

Particle Shedding From HPV Valves

Furon® HPV valves are designed for use with ultrapure media in semiconductor manufacturing, chemical processing, and biomedical industries. HPV valves do not add a significant number of particles to process chemicals. They have been tested by an independent lab to verify their low particle shedding.

Particle Shedding Tests

A series of tests was conducted to measure particle shedding from HPV valves during initial use and during valve cycling. A PMS HSLIS M50 particle monitor was used to measure the concentration of particles shed into ultrapure water (UPW). The particles measured ranged in size from $\geq 0.050 \mu\text{m}$ to $\geq 0.20 \mu\text{m}$. All tests were run in a Class 100 cleanroom on valves precleaned with a proprietary cleaning process¹.

Test Methods

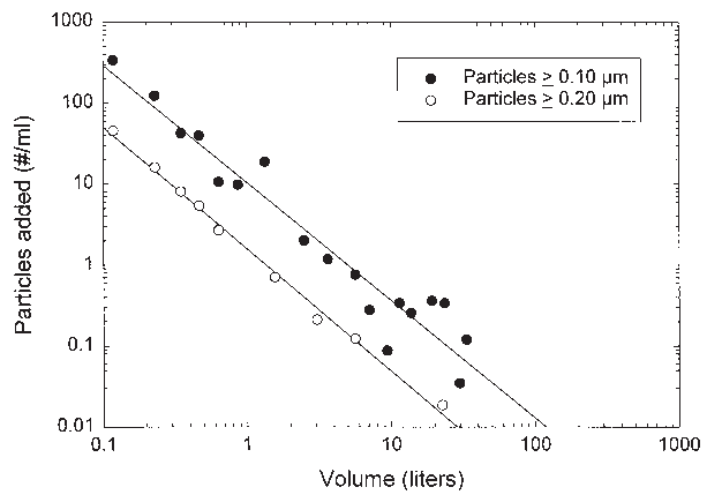
Four HPV valves (HPV2-144NC) were flushed with UPW at a flow rate of 0.12 L/min with the valve actuated in the open position. Particle shedding was measured until particle concentrations fell to background levels².

To measure particle shedding during valve cycling, a programmable controller cycled each valve once per minute. Particle concentrations downstream of the valves were monitored for 14 hours or until background particle concentrations were achieved.

Results

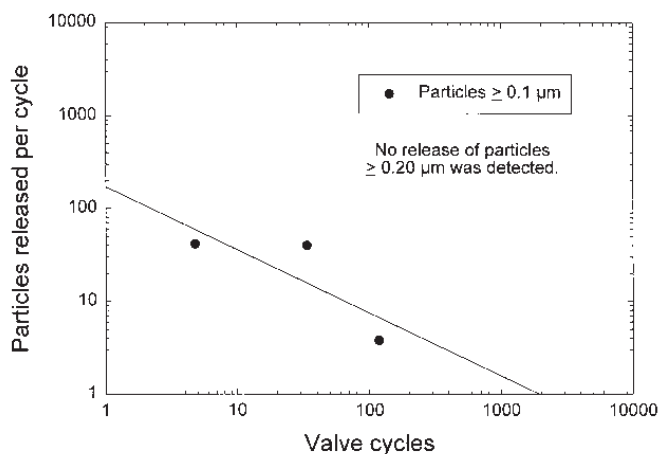
Because the valve-to-valve repeatability in the steady-flow tests was high, the data were combined. Cleanup curves for particles $\geq 0.1 \mu\text{m}$ and $\geq 0.2 \mu\text{m}$ are shown in Figure 1. Results are expressed as particles added as a function of the volume of UPW passed through each valve. Log-log regression curves have been fit to the data. The concentration of particles $\geq 0.10 \mu\text{m}$ decreased to less than 0.1 particle/ml added after being flushed with only 25 liters of UPW. For particles $\geq 0.2 \mu\text{m}$, flushing with less than 7 liters of UPW reduced the particle addition to less than 0.1/ml.

Figure 1: Particle cleanliness under steady-flow conditions



The results of the cycling tests are shown in Figure 2. The number of particles released at each valve actuation decreased with valve use. Within 10 cycles, less than 100 particles $\geq 0.1 \mu\text{m}$ were released at each cycle. No particles $\geq 0.2 \mu\text{m}$ were detected during the valve cycling test.

Figure 2: Particle cleanliness of cycled valves



Summary

Furon® HPV valves have been tested for particle shedding by an independent test lab. The concentration of particles $\geq 0.10 \mu\text{m}$ decreased to less than 0.1 particle/ml added after being flushed with only 25 liters of UPW. Less than 7 liters of UPW were required for the concentration of particles $\geq 0.20 \mu\text{m}$ to reach the same level. Within 10 cycles, less than 100 particles $\geq 0.1 \mu\text{m}$ were released at each actuation cycle. No release of particles $\geq 0.20 \mu\text{m}$ was detected during valve cycling.

References

1. Valves were cleaned with a patent-pending, proprietary process by CT Associates, Inc., Bloomington, MN.
2. Grant, DC, W Kelly, G Van Schooneveld, D Carrieri, D Smith, A Rodemeyer and D Henderson, "The Effect of Fluid Dynamics on Particle Shedding from Semiconductor Fluid-Handling Components," presented at the Fine Particle Society Meeting, Dallas, TX, 1998.

The data provided here were obtained under defined test conditions. The tests were designed to mimic use or worst case conditions. However, Saint-Gobain Performance Plastics Company makes no specific claims about the performance of the valves in other chemicals or systems.



PERFORMANCE PLASTICS

Saint-Gobain Performance Plastics
7301 Oranewood Ave.
Garden Grove, CA 92841-1411
USA Toll Free: (800) 543-8823
www.plastics.saint-gobain.com
www.furon-asti.com

France

Tel: 33/(0) 1 55 68 59 59

Fax: 33/(0) 1 55 68 59 68

Japan

Tel: 81/(0) 2 6679 6400

Fax: 81/(0) 2 6670 1001