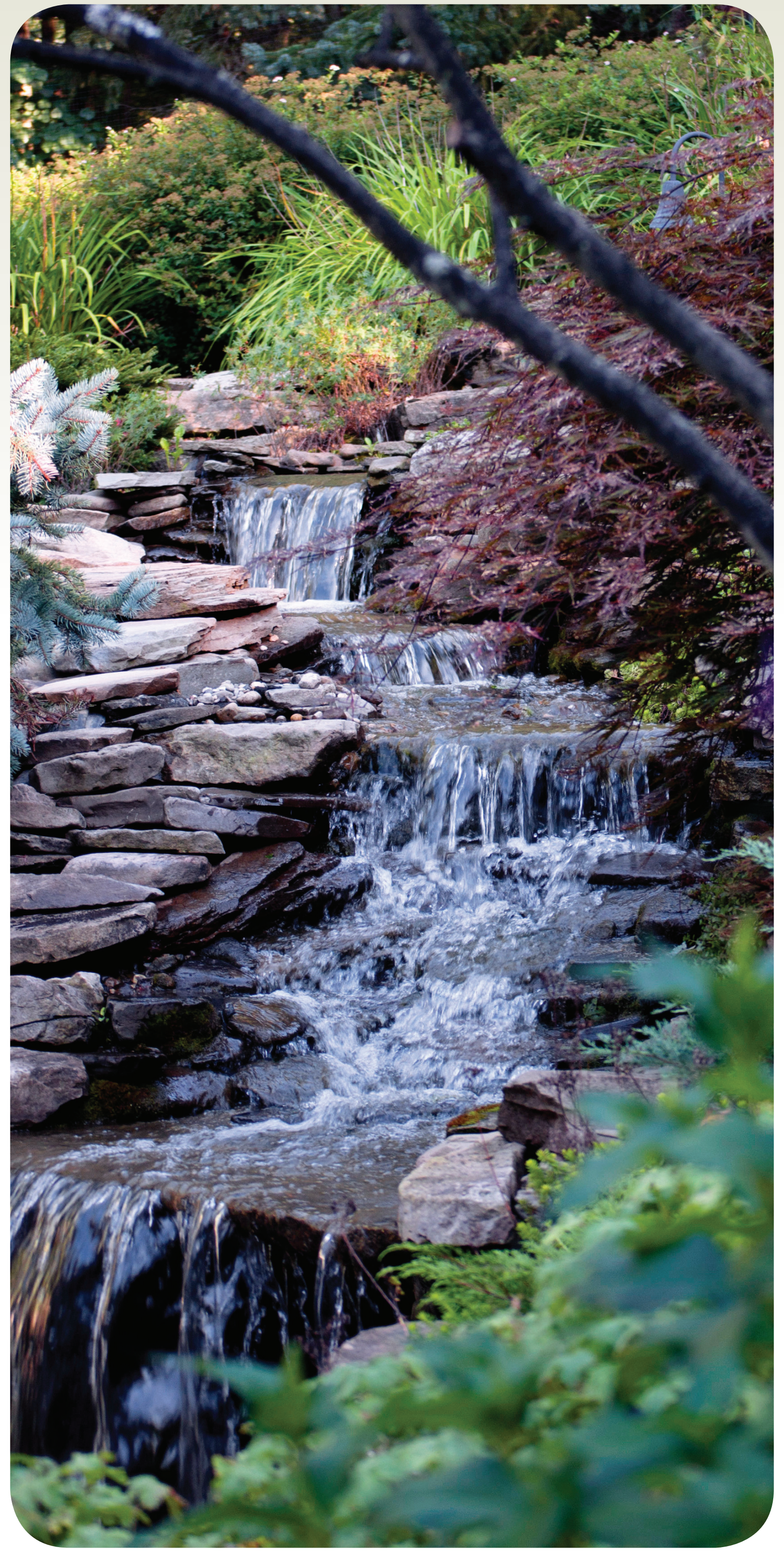


Once upon a time...

...not that long ago, Water Gardeners had very few choices. We built clay or cement basins, installed sump or swimming pool pumps and had few other options. It's a very different world today, with dozens of choices open to us, from which type of liner to use, to the kind of skimmer or vault we prefer, to a myriad of filtration options. The choice of pump is one of the most important, because unlike other equipment, pumps cost a significant amount to run over their lifetimes.

Just like with vehicles, there's a perfect pump for every job. Subcompacts don't tow horse trailers, and dump trucks aren't economical commuter cars. It's the same with pumps. Sump pumps aren't designed for continuous, economical operation in clean water. Swimming pool pumps require restrictive plumbing and cost so much to run they're only on a couple of hours a day. These days there are much better, longer lasting and more economical options for water features, and you'll find out about them right here.

To choose the perfect pump for your water feature, you need to know how much work it will have to do – not just the Flow your feature will require, but also the Head, or pressure, the pump will have to produce to get that flow to where it's going. Here are the three steps you'll take:

Find the right flow, the volume of water, in Gallons Per Hour (GPH), to get the look you want;

Figure out the head, the pressure, expressed in Feet of Head, to lift that flow to the right height;

Pick the right pump, one that provides the right flow at the right head, from the four main types.

Last but not least, you'll want to know how to maintain your pump and what it will cost to run.

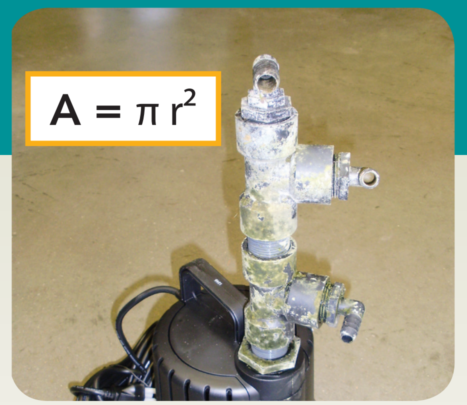
This brochure will tell you all you need to know, so…

Let's Talk Pumps!

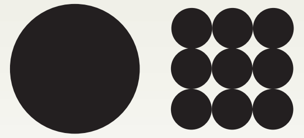
HOW TO KEEP PUMPS ALIVE

RUN PUMPS IN THEIR BEST EFFICIENCY RANGE

Too much restriction kills pumps, which is why you need to choose the right tubing. Take a look at the low head mag pump pictured. Perhaps someone figured that three ½" lines would carry the flow of one 1½" discharge. They don't. It takes NINE ½" hoses to equal the area of ONE 1½"outlet. This pump choked, overheated and failed. On the other hand, using high head pumps at low head heights doesn't give them enough work to do, causing "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 head height, installing a ball valve and pressure gauge on the discharge line to restrict the flow will raise the head and ensure it is within the recommended operating range. (Note that Head is the same as pressure; every 1 feet of Head equals .433 psi, but Head Height is a lot easier to visualize!)

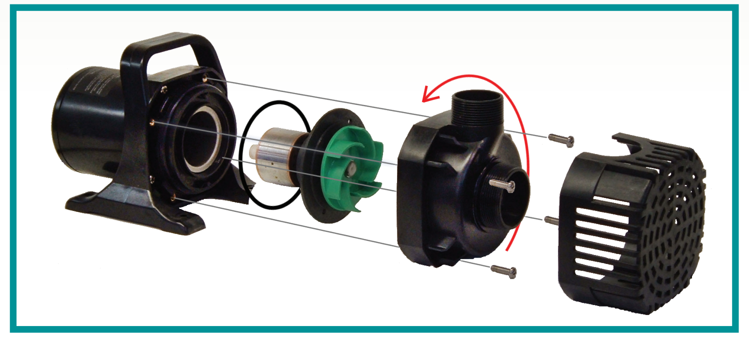


One 1½" pipe = Nine ½" pipes



KEEP PUMPS CLEAN ESPECIALLY IN HARD WATER!

Regular Maintenance is the best way to get the most out of your pump, and it's most important in harsh environments and areas with very hard water. If debris clogs the intake or calcification (lime scale) builds up around the impeller assembly or motor housing, the pump can quickly overheat, the Number 1 cause of pump failure. 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 prefilter and check for debris in the inlet.
2. Remove (1) set screw on Mags, (4) screws on Asynchs.
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 5 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. It doesn't take long out of the water for the top of the pump, where all the electronics are located, to heat up, and the pump won't last long. 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.

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

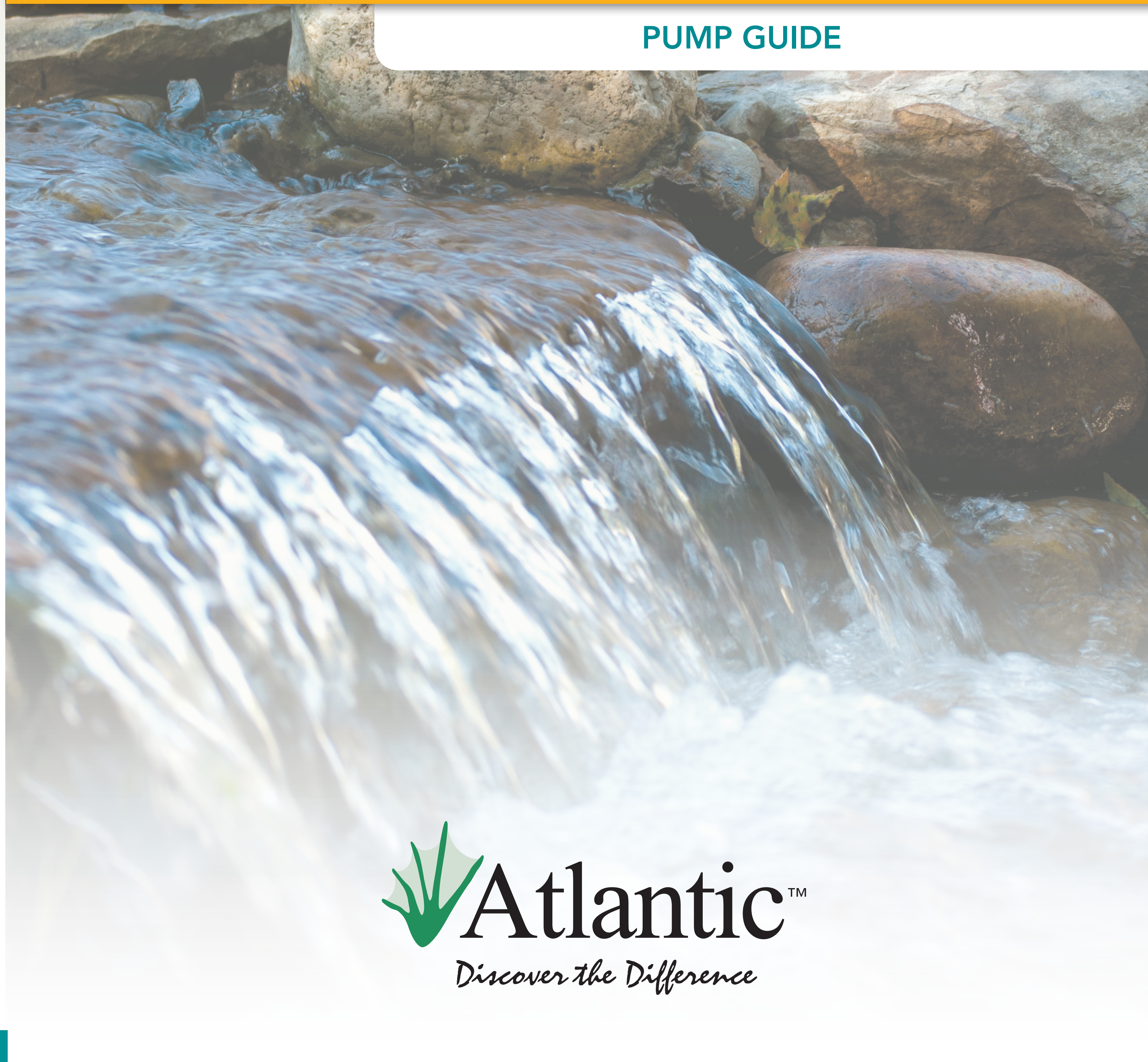
THE ADVANTAGES OF REDUNDANCY

HOW TWO PUMPS COST LESS THAN ONE

For greatest economy, using two half-size pumps instead of one larger typically saves 20-40%, all else being equal. For example, an MD2000 will provide 1800 GPH at 4' of Head for 250 Watts, where two MD1000s will provide the same flow at the same head for 180 Watts, 28% less. A single TW4800 will push 4000 GPH at 5' for 425 Watts; two TW2400's, 3900 GPH for 350 Watts, a 21% savings. That's over $300 saved over 3 years at $0.16 per kilowatt/hour! The advantages don't stop there. Two pumps mean you never have to worry about fish mortality due to a single pump failure; either one or both can be run to vary the appearance; run only one overnight or when no one is home for even greater savings, or pull one for service without losing all circulation.

Let's Talk Pumps

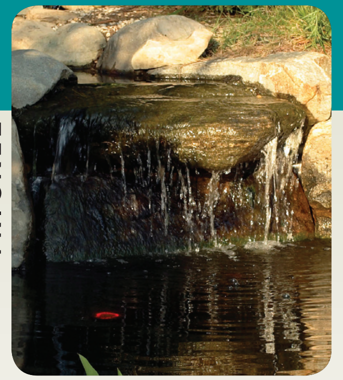
PUMP GUIDE



Atlantic™

Discover the Difference

TRICKLE

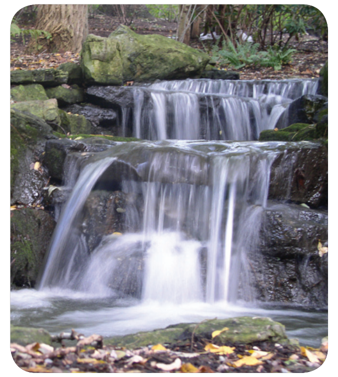


750 GPH per foot

SHEET

1500 GPH per foot

NIAGARA



2250 GPH per foot

VERTICAL HEAD + FRICTION HEAD = TOTAL DYNAMIC HEAD

Pumps have two jobs to do, and flow is only half the story. The pump also has to push that flow up to the top of your water feature. You'll need to know the height the flow is going to (the "Vertical Head"), and the extra work required to push that flow through the plumbing (the "Friction Head"). You'll calculate both below, in feet to make it easy to add them together, to find the total working head pressure your pump will have to produce. This "Total Dynamic Head" (TDH) of your water feature, together with the flow you need, get plugged into the Comprehensive Pump Chart at far right to find the right pump for you.

YOUR CALCULATIONS:

Waterfall width _____ ft. x _____ GPH per ft. = Your Flow _____ Through _____ Inch Tubing

A Tubing length _____ + B Equivalent Fitting length _____ = Total Equivalent length _____

Total Equivalent length _____ x C Tubing Friction loss _____ = Friction Head _____

Friction Head _____ + D Vertical Head _____ = Total Dynamic Head _____

1. FIND THE RIGHT FLOW

First, log the width of your waterfall, in feet, on the first line above. Then, pick a "look":

- For a Trickle, many little dribbles coming off a rock, you need 750 GPH per foot
- For a Sheet, a sheer curtain of water off a clean edge, you need 1500 GPH per foot
- For "Niagara", noise and action in the stream and falls, you need 2250 GPH per foot

Log the GPH per ft after Waterfall width above and multiply them to calculate Your Flow.

Example: A two-foot-wide Sheet of water will require: 2ft x 1500 GPH/ft = 3000 GPH

Knowing Your Flow means you can now find the right Tubing Size to keep friction to a minimum and get all the GPH you're paying for. On the Friction Loss Chart at the top of the next page, find the line corresponding to Your Flow, locate the dark blue cell on that line and follow that column up to the Tubing Size line on top. Log the recommended Tubing Size after Your Flow above.

2. FIGURE OUT THE HEAD

First let's figure out the Friction Head, the work the pump has to do to push against the friction in the tubing and the fittings:

A Log the total length of Tubing you'll be using in your water feature on the second line above.

B Your plumbing setup will include some fittings, which slow the flow by adding friction. The chart to the right converts the friction of fittings into tubing length. For instance, note that a 2" 90° Elbow adds the same amount of friction as 8.5' of 2" tubing. Add up the lengths of all the fittings in your setup and log the Equivalent Fitting length above, then add that to the Tubing length to get the Total Equivalent length.

FRICTION LOSS IN EQUIVALENT FEET OF STRAIGHT PIPE

PVC Fittings	FITTING SIZE					
	3/4"	1"	1-1/4"	1-1/2"	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	2.0	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:
For 3000 GPH through 2" plumbing, Swing Check Valve (19') + 90° Elbow (8.5') + Male adapter (4.5') = 32' Equivalent Fitting length

FRICTION LOSS PER FOOT OF TUBING

GPH	TUBING SIZE						
	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	3"
100	0.10	0.01					
200	0.40	0.05	0.01				
300	0.80	0.10	0.03				
400	1.00	0.20	0.04				
500	2.20	0.30	0.06	0.01			
750		0.60	0.10	0.03	0.02		
1000		0.80	0.20	0.05	0.03		
1250		1.60	0.30	0.07	0.05	0.01	
1500			0.40	0.10	0.06	0.02	
2000			0.90	0.20	0.10	0.03	
3000			2.70	0.30	0.20	0.05	
4000				0.50	0.40	0.10	0.01
5000				1.10	0.70	0.20	0.02
6000				2.50	1.00	0.30	0.03
8000					2.60	0.40	0.05
10000						0.60	0.08
12000						0.80	0.10
15000						2.00	0.18

Recommended | Best | Restrictive | Impractical

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

C The chart to the left will tell you the Friction Loss per foot of tubing in your water feature. The dark blue cell in every line indicates the recommended Tubing Size for that flow, to minimize Friction Loss and wear and tear on the pump, and maximize flow. Locate the GPH in the left column of the chart that best matches Your Flow, then run your finger across to the number in the dark blue cell on that line, and log this Tubing Friction loss on the third line of Your Calculations. Multiply the Total Equivalent length by the Tubing Friction loss per ft. to find, and log, the Friction Head.

Example: 3000 GPH = Friction Loss of .05 per foot of 2"

D Now log the Vertical Head, 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.

Finally, add the Friction Head to the Vertical Head to find the Total Dynamic Head of your water feature.

Every job deserves the right tool, and water features are no exception. Using the right kind of pump for your water feature will get the job done for the least cost and keep your pump alive longer! There are four types to choose from:

Magnetic Drives

Magnetic Drives (Fountain Pump Series, Mag Drive Series) use a rotating magnet to spin a simple, replaceable impeller to push up to 2000 GPH. They don't cost much to run but can jam easily, so they're best for clean water in smaller features under 500 gallons, with head heights under 10'.

Asynchronous Drives

Asynchronous Drives (Hybrid Series) use a copper rotor spinning in one direction ("asynchronous") to drive an efficient, Direct Drive-type impeller (hence the term "Hybrid"). Powerful and efficient, Asynchs are great for clean, soft water in features up to 6000 gallons and 6000 GPH, under 15' of head.

Direct Drives

Direct Drives (SH-Series, PAF-Series, A-Series), named for their heavy asynchronous impeller directly attached to the motor, move dirty water and even solids at the cost of higher power consumption than "clean water" pumps. Industry favorites for their durability, Direct Drives are best for demanding high head applications over 15'.

Axial Pumps

Axial Pumps (L-Series) trade the impeller of the Magnetic and Direct Drive Pumps for a propeller, to move huge volumes at very low heads very efficiently. Perfect for very large, low head water features where efficiency and economy are critical, Axials require at least 3"or 4" tubing to keep Total Dynamic Head below 10'.

3. PICK THE RIGHT PUMP

Now you're ready to find the best possible pump for your application, using the Comprehensive Pump Chart. Locate the column at the top of the Chart corresponding to the Total Dynamic Head of your system. Run down that column with your finger and find the cells with numbers colored Your Flow in them. Beige colored cells indicate that the pump on that line is out of its operating range, and will not last, so you'll want the blue cells in the right range. Dark blue means the pump on that line is closest to its Best Efficiency Point, where it will run the best and the 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 (Mag Drive Series)
- For Low Head, Very High Volume applications, use Axial Pumps (L-Series) with 3' or larger tubing
- For Medium Head and Volume, Soft Water applications, use Asynchronous Pumps (Hybrid Series)
- For Medium Head and Volume, Hard Water applications, use Direct Drive Solids Handling Pumps (PAF and SH-Series)
- For High Head, High Volume Applications, use Direct Drive A-Series Pumps
- For Solids and Dirty Water applications, use Direct Drive Solids Handling Pumps (PAF and SH-Series)

TOTAL DYNAMIC HEAD

Series	Model #	Watts	Max	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'
MAG DRIVE SERIES	MD250	15	300												
MAG DRIVE SERIES	MD350	25	370	145											
MAG DRIVE SERIES	MD550	40	650	385											
MAG DRIVE SERIES	MD750	50	790	465											
MAG DRIVE SERIES	MD1000	90	1080	785	275										
MAG DRIVE SERIES	MD1250	120	1330	1040	580										
MAG DRIVE SERIES	MD1500	165	1560	1255	780										
MAG DRIVE SERIES	MD2000	250	2010	1695	1320	695									
HYBRID SERIES	TW1200	110	1290	1080	720										
HYBRID SERIES	TW1900	130	1900	1440	900										
HYBRID SERIES	TW2400	175	2400	1950	1390	825									
HYBRID SERIES	TW3700	355	3730	3010	2230	1425									
HYBRID SERIES	TW4800	425	4800	4000	3140	2230	1260								
HYBRID SERIES	TW6000	495	6000	5040	4050	3000	1930								
SH-SERIES	SH1450	240	1450	1170	650										
SH-SERIES	SH2050	320	2050	1700	1130										
SH-SERIES	SH3600	575		3245	2750	2090									
SH-SERIES	SH5000	950		4350	3620	2800									
SH-SERIES	SH6500	1000			4875	4000	3080								
PAF-SERIES	PAF-20	360		2800	1950	1080									
PAF-SERIES	PAF-25	545		3900	3150	2300									
PAF-SERIES	PAF-40	650			4350	3570	2700								
PAF-SERIES	PAF-75	900				4560	3750	2830							
A-SERIES	A-05	645					2155	1875	1450	935					
A-SERIES	A-05L	725			4320	3600	2820	1920							
A-SERIES	A-21	1060					4335	3770	3140	2400					
A-SERIES	A-31	1160			8150	6830	5535	4120	2535						
A-SERIES	A-32	2055							8280	7560	6780	5580	4920		
L-SERIES	L-305	710		10380	7380										
L-SERIES	L-310	1105		13500	10560	7380									

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