

## EPA Pre-Rinse Spray Valves Research Study Scope

### Purpose of research on pre-rinse spray valves:

The Energy Policy Act of 2005 (EPAAct 2005) restricts pre-rinse spray valve sales in the United States to those with flow rates of 1.6 gallons per minute (gpm) or lower, as tested by the American Society for Testing and Materials (ASTM) F2324-03 standard test method for pre-rinse spray valves. ASTM F2324-03 also includes a test protocol designed to assess a pre-rinse spray valve's ability to remove food waste from plates that is measured in "cleanability," or in the time in seconds per plate cleaned. EPAAct 2005 does not specify a necessary performance level based on the cleanability portion of the test protocol.

In recent years, manufacturers have begun to meet demands for more efficient products and have introduced ultra-high-efficiency pre-rinse spray valve models to the market with rated flow rates of 1.0 gpm or less. These spray valves have demonstrated ASTM-tested cleanability times equal to or better than standard models. However, minimal research has been done, particularly with these ultra-high-efficiency spray valves, to evaluate actual field usage times, water and energy savings, and customer satisfaction.

The U.S. Environmental Protection Agency (EPA) would like to determine if high-efficiency and ultra-high-efficiency pre-rinse spray valves perform as well as or better than their conventional counterparts (those with flow rates at or around the EPAAct 2005 requirement of 1.6 gpm) in the field, as performance is critical for EPA to ensure the long-term water and energy savings associated with these products. Particularly, EPA is interested in determining whether users spend more time removing food waste from dishes using high-efficiency and/or ultra-high-efficiency pre-rinse spray valves than conventional valves, and, if so, whether the usage time increases to the point that it negates water and energy savings and impacts user satisfaction.

### Questions to be answered through independent, third-party research:

To assist in the development of a performance specification for pre-rinse spray valves, EPA seeks data that answers the following questions:

1. How do water usage and time usage vary among pre-rinse spray valves currently on the market?
2. Do usage times in the field correlate to cleanability times achieved using the ASTM F2324-03 test method?
3. How do flow rate, actual field usage time, and ASTM-tested cleanability time correlate to user satisfaction?

EPA is seeking independent data to answer the above questions. Below is an outline of the ideal research study scope.

## Scope:

### Goal:

- For at least three weeks each, install at least one model of applicable (see next bullet) pre-rinse spray valves from each flow rate category listed below in a minimum of 10 facilities, for a total of three spray valves per facility. The pre-rinse spray valves for each facility should be made by different manufacturers whenever possible.
  - Category 1: pre-rinse spray valves with a rated flow rate  $\geq 1.25$  to 1.6 gpm
  - Category 2: pre-rinse spray valves with a rated flow rate  $\geq 1.0$  to  $<1.25$  gpm
  - Category 3: pre-rinse spray valves with a rated flow rate  $< 1.0$  gpm
- Applicable pre-rinse spray valves must have posted ASTM F2324-03 test results from the Food Service Technology Center. A list of applicable pre-rinse spray valve models can be found at [www.fishnick.com/equipment/sprayvalves](http://www.fishnick.com/equipment/sprayvalves).

### Facilities:

- Target facilities that have an existing pre-rinse spray valve with a rated flow rate of  $\leq 1.6$  gpm.<sup>1</sup>
- Target facilities that use commercial pre-rinse spray valves for use with commercial dishwashing and ware washing equipment.<sup>2</sup>
- Target facilities that have a commercial dishwasher.<sup>3</sup>
- Target facilities that serve on china dishware, not plasticware.<sup>4</sup>
- Track facilities contacted to keep record of the number of facilities that did not qualify because they did not meet any of the above-mentioned criteria. Track facilities that decline to participate and document the reasoning.

### Equipment Needed for Study:

- Graduated pail/container (one per person collecting data)
- Stop watch or watch with a second hand (one per person collecting data)
- Pressure gauge and adaptor (one set per person collecting data)
- Usage counters/flow totalizers or inline meter (one per facility for single water supply line; two per facility for separate hot and cold water supply lines)
- Pre-rinse spray valves (enough to have one new pre-rinse spray valve installed at each facility during each installation period; pre-rinse spray valves should not be interchanged among facilities as scaling or use may impact test results in later installation periods)
- Wrench (one per person collecting data)

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<sup>1</sup> When recruiting participants for this field study, note that participating facilities should have EPA 2005-compliant pre-rinse spray valves already installed in the facility. EPA is not interested in studying flow rate, usage time, and user satisfaction comparisons with pre-rinse spray valves that can no longer be sold in the U.S. For accurate comparison of models currently available on the market, EPA would like to limit facility selection to only those facilities already using pre-rinse spray valves flowing at 1.6 gpm or lower.

<sup>2</sup> EPA is interested in looking at pre-rinse spray valves that meet the EPA 2005 definition for commercial pre-rinse spray valves. These valves typically use hot water only and reduced flow rate should result in energy savings.

<sup>3</sup> Pre-rinse spray valves are intended to be used for pre-cleaning dishes prior to entering a commercial dishwasher, not for cleaning or sanitizing dishes. Targeted facilities should have a commercial dishwasher in place.

<sup>4</sup> Targeting facilities that use china will make data more comparable to the ASTM test method, which uses china dishes.

- Teflon tape (one roll per person collecting data)
- Thermometer (one per person collecting data)
- Tape measure (one per person collecting data)
- Digital camera (one per person collecting data)

**Photo Documentation:**

- Take digital photographs and/or video clips during the installation periods to document field conditions, pre-rinse spray valve use, and dish cleaning operations, where such documentation will assist in data analysis.

**Baseline Measurements at Participating Facilities:**

- Identify the make and model of the existing pre-rinse spray valve that receives the most use and/or that is used for the purposes of pre-cleaning the dishes prior to the commercial dishwasher. Use this pre-rinse unit for the purpose of the study.
- The original valve should be monitored during the pre-installation period for at least three weeks, and the following measurements should be taken:
  - Using a stop watch or a watch with a second hand and graduated pail, measure and record the baseline flow rate of the existing pre-rinse spray valve at the beginning of the pre-installation period.
  - Using a pressure gauge, measure and record the static and flowing water pressure at least once during the pre-installation period. Water pressure should be measured in-line prior to the spray hose (at the inlet to the spray hose) and after the spray hose but before the pre-rinse spray valve.
  - Using the usage counter/flow totalizer or inline meter, measure and record the total gallons used and/or the total time spent using the existing pre-rinse spray valve during the pre-installation period.
  - Using a thermometer, measure and record the hot- and cold-water temperature from a separate faucet (not using the pre-rinse spray valve) at the facility as many times as is feasible during the pre-installation period. If multiple temperature measurements are taken, average the temperatures to calculate the representative water temperature for the pre-installation period.
  - Using a thermometer, measure and record the outlet water temperature (with the mixing valves adjusted as per normal operation) from the existing pre-rinse spray valve as many times as is feasible during the pre-installation period. If multiple temperature measurements are taken, average the temperatures to calculate the representative water temperature for the pre-installation period.
- Provide a description and photo documentation of the entire pre-rinse unit, including measurements of the inside hose diameter and hose length, description of hot water and cold water supply lines (combined, separate, etc.), and descriptions of any other important parameters.
- Document and photograph the make, model, and type of dishwasher(s) present in the facility (e.g., under counter, stationary single tank door, single tank conveyor, multiple tank conveyor, high or low temperature unit).
- At the end of the pre-installation period, spray valve operators should be interviewed briefly to assess user satisfaction, answering at least the following questions:
  - Are you satisfied with the current pre-rinse spray valve?
  - What do you like about the valve?
  - What do you dislike about the valve?

- What type of food/residue is particularly hard to clean from plates?
- What type of dishes do you wash daily (e.g. mostly plates, pots and pans, utensils)?
- Do you typically clean dishes separately or in a rack? If different for different dishes, please explain.
- How completely do you pre-rinse the dishes? Is your dishwasher effective in removing waste missed by the spray valve?
- Ask operator to demonstrate dish cleaning method. Observe the spray pattern, distance spray valve is held from plate, angle at which spray valve is held, and hand motion while cleaning the dish. Collect photo or video documentation, if possible.
- Note whether the spray valve has an “always on” clamp. If so, ask the spray valve operator how frequently they use the clamp.
- Facility managers should provide the following business information for the pre-installation testing period:
  - Typical hours of facility operation
  - General type of food the facility serves for each mealtime
  - Number of customers served and/or volume of dishes washed (per day, per week)
  - Any information about atypical business (i.e., special events)
  - If their water is heated by electricity, natural gas, or other means
  - If their pre-rinse spray valves use hot water, cold water, or both
  - If there is a mixing valve on their faucet that feeds their pre-rinse spray valve
  - How long the spray valves usually last and/or how frequently they are replaced

**New Installation for Each Participating Facility:**

- The three pre-rinse spray valves (one from each flow rate category) should be installed for at least three weeks each (hereafter referred to as the installation period). The test should be a blind test—the user should not know the flow rate of the valve being installed. The order of installation should be done at random (i.e., flow rate should not ramp up or ramp down during the study; pre-rinse spray valve selection per week should be randomly generated). See example schedule matrix below.

Flow Rate Category	Pre-Rinse Spray Valve
≥ 1.25 to 1.6 gpm	Model A
≥ 1.0 to <1.25 gpm	Model B
< 1.0 gpm	Model C
<b>Installation Schedule Matrix</b>	
Week	Valve Installed
1 – 3	Existing Valve
4 – 6	Model B
7 – 9	Model C
10 – 12	Model A

- All new pre-rinse spray valves should be installed on the existing pre-rinse units at each facility (the only variable will be the spray valve, not the entire spray unit; spray units may vary by location), and the following measurements should be taken:
  - Using a stop watch or a watch with a second hand and graduated pail, measure and record the flow rate of each pre-rinse spray valve at the beginning of each installation period.

- Using a pressure gauge, measure and record the static and flowing water pressure at least once during each installation period. Water pressure should be measured in-line prior to the spray hose (at the inlet to the spray hose) and after the spray hose but before the pre-rinse spray valve.
- Using the usage counter/flow totalizer or inline water meter, measure and record the total gallons used and/or the total time spent using each pre-rinse spray valve during each installation period.
- Using a thermometer, measure and record the hot- and cold-water temperatures from a separate faucet (not using the pre-rinse spray valve) at the facility as many times as is feasible during each installation period. If multiple temperature measurements are taken, average the temperatures to calculate the representative water temperature for that installation period.
- Using a thermometer, measure and record the outlet water temperature (with the mixing valves adjusted as per normal operation) from each pre-rinse spray valve as many times as is feasible during each installation period. If multiple temperature measurements are taken, average the temperatures to calculate the representative water temperature for that installation period.
- At the end of each installation period, spray valve operators should be interviewed briefly to assess user satisfaction, answering at least the following questions:
  - Were you satisfied with the pre-rinse spray valve?
  - What did you like about the valve?
  - What did you dislike about the valve?
  - What type of food/residue was particularly hard to clean from plates using this pre-rinse spray valve?
  - Did you have to adjust the water temperature at all while using the valve? If so, did you adjust it to make the water hotter or colder? Why?
  - What type of dishes do you wash daily (e.g. mostly plates, pots and pans, utensils)?
  - Do you typically clean dishes separately or in a rack? If different for different dishes, please explain.
  - How completely do you pre-rinse the dishes? Is your dishwasher effective in removing waste missed by the spray valve?
  - Ask operator to demonstrate dish cleaning method. Observe the spray pattern, distance spray valve is held from plate, angle at which spray valve is held, and hand motion while cleaning the dish. Collect photo or video documentation, if possible.
  - Note whether the spray valve has an “always on” clamp. If so, ask the spray valve operator how frequently they used the clamp.
- Facility managers should provide the following business information for each installation period:
  - Number of customers served and/or volume of dishes washed (per day, per week)
  - Any information about atypical business (i.e., special events)
  - Any changes in the type of food served
- At the end the study, request the most recent water quality report from the facility's water utility.

## Data to provide to EPA:

- Background information regarding the facility and installation conditions at each site, including:
  - Inside hose diameter and hose length;
  - Hot water and cold water spigot descriptions (combined, separate, etc.);
  - Dishwasher make, model, and type, including a photograph;
  - Hot and cold water temperature (averages, if applicable) (from a separate faucet);
  - Pre-rinse spray valve outlet temperature (average, if applicable);
  - One photograph of the pre-rinse spray unit set up from each facility;
  - Existing pre-rinse spray valve make and model; and
  - Existing pre-rinse spray valve measured flow rate, static and flowing water pressure, and total baseline water and/or time usage recorded during the pre-installation period.
- Make, model, and measured flow rate of each pre-rinse spray valve being tested and static and flowing water pressure, outlet water temperature (average, if applicable), and total water and/or time usage recorded for each tested pre-rinse spray valve during each installation period.
- Hot and cold water temperature (averages, if applicable) (from a separate faucet) collected during each installation period.
- A description of the random pre-rinse spray valve installation order for each facility (schedule matrix would suffice).
- Responses to the survey of spray valve operators (one for the existing spray valve and one for each tested model) and responses to the survey questions from each facility manager (for baseline and each separate installation period).
- Additional photographs or videos, if applicable.
- The most recent water quality report from the facility's water utility.