TOWER-FLO®

Water Filter Systems

BASIN SWEEPER PIPING SYSTEMS

REDUCE

Fouling
Energy Costs
Chemical Costs
Maintenance
Downtime
Legionella Risk

IMPROVE

Thermal Capacity

The purpose of adding a Tower-Flo® Filter to a condenser water system is to remove suspended solids. Bottom line, solids have to get to the filter or they don't get removed.

Choice of installation style is key to filter effectiveness (see www.towerflo.com/installation.pdf). When the installation choice is independent side stream (as Tower-Flo recommends), basin sweeper piping systems are often used to further improve filter effectiveness.

There are two halves to a basin sweeper piping system: 1) the piping system for return of filtered water around the basin to create a sweeping action; and, 2) the piping system for attracting solids to the filter's suction or supply. Of these two, much more attention seems to be paid to design of return piping, while little or no attention is given to design and placement of the filter's suction piping.

A pipe opening in the corner of the floor of the basin, feet away from the tower's condenser water outlet, has a very small area of influence and does little to attract solids to the filter for removal; the solids are headed towards the condenser water outlet, not the corner. If at all possible, a perforated suction header should be placed around or in front of the condenser water outlet to intercept solids, before they reach the outlet, with an invitation to go to the filter for removal.

In the absence of attention to the suction piping, all that is accomplished with the return half of the sweeper system is an elaborate agitation system that promotes movement of solids out of the basin, entrained in the condenser water, which will then accumulate at the next location of lower water velocity; the chiller, condenser, heat exchanger, etc. The basin may look clean, but the problem has simply been transfered to other machinery where it can have significantly greater detrimental impact on operating and maintenance costs.

The most important determinant to an effective sweeper piping system is the design and placement of the filter's suction piping. Bottom line, solids have to get to the filter or they don't get removed.

There is benefit to be gained by directing the return flow of filtered water through a piping system to help sweep solids from the perimeter of the basin or tank towards the filter's suction piping. It is very important, however, to establish reasonable expectations of such a basin sweeper piping system from step one, the filter sizing step. Define the filtration objective – "clean water" or "clean basin floor"? The "clean water" objective is a function of volume and turnover frequency, while the "clean basin floor" objective is a function of flow rate to surface area. Filter sizing to achieve a clean basin floor objective will typically require two to three times the filter flow rate necessary to achieve a clean water objective.

When the primary objective has been determined to be "clean water", the filter can provide a secondary benefit using a basin sweeper piping system, matched to the filter's flow rate, to return filtered water flow in a manner that works with the basin's flow dynamics to address it's most troublesome areas of silt accumulation.

When the primary objective has been determined to be a "clean basin floor", the sweeper piping system must be designed to distribute the filter's return flow in manner that works with the basin's flow dynamics to effectively address the entire basin surface area.

With either filtration objective, the most important determinant to an effective sweeper piping system is the design and placement of the filter's suction piping. Bottom line, solids have to get to the filter or they don't get removed.

LESS ***suspended solids in cooling water***

IS MORE ***thermal capacity***

FOR LESS ***operating cost***

UNITED INDUSTRIES INCORPORATED

202 E. CLEVELAND • P. O. BOX 58 • STERLING, KS 67579 • 800-835-3272 • 620-278-3160 • FAX: 800-500-3115 • 620-278-3115
www.towerflo.com

Basin Sweeper Piping

DISCHARGE OPENINGS: The sizing of holes in a basin sweeper piping system evolves from the decision of the *type* of DISCHARGE openings to be used; either simple holes, sweeper-eductor nozzles, or a combination of those two types. Different criteria must be used to determine the number of discharge holes and/or nozzles to be used for a given application, as follows:

HOLES ONLY: The total open area of discharge line openings should be equal to or slightly greater than the total open area of the discharge pipe size. Use the table or the formula below to determine the size and number of holes to be used.

NOZZLES ONLY: The total number of nozzles will be the flow rate of the filter system divided by 5 gpm per nozzle.

COMBINATION OF NOZZLES & HOLES:

1) start with the filter flow rate.
2) determine the preliminary number of nozzles you want to use.
3) multiply that number of nozzles by 5gpm per nozzle.
4) subtract the outcome of 3) from the total flow rate of the filter system (this is the portion of the filter flow rate consumed by nozzles; this number cannot exceed the filter's flow rate; if it does, return to the nozzle only instructions).
5) divide the remaining flow rate by 3 gpm to determine the number of **1/4"** holes to be used in conjunction with the nozzles.

SUCTION OPENINGS: Irrespective of the *type* of discharge openings selected, the number and size of suction openings will **always** be determined by the following: the total open area of suction line openings should be equal to or slightly greater than 125% of the total open area of the discharge pipe size.

TO CALCULATE NUMBER AND SIZE OF DISCHARGE AND SUCTION OPENINGS

Steps:
1 Calculate open area of selected discharge pipe size based on its inside diameter (πr^2);
2 Calculate open area of selected discharge hole size (πr^2);
3 Divide result of Step 1 by result of Step 2 to find number of holes in discharge piping (round up);
4 Multiply result of Step 3 by 1.25 to find number of suction holes (round up).

The calculated number of discharge openings should be spaced evenly around the discharge pipe run or across pipe runs designed to influence specific areas. Suction holes should be spaced evenly around the suction header in the water basin or reservoir. Common sense should always govern the selection of hole sizes, the resulting number of holes, and the placement of those openings; keep the number of holes to be drilled to a practical, manageable number for the run of pipe.

The tables below will help you select the size and number of holes for most Series TF, TFD, TFD2, and TFH installations. The Inside Diameter Table provides the information necessary for you to calculate hole sizes and number for other installations.

Inside Diameter of Common Pipe Sizes

	1.5"	2.0"	2.5"	3.0"	4.0"	6.0"	8.0"
Sch 40	1.610	2.067	2.469	3.068	4.026	6.065	7.981
Sch 80	1.500	1.939	2.323	2.900	3.826	5.761	7.625

Suggested Number of Pipe Holes

PIPE	SCH 40						SCH 80					
	# 1/4" holes		#3/8" holes		# 1/2" holes		# 1/4" holes		#3/8" holes		# 1/2" holes	
SIZE	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC
1.5"	50	63	19	24	11	14	36	45	16	20	9	12
2"	68	85	31	39	18	23	61	77	27	34	16	20
2.5"	98	123	44	55	25	32	87	109	39	49	22	28
3"	•	•	67	84	38	48	•	•	60	75	34	43
4"	•	•	116	145	65	85	•	•	104	130	59	74
6"	•	•	•	•	148	185	•	•	•	•	133	167
8"	•	•	•	•	255	319	•	•	•	•	233	292

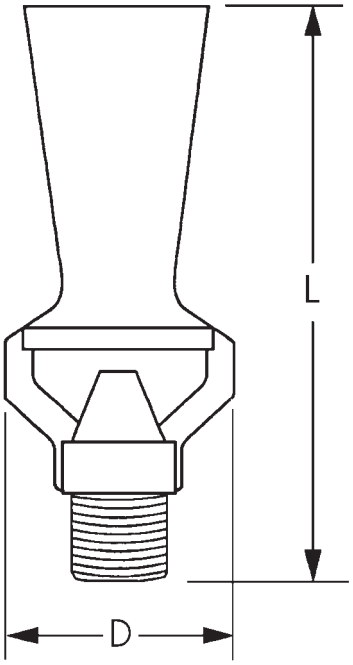
UNITED INDUSTRIES INCORPORATED
United Industries, Inc.
P.O. Box 58
Sterling, KS 67579
800-835-3272 • 620-278-3160
Fax 800-500-3115 • 620-278-3115
www.towerflo.com

NSF Listed

Form SWEEP:4/98

SWEEPER-EDUCTOR NOZZLES

A common secondary objective of sidestream cooling water filtration is to prevent the buildup of dirt and sediment on the floor of the cooling tower basin or other water-holding reservoir. The ability of the filter system to accomplish that objective is, in part, a function of a well-designed “sweeping” system which uses the filter’s sidestream water flow to constantly move dirt and suspended solids across the floor of the reservoir toward the filter inlet. This “sweeping” action meets its stiffest challenge in basins and reservoirs with a large surface area. The “sweeping” action of water can only be sustained over limited distances.



Model 250 Nozzle
Actual Size

Part No.:	P260250
Pipe Size:	1/4" NPT
Material:	ABS
L:	3-1/8"
D:	1-1/4"

Tower-Flo® Water Filter Systems offers improved “sweeping” action to maximize sidestream filter performance with its 1/4” Sweeper-Eductor Nozzles. Tower-Flo®‘s Sweeper-Eductor Nozzles employ proven venturi action to draw four gallons of water into the nozzle for each gallon pumped through the nozzle. This increased agitation, flow, and throw (area affected outward from nozzle) serves to significantly improve water turbulence which keeps solids from settling and keeps them moving toward the filter’s suction inlet.

In most cooling towers, air washers, and water reservoirs, the maximum number of nozzles should be used to provide the greatest turbulence over the greatest area. Due to widely varying surface areas, volumes, and water depths other configurations may be required. Consult Tower-Flo® Water Filter Systems or your Tower-Flo® Representative.

Select one Sweeper-Eductor Nozzle Model 250 for each 5 gpm of filter flow rate. For example, a 30” filter system with a flow rate of 100 gpm would require 20 nozzles:

100 gpm ÷ 5 = 20 nozzles.

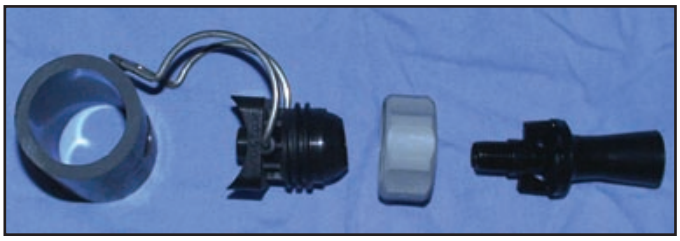
The 20 nozzles would be installed on the filter’s return piping header, spread evenly along its length on a maximum of 18” centers, if possible.

UNITED INDUSTRIES INCORPORATED
United Industries, Inc.
P.O. Box 58
Sterling, KS 67579
800-835-3272 • 620-278-3160
Fax 800-500-3115 • 620-278-3115
www.towerflo.com

NSF Listed

The Clean Water People Since 1954™

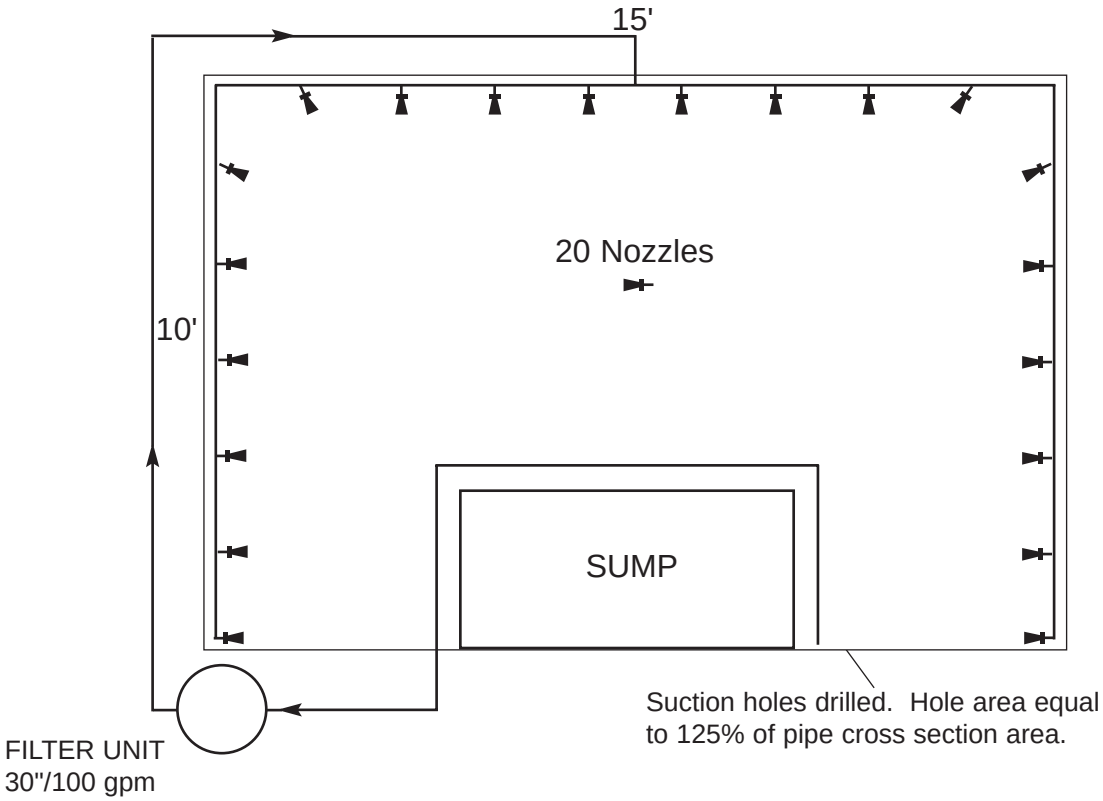
CLIP-ON NOZZLE HOLDERS



Tower-Flo's Sweeper-Eductor Nozzles can be used to greater advantage when they are installed using our Clip-On Nozzle Holders. While the Nozzle can be attached to the filter's effluent return piping system via threaded 1/4" holes, that style of installation fixes the nozzle's flow in one direction. The Clip-On Holders provide the ability to "aim" nozzles in the desired direction; flow can be directed into corners or into and around appertanances.

Clip-On S-E Nozzle Holders simply align over a 5/8" hole drilled into the return piping and clip over the pipe holding the nozzle on the hole. Holders are available for 1-1/4", 1-1/2", and 2" piping. Each Holder consists of a stainless steel spring clip, a glass reinforced polypropylene body with fingers, a glass reinforced polypropylene ball with female NPT, a glass reinforced polypropylene cap collar, and an EPDM o-ring.

TYPICAL COOLING TOWER APPLICATION OF SWEEPER-EDUCTOR NOZZLES



UNITED INDUSTRIES INCORPORATED
United Industries, Inc.
P.O. Box 58
Sterling, KS 67579
800-835-3272 • 620-278-3160
Fax 800-500-3115 • 620-278-3115
www.towerflo.com

NSF Listed

Form NOZZ:9/99