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Kriebel Engineered Equipment, Ltd.

Metering your Success

Metering pumps are positive displacement machines that use a diaphragm in combination with suction and discharge check valves to pressurize and move a fluid.

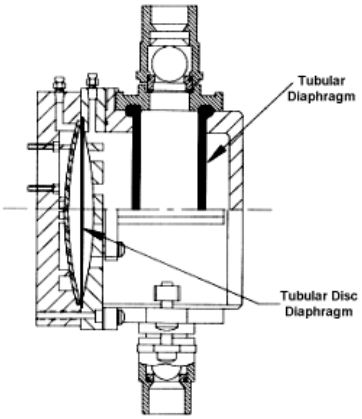
Quite simply, metering pumps are either mechanically or hydraulically actuated. In a mechanical pump, the diaphragm and the drive unit are physically connected. In a hydraulically actuated pump, the diaphragm is actuated by pressurized hydraulic oil.

Both types of pumps can be further classified by their method of volume control: either lost motion or amplitude modulation. In an amplitude-modulated machine, the actual stroke length of the diaphragm is adjusted by means of a variable cam and gear arrangement. Horsepower requirements will therefore increase and decrease with flow. A lost motion machine will utilize mechanical stops, springs or a hydraulic bypass without actually adjusting the travel of the cam; horsepower consumption remains constant.

The first metering pumps were mechanically actuated. Typically, these pumps are applied in low-pressure, high-flow applications. Accuracy of mechanically actuated metering pumps varies between 1-2% depending on manufacturer and model.

Mechanically actuated pumps can either be driven by a solenoid, a gear drive or pneumatic cylinder. Solenoid pumps are limited to the smallest power requirements, typically less than 1/10 hp.

A low cost alternative, bellows pumps are used predominately in low flow, low pressure applications.



Hydraulically actuated pumps have one of two methods of control: amplitude modulation or hydraulic bypass. Hydraulically actuated amplitude modulation pumps operate in the same fashion their mechanically actuated counterparts: by varying stoke length.

Bypass machines vary the flow of hydraulic fluid to the backside of the diaphragm to control volume or capacity. Thus, capacity control is adjusted rather than stroke length. The effect is that the power requirement is constant because pump technically does the same amount of work internally whether at 0% or 100%.

Hydraulically actuated pumps are gear driven and have an accuracy of 0.5-1.0%.

The capacity of metering pumps can be changed by modifying stroke speed, and/or stroke length.

Typically, in automated systems, the pump's stroke speed is varied to change pump control. In applications where the capacity requirement remains constant, stroke length can be varied to fine tune pump capacity. If pump capacity is expected to vary and accuracy is important, the maximum turndown ratio is 10:1 via either stroke length control or speed control. However, the two can be combined to provide infinite control of your metering pump.

Thorough definition of the pump's expected duty, including accuracy requirements, is extremely important in selecting a metering pump. Proper system design is also important, and will be addressed in a later issue.

In general, bellows pumps are used in low flow (less than 1 gpm) and low-pressure (under 50 psig) applications. Up to 3 heads can be combined in a single pump.

Solenoid pumps typically are used in flow conditions less than 10 gph and less than 200 psig. Both bellows and solenoid pumps are considered "throw-away" pumps in that it is easier and cheaper to replace the pump than repair it.

For flows up to 600 gph, one of three pumps can be selected depending upon the particular technology requirements: mechanically actuated, lost motion; hydraulically actuated, hydraulic bypass; or hydraulically actuated, amplitude modulated.

The world of metering pumps encompasses applications from drops per hour up to 100 gpm, with pressures nearing 10,000 psi. With a basic understanding of the different types of metering pumps, you're on your way to selecting the right one for your application.

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