GENERAC®
MOBILE

WHITE PAPER

Choosing the Right Pump for Your Application

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Unwanted water can throw a wrench in any project. Timelines can be delayed and money can be lost. Construction, mining and oil and gas contractors often have to contend with unwanted surface and ground water on their jobsites and rely heavily on trash pumps to remove the dirty and often debris-laden water from their sites. By removing ground and surface water, they are able to lower the water table, allowing them to begin excavation and provide a safer work environment for their employees. The use of high quality dewatering pumps is the most effective and efficient way to get the job done. When it comes to pumps, there are multitudes of different types to choose between. Pumps are designed specifically for different types of applications and to handle different environments. This paper will cover the basic aspects of selecting the best pump for your application.

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INTRODUCTION

In the market today, we see buyers gravitating towards one of two different kinds of pumps, either centrifugal or diaphragm type pumps. Centrifugal pumps are the most common and come in many forms. Depending on design, they can move water at high pressure; these are known as high-pressure pumps, or they can move water at high volume; these are referred to as dewatering pumps. On jobsites, centrifugal "trash pumps" and diaphragm pumps are often used since they can handle small solids (particulate matter), slurry and muddy water. These pumps are selected for moving water, which require solids handling capability. Trash pumps can be used in applications containing storm water run-off, sewer by-pass, water diversion and water transfer. A flooded jobsite creates its own set of problems and can quickly bring work to a halt causing untimely delays. The process of removing unwanted water is called dewatering.

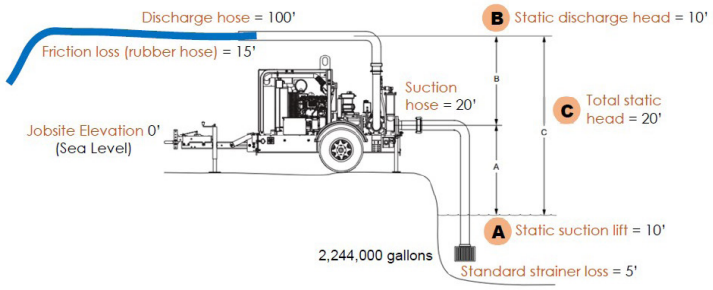
All centrifugal pumps must be primed before they can create the required pressure to pump water effectively. This is done by filling the priming chamber with water. Generac trash pumps utilize three different designed priming systems: Diaphragm Dry Prime, Venturi Dry Prime and Wet Prime. Both Diaphragm and Venturi Dry Prime systems will prime the pump automatically. Wet Prime systems need to be primed manually, meaning you fill the pump chamber with a bucket of water. Diaphragm Dry Prime systems are ideal and will auto prime in much less time than a Venturi Dry Prime system. Diaphragm Dry Prime pumps, however, will not perform as well as Venturi Prime pumps in cold weather applications less than 25 degrees Fahrenheit. If you are planning to use the pump in a colder environment, then a Venturi Dry Prime may be the best option.

HOW PUMPS WORK

A common mistake that buyers make when purchasing a pump is that they are not familiar with basic pump theory. There are certain laws of physics that come into play, which will limit the performance of pumps: atmospheric pressure at the altitude in which the pump is operating, air and water temperature, size and concentration of particulate matter (solids), and friction caused from hoses.

Atmospheric pressure at sea level is 14.7 pounds per square inch. This is where you can achieve optimal performance of the pump. In a perfect vacuum, the highest suction lift you can achieve from a pump is 33.9 feet at sea level. This is measured from the source of the water to the inlet of the pump head. Since a perfect vacuum is nearly never achieved with a centrifugal pump, practical suction lift is more realistic and often close to 25 feet at sea level. Unfortunately, many applications are well above sea level and this performance will not always be achieved.

Static discharge head and flow are two major components of pump performance. The vertical distance in which you can pump water from the discharge outlet of the pump head is referred to as



static discharge head. The rate at which you can pump water is referred to as the flow and is often expressed in gallons per minute (GPM). Basically, the higher the vertical distance you are pumping water, the lower the flow or GPM that will be achieved. This is expressed in pump performance curves that will be covered later.

Comparing static discharge head to Total Dynamic Head, dynamic calculations take into account the friction or resistance created by the hose material, hose connections and strainers. Friction is created as water flows through the suction and discharge hoses. Total Dynamic Head is an accurate way to calculate the performance of a pump and size it appropriately for each application.

CALCULATING FRICTION LOSS

There are calculators available to assist with estimated friction loss from different types of hose materials. In the example seen in **Table 1**, the friction loss of an 8 inch pump using 120 feet of rubber hose is estimated at 14.663 feet. Therefore, the Total Dynamic Head in the example is 40 feet when we add in the 15 feet of friction loss created by the rubber hose and 5 feet of friction loss created from the strainer. Now that we know the Total Dynamic Head in this example is 40 feet, we can estimate the pumps performance by referencing **Figure 2**. At 40 feet of Total Dynamic Head, the flow of the pump is approximately 3,000 GPM. We can now determine how long it will take to dewater a jobsite with this pump.

FRICTION LOSS CALCULATOR FOR STRAIGHT PIPE

Calculations are based on Hazen and Williams empirical equation which is applicable in turbulent flow regime for water at most nearly 60°F

Flow Rate	3000	User Input (gpm)
Length of Pipe	120	User Input (ft)
Nominal Pipe Diameter	8	User Input (in)
Actual Inside Diameter	8	Output (inches, lookup value)
Average Velocity	19.15	Output (ft/sec)
Type of Pipe	Rubber	User Input
C Value	140	Output
Friction Loss	14.663	Output (ft)

Table 1

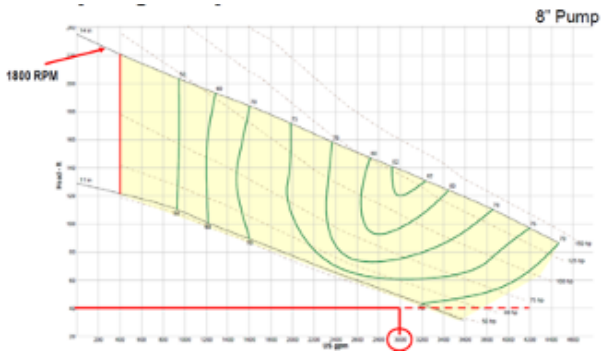
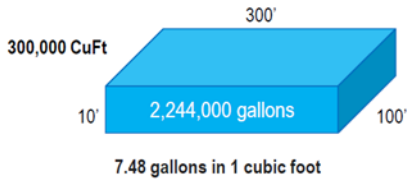


Figure 2

In this example, an 8 inch pump can dewater a jobsite with 300,000 Cu/Ft of water in approximately 12.5 hours.

$$\frac{\text{2,244,000 gallons}}{\text{3,000 GPM}} = \text{748 minutes or 12.5 hours}$$



7.48 gallons in 1 cubic foot

$$\frac{\text{Total Dynamic Head}}{2.31} = \text{PSI}$$

$$2.31 \times \text{PSI} = \text{TDH (total dynamic head)}$$

Total Dynamic Head can also be expressed in pounds per square inch (PSI). A pump must produce 1 PSI to push a column of water vertically 2.31 feet. Often pumps will have a pressure gauge attached to measure Total Dynamic Head. The calculation from PSI to feet is quite simple, just multiply the PSI value by 2.31 to convert to feet. Conversely, divide the Total Dynamic Head by 2.31 to convert to PSI. Understanding the Total Dynamic Head (THD) is the most important thing to remember when sizing a pump.

At Generac, we offer a wide selection of pump solutions to meet your needs, ranging from portable 2 inch trash and 2 inch diaphragm pumps all the way up to 8 inch trailered trash pumps. Generac Mobile trash pumps are offered in three different priming configurations: Diaphragm Dry Prime, Venturi Dry Prime and Wet Prime. All mobile trash pumps are fitted with premium Cornell Pump ends, Deutz engines and Lofa controllers. Some distinctive features and options that can be found on Generac pumps are the Cycloseal with a run-dry seal system, cutter impellers and sound attenuated enclosures. Most notably is the smart design of the pump head, which offers the lowest suction height in the industry.

Cycloseal® Design

Premium seal system clears solids and abrasive material from the seal area, while purging air and gas pockets, extending seal life and eliminating need for venting or flush water.

- Extended Seal Life
- Greater Reliability
- Maintenance Savings
- No Flush Water or Packing
- No Instrumentation
- System Savings
- Better for Abrasive Applications

Cutter Impeller

Consists of a rotating and stationary cutter, utilizing a standard impeller.

- Minimal energy consumption (4% or less) for solution
- Designed to break up clogs/ragging
- Hardened cutter material
- Adjustable clearances
- Minimal flow restrictions
- Does not change external pump dimensions
- Retrofittable

Run-Dry System – Standard on all Generac Dry-Prime Pumps

Continuous lubrication of the mechanical seal, providing exceptional seal life regardless of operating conditions – without worry of prime condition.

- Seal protection
- Seal cooling
- Easily-checked lubricant reservoir
- Peace of mind if pump runs dry

Float Switches can be a great option to add to your pump to help manage applications where there is a continuous flow of ground water or flooding. Float switches can conserve fuel and prevent wear and tear on the pump by shutting the pump off when the float reaches a predetermined level and starting the pump when the float returns to a set level. All Generac mobile trash pumps are equipped with Lofa controllers that can manage a dual float switch system.

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COMMON PUMP HOSE INTERFACES

When selecting a pump, it is important to specify which type of pump connections are needed on the suction and discharge ports of the pump end. All connections will have a male and female interface, so it is important to specify which type of connection is required.

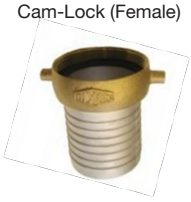
Here are some examples:


Cam-Lock (Male)


Cam-Lock (Female)


Bauer (Ball and Socket) Male


Pin Lug (Male)


Pin Lug (Female)


Bauer (Ball and Socket) Female

CONCLUSION

Now that we have a good understanding on what information is needed to select the right pump for the application, you can utilize the following worksheet as a guide to ensure you capture the right inputs.

INFORMATION NEEDED FOR PUMP SELECTION	
Jobsite elevation and/or location	
Type of liquid being pumped	
Precent of suspended solids in the liquid being pumped	
Volume of water to be moved **OR** dimension of area to be dewatered (L X W X D)	
GPM or pressure requirement	
TDH calculation, TDH = 2.31 x PSI	
Static suction fit	
Static discharge head	
Suction hose length	
Discharge hose length	
Pipe/hose size and material	
Type and number of connectors	
Strainer type	

Generac offers a full assortment of pump accessories to meet your needs such as suction and discharge hoses in various sizes and configurations, spill containment kits for special applications where fluid containment is a requirement, and sound dampening panels for additional sound attenuation.

Please visit our website at **www.generacmobileproducts.com/products/pumps** or call us at **800-926-9768** for more details on the wide range of Generac pump solutions.