CONTRIBUTING EDITOR

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Float valves improve pipeline systems

Water shortages and rising energy and labor costs are forcing irrigators to look for ways to increase irrigation efficiency and reduce operating costs. To accomplish this, they need maximum system flexibility and ease of operation. Many low pressure pipeline systems can be improved by using float valves to provide better and easier water control. Float valves are relatively new and since most of them are used in California where they were developed, many farmers are not familiar with them.

Pressure in supply pipelines should be as uniform as possible to distribute water evenly with minimum erosion at field discharge outlets. Overflow stands are commonly used to limit the pressure in a pipeline. On steep or rolling land, they act both as check and as drop structures. As a check structure, the stand controls the pressure in the upstream reach of pipe to maintain uniform flow from field outlets or into pipe laterals. As a drop structure, the stand limits the pressure developed by natural land slopes. Stands are not always trouble free. Air entrained when water flows over the spillway crest may cause surging in the pipeline.

A semiclosed system using float valves instead of overflow stands results in a smoother; more satisfactory operation and eliminates air entrainment problems. Float valves conserve water since surplus water is not wasted at the end of the line, with overflow stands. The valves also eliminate the need for tall overflow stands on steep slopes. Because of these advantages, float valves should be considered when installing a new system or when updating and repairing an existing system.

In contrast to overflow stands, float valves automatically control the flow and maintain near constant pressure in the pipeline immediately downstream from the stand; this provides good regulation for gated pipe or other discharge outlets. A typical installation is shown in the figure. The valve is attached to the end of the inlet pipe and releases water as needed to satisfy the demands of downstream outlets. The water level in the float valve stand rises or falls when the flow from these outlets is adjusted. The float valve responds to these changes and opens or closes to maintain a near constant water level in the stand for all flows within the design range. When the demand for water ceases, the float valve closes completely and the downstream pipeline is kept pressurized with zero flow ready to provide water to any downstream outlet on demand. Thus, float valves eliminate waste and the need to manually adjust gates or valves to obtain a given flow.

Pressure in the downstream pipe is determined by the float setting, usually adjusted so that the water surface in the stand is between one and two feet above the ground surface when the downstream outlets are wide open with full flow. The amount of float travel from valve-closed to valve-open position varies from about 6 inches for a 4-inch valve to 32 inches for a 24-inch valve. The larger the valve, the greater the float travel. Large, flat floats can be used to minimize the amount of water level change and, thus, the freeboard needed. If the freeboard is limited or the amount of float travel required for a large valve cannot be obtained, two or more smaller valves can be used in parallel. As the pressure in the upstream pipe increases, the water level travel on the float must also increase to provide the lift necessary to close the valve.

Valves ranging in size from 4 to 36 inches can be purchased in two types (Gardiner D. Harris, Route 1, Box 628, Woodlake, CA 93286 or Bryant W. Harris, Box 576, Fallbrook, CA 92028*).

A single disk, non-balanced type is generally used for heads of less than 15 feet. The total force required to close the valve is obtained from a float acting through a scissors-type linkage. A double-disk, balanced type valve is flanged and uses the pressure in the pipeline to assist in closing the valve. It can be used with higher pressures than the non-balanced design, however, it is recommended that the larger sizes still be limited to the 15-foot head range.

The distribution system must be designed so that the minimum elevation difference between stands is not less than the head loss through the valve plus the pipeline friction loss between stands at full flow. Valve head losses for different size valves and flow rates are shown in the table. The maximum stand spacing is about 660 feet and is

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Table 1. Flow in cubic feet per second (cfs) through fully open float valves at various heads.

Valve Size (Inch)	Head (Feet)				
	2	5	10	15	20
Single disk, non-balanced type					
4	0.64	1.07	1.52	1.76	2.4
5	0.94	1.48	2.1	2.75	3.3
8	2.55	4.04	5.71	7.05	8.4
12	5.7	7.9	11.2	13.7	15.8
16	9.5	15.0	21.2	26.0	30.1
20	14.8	23.4	33.1	40.5	47.0
24	21.3	33.8	47.6	58.5	67.6
Double disk, balanced type					
12	8.5	13.5	19.1	23.2	26.9
16	14.5	23.0	32.5	39.7	46.0
20	24.2	38.4	54.4	66.5	77.0
24	36.2	57.3	81.0	99.1	114.0

Float valves
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such that the elevation difference does not exceed 5 to 10 feet. The valves are designed to prevent 'hunting' or oscillation even when placed in series.

Where variable on-demand water deliveries to the farm can be made, float valves may be used to automatically control water flow into a pipeline. In most cases, however, on-demand deliveries from canals are not possible. Opportunities exist on many farms to increase system flexibility by providing regulatory storage reservoirs or ponds near the farm turnout (see "The Continuing Fight With Sediment" in the Nov-Dec issue of Irrigation Age).

Small continuous or intermittent flows can be accumulated in the storage reservoir and regulated flow from the storage pond into the farm irrigation pipeline controlled by a float valve. This provides the flexibility in stream size and duration that are needed for efficient automated or manual systems. Float valves can also be used to control the flow from a high pressure pipeline into a low pressure pipeline so that hydrants, alfalfa valves, gated pipe and other low pressure distribution outlets can be used. Float valves have also been used for flow control between reservoirs, automatic control of water over a weed screen at the inlet to sprinkler systems and for rapid filling of livestock watering troughs. ▼

**Company names are included for the benefit of the reader and do not imply endorsement.*

Four men honored

Four men received "Headgate Awards" for service to irrigation at the January meeting of the Four-States Irrigation Council in Denver.

This year's recipients were J. Ben Nix, Eaton, Colo.; Lyle S. Russell, Stockton, Kan.; Cyril P. Shaughnessy, St. Paul, Neb., and Ralph Wells, Huntley, Wyo.

The organization is made up of representatives of irrigation districts, associated governmental organizations and commercial firms from Colorado, Wyoming, Kansas and Nebraska. Rod Cox, Holdrege, Neb., is the council's new president.