Overview

A wok stove is a Chinese pit-style stove that has a wok, or multiple woks, recessed into the stove top, allowing heat to be fully directed onto the bottom of the wok. Wok stoves can use water for cooling, cleaning, and cooking.[36]

Cooling

In a conventional water-cooled wok stove, 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 spray cooling water across the cooktop at a rate of approximately 1.0 gallon per minute (gpm) per burner.

Cleaning

Wok stoves can be outfitted with a rinsing spout used to rinse and clean the wok between uses. In many cases, the rinsing spout might be left running continuously, even when not in use, because the operator may not have time to turn it off.

Cooking

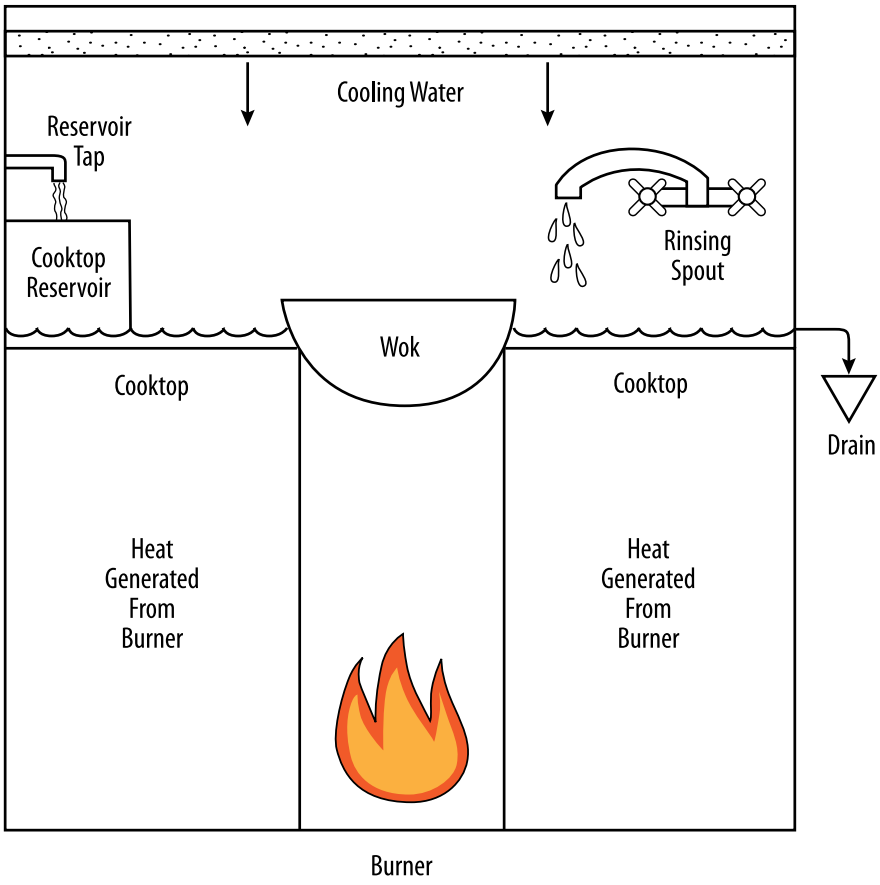
Many wok stoves also have a separate reservoir tap that fills a small reservoir used for cooking. As with rinsing spouts, the reservoir tap might be left running continuously even when the reservoir is full.

An illustration of a conventional water-cooled wok stove is shown in Figure 4-4.

Wok stoves

[36] Sydney Water. *Wok stoves: The waterless wok stove*. www.sydneywater.com.au/Water4Life/InYourBusiness/FactSheets.cfm.

Figure 4-4. Water-Cooled Wok Stove

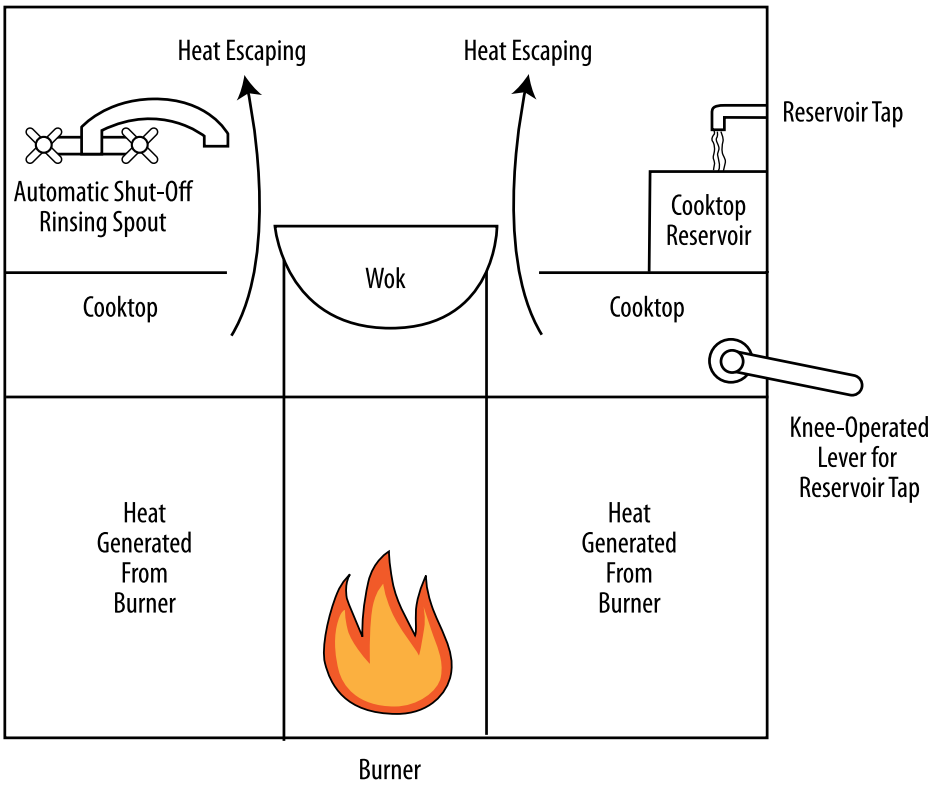


Waterless wok stoves, a relatively new technology, are cooled with air, and thus do not require the use of cooling water. One such type of wok stove functions by creating an air gap between the burner chimney and ring and the top of the stove, so that the heat can be released directly from beneath the cooktop and vented to the kitchen exhaust (see Figure 4-5). This eliminates the need for cooling water entirely. Waterless wok stoves can further reduce water use if they are outfitted with a rinsing spout that shuts off the water supply when it is not needed for wok cleaning. In addition, waterless wok stoves may have a mechanism such as a knee-operated timer reservoir tap that limits both the flow rate and duration of flow of the reservoir tap.[37]

Another new wok stove technology connects to a built-in recirculation loop originating from under the wok stove cooktop to recirculate cooling water via an external point-of-use chiller. This type of wok stove has an internal backup water-using system in the event that the recirculated chilled water is not available. A study of this type of wok stove conducted by the Food Service Technology Center showed negligible energy use associated with the use of the external chiller.[38]

[37] Alliance for Water Efficiency. Waterless Wok Introduction. www.allianceforwaterefficiency.org/1Column.aspx?id=700.
[38] Sham, Kong and Zabrowski, David. Food Service Technology Center. March 2010. *Wok Water Saver Performance Test*. Prepared for Pacific Gas & Electric Company. www.fishnick.com/publications/appliancereports/rangetops/Wok_Water_Saver.pdf.

Figure 4-5. One Type of Air-Cooled Wok Stove



By replacing conventional wok stoves with waterless or recirculating chilled water models and reducing the flow rate and duration of rinse spouts and reservoir taps, facilities could use 90 percent less water than normally required for cooling, cleaning, and cooking in wok stoves.[39]

Operation, Maintenance, and User Education

For optimal wok stove efficiency, consider the following:

- Encourage cooking staff to turn off rinse spouts and reservoir taps when not in use.
- Inspect and ensure the shut-off 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 cooling water lines for leaks and corrosion.

[39] Sydney Water, *op. cit.*

Retrofit Options

If retrofitting an existing conventional wok stove, check to see if rinse spouts can be replaced with spouts that automatically shut off or that can switch off when pushed back away from the wok.

Replacement Options

When purchasing a new wok stove or replacing an existing conventional wok stove, look for models that are considered waterless, or are air-cooled instead of water-cooled. Waterless wok stoves can use about 2 percent more energy than a conventional wok stove,[40] but they can use 90 percent less water. Alternatively, look for models that use recirculated chilled water. Also, consider models that have 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.

Savings Potential

Water savings can be achieved through two mechanisms: eliminating the use of cooling water and reducing the flow rate and duration of use of rinse spouts and reservoir tap.

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

Wok Stove Retrofit

Wok cleaning and cooking activities can use 500 to 800 gallons of water per day, particularly if the rinse spouts and reservoir taps are left constantly running. 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 the existing wok stove rinse and reservoir spouts, identify the following information and use Equation 4-9:

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

[40] International Association of Plumbing and Mechanical Officials (IAPMO). 2010. "2010's Top-5 New and Innovative Water Efficient Products." *Green Newsletter*. forms.iapmo.org/newsletter/green/2010/05/2010_Top5.asp.

Equation 4-9. Water Use of Wok Stove Rinse and Reservoir Spouts (gallons 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 per minute)
- Daily Use Time (minutes per day)
- Days of Facility Operation (days per year)

Water Use After Retrofit

To estimate the water use of more efficient rinse and reservoir spouts, use Equation 4-9, substituting the flow rate and use time of the retrofit rinse and reservoir spouts.

Water Savings

To calculate the water savings from the retrofit of an existing wok stove with more efficient rinse and reservoir spouts, identify the following information and use Equation 4-10:

- Current water use as calculated using Equation 4-9.
- Water use after retrofit using Equation 4-9.

Equation 4-10. Water Savings From Wok Stove Rinse and Reservoir Spout Retrofit (gallons 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 per year)
- Water Use of Wok Stove After Retrofit of Rinse and Reservoir Spouts (gallons 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 4-10, and the facility-specific cost of water and wastewater.

Wok Stove Replacement

During the course of a 12-hour day, a conventional water-cooled wok stove can use more than 700 gallons of water. Switching to a waterless wok or one that uses recirculated chilled water can eliminate this use of single-pass cooling water. To estimate facility-specific water savings and payback, use the following information.

Water Use and Savings

To estimate the water used for cooling of a conventional wok stove and subsequent water savings associated with a waterless wok stove or one that uses recirculated chilled water, identify the following information and use Equation 4-11:

- Flow rate of the cooling water. This flow rate is typically 1.0 gpm.
- Average daily use time.
- Days of facility operation per year.

Equation 4-11. Water Use and Savings From Water-Cooled Wok Stove Replacement (gallons per year)

= Current Wok Stove Cooling Water Flow Rate x Daily Use Time x Days of Facility Operation

Where:

- Current Wok Stove Cooling Water Flow Rate (gallons per minute)
- Daily Use Time (minutes per day)
- Days of Facility Operation (days per year)

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 or one that uses recirculated chilled water, the water savings as calculated using Equation 4-11, 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 2 percent more energy than a conventional wok stove,[41] but they use at least 90 percent less water.

Additional Resources

Alliance for Water Efficiency. Waterless Wok Introduction. www.allianceforwaterefficiency.org/1Column.aspx?id=700.

City West Water Limited. Programs and Assistance, Woking the Way to Water Savings. www.citywestwater.com.au/business/programs_and_assistance_woking_the_way_to_water_savings.aspx.

[41] IAPMO, *op. cit.*

International Association of Plumbing and Mechanical Officials. 2010. "2010's Top-5 New and Innovative Water Efficient Products." *Green Newsletter*. forms.iapmo.org/newsletter/green/2010/05/2010_Top5.asp.

Sydney Water. Wok stoves: The waterless wok stove. www.sydneywater.com.au/Water4Life/InYourBusiness/FactSheets.cfm.