WaterSense at Work

Commercial Kitchen Equipment

4.6 Wok Stoves

Best Management Practices for Commercial and Institutional Facilities

EPA WaterSense

February 2025

WaterSense® is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the nation's water supply by transforming the market for water-efficient products, services, and practices.

WaterSense at Work is a compilation of water efficiency best management practices intended to help commercial and institutional facility owners and managers from multiple sectors understand and better manage their water use. It provides guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

An overview of the sections in *WaterSense at Work* is below. This document, covering water efficiency for wok stoves, is part of **Section 4: Commercial Kitchen Equipment**. The complete library of best management practices is available at www.epa.gov/watersense/best-management-practices. WaterSense has also developed worksheets to assist with water management planning and case studies that highlight successful water efficiency efforts of building owners and facility managers throughout the country, available at www.epa.gov/watersense/commercial-buildings.

EPA 832-F-23-003
Office of Water
U.S. Environmental Protection Agency
February 2025

This document is one section from *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* (EPA-832-F-23-003). Other sections can be downloaded from www.epa.gov/watersense/best-management-practices. Sections will be reviewed and periodically updated to reflect new information. The work was supported under contract 68HERC20D0026 with Eastern Research Group, Inc. (ERG).

Overview

Water-cooled wok stoves

A wok stove is a Chinese pit-style stove that has at least one wok recessed into the stove top, allowing heat to be fully directed onto the bottom of the wok. Wok ranges often have multiple high-output burners for fast, high-temperature cooking and can use water for cooling, cleaning, and cooking.

In a conventional water-cooled wok stove (illustrated in Figure 1 on the next page), the burner chimney and ring are affixed to the top of the stove, trapping heat under the cooktop. To absorb the heat and keep the cooktop cool, water jets continuously spray cooling water across the cooktop at a rate of approximately 660 to 925 gallons (2,500 to 3,500 liters) per day per burner,[1] or about 1 gallon per minute (gpm) (3.8 liters per minute [lpm]) per burner, assuming a 12-hour workday. Cooling water prevents the stainless steel deck surface from overheating and warping and reduces the risk of cooking oil fires.[2,3]

Wok stoves can be outfitted with a rinsing spout used to rinse and clean the cook top and wok between uses. In many cases, the rinsing spout might be left running continuously, even when not in use. Some wok stoves also have a separate tap that fills a small reservoir used for cooking. As with rinsing spouts, the reservoir tap might be left running continuously, even when the reservoir is full.

As illustrated in Figure 2 on page 3, air-cooled wok stoves (also referred to as waterless woks) function without the use of cooling water by creating an air gap between the burner chimney and ring and the top of the stove, allowing heat to be released directly from beneath the cooktop and vented to the kitchen exhaust. Waterless wok stoves address water used for cleaning and cooking with other efficiency measures. For example, they

---

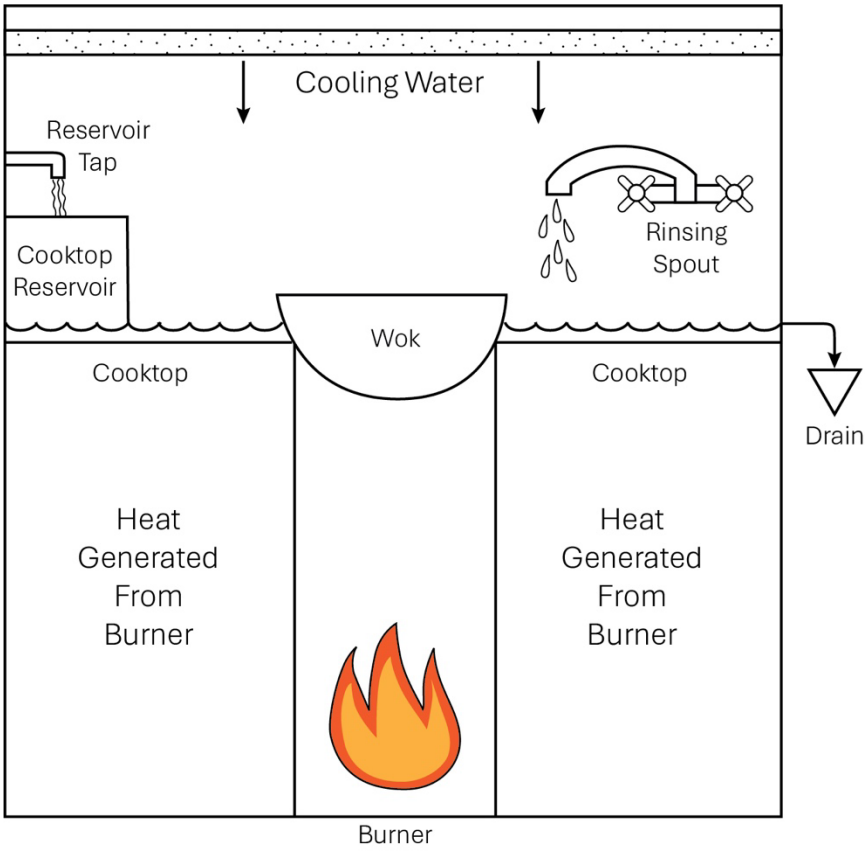
[1] Turner, A., White, S., Chong, J., Dickinson, M.A., Cooley, H. and Donnelly, K. February 2016. *Managing Drought: Learning from Australia*. Prepared by the Alliance for Water Efficiency; the Institute for Sustainable Futures, University of Technology Sydney; and the Pacific Institute for the Metropolitan Water District of Southern California, the San Francisco Public Utilities Commission, and the Water Research Foundation. Page 48. https://pacinst.org/wp-content/uploads/2016/02/Managing-Drought-Report-2016-02-23-FINAL-US-Letter.pdf.

[2] Sydney Water. 2005. *The waterless wok stove*. https://p2infohouse.org/ref/50/49033.pdf.

[3] Southern California Gas Company. 2021/2022. *Natural Gas Foodservice Equipment Cleaning & Maintaining User's Guide*. https://caenergywise.com/design-guides/SCG_FSEC_CleaningGuide_FE-v2-published.pdf.

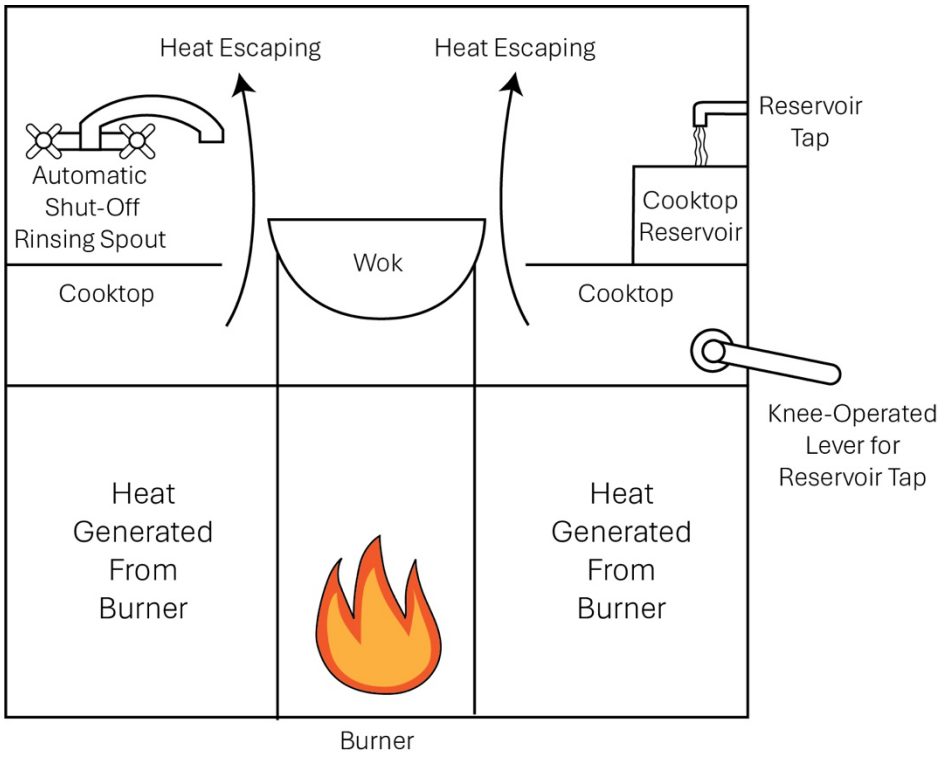
may include a rinsing spout that shuts off the water supply when it is swiveled parallel to the backsplash (i.e., when it is not needed for wok cleaning); a button-operated water-wash for on-demand cooktop cleaning; and/or a knee-operated joy-stick on a timer tap to limit the flow rate and duration of the flow from the reservoir tap.[4,5,6] Waterless wok stoves use about two percent more energy than conventional water-cooled wok stoves but can reduce water use by up to 90 percent and could reduce required maintenance.[7,8]

Figure 1. Example of a Water-Cooled Wok Stove



[4] *Ibid.*
[5] Town Food Service Equipment. Custom EcoDeck Series Commercial Wok Range (Waterless). https://townfood.com/product/waterless-wok-range/.
[6] Sydney Water, *op. cit.*
[7] Gauley, Bill and John Koeller. 2010. "2010's Top-5 New and Innovative Water Efficient Products." Presented at the International Emerging Technology Symposium. https://forms.iapmo.org/newsletter/green/2010/05/2010_Top5.asp.
[8] Turner, A., et. al., *op. cit.* Page 15.

Figure 2. Example of an Air-Cooled Wok Stove



Operation, Maintenance, and User Education

For optimum wok stove efficiency, consider the following:

- Encourage cooking staff to turn off rinse spouts and reservoir taps when not in use. One study found that filling a basin to be used for cooking and cleaning rather than leaving taps running reduced water use by 75 percent.[9]
- Inspect and ensure the shutoff valves for the rinse spouts and reservoir taps are in working order.
- Ensure the cooling water is shut off when the wok stove is not in use, especially at the end of each day.
- Routinely check water lines for leaks and corrosion.

Retrofit Options

When retrofitting an existing conventional wok stove, check whether rinse spouts can be replaced with spouts that automatically shut off or switch off when pushed away from the

[9] Water Corporation. "Waterless woks." www.watercorporation.com.au/Help-and-advice/Waterwise/Business/Waterless-woks.

wok. Kitchen staff can also consider reducing the flow rate of rinse and reservoir spouts where possible.

Replacement Options

When purchasing a new wok stove or replacing an existing conventional one, look for a model that:

- Is considered waterless or is air-cooled instead of water-cooled.
- Has automatic shut-off rinse spouts and/or knee-operated timer reservoir taps to limit both the flow rate and duration of the flow to the rinse spout and reservoir tap.

Waterless wok stove

Savings Potential

Wok stoves can achieve water savings in two ways: reducing the flow rate and duration of use of rinse spouts and reservoir tap, and eliminating the use of cooling water.

To calculate facility-specific water savings and payback, use the following information.

Wok Stove Retrofit

Retrofitting the wok stove to reduce the flow rate and duration of use of rinse spouts and reservoir taps can significantly reduce water use associated with wok cleaning and cooking.

Current Water Use

To estimate the current water use of an existing wok stove rinse or reservoir spout, identify the following information and use Equation 1 on the next page:

- Flow rate of rinse or reservoir spout.
- Average daily use time of the rinse or reservoir spout.
- Number of days the facility operates each year.

Equation 1. Water Use of Wok Stove Rinse or Reservoir Spout (gallons or liters per year)

= Flow Rate of Rinse or Reservoir Spout x Daily Use Time x Days of Facility Operation

Where:

- Flow Rate of Rinse or Reservoir Spout: Gallons or liters per minute
- Daily Use Time: Minutes per day
- Days of Facility Operation: Days per year

Sum the water use of all rinse and reservoir spouts in your facility to estimate total water use.

Water Use After Retrofit

To estimate the water use of more efficient rinse and reservoir spouts, use Equation 1, substituting the flow rate and use time of the retrofit rinse and reservoir spouts.

Water Savings

To calculate water savings from retrofitting an existing wok stove with more efficient rinse and reservoir spouts, identify the following information and use Equation 2:

- Current water use as calculated using Equation 1.
- Water use after retrofit using Equation 1.

Equation 2. Water Savings From Wok Stove Rinse and Reservoir Spouts Retrofit (gallons or liters per year)

= Current Water Use of Wok Stove Rinse and Reservoir Spouts – Water Use of Wok Stove After Retrofit of Rinse and Reservoir Spouts

Where:

- Current Water Use of Wok Stove Rinse and Reservoir Spouts: Gallons or liters per year
- Water Use of Wok Stove After Retrofit of Rinse and Reservoir Spouts: Gallons or liters per year

Payback

To calculate the simple payback from the water savings associated with retrofitting an existing wok stove with more efficient rinse and reservoir spouts, consider the equipment and installation cost of the retrofit rinse and reservoir spouts, the water savings as calculated using Equation 2, and the facility-specific cost of water and wastewater.

Wok Stove Replacement

Conventional water-cooled wok stoves can use approximately 660 to 925 gallons (2,500 to 3,500 liters) per day per burner for cooling.[10] Switching to a waterless wok can eliminate the use of single-pass cooling water and reduce wasted water from rinse and reservoir spouts. To estimate facility-specific water savings and payback, use the following information.

Water Use and Savings

To estimate the water used for cooling a conventional wok stove, calculate the water use from rinse and reservoir spouts using Equation 1, identify the following information, and use Equation 3:

- Flow rate of the cooling water. If a facility-specific value isn't available, the flow rate per burner can be estimated at 1.0 gpm (3.8 lpm).[11]
- Average daily use time.
- Days of facility operation per year.

Equation 3. Water Use From Water-Cooled Wok Stove (gallons or liters per year)

= Water Use of Wok Stove Rinse and Reservoir Spouts + [(Current Wok Stove Cooling Water Flow Rate x Daily Use Time x Days of Facility Operation) x Number of Burners]

Where:

- Water Use of Wok Stove Rinse and Reservoir Spouts: Gallons or liters, calculated using Equation 1
- Current Wok Stove Cooling Water Flow Rate: Gallons or liters per minute
- Daily Use Time: Minutes per day
- Days of Facility Operation: Days per year
- Number of Burners: Total number of water-cooled wok stove burners

[10] Turner, A., *op. cit.*

[11] Estimated based on use of 660 to 925 gallons (2,500 to 3,500 liters) of cooling water per day per burner (Turner, A., et. al, *op. cit.* Page 48), divided by an estimated 12 hours of continuous use per day.

Water Savings

To calculate water savings from replacing conventional water-cooled wok stoves with waterless wok stoves, identify the following information and use Equation 4:

- Current water use as calculated using Equation 3.
- Percent savings from replacing water-cooled woks with waterless woks, estimated at 90 percent.[12]

Equation 4. Water Savings From Wok Stove Replacement (gallons or liters per year)

= Water Use From Water-Cooled Wok Stoves x Percent Savings (0.90)

Where:

- Water Use From Water-Cooled Wok Stoves: Gallons or liters per year, calculated using Equation 3
- Percent Savings: 90 percent

Payback

To calculate the simple payback from the water savings associated with replacing an existing conventional wok stove, consider the equipment and installation cost of the replacement waterless wok stove, the water savings as calculated using Equation 4, and the facility-specific cost of water and wastewater.

The facility should also consider the energy impact of replacing old equipment. Waterless wok stoves can use about two percent more energy than a conventional wok stove.[13]

Rebates and other incentives can also impact the cost savings and payback of replacing conventional equipment. Local water utilities may offer rebates to offset the cost of new, waterless wok stoves. Kitchen or facility managers should review available rebates from their water utility prior to project implementation.

Additional Resources

Gauley, Bill and John Koeller. 2010. "2010's Top-5 New and Innovative Water Efficient Products." Presented at the International Emerging Technology Symposium. https://forms.iapmo.org/newsletter/green/2010/05/2010_Top5.asp.

[12] Turner, A., et. al., *op. cit.* Page 15
[13] Gauley, Bill and John Koeller, *op. cit.*

Plumbing Connection. September 9, 2009. "Waterless Woks are a Cool Way to Cook." https://plumbingconnection.com.au/waterless-woks-are-cool-way-cook/.

Southern California Gas Company. 2021/2022. *Natural Gas Foodservice Equipment Cleaning & Maintaining User's Guide*. https://caenergywise.com/design-guides/SCG_FSEC_CleaningGuide_FE-v2-published.pdf.

Sydney Water. 2005. The waterless wok stove. https://p2infohouse.org/ref/50/49033.pdf.

Turner, A., White, S., Chong, J., Dickinson, M.A., Cooley, H. and Donnelly, K. February 2016. *Managing Drought: Learning from Australia*. Prepared by the Alliance for Water Efficiency; the Institute for Sustainable Futures, University of Technology Sydney; and the Pacific Institute for the Metropolitan Water District of Southern California, the San Francisco Public Utilities Commission, and the Water Research Foundation. https://pacinst.org/wp-content/uploads/2016/02/Managing-Drought-Report-2016-02-23-FINAL-US-Letter.pdf.

This page intentionally left blank.

Disclaimer

United States Environmental Protection Agency
(4204M)
EPA 832-F-23-003
February 2025
www.epa.gov/watersense
(866) WTR-SENS (987-7367)