WaterSense at Work

Commercial Kitchen Equipment

4.5 Commercial Steam Kettles

Best Management Practices for Commercial and Institutional Facilities

EPA WaterSense

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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 commercial steam kettles, 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.

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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

Commercial steam kettles are boiler-based or self-contained cooking appliances that use circulating steam to heat large quantities of liquid foods (e.g., soups, sauces) or to boil water for cooking pasta and vegetables. Steam kettles may be preferable to traditional stockpots due to their rapid, uniform cooking and ease of control.

Steam kettle with lid open in a commercial kitchen

Steam kettles have a double wall, or "jacket," that covers at least half the height of the sides of the kettle. Steam is circulated within this double wall, then condenses to transfer heat to the food product by means of conduction. Steam kettles can hold between 0.5 gallons (1.9 liters) to more than 200 gallons (757 liters) of liquid foods.[1] Steam kettles can also be designed with tilting capability, mounting options, strainers, covers, and other optional features.

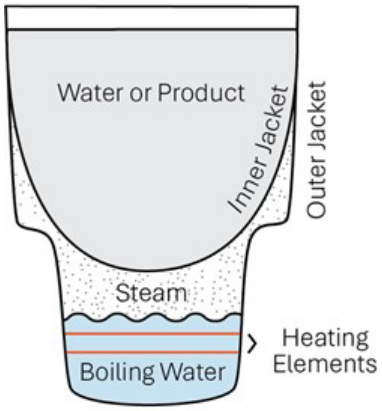
Steam kettles use water to produce steam. Boiler-based steam kettles rely on an external central boiler to deliver steam. These types of steam kettles are commonly found in large facilities with centrally located boilers. To reduce the amount of make-up water a steam boiler needs, steam condensate from boiler-based steam kettles can be captured in a steam trap and returned to the boiler.

Self-contained steam kettles rely on their own heat source to generate steam under pressure (see Figure 1). Self-contained steam kettles use less water and energy than boiler-based steam kettles because they do not require significant blowdown water. Self-contained steam kettles are pre-filled during manufacturing with water that is treated to prevent scale buildup and eliminate the need for blowdown. Over time, water may need to be added due to steam losses. Replacement water should be treated per manufacturer

[1] The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University. 2008. *Small Scale Food Entrepreneurship: A Technical Guide for Food Ventures, Second Edition*. Page 122. https://projects.sare.org/wp-content/uploads/977999initial-guide-lite.pdf.

recommendations so that scale doesn't form and regular blowdown and excess make-up water isn't needed.[2]

Figure 1. Self-Contained Steam Kettle



Operation, Maintenance, and User Education

For optimum steam kettle efficiency, consider the following:[3]

- For self-contained steam kettles, ensure there is enough water in the jacket daily and bleed air from the jacket as needed. When adding water, ensure it has been treated per manufacturer recommendations to eliminate the need for blowdown and ensure optimal performance.
- Periodically check valves, traps, and piping for leaks, scale, and corrosion, and clean and repair as needed.
- Turn the steam kettle down or off between uses.
- Make sure the steam kettle lid is secured whenever possible to reduce the amount of energy required for cooking.
- For boiler-based steam kettles, maintain insulation on steam lines that feed the steam kettle to maintain temperature and efficiency.

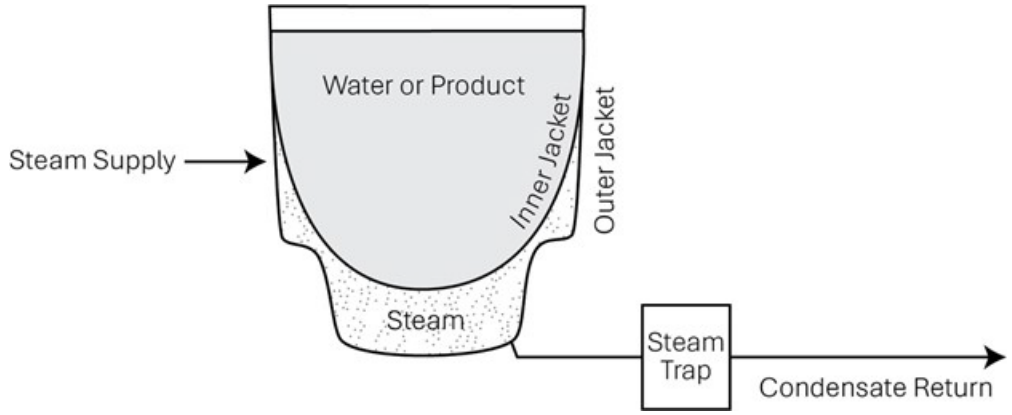
Retrofit Options

Since the steam does not come into contact with the food, if a boiler-based steam kettle is used, a condensate return system can be installed to direct the condensate back into the

[2] Southern California Gas Company. 2021/2022. *Natural Gas Foodservice Equipment: Cleaning & Maintaining User's Guide*. Pages 18-19. www.caenergywise.com/design-guides/SCG_FSEC_CleaningGuide_FE-v2-published.pdf.
[3] *Ibid*.

central boiler system for reuse (see Figure 2). This process will improve both water and energy efficiency, because the condensate can be used as boiler make-up water. Facilities can purchase packaged condensate return systems from most steam equipment suppliers and plumb them directly into an existing system. Insulating condensate return lines will further improve their efficiency. For more information on best management practices for steam boilers see *WaterSense at Work Section 6.5 Boiler and Steam Systems* at www.epa.gov/watersense/best-management-practices.

Figure 2. Boiler-Based Steam Kettle With Steam Condensate Recovery



Replacement Options

When purchasing a new steam kettle or replacing an old one, consider the kettle cooking needs of the kitchen. For smaller needs, consider a self-contained steam kettle without an external boiler, which uses less water and energy than boiler-based steam kettles. If daily operations require a boiler-based steam kettle, consider a model with a condensate return system. Be sure to choose a steam kettle with a properly sized steam trap to prevent inadvertent dumping of condensate.

Savings Potential

Retrofitting existing boiler-based steam kettles with a steam condensate recovery system or replacing them with self-contained steam kettles can yield water savings. For a boiler-based steam kettle, the water savings achieved by returning the condensate to the boiler can be substantial. See *WaterSense at Work Section 6.5 Boiler and Steam Systems* at www.epa.gov/watersense/best-management-practices for more information. Replacing a boiler-based steam kettle with a self-contained unit can significantly reduce water use, since water is infrequently added to self-contained steam kettles.

By switching to self-contained steam kettle or by returning condensate back to the boiler in a boiler-based system, facilities can also save a significant amount of energy and associated energy costs.

Additional Resources

Bowser, Tim. *Food Technology Fact Sheet: Steam Kettle Hookup*. https://extension.okstate.edu/fact-sheets/print-publications/fapc-food-and-agricultural-products-center/steam-kettle-hookup-fapc-120.pdf.

East Bay Municipal Utility District. 2008. *Watersmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. www.ebmud.com/water/conservation-and-rebates/commercial/commercial-guidebook.

Electric Power Research Institute. *Steam-Jacketed Kettles Offer Cooking Advantages*. www.epri.com/research/products/1001250

New York City Environmental Protection. *Restaurant Managers Guide to Water Efficiency*. www.nyc.gov/assets/dep/downloads/pdf/water/drinking-water/restaurant-managers-guide-to-water-efficiency.pdf.

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

The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University. 2008. *Small Scale Food Entrepreneurship: A Technical Guide for Food Ventures, Second Edition*. Page 122. https://projects.sare.org/wp-content/uploads/977999initial-guide-lite.pdf.

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