.6	39.0	47.7	55.0	61.5	67.3	.064	12
	HWS2-66		33.4	46.9	57.3	66.0	73.7	80.6	.094	12
	HWS2-84		43.2	60.2	73.2	84.0	93.5	102	.125	12

Table 6 - Flow Rates at Different Pressures - English Units

Female Connection Type	Nozzle Number	Spray Angles	Flow Rate (LPM) @ Differential Pressure (bar)					Maximum Free Passage	Coverage Dia @ 2 bar
			0.7	1	2	3	4		
			bar	bar	bar	bar	bar	mm	m
1/8" FNPT, BSP 3/8" Tube Clip-On	**HWS2-2.1**	360°	4.15	4.92	6.83	8.27	9.48	0.64	0.6
	HWS2-4		7.80	9.27	13.0	15.8	18.1	0.99	2
	HWS2-7.5		14.6	17.4	24.3	29.6	34.0	1.60	2
3/8" FNPT, BSP 1/2" Tube Clip-On	**HWS2-10**	360°	18.8	22.6	32.1	39.5	45.7	0.61	2
	HWS2-12		23.7	28.1	39.0	47.3	54.2	0.99	3
	HWS2-17		32.8	39.1	54.9	67.1	77.3	2.00	3
1/2" FNPT, BSP	**HWS2-20**	360°	39.0	46.3	64.8	78.9	90.6	0.99	3
	HWS2-26		49.0	58.8	83.6	103	119	1.63	3
3/4" FNPT, BSP 3/4" Tube Clip-On	**HWS2-20**	360°	39.0	46.3	64.8	78.9	90.6	0.99	3
	HWS2-26		49.0	58.8	83.6	103	119	1.63	3
1" FNPT, BSP 1" Tube Clip-On	**HWS2-33**	360°	63.5	75.7	107	130	150	0.79	3
	HWS2-55		105	126	177	217	251	1.63	4
	HWS2-66		127	152	213	260	300	2.39	4
	HWS2-84		165	195	272	331	380	3.18	4

Table 7 - Flow Rates at Different Pressures - Metric Units

4.3. Operating Pressure Range

The HWS2 nozzle operates best in a pressure range of 10-60 PSI (0.7-4.1 bar). Pressures below 10 PSI (0.7 bar) reduce the reach of the nozzle resulting in less effective cleaning. Pressures above 60 PSI (4.1 bar) will atomize the spray more quickly also resulting in less effective cleaning, and in addition, cause the nozzle to rotate faster, which may shorten bearing life. The recommended pressure for the best performance and maximum service life is between 30 and 50 PSI (2.1 and 3.4 bar).

4.4. Maximum Operating Pressure

The maximum operating pressure for the HWS2 is 80 PSI (5.5 bar). Beyond this operating pressure, the nozzle will suffer decreased performance and shortened bearing life.

4.5. Maximum Operating Temperature

- The operating temperature is determined by the temperature of the spray media.
- Refer to section 2.5 for additional precautions.
- The maximum operating temperature is 200°F/95°C.
- The maximum non-Operating (when the nozzle is stationary) temperature is 500°F/260°C. Allow the nozzle to cool down before liquid flows through to avoid vaporization in the heated nozzle.

5. MAINTENANCE

5.1. Preventative Maintenance

The most important preventative maintenance that will ensure a trouble-free maximized lifetime for the HWS2 nozzle is to have filtration (in accordance with section 3.5 of this guide) upstream of the nozzle that is cleaned on a regular basis. The frequency of cleaning depends on the quality of the liquid flowing through the filter and must be determined by facility maintenance personnel.

5.2. Cleaning

The HWS2 is designed to be self-cleaning. If recommended filtration is provided and maintained, the nozzle should not clog. If the nozzle does become clogged, remove it from service and soak it in an appropriate solvent. The nozzle should then be rinsed with clean water. If this does not remove the clog, try cleaning in an ultrasonic bath for 30-60 minutes. If the clog persists the nozzle must be replaced.

5.3. Replacement Parts

Except for connector pins for clip-on connectors (see section 2.5.2, Table 4), there are no replacement parts for the HWS2 nozzle. These pins should be periodically inspected for wear and replaced if worn. Once the HWS2 nozzle has reached the end of its service life it should be replaced.

6. SUPPORT

6.1. Nearest Distributor or Representative

The most up-to-date list of BETE representatives and distributors can be found at https://bete.com/map-finder/

6.2. BETE Corporate

6.2.1. BETE Corporate Contact for Europe

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