

# Fact Sheet

## Wilbur Kitchen Dishwasher Water and Energy Monitoring Project



**Food Service  
Technology Center**  
Promoting Energy Efficiency in Food Service



Stanford University

### Project Overview

Stanford University partnered with the PG&E Food Service and Technology Center (FSTC) on a research project to better understand the water and energy use of commercial dishwashers. FSTC is conducting a larger research project which includes studying eight conveyor dishwashers in the San Francisco Bay Area. At the Stanford site, the study compares water and energy use of an old dishwasher (installed in 2001) to a new efficient machine. FSTC installed equipment to monitor hot water and electricity consumption for the old machine (photo 1) prior to its replacement and on the new machine after it was installed in December 2014. The construction of the new Stanford Energy System Innovations (SESI) plant led to changes to the campus steam distribution system, which required the conversion from steam equipment to hot water equipment. The old dishwasher was not compatible with the new hot water system and needed to be replaced; an efficient model was chosen for the replacement.



Photo 1 - Old Dishwasher

### Wilbur Kitchen Metrics

Kitchen Size:	22,000 sq. ft.
Number of Seats Served by the Dish room:	650
Average Meals Served Per Day:	1,300
Meals Served per Mealtime per Day:	Breakfast ~ 230 Lunch ~ 525 Dinner ~ 545
Dishwasher Operation:	7 Days a week, from 7:30am- 7pm

### Metering Equipment Facts

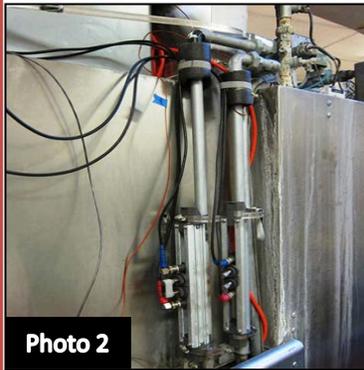


Photo 2

Ultrasonic metering equipment (Photo 2) and thermocouples were placed on incoming water lines inside the dishwasher to collect data on water consumption and temperature.



Photo 3

Data from the ultrasonic water meters, current transformers, and thermocouples was wirelessly transmitted to a database for analysis by FSTC staff. The old dishwasher was monitored for three weeks before its removal.

### Water and Temperature Plot

The old and new conveyor dishwashers being studied in this project have three internal compartments for prewashing, washing, and rinsing wares. The graph in Figure 1 shows temperature and water use readings from the inlet hot and cold water lines and dishwasher electricity use.

Based on the timing, intervals, and placement of the sensors, FSTC was able to identify the water use for tank fills, tank top offs, or for final rinse, and determine if the machine was working effectively.

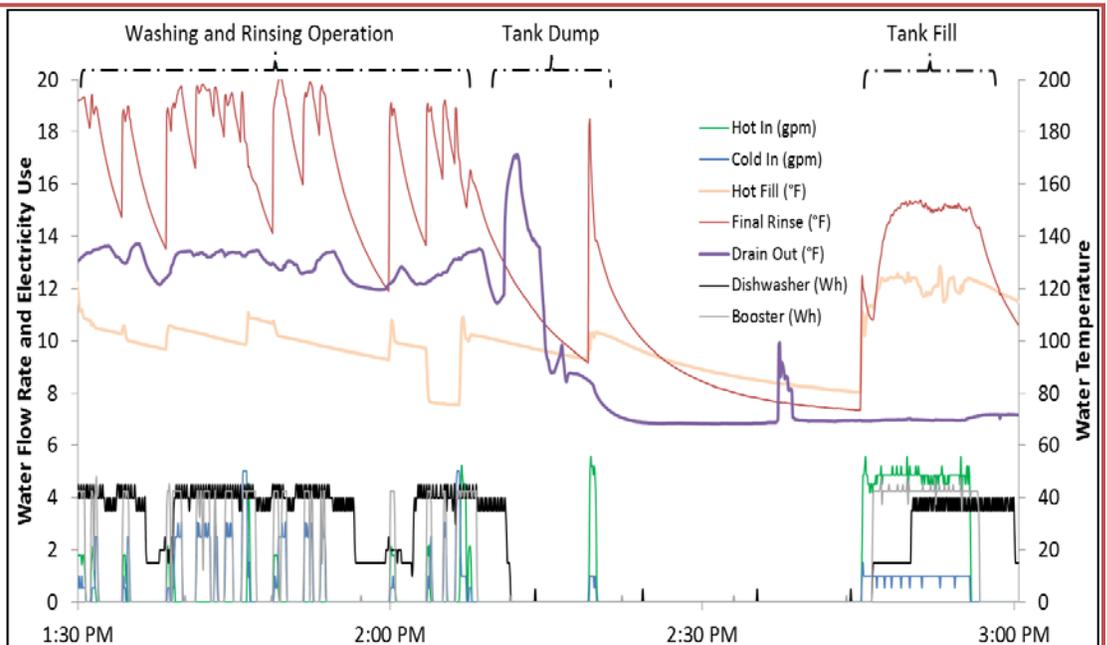


Figure 1- Data from water use and temperature

## The new Hobart dishwasher installed in December 2014

The original dishwasher at Wilbur Dining was replaced with a more efficient machine (left) on December 23, 2014. The new machine uses hot water instead of steam and is equipped with a heat recovery unit to maximize efficiency. The new machine is smaller and more appropriately sized for the kitchen as the previous machine was oversized. After the first month of analysis, the new machine showed a reduction of 54% in water use and 64% in energy use.



Photo 4

### Features of the new Dishwasher



Photo 5

The heat recovery unit on the new dishwasher minimizes heat loss by capturing steam created during the rinsing process and condensing it to preheat the incoming cold water, which is then used in the final rinse. This process reduces the amount of water needed for rinsing as well as the energy needed to heat the water. The machine also includes an automatic shut off that stops the machine from running and wasting water if the conveyor gets stuck due to the 90 degree turn on the exiting side of the conveyor belt.

### Observing and Monitoring Kitchen Practices



Photo 6

To obtain a complete understanding of water use and dishwashing practices in the dish room, FSTC installed water meters on three hoses located in the kitchen which are used for cleaning floors, pre-rinsing the dishes, and cleaning the dishwasher. By monitoring the hose use, FTSC was able to recommend improvements and suggest best management practices (BMPs). Even with new hardware, BMPs are essential to improve efficiency.

A close up of the metering equipment on the hoses (Photo 6).

### Metering Equipment



Photo 7

FSTC's clamp-on ultrasonic meters were used to measure the flow rate of the water without cutting any pipes. This equipment was used because the dishwasher is not individually metered. This technology allowed FSTC to isolate water use from the dishwasher. FSTC was able to determine if the dishwasher was working in an efficient manner by analyzing flow patterns, temperature fluctuations, and cycle times.



Photo 8

A yellow hose with the metering equipment installed.



Photo 9

Amin Delagah from FSTC (left) and Marty Laporte from Stanford Utilities (right) after the installation of the new machine.

The combination of installing an efficient dishwasher, along with replacing other equipment (i.e. kitchen hoses) and collaborating with kitchen staff to employ BMPs, will result in Wilbur Dining Hall using a fraction of the water they previously consumed.