

## 4.5 Steam Kettles

### Overview

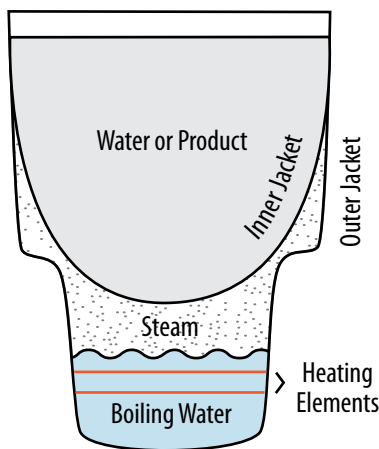
Steam kettles are boiler-based or self-contained cooking appliances that use circulating steam to perform tasks similar to traditional stockpots, including boiling pasta and simmering sauces. Steam kettles may be preferable to traditional stockpots due to their rapid, uniform cooking and ease of control.

Steam kettles have a double wall that covers at least half of the height of the sides of the kettle. Steam is circulated within this double wall, or “jacket,” then condenses to transfer heat to the food product by means of conduction. Steam kettles range in capacity from 0.5 gallon to more than 200 gallons each.<sup>33</sup> Steam kettles can also be designed with tilting capability, strainers, and covers.

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. Boiler-based steam kettles require a regular blowdown to remove condensate on the steam supply line and can consume more than 100,000 gallons of water per year. Returning condensate to the boiler as make-up water can reduce this water consumption.<sup>34</sup>

Self-contained steam kettles rely on their own heat source to generate steam under pressure (see Figure 4-2). Self-contained steam kettles use less water and energy than boiler-based steam kettles because they do not require significant blowdown water. Boiler water must be dumped at the end of the day to prevent mineral buildup. They also require de-liming on a regular basis and regular manual venting and refilling.<sup>35</sup>

Figure 4-2. Self-Contained Steam Kettle



<sup>33</sup> The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University. January 2007. *Steam Kettles in Food Processing: Fact Sheets for the Small Scale Food Entrepreneur*. [necfe.foodscience.cornell.edu/publications/fact-sheets.php](http://necfe.foodscience.cornell.edu/publications/fact-sheets.php).

<sup>34</sup> East Bay Municipal Utility District. 2008. *WaterSmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. Page FOOD6. [www.ebmud.com/for-customers/conservation-rebates-and-services/commercial/watersmart-guidebook](http://www.ebmud.com/for-customers/conservation-rebates-and-services/commercial/watersmart-guidebook).

<sup>35</sup> The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University, *op. cit.*

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### Operation, Maintenance, and User Education

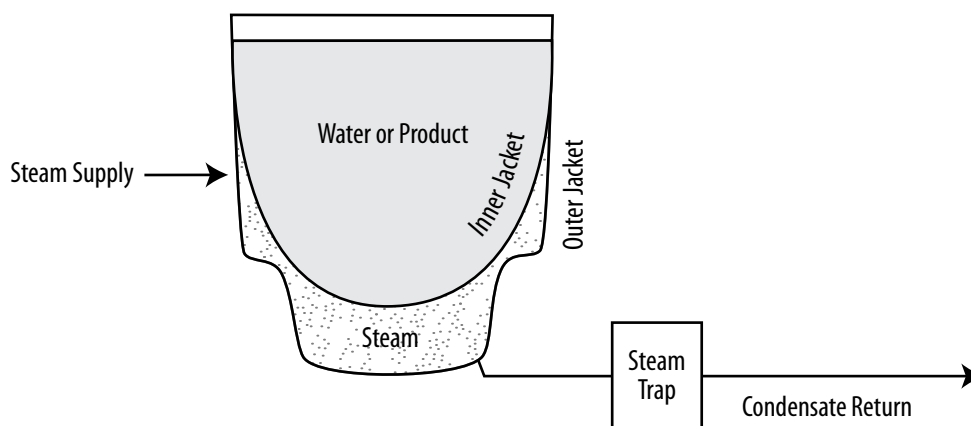
For optimal steam kettle efficiency, consider the following:

- Regularly monitor self-contained steam kettle water levels and maintain temperature control components to ensure efficient operation.
- 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 simmering and boiling.

### 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 central boiler system for reuse (see Figure 4-3). 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.

Figure 4-3. Boiler-Type Steam Kettle



### 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 or replacing existing steam kettles can yield significant water savings. For a boiler-based steam kettle, the water savings achieved by returning the condensate to the boiler can be substantial. Actual water savings are difficult to approximate because the water use of a steam kettle varies based on its size and the pressure of the steam.

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

#### *Current Water Use*

To estimate the water use of a steam kettle, identify the following information and use Equation 4-7:

- Water use per day of the existing steam kettle. The equipment manufacturer or vendor should be able to help determine the daily water use.
- Days of facility operation per year.

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#### Equation 4-7. Water Use of Steam Kettle (gallons per year)

$$= \text{Water Use of Steam Kettle} \times \text{Days of Facility Operation}$$

Where:

- Water Use of Steam Kettle (gallons per day)
  - Days of Facility Operation (days per year)
- 

#### *Water Use After Retrofit or Replacement*

To estimate the water use after retrofitting or replacing an existing steam kettle, use Equation 4-7, substituting water use of the new configuration or new system for the water use of the existing steam kettle.

#### *Water Savings*

To calculate the water savings that can be achieved from retrofitting or replacing an existing steam kettle, identify the following information and use Equation 4-8:

- Current water use as calculated using Equation 4-7.
- Water use after retrofit or replacement as calculated using Equation 4-7.

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### Equation 4-8. Water Savings From Steam Kettle Retrofit or Replacement (gallons per year)

$$= \text{Current Water Use of Steam Kettle} - \text{Water Use of Steam Kettle After Retrofit or Replacement}$$

Where:

- Current Water Use of Steam Kettle (gallons per year)
  - Water Use of Steam Kettle After Retrofit or Replacement (gallons per year)
- 

#### *Payback*

To calculate the simple payback associated with the water savings from retrofitting or replacing an existing steam kettle, consider the equipment and installation cost of the retrofit or replacement, the water savings as calculated in Equation 4-8, and the facility-specific cost of water and wastewater.

By switching to a 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. This energy savings will further reduce the payback period and increase replacement cost-effectiveness.

### Additional Resources

DOE, Energy Efficiency & Renewable Energy, Federal Energy Management Program. Best Management Practice: Commercial Kitchen Equipment. [www1.eere.energy.gov/femp/program/waterefficiency\\_bmp11.html](http://www1.eere.energy.gov/femp/program/waterefficiency_bmp11.html).

East Bay Municipal Utility District. 2008. *WaterSmart Guidebook—A Water-Use Efficiency Plan Review Guide for New Businesses*. Pages FOOD5-6. [www.ebmud.com/customers/conservation-rebates-and-services/commercial/water-smart-guidebook](http://www.ebmud.com/customers/conservation-rebates-and-services/commercial/water-smart-guidebook).

Food Service Technology Center. Steam Kettles. [www.fishnick.com/equipment/appliancetypes/steamkettles](http://www.fishnick.com/equipment/appliancetypes/steamkettles).

The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University. January 2007. *Steam Kettles in Food Processing: Fact Sheets for the Small Scale Food Entrepreneur*. [necfe.foodscience.cornell.edu/publications/fact-sheets.php](http://necfe.foodscience.cornell.edu/publications/fact-sheets.php).

Robert M. Kerr Food & Agricultural Products Center. *Food Technology Fact Sheet: Steam Kettle Hookup*. [www.fapc.okstate.edu/files/factsheets/fapc120.pdf](http://www.fapc.okstate.edu/files/factsheets/fapc120.pdf).