IRRIGATION MANAGEMENT SERIES

Guidelines for Use of Propeller-type Irrigation Water Meters

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Without measuring how much water is being applied, irrigation efficiency is unknown. Water measurement is necessary to see whether your system is operating within reasonable boundaries.

Irrigation water use efficiency has become an important issue. In the western United States, about 80 percent of water use is for irrigation and the demand is increasing. Urban population growth, increased industrialization and environmental protection are adding to the demand for more water or more of a say in how water is allocated and used. Irrigation is the major use and consequently irrigation efficiency is seen as a potential source for more water.

Research has determined how much water is necessary to produce a bushel of grain or a ton of dry matter and the potential efficiency of various irrigation systems. Improvements to irrigation systems and management can improve water use efficiency and save water without loss of production. With proper selection and maintenance, water meters can be an accurate, easy method for measuring the flow.

PROPELLER-TYPE METERS

The most common irrigation water meter is the propeller-type. The system uses a multi-blade propeller that occupies most of the pipe area. Rotation speed is determined by the velocity of the flow (see illustration below).

A number of companies manufacture this type of meter in a variety of sizes and styles. All of the meters register the total flow and most modern designs register both rate and volume.

SELECTION

When buying a meter, be sure to check the installation requirements. If your particular situation does not meet all of the requirements the meter should be calibrated in place. Checking the meter by another means or with a calibrated meter is desirable. It is also important to have parts and maintenance service available. Local service is best, but convenience and speed are the elements that count.

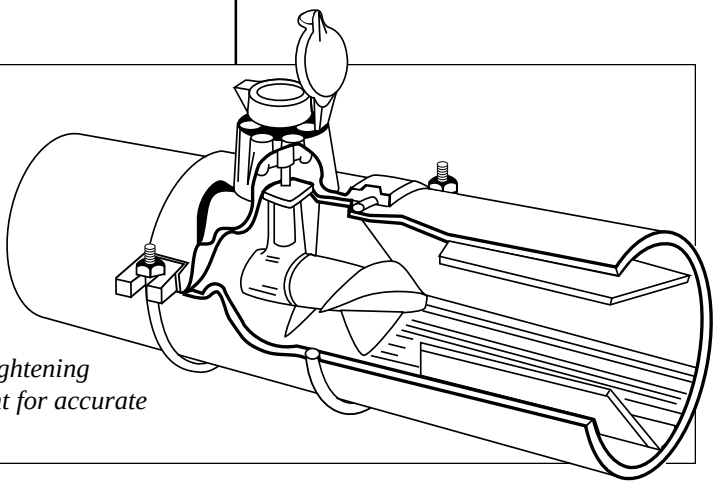
Water meters vary in size, quality and design. *Meter size* should be determined by the size of the pipe, the range of flow to be measured, and the head loss characteristics. The manufacturer should provide this information in a manner similar to the chart on the next page.

The meter must accommodate the expected range of flows, and the lowest anticipated flow should fit within the normal accuracy of the meter. It is also desirable to select a size that will not create excessive head loss.

Most meters use a magnetic drive between the propeller and the indicator head. This eliminates problems with sealing direct drive bearings which sometimes bind because of sand or corrosion.

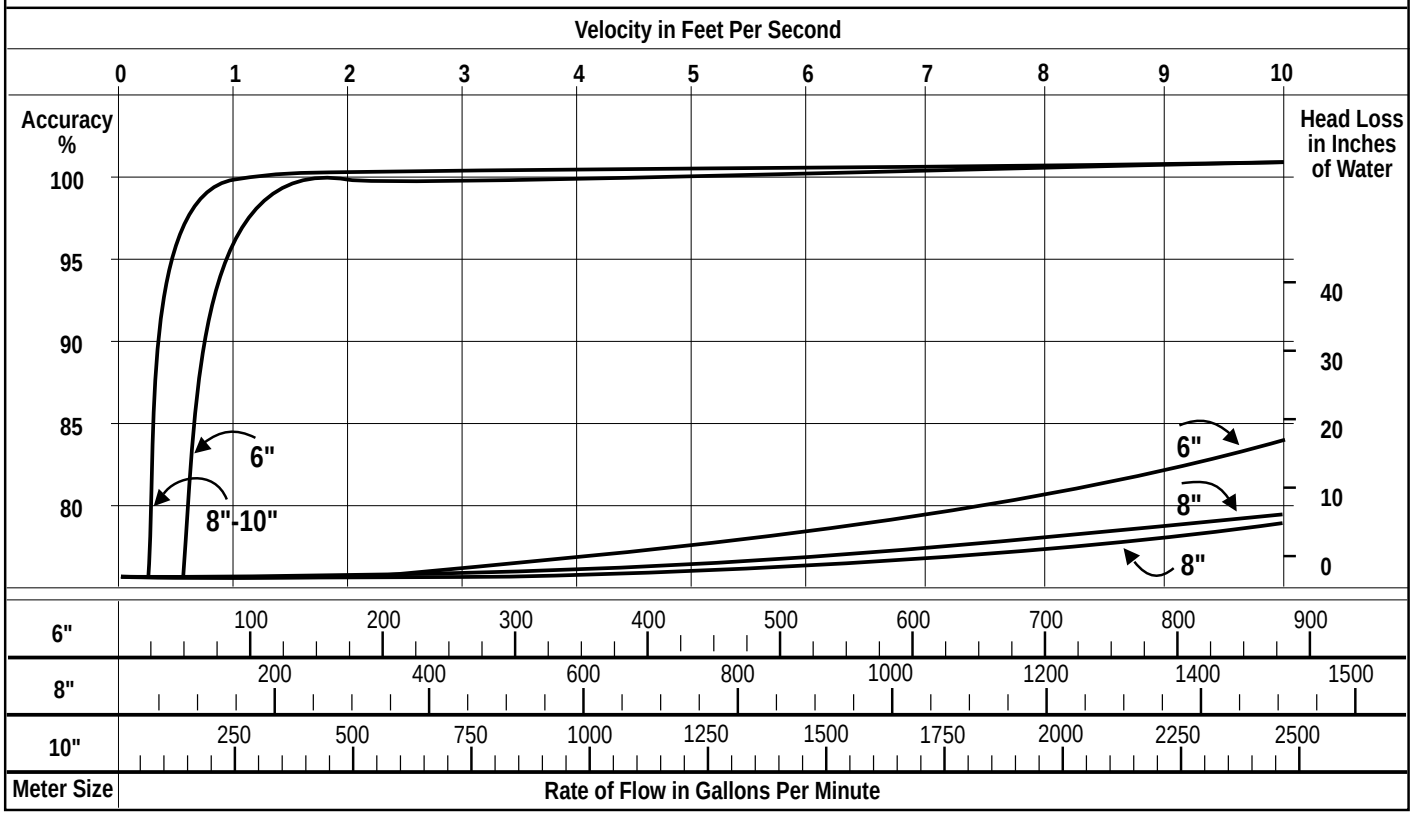
Propeller size usually ranges from 50 to 80 percent of pipe diameter. Small propellers are suitable when there is little variation in the flow, but larger propellers generally are more accurate when there are wide fluctuations in flow. The larger propeller is driven by more of the total flow.

Make sure the *meter gear ratio* is selected for the *inside* diameter of the pipe in which the meter will be installed. As an example, a meter geared for a 6-inch-diameter aluminum pipe with a 5.884-inch inside diameter will be off by 6 percent if it is installed in a 6-inch diameter seamless steel pipe with an inside diameter of 6.065 inches.



Typical irrigation propeller meter. The large diameter propeller and straightening vanes are important for accurate measurement.

ACCURACY AND HEAD LOSS CURVES



INSTALLATION

The accuracy of the meter also depends on proper installation. Different installation procedures are required for different meters. Saddle meters are normally bolted onto the pipe, but some older styles were made to be welded in place. Meters mounted, for example, in straight tubes can be installed with dresser couplers or flanges and some may be welded into the pipeline. Welding is not recommended unless there is provision for removing the meter for service without having to cut the pipeline. For accuracy the center line of the meter propeller must be positioned on the center line of the pipe.

Propeller meters may be installed in any convenient position—vertical, horizontal or at an angle, but for accurate readings, the pipe must always be flowing full. If the pipe is not full, some arrangement, such as a restriction, bend or baffle plate must be made to ensure that it will flow full.

Spiraling flow or turbulence also affects meter accuracy. To minimize this problem, the meter should be installed at a distance of at least five pipe diameters downstream from any bend or obstructions and at least one diameter upstream from such obstructions. It is better to have more distance between the meter and fittings that increase turbulence, but the meter should perform well with the minimum distances recommended. For example, an 8-inch meter will need at least 40 inches of straight pipe between the meter propeller and a fitting or pump outlet.

If the minimum straight pipe cannot be provided, straightening vanes should be installed in the pipe ahead of the meter to reduce excessive turbulence.

MAINTENANCE

Propeller meters, like any machinery, require maintenance and care. Follow the manufacturer's recommendations for maintenance including lubrication, periodic servicing and frequent checks to make sure the meter is operating properly.

It is important that the propeller spins easily. If it seems to drag, check for the causes. Something may be caught on the shaft, binding the propeller. Look for shaft wear and check bearings and gears.

Every meter should have a calibration check periodically. This may be done in place or the meter may be sent out. Corrosion and wear may increase friction between moving parts that affects the calibration.

The pipe containing the meter should be drained when not in use, especially over winter when freeze may cause damage. Meters that are removed during the off season should be drained and blocked to prevent entry of dust, dirt, insects and rodents.

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