"How To" Series: Selecting the Correct Pump

By Rick Smith, EasyPro® Pond Products

Selecting the correct pump can be a straighforward and easy process if you have an understanding of basic calculations.

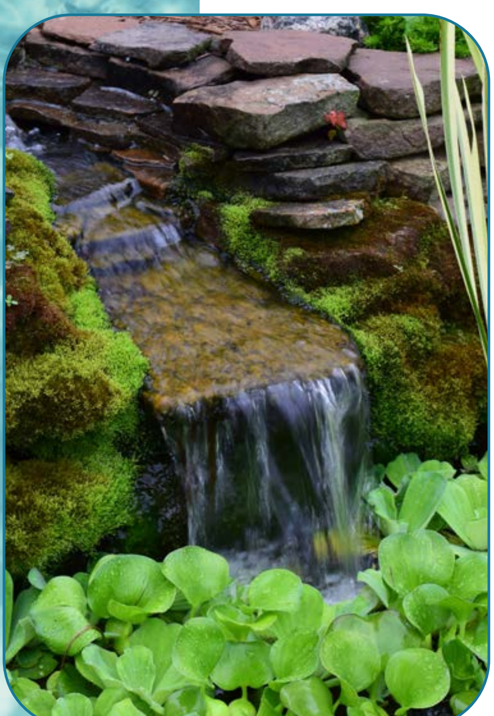
However, there are a few misconceptions, and even a number of myths, to be aware of that could lead to spending your hard earned money only to find out:

1. **The pump doesn't provide the results as expected.**
2. **The pump has problems shortly after installing.**
3. **The pump has a shorter life-span than the pond it was designed for.**

In this article, you will learn:

- **Basic flow rate calculations** for selecting the correct pump to meet filtration and waterfall requirements
- **The different type of pumps** available and the features of each one
- **The myths and misconceptions** that could lead to an error in pump selection and/or application.

Basic Flow Rate Calculations



Each water feature requires different flow rates at the point of discharge after lift. Lift is the affect that gravity has on the flow rate from the top of the water to the point of discharge. Every pump comes with a performance chart.

For Waterfalls in Ponds or Just-A-Falls

it is desired to achieve 1" thick of water flow over the weir. This would be 2,160 gph or 36 gpm after lift per weir foot.

- **26" weir = 2.16 feet x 2,160 = 4,665 gph or 78 gpm**

For Spillways in Hardscape Features

where a smooth sheet of water is desired, 600 gph or 10 gpm per weir foot works best.

- **23" weir = 2 feet x 600 gph = 1,200 gph or 20 gpm**

For Basalts and Statuary

There is a wide range depending on the inner diameter of the feed tubing and number of features being supplied by the same pump.

- **200 to 400 gpm per column = 2" bubble**

Water Gardens & Koi Ponds

The filtration needs will be different between a Water Garden and a pond with fish. This may change the size of the pump required as well.

- **With fish – filter the water volume once an hour**
- **No fish – filter the water volume once every 2 hours**

A Pond with Fish Example

We will need to complete two calculations. One is for proper filtration rate and other is for waterfall needs. After figuring both, we will use the larger of the two numbers for the proper flow rate.

We first need to know the actual water volume of the pond to calculate the proper filtration rate per hour.

This is done by multiplying the pond length x width x average depth x 7.48 gallons of water per cubic foot (cf). Then, if the sides are sloped or stepped, take the answer and multiply it by 80 percent. This will tell you the water volume.

- 18′ x 13′ = 234 sq. ft. x 2 avg. feet of depth = 468 cf x 7.48 gallons per cf = **3,500 gallons**
- **3,500 x 0.80 (80%) = 2,800 gallons**

Using the waterfall calculations for a 26″ weir.

- 2.17 feet x 2,160 gph = **4,687 gph** (78 gpm)

Using the larger of the two numbers, 4,687, we will need a pump that produces 78 gpm after lift as well as an Aquafall box (AM2) and Skimmer (PSA5000) that can handle this flow rate.

Provided the lift is 5′ or less, you could use either:

- **TH400 –** 83 gpm at 5′ of lift
- **EPA5500 –** 78 gpm at 5′ of lift

EPA5500

TH400

Total Dynamic Head - Larger Projects

Typically in most small ponds, with short pipe runs, friction loss is not a problem. However, in a feature with long streams or high flow rates, friction loss can have a big impact on pump performance.

Total Dynamic Head is the feet or head (lift) added to the friction loss created by the pipe.

Feet of head is typically measured in terms of vertical lift. However, the diameter and length of pipe can have a significant effect on the performance of the pump as well, especially if the pipe diameter is too small. A pump must have the power to not only push the water up to the vertical height of the waterfall, but to also overcome the friction loss created by the pipe.

A pump has to work to push water up hill (lift). In addition, the smaller the pipe and the longer the length of pipe the harder the pump has to work. **Without compensating for these factors, (with a larger pipe and/or a different pump) two undesirable events occur:**

1. **We don't achieve the water flow rate desired**
2. **The pump fails, or the life of the pump is dramatically shortened.**

For example: Since the number must be added to the pumps gpm flow rate (output) at different feet of lift (feet of head) the lower the number the better.

We are pumping 70 gpm (4,200 gph). 70 gpm through 100′ of 2″ pipe equals 7.76′ of head while a 3″ pipe only equals 1.13′ of head. If the waterfall is 10′ high and 100′ away, you will have a total head of 17.76′ using a 2″ pipe but only 11.13′ using 3″ pipe.

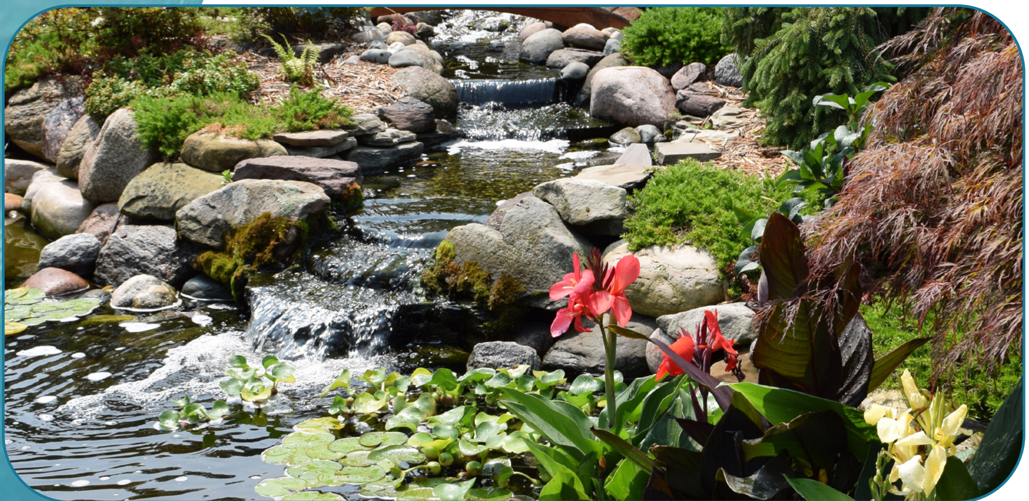
Application: Let's say we have a flow rate need of 70 gpm after a 10′ lift. A TH400 does 73 gpm at a 10′ lift.

However, if the pipe length is 100′ and we use a 2″ pipe, we have to add 7.76′ of friction loss, which means we are now looking for a pump that can produce 70 gpm at 17.76′ of Total Dynamic Head.

The other option is to use a 3″ pipe, which adds only 1.13′ to the 10′ lift for a total of 11.13′ of Total Dynamic Head. We can still use the same TH400 pump and not jeopardize the health of the pump.

For additional assistance contact your local Authorized EasyPro® Distributor or Dealer or check out EasyPro.com.

The Different Types of Pumps



Direct Drive Pumps

A commonly used pump for its reliability, high flow rate, and ability to handle medium range pressure.

Example EasyPro® TH Series

Low Head Direct Drive Pumps

Ideal for streams and waterfalls where high water flow rates are required and there is low to medium head pressure.

Example: EasyPro® TM Series

High Head Direct Drive Pumps

Best choice for water features above 20 feet. Applications need a minimum of 20 feet head pressure. A ball-valve can be used to create back pressure if system has less then 20 feet of head pressure.

Example: EasyPro® TBSeries

Mag-Drive Pumps

Energy efficient pumps for low head conditions in a compact size. Fewer moving parts and long life.

Hybrid-Asynchronous Pumps

VERY energy efficient and quiet. Can handle higher water flows than Mag-Drive. Long pump life.

External Centrifugal Pumps

Very energy efficient with the longest pump life. A big advantage: Electric is away from the water.

External Centrifugal Self-priming Pumps

The self-priming benefit eliminates the frustration of an air lock or having to prime the pump once it has been shut off or loses prime.

Three Myths & Misconceptions

#1 - I NEED a 2-HP Pump

TRUTH: There's a lot more to it than just the horsepower! Don't make this mistake.

Comparing two 2-HP pumps just based on the horsepower alone, we could find that one pump will provide 88 gpm at 20-feet of head while the other pump will provide 250 gpm at 20-feet of head.

How can this be? Quick answer: it depends on the design of the impellor and the outlet. Always check the performance chart of each pump to make sure it meets your specific projects requirements before purchasing.

#2 - I NEED 1.5" Tubing/Pipe Because My Pump has a 1.5" Outlet

TRUTH: The pump outlet size does not automatically determine the proper tubing/pipe size requirements.

There is a big difference between 2-inch and 3-inch pipe. almost 225% more space. That is why using the correct size tubing/pipe is important to the output of the pump.

The target flow rate and friction loss will help determine the actual size of tubing/pipe needed for your specific pond needs.

#3 - I Can Only Get 5,400 gph (or 90 gpm) Through My Pump

TRUTH: That is not the entire story. It is only a good rule of thumb.

For example, if you had a mouth full of water, would it be easier to squirt the water through a soda straw or a garden hose? Which one would you have to work harder at getting the water through?

The rule of thumb directly relates to allowing the pump to operate within its designed "sweet spot." Each pump is designed to operate the best while drawing a certain number of amps. When a pump has to work harder, the amount of amp draw goes up. This will use more energy, cost more to operate and also cause the pump to run hotter, reducing it's life span.