



8525 SW St. Helens Drive • P.O. Box 1849
Wilsonville, OR 97070
(503) 682-4411 FAX (503) 682-4421

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FLOWMETER BASICS (3" to 48" Pipe Diameters)

A paddle wheel flow sensor is the basic sensor for determining how much water is moving through a pipe of virtually any size. How does that little wheel tell me how much flow is going through my pipe? Truth be told, it doesn't. However, it does provide a critical piece of information: **Water Velocity**.

The meter's paddle wheel must make contact with the moving water stream (most flow sensors require that the pipe be full) and as the water flows through the pipe, the paddle spins in proportion to the water **velocity**. Magnets embedded in the paddle wheel blades spin closely past an all-important pick-up switch buried inside the sensor body. As the magnet passes the pick-up switch, the switch closes and opens (pulses) in direct proportion to the frequency of the passing magnets, so more water means more pulses.

All of these spinning wheels and inserting sensors are not helpful to determine **velocity** unless the equipment can record exactly how many **pulses per gallon** are occurring. If the paddle has only one magnet, then a complete revolution will result in only one switch closure (pulse). As the pipe size increases, the number of **gallons per pulse** increases. A small pipe will pass only fractions of an ounce per pulse while a huge pipe employing the same flow sensor will pass many gallons per pulse.

A pulse counting flow indicator (also known as a Flow Computer, Pulse Divider or PLC) must be employed to read and accumulate the number of pulses per minute. Once they are converted to **gallons per minute** in the flow indicator, we have our flow-rate of water expressed in terms we can understand and output signals we can utilize..

With a pipe full of **non-compressible water**, the volume of water in that pipe never changes regardless of the pressure on the water. That non-compressible property of water produces this equation:

Pipe size x Velocity = Flow-rate.

The **paddle wheel meters** are very sensitive to their location in the pipe. Depth as well as location plays a critical role in their accuracy.

Insertion Magnetic Flow Sensors and Full-line Magnetic Sensors ("Mags or Mag-meters") create a magnet field where the current flow changes in direct proportion to the velocity of "ferrous particles" that pass through the field. Water doesn't seem like it would contain very many "ferrous particles" but the dissolved minerals provide that connection to the magnetic flow sensor electrode.

Magnet sensors are more costly than their paddle wheel counterparts but Mags are much less likely to give erroneous results due to a constrained installation in the pipe. If you have a tight installation space, go with a mag-meter. Some Full-line Mag-meters boast the ability to operate effectively with **virtually no straight pipe** run in front of the meter. This unique feature enables the operator to get good flow results even in a small vault or limited access area.

To conclude

The **Insertion Paddle Wheel** is the basic flow sensing device in the market today. Low cost and easy installation make it a good choice for clean water flow sensing.

The **Insertion Mag-Meter** is a compromise for higher solids applications where a paddle wheel will bind up. Still low cost and easy to install, it does require 10-20 pipe diameters of free run prior to the meter installation. Not always possible.

The **Full-Line Mag-Meter** is the ultimate answer for questionable applications. They cost more to acquire and install but the data they provide is of much greater value with the Full Line Mag-Meter.