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Choosing the correct chemical metering pump for your application

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Selecting the correct chemical metering pump can be a daunting task because of the variations and types of chemical pumps available. In order to pick the best metering pump for the application you will need to consider several factors. For the sake of simplicity, we will limit our discussion to pumps that deliver no more than 50 gph and pressures of less than 250 psi.

What chemical and concentration is being pumped?

This is probably the most important question, because certain materials of construction will work well with specific chemicals and this will determine the wet end of the pump. The concentration is also important because materials that would normally work well at lower concentrations may not perform well at higher concentrations.

What chemical output is required?

You want to choose a pump that runs at approximately 70%-80% of its total capacity in a normal operational situation. This is the “sweet spot” where chemical pumps will be most accurate and maintain prime. There are other applications that may require a broad range of outputs, so pumps that can be accurately turned down to provide low outputs are desired. Wide variation in flow especially in the 5%-25% range are best served by pumps that have adjustable motor speeds, because they can vary the time it takes to complete a stroke, much like slowly depressing a syringe.

What is the line or system pressure where the pump will inject?

This is a critical question, because pumps are rated at a maximum discharge pressure and when that line pressure exceeds the discharge pressure of the pump, little or no chemical will be injected. Alternately, if a chemical pump is rated at a much higher discharge pressure, it can cause an overfeed of chemical due to inertia, the check balls will not seat immediately and the chemical will continue to pass after the stroke is completed.

How will the pump be controlled?

There are three common modes of control: manual, digital pulse and analog input. Manual is simple control based on manually adjusting stroke length and frequency to obtain the desired flow rate. Digital pulse is a discrete contact or optical signal that can be read by the control module and converted to strokes per minute. Many chemical pumps have multipliers and dividers for the discrete contacts, allowing greater flexibility in the output range proportional to the pulse signal. Analog control is typically a 4-20 milliamp signal, which varies the stroke frequency in a linear fashion proportional to the output of the device, such as a flowmeter or controller. For example, a pH controller may be set to pH 7 which is equal to 4 mA and pH 9 is equal to 20 mA. The pump has 0-360 strokes per minute. A pH of 8 would be the middle of the scale equal to 12 mA and the pump would be running at 180 strokes per minute.

Where will the pump be located?

Most chemical pumps are not meant to be put in direct sunlight with elevated temperatures or direct rain. While the pump may work fine for a while, this will greatly decrease the longevity of the pump. It is always good practice to shield the pump with a protective housing or cover when out in the elements.

There are different ratings for environmental resistance, they are typically IP or NEMA rated. These ratings will help you to determine if your pump is correct for your application, for example, an IP 67 chemical pump would have significant resistance to hose-downs and flooding.

What is the viscosity of the solution being pumped?

Viscosity is the resistance to flow of a particular chemical. An example of a high viscosity fluid is honey. High viscosities have a tendency to keep the check balls suspended, which will reduce output or cease output altogether. Metering pumps have limitations on viscosity based on their design. Some designs utilize springs in the check valves to create pumps with higher viscosity capabilities. Viscosity often changes with temperature, so it is important to maintain the temperature of the solution to stay within the specifications of the chemical pump or be sure that the pump can handle the maximum viscosity at a specific temperature where it will be used.

Does the chemical off-gas?

Many oxidizers such as sodium hypochlorite, hydrogen peroxide, peracetic acid and bromine evolve gas that can be a serious issue to positive displacement pumps. Many times peristaltic pumps have been used because they do not compress the same void continuously (similar to vapor lock), however, many low price peristaltic pumps do not have the desired pressure requirements, accuracy and repeatability. New innovations by pump manufacturers have resolved most of these issues with diaphragm pumps by monitoring the flow with magnetic or ultrasonic flow meters that feedback to the control module of the pump. When the flow drops below a specified output, the pump speeds up to eject the gas through an auto-degassing valve and maintains prime.

Cost versus features

Manufacturers tout the features of their pumps as being the most innovative and necessary, but as the consumer you must determine what the application requires and how critical those features are to you. Not every application requires a magnetic flow meter and software that controls the loss of prime, but if you are feeding sodium hypochlorite to a drinking water supply at an unmanned facility, these features are critical. Repeatability and reliability are probably the most important functions of the pump. You should be able to measure the output of the pump when installed and again in 3 months and have the same value, if not than you will always be chasing your desired residual and adjusting the pump.

In conclusion, if you follow the guidelines outlined above and know the criticality of your application you should be able to source the correct pump that offers performance and reliability at a reasonable price.