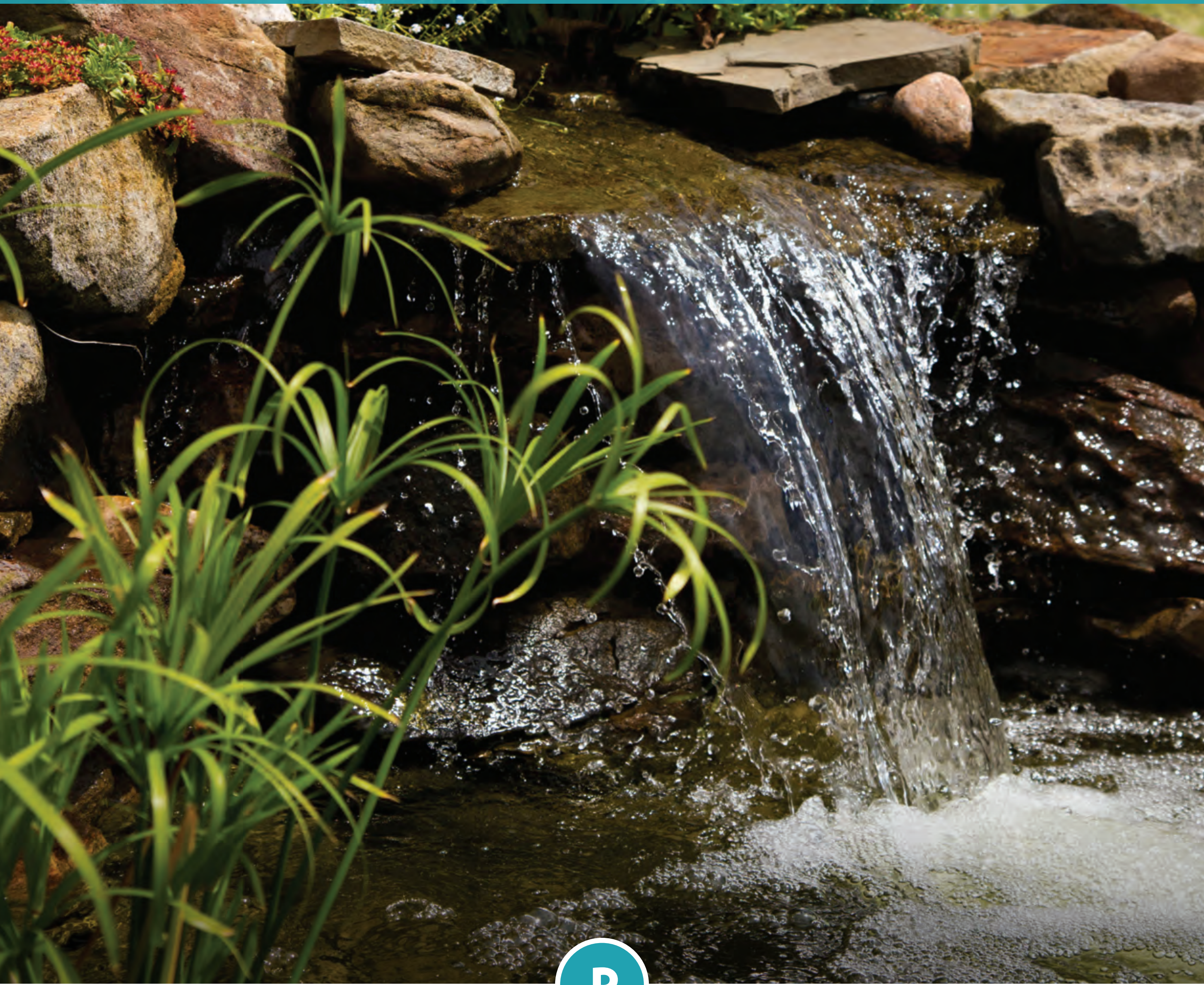
Atlantic™

CHOOSING THE PERFECT PUMP



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All pumps have an optimal range, measured in feet of head, in which they run best and last longest. Calculating the Total Dynamic Head enables you to select just the right pump, running in its Best Efficiency Range, to provide the desired flow at the right head.

1. PICK A LOOK & SPECIFY A FLOW

Choose the appearance you would like for your waterfall from the suggested choices to the left. Multiply the corresponding **GPH Per Foot** by the desired **Width of the Waterfall** to find the **Recommended Flow**.

≈ 750 GPH PER FOOT

≈ 1500 GPH PER FOOT

≈ 2250+ GPH PER FOOT

THE LOOK YOU WANT IN GPH/FT **x** THE WIDTH OF WATERFALL IN FEET **=** RECOMMENDED FLOW (GPH)

[ ] x [ ] = [ ]

2. DETERMINE FRICTION LOSS

CHART A
FRICTION LOSS PER FOOT OF TUBING

FLOW (GPH)	TUBING SIZE ½"	¾"	1″	1¼"	1½"	2"	3"
100	0.10	0.01					
200	0.38	0.05	0.01				
300	0.83	0.10	0.02				
400	1.00	0.18	0.04	0.01			
500	2.23	0.27	0.06	0.02			
750		0.50	0.14	0.04	0.02		
1000		0.84	0.21	0.07	0.03		
1250		1.20	0.33	0.10	0.04	0.01	
1500			0.43	0.15	0.06	0.02	
2000			0.94	0.26	0.10	0.03	
3000			2.07	0.52	0.22	0.05	
4000				1.10	0.43	0.09	0.01
5000				1.80	0.67	0.15	0.02
6000					0.96	0.22	0.03
8000					1.77	0.38	0.05
10,000						0.59	0.07
12,000						0.84	0.10
15,000							0.15
18,000							0.25

Example: GPH: 3000 Friction Loss: 0.05 Tubing: 2"

** For flows over 10,000 GPH or lengths over 100 ft. please contact us.

2.1 FIND TUBING SIZE & FRICTION

Find the dark blue cell in the row that corresponds with the **Recommended Flow (GPH)** in CHART A. The column indicates the recommended tubing size and the number in the cell is the **Friction Loss** in every foot of tubing. Keep Friction Loss low for greatest flow.

To find the Friction Loss of existing systems, estimate the flow through the actual tubing size used.

2.2 ADD FRICTION IN FITTINGS

Add the equivalent lengths of all the fittings in the system, from CHART B, to the tubing length from pump to falls to find the **Equivalent Tubing Length.**

FITTING LENGTH IN FEET **+** TUBING LENGTH IN FEET **=** EQUIVALENT TUBING LENGTH IN FEET

[ ] + [ ] = [ ]

CHART B
FRICTION IN EQUIVALENT FEET OF STRAIGHT PIPE

PVC FITTINGS	FITTING SIZE ¾"	1"	1¼"	1½"	2"	3"
Std Elbow, 90 degree	4.5	5.5	7.0	7.5	8.5	11.0
Std Elbow, 45 degree	1.0	1.5	2.0	2.5	3.0	4.0
Male / Female Adapter	1.5	2.0	3.0	3.5	4.5	6.5
Tee (Straight Thru)	2.5	3.0	5.0	6.0	8.0	12.0
Tee (Thru Branch)	5.5	7.0	9.0	10.0	12.0	17.0
Swing Check Valve	9.0	11.0	13.0	15.0	19.0	27.0

Example: 8.5 (90°) + 4.5 (M/FA) + 19.0 (Check Valve) = 32 (Fitting Length in Feet)

2.3 CALCULATE FRICTION HEAD

Multiply the **Equivalent Tubing Length** in feet by the **Friction Loss** in the dark blue cell from CHART A to find the **Friction Head** of the system.

EQUIVALENT TUBING LENGTH IN FEET **x** FRICTION LOSS FROM CHART **=** FRICTION HEAD IN FEET

[ ] x [ ] = [ ]

3. FIND THE TOTAL DYNAMIC HEAD

Add the **Friction Head in Feet** to the **Vertical Head** of the system. Vertical Head is the height in feet from the surface of the water the pump will be sitting in, to the highest point the water is pumped to.

FRICTION HEAD IN FEET **+** VERTICAL HEAD IN FEET **=** TDH

[ ] + [ ] = [ ]

4. CHOOSE YOUR TIDALWAVE PUMP

Find the **Total Dynamic Head (TDH)** at the top of CHART C, then find the pumps below that provide at least the **Recommended Flow**. Grey colored cells indicate that the TDH is outside the pump's operating range and the pump will likely not last in this application. The light blue cells indicate the pump is operating within its operating range. Dark blue means the TDH is in the pump's Best Efficiency Range, where the pump will run best and longest. If the chart gives you a choice of more than one pump, check for the type that best fits your application from the list below, then check for the lowest wattage, to save on operating costs.

- For Low Head, Low Volume applications, use Magnetic Drive Pumps (MD Series)
- For Low Head, Very High Volume applications, use Axial Pumps (L-Series) with 3" or larger tubing
- For Medium Head, Medium Volume, use Asynchronous Pumps (TT & TW-Series)
- For High Head, High Volume Applications, use Direct Drive Pumps (A-Series)
- For Solids and Dirty Water applications, use Direct Drive Solids Handling Pumps (PAF and SH-Series)

CHART C

MODEL	WATTS	MAX FLOW	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'
MD250	15	300	65											
MD350	25	370	145											
MD550	40	650	385											
MD750	50	790	465											
MD1000	90	1080	785	275										
MD1250	120	1330	1040	580										
MD1500	165	1560	1255	780										
TT1500	101	1640	1060	350										
TT2000	115	2640	1760	715										
TT3000	173	3000	2180	1215	475									
TT4000	230	4490	3330	1785	700									
TT5000	310	5150	4255	3170	1615									
TT6000	334	6600	4915	3395	1750									
TT7500	520	7650	6300	4640	2860	1250								
TT9000	587	8800	7470	5990	4260	2595								
SH1450	240	---	1170	650										
SH2050	320	---	1700	1130										
SH3600	575	---	3245	2750	2090									
SH5000	950	---	4350	3620	2800									
SH6500	1000	---		4875	4000	3080								
PAF-20	360	---	2800	1950	1080									
PAF-25	545	---	3900	3150	2300									
PAF-40	650	---		4350	3570	2700								
PAF-75	900	---			4560	3750	2830							
A-05	645	---			2500	2155	1875	1455	935					
A-05L	725	---		4320	3600	2820	1920							
A-21	1060	---				4335	3770	3140	2400					
A-31	1160	---		8150	6830	5535	4120	2535						
A-32	2055	---						8280	7560	6780	5580	4920		
L-305	710	---	10380	7380										
L-310	1105	---	13500	10560	7380									

Recommended Operating Range · Best Efficiency Point · Do Not Operate Range

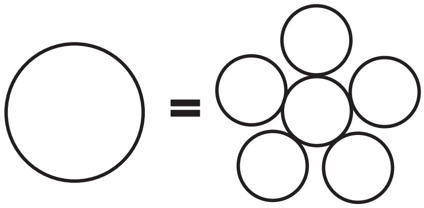
WHAT YOU NEED TO KNOW ABOUT PUMPS & PLUMBING

FLOW, PRESSURE & THE BEST EFFICIENCY POINT

All pumps have an optimal range of flow, measured in GPH, and pressure, measured in feet of Head. Pumps operating within their Recommended Operating Range will run better and last longer. Pumps forced to run outside their operating range will tend to fail sooner. Every waterfall needs a certain amount of flow at a certain amount of pressure to achieve a desired effect. Knowing the feature's Recommended Flow in GPH, and its Total Dynamic Head in feet, lets you select the right pump, running in its optimal range, providing the desired flow at the right head.

AREA VS. CIRCUMFERENCE

Though it might seem that two 1.5" pipes would have the same capacity as one 3" pipe, appearances are deceiving. Calculating their relative areas shows it would take four 1.5" pipes to equal one 3" pipe (Area = πr^2). However, the four 1.5" pipes have double the inside surface area of the 3" pipe, creating twice the friction and restricting flow even though the areas are the same. The Friction Loss Chart shows 8000 GPH through 3" pipe has a friction loss of .05 per foot of tubing. The same friction loss through 1.5" pipe happens at 1375 GPH, so it would take six 1.5" pipes to carry the same flow at the same friction as one 3" pipe. One big pipe always increases flow.



One 3" pipe **Six 1½" pipes**

DECREASING TDH FOR LOW HEAD PUMPS

Total Dynamic Head is the combination of Friction Head, the restriction caused by the plumbing, and the Vertical Head, the height the water is pumped to. The lower the TDH, the higher the flow will be. The height of the feature is fixed, but eliminating friction is an easy way to increase flow without buying a bigger pump. Restrictive plumbing adds friction head, robs flow and tends to shorten pump life. Low head pumps should typically be plumbed with generous tubing to reduce friction and increase both flow and pump life. The Friction Loss Chart provides the optimal size tubing to eliminate excess Friction Head.

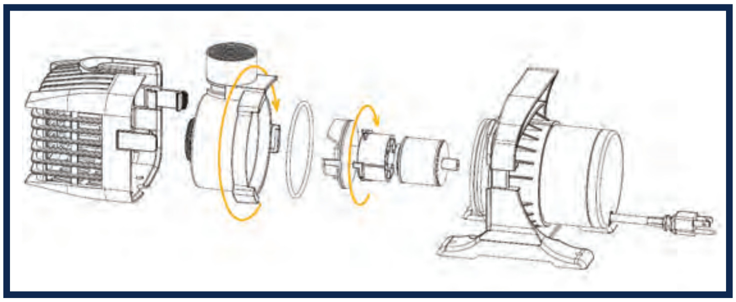
INCREASING TDH FOR HIGH HEAD PUMPS

Lowering TDH is not always desired. Unlike low head pumps, high head pumps usually require a minimum amount of head to function. Too little TDH will lead to overspeeding, overheating and cavitation, a low pressure condition which can destroy both motor and impeller. If the pump you want to use will be happier at a higher TDH, install a ball valve on the discharge line to restrict the flow and raise the head pressure into the recommended operating range. (Note that Head is the same as pressure; every one foot of Head equals .433 psi, but Head Height is a lot easier to visualize than pounds per square inch!)

KEEP PUMPS CLEAN

Regular cleaning and maintenance is the best way to get the most out of your pump, especially in harsh environments. Keep intakes and pre-filters clean. If debris clogs the intake the pump can quickly overheat, which can cause pump failure. The larger the prefilter the longer the pump can safely go between cleanings, which is why pond skimmers, the ultimate pre-filters, are so popular.

In areas with very hard water, calcification (lime scale) can build up around the impeller assembly or motor housing of TT and MD pumps, leading to overheating or even seizing. Clean your pump after the first month of operation to determine how often you'll need to perform maintenance.



CLEANING MAGNETIC AND ASYNCHRONOUS PUMPS:

1. Remove pre-filter and check for debris in the inlet
2. Loosen or remove screw(s) securing volute, if necessary.
3. Rotate volute to remove, then remove and inspect impeller assembly
4. If needed, soak assembly in white vinegar solution and clean completely
5. Reassemble

Note: Pumps can often be cleaned of hard water deposits by running for five minutes immersed in a bucket of white vinegar solution. See if this works for you in your hard water application.

KEEP SUBMERSIBLE PUMPS SUBMERGED

Low water levels are the main cause of pump overheating and failure. This can easily happen with vertical pumps in a skimmer if the pad or net is neglected. Debris blocking the flow of water into the pump chamber causes the water level around the pump to drop, even though the pond level is normal. Pumps in vaults are especially susceptible, since water levels in a hidden reservoir can easily drop unseen. If a drop in water level exposes the top of the pump, the electronics located there will quickly overheat, shortening pump life dramatically. Worst of all, this abuse is not covered under warranty!

COST TO RUN A PUMP

Figuring the hourly cost of operation of your pump is easy. Take what you pay per kilowatt per hour, multiply that by the wattage of the pump and divide by 1000. For the monthly cost, multiply the hourly cost by 720, 24 hours per day times 30 days in a month. For more information, visit the College of Pumps in the Atlantic Water Gardens University, www.atlanticwatergardens.com/university.

COST PER HOUR = ______ $ /kW/hr. x ______ Watts ÷ 1000 = ______ x 720 = ______ COST PER MONTH

Example: Electric costs $0.10/kW/hr, the pump draws 100 Watts, so $0.10/kW/hr x 100W/1000 = $0.01/hr x 720hrs/mo = $7.20/month