putting valve coatings to the test

Evaluating combination air valve coatings at a WWTP

By Rachel Staats & John Ballun

Located within a half mile of two water and wastewater treatment facilities, Val-Matic Valve & Mfg. Corp. is fortunate to have working environments available for valve testing. In June 2006, company engineers had the opportunity to compare multiple valve interior coatings at the Salt Creek Sanitary District Water and Waste Treatment Plant (SCSD WWTP) in Villa Park, Ill. The plant agreed to a trial installation of four 2-in. 802A combination air valves, each with different coatings. The objective of Val-Matic's engineering department was to determine which coating provided the most protection against harmful buildup and deposits in a wastewater application.

Figure 1. Open Valve Outlet

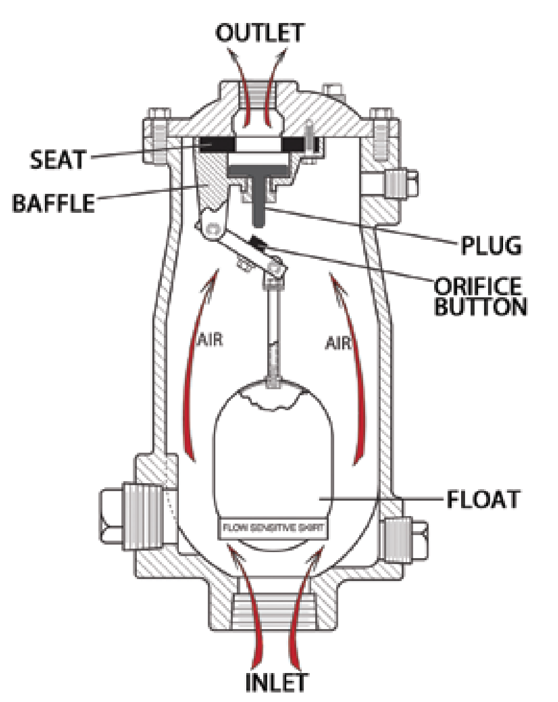
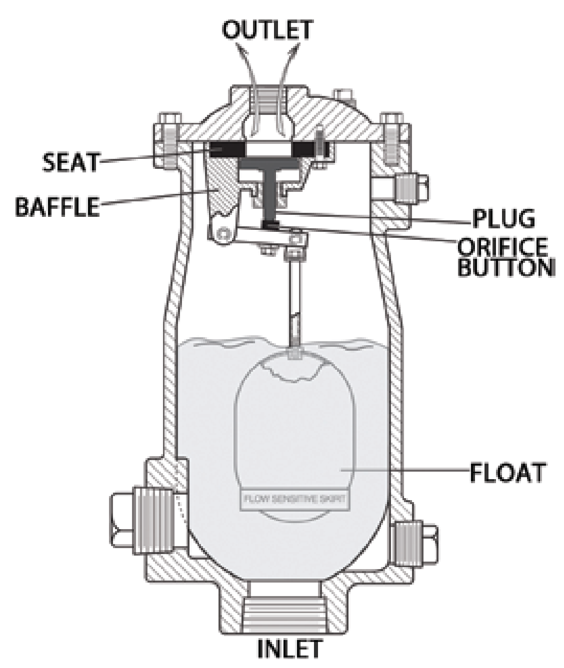


Figure 2. Closed Valve Outlet



The combination air valves used in the evaluation were cast iron construction with 316 stainless steel trim. In general, the valve's outlet is open and designed to exhaust air during pipeline filling (see Figure 1). It will automatically close when fluid enters the valve, causing the stainless steel float to rise, thus lifting the stainless steel plug against the Buna-N seat (see Figure 2).

The valve is used to release air during system startup and accumulated air during system operation, as well as allowing air to re-enter the line upon system shutdown or failure. The combination air valve also provides protection from pipeline vacuums by allowing the valve to open as negative pressure develops, admitting air back into the line. This feature reduces the potential for surges created by column separation. The design of the valve body is elongated to prevent sewage from interfering with the upper mechanism, and the bottom of the body is sloped toward the inlet to reduce the buildup of debris.

The SCSD WWTP serves 22,500 residents along with commercial and industrial users. It has a design average flow of 3.3 million gal per day (mgd) and an 8-mgd maximum flow. The four combination air valves were installed in a valve vault opposite a submersible pump wet well, downstream from the pumps and upstream from the check valves. The pumps run every few minutes in lead-lag fashion, except during rainy periods, when all four pumps may run continuously. Each valve is installed on a raw sewage main, and the mains run parallel in the vault. The valves are subjected to harsh raw sewage pumped directly from the plant's mechanical screens.

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Val-Matic's engineering department compared three different coatings and used the noncoated valve as the control. The interior coatings evaluated were fusion-bonded epoxy (FBE), Teflon and a two-part epoxy. For each coating, the underside of the cover, baffle, body interior and float were coated prior to assembly. Each valve was then factory tested in accordance with AWWA C512 prior to installation at the SCSD WWTP.

Test Results

One month after installation, the valves were inspected and tested in place to confirm that all four were functioning properly. The valve internals were inspected. After the first month of service, none of the valves showed a buildup of sludge and there was no damage or wear to any parts. The valves were checked periodically for performance during the next three years. In July 2009, after three years of installation, the valves were removed from the system and inspected. Plant personnel reported that the valves saw equal usage over the three-year period. Backwashing and maintenance were not necessary over the duration of the installation, and there were no problems with valve operation.

During the inspection, all valve exteriors still displayed the factory epoxy or blue primer coating and did not exhibit excessive corrosion. Then, each valve cover and float mechanism was lifted from its valve and documented. There was no damage or wear to any of the valve mechanisms. All four of the valves were operational, and there was no clogging in the valve mechanism or the valve inlet. A summary of the observations is given in Table 1 and illustrated in Figures 3 to 6.

After three years of continuous usage, the 2-in. 802A combination air valves were effective in exhausting and admitting air in the 10-in. pump discharge lines and assisted in quiet check valve operation.

George Smith, maintenance supervisor at the SCSD WWTP, said: "The air valves were essential in preventing slam in our check valves, and they operated for three years in raw sewage without the need for backwashing or maintenance."

Regardless of the type of internal coating, all of the valves performed satisfactorily in wastewater service. The valves with the coated interiors were more resistant to buildup of sludge or debris than the standard valve. Of the coatings evaluated, the FBE provided the greatest overall level of protection (see Table 1 and Figure 4). The uncoated 316 stainless steel float had the greatest resistance to buildup of sludge or debris. Satisfied by their performance and low maintenance, the four air valves will remain installed indefinitely.

Figure 3. Valve With No Coating

Figure 4. Valve With FBE Coating

Figure 5. Valve With Teflon Coating

Figure 6. Valve With Epoxy Coating

Designed to Peform

The nonclog design and nonstick FBE coating of the air valves are the perfect solution for severe applications such as that of the SCSD WWTP. As a result of their valve design, the four 802A combination air valves with various interior coatings have not required backwashing in nearly four years of service. The extended valve body prevents solid material from reaching the operating mechanism, and the bottom is sloped toward the outlet to prevent clogging. The smooth interior coating options are able to withstand harsh wastewater applications, thus reducing the frequency of maintenance. WWD

Table 1. Sludge Buildup on Salt Creek Air Valve Interiors

FIGURE NO.	TYPE OF COATING	BODY	COVER	FLOAT	VALVE
		Average Volume (cu in.)	Average Volume (cu in.)	Average Volume (cu in.)	TOTAL VOLUME (cu in.)
Figure 4	None	61.37	6.84	1.01	69.2
Figure 5	FBE	9.69	0.76	3.03	13.5
Figure 6	Teflon	19.38	1.9	6.06	27.3
Figure 7	Epoxy	48.45	1.14	18.18	67.8

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