

Pump selection for small projects

J. Chaurette, July 2016

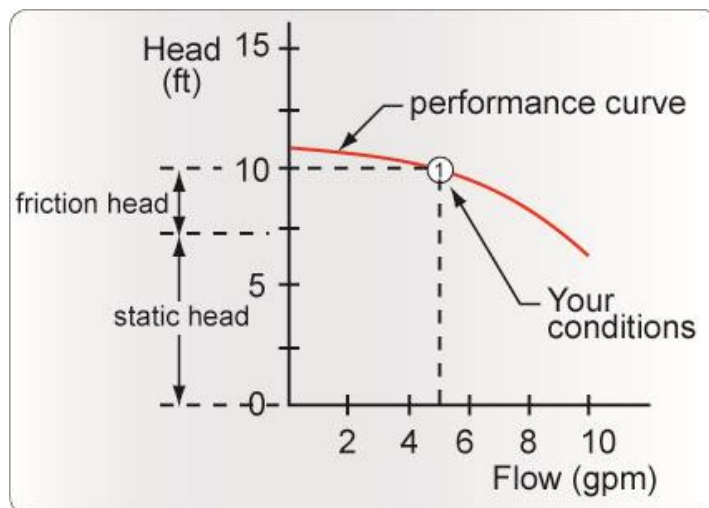
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How to select a pump from the big block store or internet for your application?

You have a flow schematic, nothing fancy just some hand-drawn lines on paper indicating where the pump is relative to the different liquid levels, the pipe or tube size and the flow rate. The static head (difference between the liquid levels) is known and you have calculated the total head (pump head) of the pump based on the flow rate required. The flow rate and the head are the critical parameters. You are ready to purchase the pump that meets your needs and are now at the big box store or on amazon ready to purchase the pump.

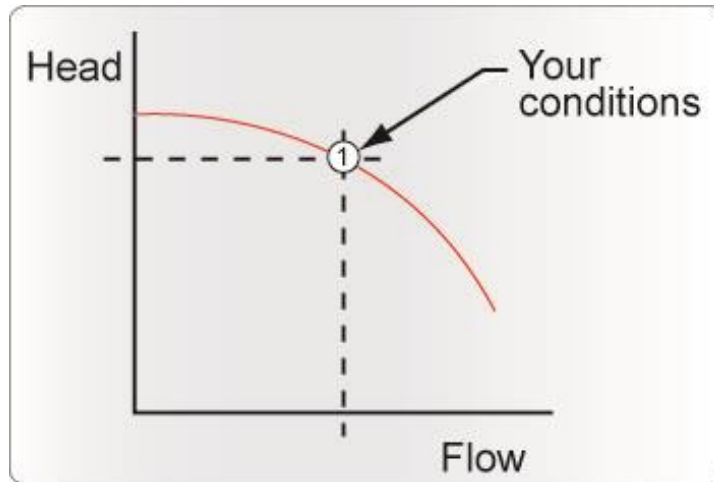
Two situations are going to occur. The seller has a performance curve that you can analyze to see if the pump is a good fit or he doesn't.

What is a performance curve? It's a plot of head vs flow appropriate to the construction and size of the pump. The pump can only operate on this curve. Head is the ability of a pump to displace the liquid to a certain height. So if you need the liquid to a height of 7 feet (static head) you need a pump that has a minimum of 7 feet of head. However you need the liquid to flow through a pipe at a certain rate (for example 5 gallons per minute or gpm) and this causes friction (friction head) which requires more energy so the head of the pump must be higher than 7 feet to account for the friction.



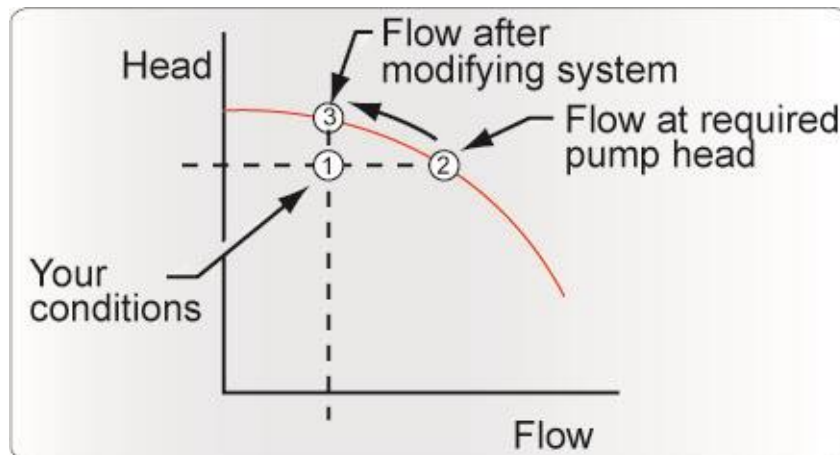
Let's take the 1st case – performance curve available

After searching you have found a pump that has a flow rate close to your requirements. Your requirements or the operating conditions (head & flow) should lie on the performance curve somewhere in the middle. The pump can operate anywhere on this curve and what determines where it operates is the head that you require. How does the pump know to operate there? The pump knows nothing of course; it is designed (i.e. impeller size, inlet and outlet size) to provide the flow rate at the middle of the curve if it is connected to a system that offers the resistance (head) for that flow rate.

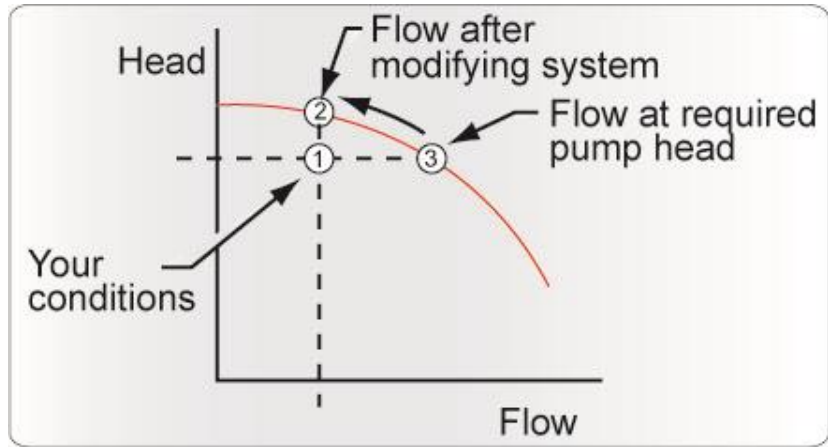


When you find a pump with the flow rate close to your requirement somewhere near the middle of the curve, what leeway do you have with your operating conditions?

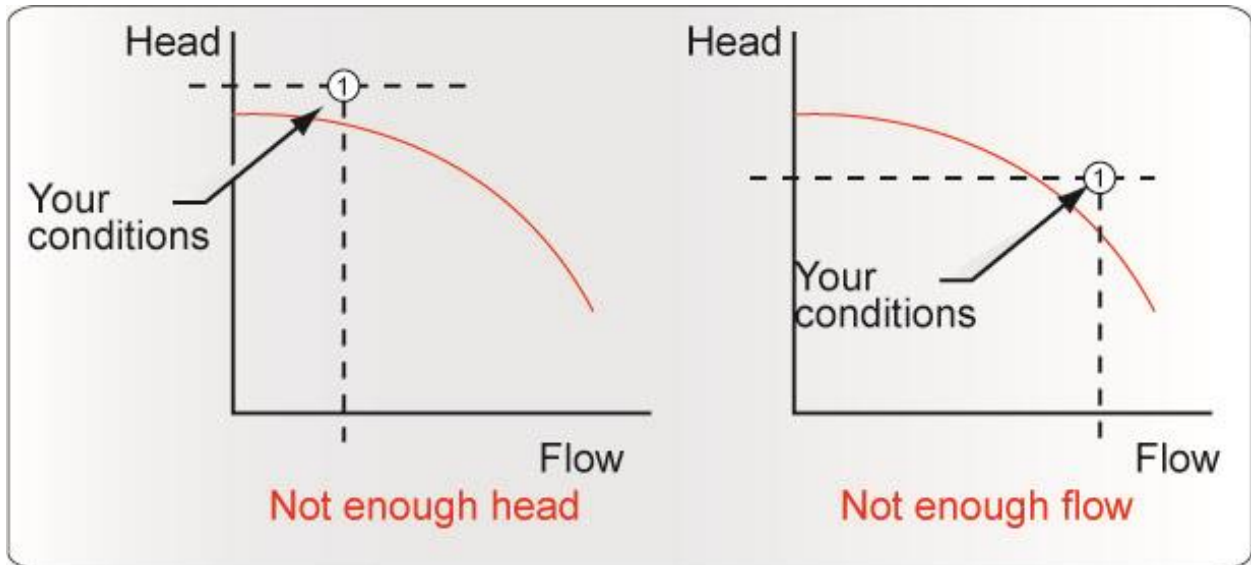
What happens if the pump curve flow corresponding to the head you require is more than what you need? You can accept the higher flow (point 2) if it is not a concern, or you can change the flow by putting a valve on the discharge line, closing it, and reducing the flow to your requirement so that you will operate at point 3 on the performance curve. The pump itself will see more head than you originally planned but you will get the correct flow through the system.



What happens if the pump curve head corresponding to your required flow rate is higher than what you need? You will have to accept more flow (point 3) or change something in the system such as: add a discharge valve and partially close it, reduce the diameter of the pipe sizes or reduce the static head so that you will operate at point 2 on the performance curve.



What happens if the pump curve head corresponding to your required flow rate is less than what you need? The pump is not suitable and you need to find a bigger pump or alternatively change something in the system such as increase the pipe size to reduce friction or lower the static head.

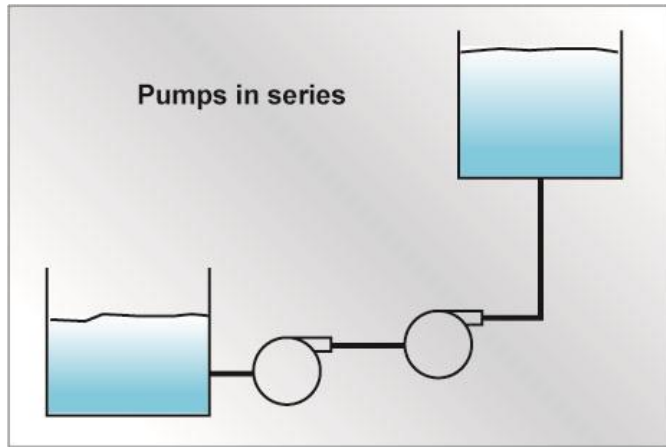


2nd case – performance curve NOT available

Many suppliers of small pump do not provide a performance curve. They will say that the pump can supply for example a head of 10 ft at a maximum flow rate of 5 gpm. Unfortunately we don't know if this is a single point on the performance curve or 2 individual points. Therefore how this pump will operate for your conditions is unknown and you may have to purchase the next bigger model to achieve your requirements.

What can you do if you can't find a small pump with enough head?

You can hook 2 pumps or more in series, the outlet of one pump into the suction of the other.



And if you need more flow, you can put pumps in parallel.

