Orenco Automatic Distributing Valve Assemblies

Orenco Systems®
Incorporated
1-800-348-9843

For Wastewater Effluent Systems

Introduction

Orenco's automatic distributing valve assemblies, pressurized with small high-head effluent pumps, are useful for distributing effluent to multiple zones. These zones can be segments of sand filter manifolds, drainfields, or other effluent distribution systems. Distributing valve assemblies can substantially simplify the design and installation of a distribution system and reduce installation costs. This is particularly true where a distributing valve assembly is used instead of multiple pumps and/or electrically operated valves. Additionally, a reduction in long term operation and maintenance costs is realized due to a reduced size and/or number of pumps. More even distribution can be achieved on sloping sites by zoning laterals at equal elevations. This eliminates drainback to lower lines and the unequal distribution of effluent that occurs at the beginning of a cycle.

Valve Operation

The valve itself has only a few moving parts, requires no electricity, and alternates automatically each cycle. Refer to Figure 1 for the following valve operation description. The flow of the incoming effluent forces the rubber flap disk ❶ to seat against the valve bottom ❷. The opening ❸ in the rubber flap disk aligns with an opening in the valve bottom to allow flow to only one valve outlet. The stem ❹ houses a stainless steel spring which pushes the rubber flap disk away from the valve bottom after the flow of effluent stops. The stem acts as a cam follower and rotates the rubber flap disk as the stem is raised and lowered through the cam ❺. The force from the flow of effluent pushes the stem down through the cam and the stainless steel spring pushes the stem back up through the cam when the flow of effluent stops. Each linear motion of the stem allows the rubber flap disk to rotate half the distance necessary to reach the next outlet. When there is no flow, the rubber flap disk is in the "up" position and is not seated against the valve bottom.

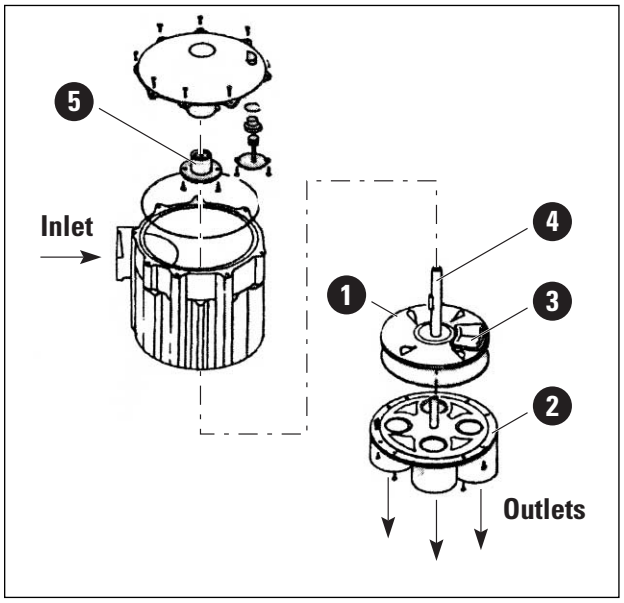

Figure 1:
6000 Series Valve

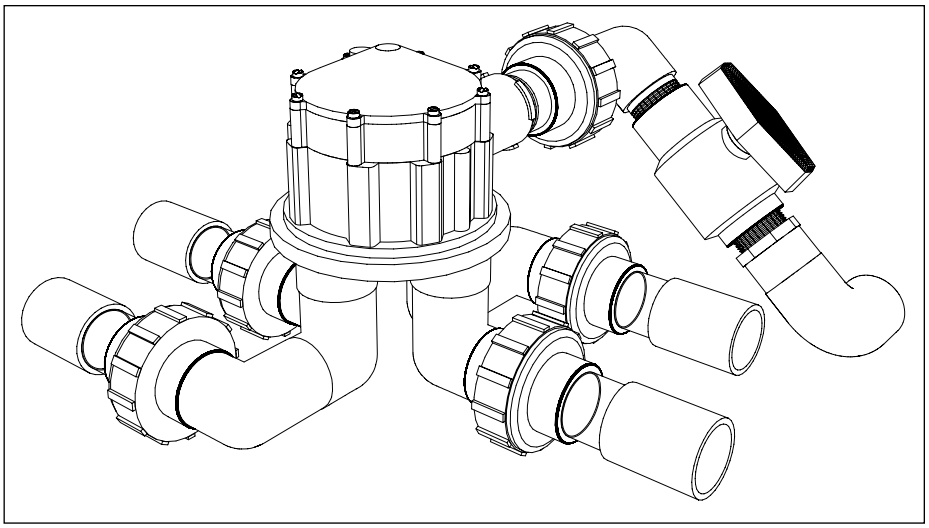

Figure 2:
Orenco Distributing Valve Assembly (6000 Series Valve)

The Distributing Valve Assembly

The Orenco Automatic Distributing Valve Assembly combines the distributing valve itself and several other components to give a complete preassembled unit that is easy to install, monitor, and maintain. Figure 2 shows a complete assembly. Because distributing valves with several outlets can be difficult to line up and glue together in the field, the discharge lines in the assemblies are glued in place at Orenco. The unions (1) allow removal and maintenance of the valve. The clear PVC pipe sections (2) give a visual check of which discharge line is being pressurized. The inlet ball valve (3) allows a quick, simple method to test for proper valve cycling. The ball valve also stops the flow of effluent in case the pump is activated unexpectedly during maintenance or inspection. Check valves may be necessary on the discharge lines. Use of check valves is discussed in the valve positioning section.

Valve Assembly Hydraulics

Liquid flowing through the valve assembly must pass through fairly small openings and make several changes in direction. Because of this, headlosses through the valve assembly are fairly high. Table 1 gives the headloss equations for several different assemblies and Figure 3 shows the graphical representations of these equations. Orenco recommends that high-head turbine pumps be used to pressurize the valve assemblies to ensure enough head is available for proper system operation. High-head turbine pumps are also recommended because the use of a distributing valve usually requires more frequent pump cycling. The high-head turbine pumps are designed for high cycling systems and will outlast conventional effluent pumps by a factor of 10 or more in a high cycling mode. Furthermore, the high-head turbine pump intake is 12 inches or more above the bottom of the pump and tends to prevent any settled solids from being pumped into the distribution valve and obstructing its operation. A minimum flow rate through the distributing valve is required to ensure proper seating of the rubber flap disk. Minimum flow rates for the various models are given in Table 1.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series	Equation	Operating Range (gpm)
V4400A	$H_L = 0.085 \times Q^{1.45}$	10 - 40
V4600A	$H_L = 0.085 \times Q^{1.58}$	10 - 25
V6400A	$H_L = 0.0045 \times Q^2 + 3.5 \times (1 - e^{-0.06Q})$	15 - 70
V6600A	$H_L = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.1Q})$	15 - 70

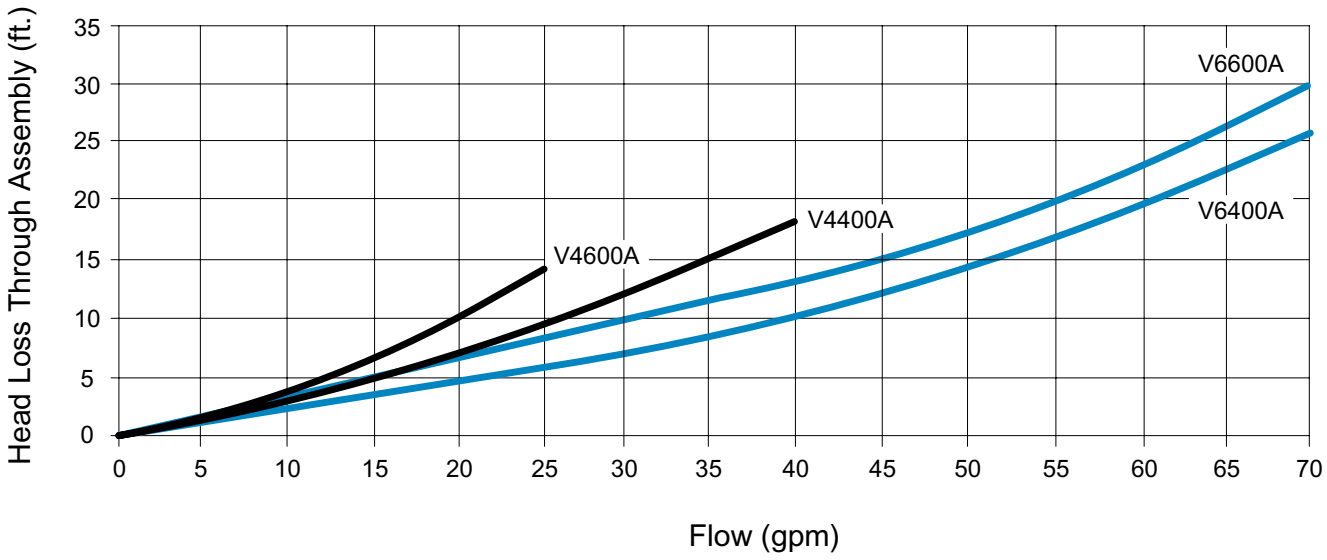

Figure 3:
Automatic distributing valve assembly headloss curves

The Pumping System

Although the distributing valve was designed for the irrigation industry, it has started to gain fairly wide acceptance in the effluent pumping industry. However, because of the mechanical movements of the valve, it is necessary to take steps to prevent solids from reaching the distributing valve that may impede the operation of the valve. Orenco Biotube® Pump Vaults — when properly sized and installed — provide the necessary protection to prevent valve malfunction. The Biotube® pump vault accepts effluent only from the clear zone between a tank's scum and sludge layers and then filters this effluent through a very large surface area screen cartridge. Without this protection in effluent systems, the valve has very little chance of reliable long-term operation.

Valve Positioning

The physical position of the valve in relation to the pump and the discharge point is very important for proper valve operation. The most reliable operation occurs when the valve is placed at the high point in the system and as close to the pump as possible. The transport line between the pump and valve should be kept full if possible. If the line is empty at the beginning of each cycle, pockets of air during filling can cause random rotation of the valve. The valve is particularly vulnerable to this erratic rotation with empty lines that are long and not laid at a constant grade. An ideal valve location is shown in Figure 4.

If the final discharge point is more than about 2 feet above the valve and the system does not drain back into the dosing tank, check valves should be installed on the lines immediately following the valve and a pressure release hole or line should be installed just prior to the valve. This pressure release hole or line can go into a return line to the dosing tank or to a "minidrainfield" near the valve. In order for the valve to rotate reliably, no more than about 2 feet of head should remain against the valve to allow the rubber flap disk to return to its up position. In many cases, it may take from one minute to several minutes for the pressure in the valve to be lowered enough for proper rotation to occur. Special care should be taken when installing systems controlled by programmable timers to ensure cycling does not occur too rapidly. Figure 5 illustrates a valve assembly using check valves. Pumping downhill to the valve should be avoided unless the transport line is very short and the elevation between the discharge line out of the tank and the valve is less than about 2 feet. If the valve is located many feet below the dosing tank, random cycling may occur while the transport line drains through the valve at the end of the cycle. A pressure sustaining valve located just before the distributing valve may overcome this problem in some instances.

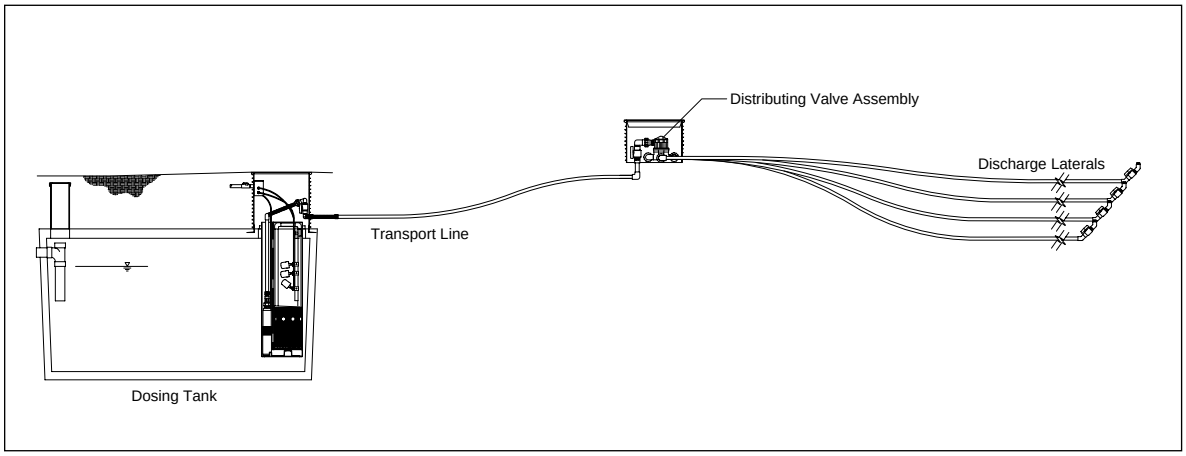

Figure 4:
Ideal valve location

System Startup

Refer to the Hydrotek Valve booklet that is provided with the distributing valve assembly for the sequencing of the valve outlets. The transport line should always be flushed with clean water before installing the valve. Any sand, gravel, or other foreign objects that may have been in the pipe during installation can easily become lodged in the distributing valve, causing malfunction.

With the pump running, alternately close and open the ball valve on the distributing valve assembly to check proper rotation of the valve. (Note: If check valves are used on the lines after the distributing valve, the pump may need to be turned on and off to allow the pressure to be released from the valve.) If visual operation of which zone is operating is not possible, watch the clear pipe on each line for indication of which zone is operating.

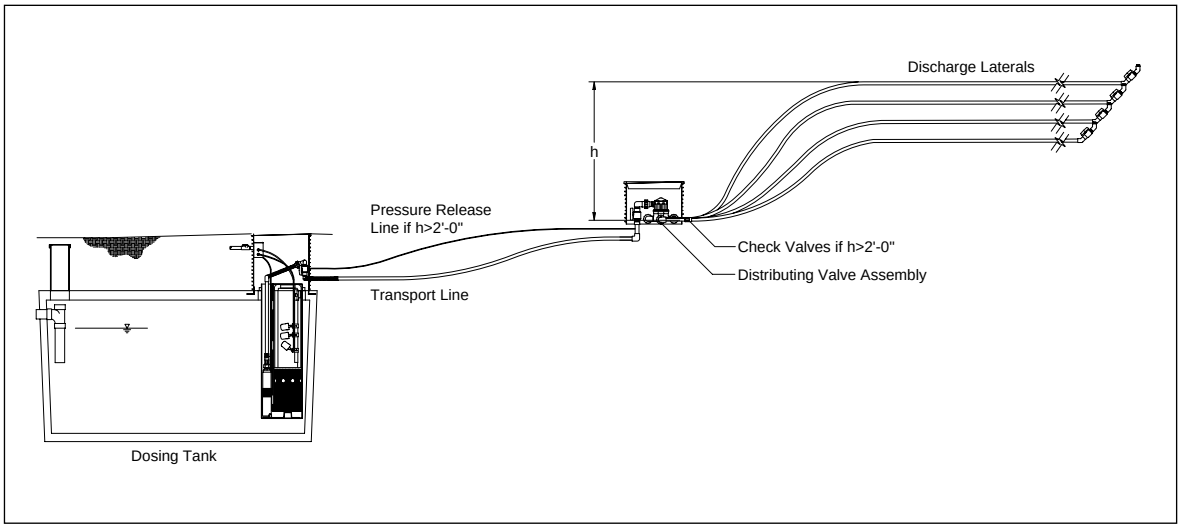

Figure 5:
Valve assembly below final discharge point

Maintenance

Annually check for proper operation by following procedures listed in the Hydrotek Valve booklet and system startup procedures listed above.

Troubleshooting

1. PROBLEM: Valve does not change or cycle to next zone or outlet

CAUSE: The stem and disk assembly is not rotating when water flow is turned off and then back on.

SOLUTION 1: Ensure that there is no debris inside the cam. Clean and carefully reinstall the cam.
SOLUTION 2: If fewer than the maximum number of outlets are being used, check the installation of the cam. Ensure that the stem and disk assembly is not being held down by an improperly installed cam. Refer to the cam replacement instructions.

SOLUTION 3: Remove the valve top and check for proper movement of stem and disk assembly. Check for and remove any debris or foreign objects that may jam or retard the movement of the disk.

SOLUTION 4: Check for freedom of movement of stem and disk assembly up and down over the center pin in bottom of valve. Scale deposits may build up on the pin and hold stem and disk assembly down. Clean pin and again check for freedom of movement.

SOLUTION 5: Be sure that all operating outlets are not capped and that the flow to operating zones is not restricted in any manner. This would cause pressure to build up in the valve and lock the stem and disk assembly in the down position.

SOLUTION 6: The backflow of water from uphill lines may be preventing the valve from cycling properly. This can happen when the valve is placed too far below an elevated line. If the valve cannot be placed close to the high point of the system, a check valve should be installed near the valve in the outlet line that runs uphill from the valve and a drain line installed just prior to the valve to relieve the pressure.

2. PROBLEM: Water comes out of all the valve outlets

CAUSE: Stem and disk assembly not seating properly on valve outlet.

SOLUTION 1: Check for sufficient water flow. A minimum flow rate is required to properly seat the disk as shown in Table 1.

SOLUTION 2: Remove the valve top and check the inside walls to ensure that nothing is interfering with the up and down movement of the stem and disk assembly inside the valve.

SOLUTION 3: Make sure that the operating outlets are not capped and that the flow to the operating zones are not restricted in any manner.

3. PROBLEM: Valve skips outlets or zones

CAUSE: Pumping into an empty transport line — especially downhill — may cause the valve to skip outlets from pockets of air allowing the rubber flap disk to raise during a cycle.

SOLUTION 1: Keep the transport line full.

SOLUTION 2: If the line must remain empty between cycles, use a larger diameter transport line laid at a constant grade to prevent air pockets from forming.

CAUSE: The stem and disk assembly is being advanced past the desired outlet.

SOLUTION 1: Ensure that the correct cam for the desired number of zones is installed and that the outlet lines are installed to the correct outlet ports of the valve as indicated by the zone numbers on the top of the cam.

Distributing Valves

Submittal
Data Sheet

Orenco Systems®
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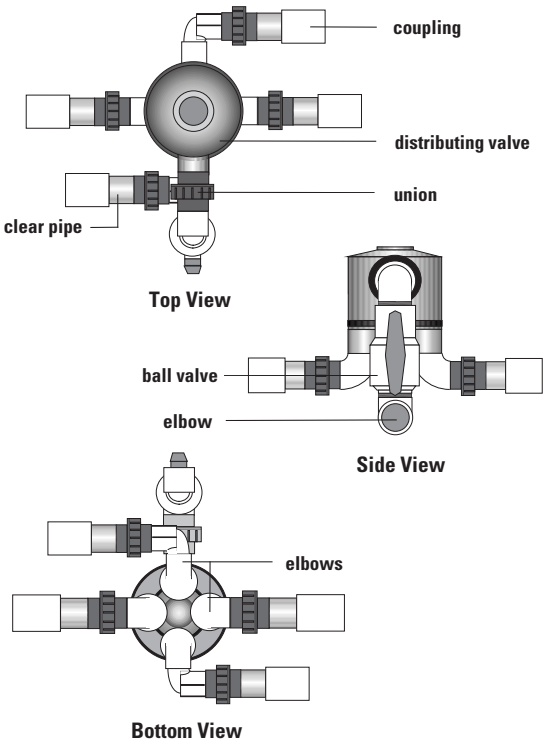
1-800-348-9843

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



General

Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. Automatic Distributing Valve Assemblies allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm can use a six-line Valve Assembly to reduce the pump flow rate requirement to only 50 gpm.

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube® Pump Vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve and a section of clear pipe and union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Nomenclature

V □□ □□ A

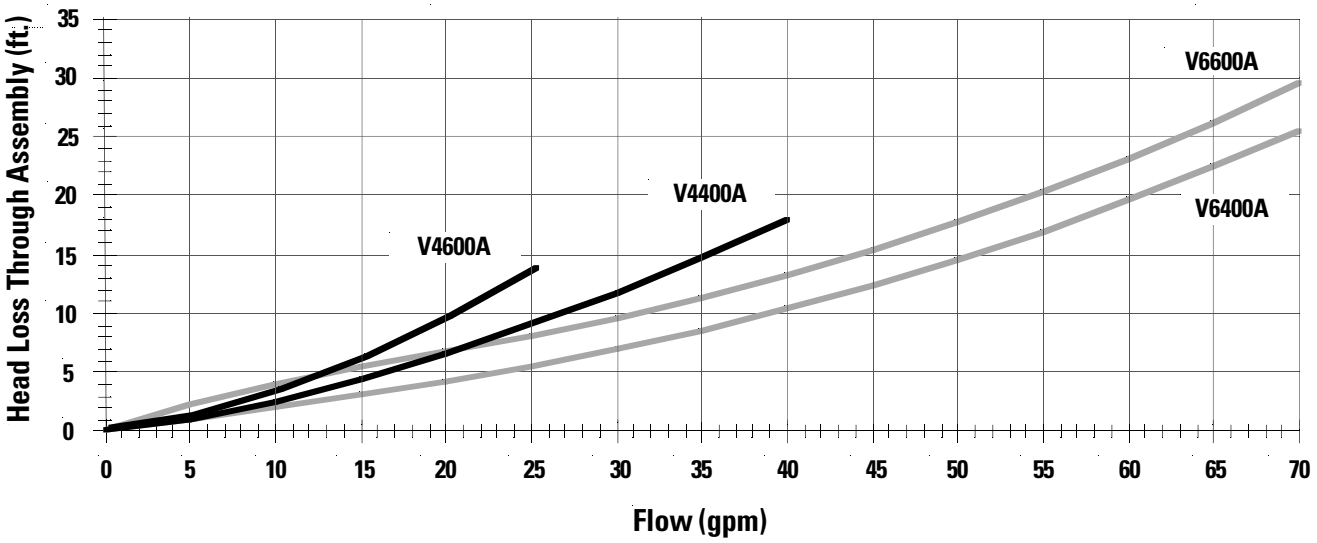
- A — Indicates assembly
- □□ — Number of active outlets
- □□ — Model series:
  - 44 = 4400 series (2-4 outlets)
  - 46 = 4600 series (5-6 outlets)
  - 64 = 6400 series (2-4 outlets)
  - 66 = 6600 series (5-6 outlets)
- V — Distributing valve

Specifications

Materials of Construction

All Fittings:	Sch. 40 PVC per ASTM specification
Unions:	Sch. 80 PVC per ASTM specification
Ball Valve:	Sch. 40 PVC per ASTM specification
Clear Pipe:	Sch. 40 PVC per ASTM specification
V4XXX Distributing Valves:	High-strength noncorrosive ABS polymer and stainless steel
V6XXX Distributing Valves:	High-strength noncorrosive ABS polymer, stainless steel, and die cast metal

Distributing Valves (continued)



Model	Inlet Size (in.)	Outlets Size (in.)	Flow range (gpm)	Max Head (ft.)	Min. Enclosure
V4402A	1.25	1.25	10 - 40	170	VB1217
V4403A	1.25	1.25	10 - 40	170	VB1217
V4404A	1.25	1.25	10 - 40	170	VB1217
V4605A	1.25	1.25	10 - 25	170	RR2418
V4606A	1.25	1.25	10 - 25	170	RR2418
V6402A	1.5	1.5	15 - 100	345	RR2418
V6403A	1.5	1.5	15 - 100	345	RR2418
V6404A	1.5	1.5	15 - 100	345	RR2418
V6605A	1.5	1.5	15 - 100	345	RR2418
V6606A	1.5	1.5	15 - 100	345	RR2418