



# WaterSense at Work

## Commercial Kitchen Equipment 4.11 Food Thawing



Best Management Practices for  
Commercial and Institutional Facilities



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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 food thawing, 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](http://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](http://www.epa.gov/watersense/commercial-buildings).

- **Section 1. Getting Started With Water Management**
  - **Section 2. Water Use Monitoring**
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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](http://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

In commercial and institutional facilities, freezing food can help extend the shelf life of fresh meat and produce that will spoil if left in the refrigerator. Purchasing frozen food can help kitchens maintain a consistent inventory and prepare for unexpected demand, supply chain issues, and food shortages. When a facility is ready to use frozen food, proper thawing methods are important to ensure food safety. Though microbes found on food become inactive in freezers set at 0°F (-18°C), they can reactivate when the food is thawed, so food must be handled as a perishable product as it thaws.<sup>1</sup>



*Frozen meat supply*

To comply with the Food and Drug Administration (FDA) Food Code, frozen food must be thawed in one of three ways: under refrigeration; as part of a cooking process (which may include using a microwave for thawing, immediately followed by cooking); or submerged in running water. If refrigerated, the food must be kept at or below 41°F (5°C). If thawed as part of a cooking process, frozen food must either be cooked directly from its frozen state or thawed in a microwave and immediately cooked. When frozen food is thawed while submerged under running water, the water temperature must be held at 70°F (21°C) or below, and the flow of water must sufficiently agitate and float off loose particles in an overflow.<sup>2</sup>

Food service managers should choose a thawing method by factoring in the type of food, the amount of food, and when the food will be cooked. If the food will be immediately cooked after thawing, cooking the food from frozen or using a microwave may suffice. However, if there is idle time between when the food is thawed and when it is cooked, a microwave may heat some areas of the food to temperatures that foster bacteria growth.<sup>3</sup> In this case, food should instead thaw under refrigeration or running water. Thawing food in the refrigerator may take anywhere from several hours to days, while thawing food

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<sup>1</sup> U.S. Department of Agriculture (USDA). Freezing and Food Safety. [www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/freezing-and-food-safety](https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/freezing-and-food-safety).

<sup>2</sup> U.S. Food and Drug Administration (FDA). January 18, 2023. 2022 Food Code. Chapter 3-26. [www.fda.gov/food/fda-food-code/food-code-2022](https://www.fda.gov/food/fda-food-code/food-code-2022).

<sup>3</sup> USDA. The Big Thaw—Safe Defrosting Methods. [www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/big-thaw-safe-defrosting-methods](https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/food-safety-basics/big-thaw-safe-defrosting-methods).

submerged under running water can be highly water-intensive because water continuously flows from a kitchen faucet to the drain throughout the process.

To improve water efficiency when using water to thaw food, manufacturers have produced devices that recirculate and/or agitate cold water over thawing food. These devices can achieve water savings of approximately 90 percent or more compared to the traditional methods of thawing food under running water.<sup>4,5</sup>

## Operation, Maintenance, and User Education

For optimal water efficiency when thawing frozen food, consider the following:

- Maintain a consistent schedule to plan when food is ordered, delivered, frozen, and moved from the freezer into the refrigerator to avoid having to resort to running water.
- Label and date both frozen and refrigerated food and regularly assess inventory to anticipate thawing needs.
- Designate space in the refrigerator for thawing frozen food.
- Move frozen food to the refrigerator with enough time to thaw to meet foodservice needs. It may take a full day to thaw even one pound of meat.<sup>6</sup>
- If there isn't time to thaw food in a refrigerator, consider using a microwave to thaw food immediately before cooking or cooking food from its frozen state, since it is safe to do so.<sup>7</sup>



*Thawing food under running water*

## Retrofit/Replacement Options

To avoid continuously running water to thaw food, consider using a device that recirculates and/or agitates cold water. Fill a basin or sink with cold water and place both the frozen food and the device in the water. The device will recirculate and/or agitate the cold water to

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<sup>4</sup> Boss Defrost. FAQs. [www.bossdefrost.com/faqs](http://www.bossdefrost.com/faqs).

<sup>5</sup> The Adept Group, Inc. June 21, 2022. *Quantification of Water Used to Defrost Food in Los Angeles Area Commercial Kitchens Final Report*. Prepared for: CNSRV LTD. Page 18. [www.bewaterwise.com/documents/CNSRV-WTR.pdf](http://www.bewaterwise.com/documents/CNSRV-WTR.pdf).

<sup>6</sup> USDA, The Big Thaw—Safe Defrosting Methods, *op. cit.*

<sup>7</sup> *Ibid.*

the same effect as water flowing continuously from a faucet, but it will use a fraction of the water.

In accordance with the FDA Food Code, the water in which thawing food is submerged must not exceed 70°F (21°C). The water in the sink or basin where the circulating device is used must start out at a temperature lower than 70°F (21°C) to account for a natural temperature rise over the thawing period without compromising food safety. Consult information provided by the manufacturer of the device for a safe starting water temperature. If the recirculating device is equipped with a thermometer, monitor the water temperature throughout the thawing process. Additionally, ensure that the food is securely packaged so that neither water from the container nor open air makes direct contact with the surface of the food, which could introduce bacteria and pose a health risk.

## Savings Potential

Water savings for implementing new operating procedures for thawing food or retrofitting a facility's sink with a recirculating and/or agitation device to thaw food will depend on the method of food thawing used prior to these changes. To estimate facility-specific water savings and payback from changing practices to reduce or eliminate the use of running water to thaw food, use the following information.

### *Current Water Use*

To estimate the current water use of thawing food submerged in running water, identify the following information and use Equation 1 on the next page:

- Flow rate of the faucet: Faucets typically have flow rates of 2.2 gallons per minute (gpm) or less; however, many commercial kitchens have faucets specifically for sink and pot filling that are commonly used for food thawing and may have higher flow rates. Faucet flow rate can be measured using a bucket, graduated cylinder or other measurement device, and stopwatch.
- Daily faucet running time: This will vary by facility and the amount of food that needs to be thawed. A pound of frozen food can thaw in an hour or less submerged under running water, but higher weights of frozen foods will take longer.<sup>8</sup> One study that analyzed water use from thawing food found that facilities run water to thaw food on average for about one hour per day.<sup>9</sup>
- Days of facility operation per year.

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<sup>8</sup> USDA, The Big Thaw—Safe Defrosting Methods, *op. cit.*

<sup>9</sup> Analyzed data from The Adept Group, Inc., *op. cit.*

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**Equation 1. Water Use of Thawing Food Submerged in Running Water (gallons or liters per year)**

$$= \text{Faucet Flow Rate} \times \text{Daily Faucet Run Time for Thawing} \times \text{Days of Facility Operation}$$

Where:

- Faucet Flow Rate: Gallons or liters per minute
  - Daily Faucet Run Time for Thawing: Minutes per day
  - Days of Facility Operation: Days per year
- 

***Water Use After Retrofit/Replacement***

To estimate the water use of thawing food submerged using a recirculating and/or agitation device, use Equation 1, changing the daily faucet run time with the daily time spent filling the sink or container where the device is used.

Alternatively, if the facility chooses to thaw frozen food in the refrigerator or microwave or to cook food in its frozen state instead of using running water for thawing, assume the water use after this operational change is negligible.

***Water Savings***

To calculate the water savings that can be achieved using a recirculating and/or agitation device or choosing another method that doesn't use running water to thaw frozen food, identify the following information and use Equation 2 below:

- Current water use as calculated using Equation 1.
  - Water use with recirculating and/or agitation device as calculated using Equation 1.
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**Equation 2. Water Savings From Food Thawing Retrofit/Replacement Device (gallons or liters per year)**

$$= \text{Current Water Use of Thawing Food Submerged in Running Water} - \text{Water Use After Food Thawing Retrofit/Replacement}$$

Where:

- Current Water Use of Thawing Food Submerged in Running Water: Gallons or liters per year
  - Water Use After Retrofit/Replacement: Gallons or liters per year
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Alternatively, if the kitchen staff chooses to thaw frozen food in the refrigerator or microwave or to cook food in its frozen state instead of using running water for thawing,

assume the water savings is equal to the current water use of thawing food submerged in running water, since the water use from changing to this practice is negligible.

### *Payback*

To calculate the simple payback from the water savings associated with using a recirculating and/or agitation device, consider the equipment cost of the device or equipment, the water savings as calculated using Equation 2, and the facility-specific cost of water and wastewater. Since recirculating and/or agitation devices use energy, there may be a small energy impact from changing food thawing practices that should be considered in payback calculations.

## **Additional Resources**

Alliance for Water Efficiency. March 2017. *Commercial Kitchens Water Use Efficiency and Best Practices Guide*. [www.allianceforwaterefficiency.org/impact/our-work/commercial-kitchens-guide](http://www.allianceforwaterefficiency.org/impact/our-work/commercial-kitchens-guide).

The Adept Group, Inc. June 21, 2022. *Quantification of Water Used to Defrost Food in Los Angeles Area Commercial Kitchens Final Report*. Prepared for: CNSRV LTD. [www.bewaterwise.com/documents/CNSRV-WTR.pdf](http://www.bewaterwise.com/documents/CNSRV-WTR.pdf).

U.S. Food and Drug Administration (FDA). January 18, 2023. *2022 Food Code*. Chapter 3-26. [www.fda.gov/food/fda-food-code/food-code-2022](http://www.fda.gov/food/fda-food-code/food-code-2022).

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