



WaterSense at Work

Commercial Kitchen Equipment 4.3 Combination Ovens



Best Management Practices for
Commercial and Institutional Facilities



May 2023

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 combination ovens, is part of **Section 4: Commercial Kitchen Equipment**. The complete list 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.

- **Section 1. Getting Started With Water Management**
 - **Section 2. Water Use Monitoring**
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 - **Section 4. Commercial Kitchen Equipment**
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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

Combination ovens are a type of commercial oven that combines three modes of cooking into one oven: steam mode, circulated hot air (i.e., dry heat) mode, or a combination of both (i.e., combi-mode). The steam mode is used for rapid cooking of food items such as vegetables and shellfish. The circulated hot air mode operates in the same manner as a typical convection oven and is traditionally used for roasting meats or baking. The combi-mode is used to reheat, roast, bake, or oven-fry foods. Steam and combi-modes require generation of steam, an energy- and water-intensive process.

The amount of water used by a combination oven is primarily dictated by whether it is boiler-based or boilerless. Typical boiler-based combination ovens are connected to a tank system that boils water and supplies the steam. These systems can waste large amounts of water because they require water to cool the condensed steam before it is disposed down the drain. They may also supply steam regardless of whether the oven is in operation. In contrast, boilerless combination ovens have a self-contained water reservoir that is used to spray water directly on a heat source to create the steam for cooking. This eliminates the use of a separate, central boiler system and saves energy that would have been used to supply continuous steam. Boilerless combination ovens are typically drained and refilled each day and do not require a drain of condensate or the addition of cooling water.

To address efficiency advances in commercial ovens, the ENERGY STAR® program has developed voluntary criteria to certify energy-efficient and water-efficient commercial ovens, including combination ovens.¹ ENERGY STAR certified combination oven models must be self-contained and must meet minimum cooking efficiency, maximum idle energy rate, and maximum water consumption (including water used for condensate cooling) criteria.



¹ ENERGY STAR. Commercial Ovens. www.energystar.gov/products/commercial_ovens.

Operation, Maintenance, and User Education

For optimal combination oven efficiency, consider the following:

- Use the oven's programming capabilities to control the use of the different cooking modes in order to minimize water and energy use, taking into account food preparation requirements. Specifically, where possible, use the steam mode and combi-mode sparingly, because these modes consume water and significantly increase energy use. Instead, maximize the use of the circulated hot air mode.
- Turn the oven off or lower the temperature during slow times or when not in use.
- Keep the oven doors completely closed.
- Whenever possible, maximize the amount of food cooked per use by ensuring that the combination oven is loaded to its full capacity and choose an oven size that fits your needs without oversizing.²
- Make sure to replace gaskets when necessary and keep door hinges tight, so that the doors stay aligned and provide a good seal to retain heat or steam.
- Increase the longevity of the equipment by keeping track of water quality and preventing scale buildup.

Retrofit Options

There are currently no known retrofit options available on the market to increase the efficiency of combination ovens.

Replacement Options

When purchasing a new combination oven or replacing an existing one, look for ENERGY STAR certified models, which use 0.5 gallons (1.9 liters) or less per pan per cooking cycle in steam mode and 0.4 gallons (1.5 liters) or less per pan per cooking cycle in convection mode. ENERGY STAR certified models that meet these criteria can be found by reviewing ENERGY STAR's list of certified combination ovens.³ Consider both energy efficiency and water consumption when selecting a model that meets your needs. Many models do not use any water when operating in convection mode.

² Crk, Tanja. ENERGY STAR Ask the Experts, "How to Choose the Right-Sized Commercial Oven." www.energystar.gov/products/ask-the-experts/how-to-choose-the-right-sized-commercial-oven.

³ ENERGY STAR. ENERGY STAR Certified Commercial Ovens. www.energystar.gov/productfinder/product/certified-commercial-ovens/.

Combination ovens come in varying sizes, depending on the amount and types of food cooked. Combination ovens usually have between five and 20 pans, although they can have as many as 40. Consult the manufacturer to choose an ENERGY STAR certified combination oven that is the appropriate size for the cooking needs of the facility. A larger-than-necessary combination oven can waste water and energy to heat unused compartment space.

Savings Potential

Boiler-based combination ovens can use more than 20 gallons (76 liters) of water per cooking cycle in steam mode.⁴ Switching to ENERGY STAR certified combination ovens can reduce that water use to 10 gallons of water or less per cooking cycle in steam mode.

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

Current Water Use

To estimate the current water use of an existing combination oven, identify the following information and use Equation 1 on the next page:

- Water use rate in gallons per pan. Older combination ovens can use 3.5 gallons (13.2 liters) or more per pan per cooking cycle.
- Pan capacity of the combination oven. Combination ovens can have between five and 40 pans.⁵
- Average number of daily cooking cycles. This will vary by facility.
- Days of facility operation per year.

Look for ENERGY STAR Certified Combination Ovens

When replacing old, inefficient combination ovens or purchasing new ovens, look for the ENERGY STAR label. ENERGY STAR certified models must meet minimum cooking efficiency, maximum idle energy rate, and maximum water consumption criteria. Facilities can also use ENERGY STAR's Product Finder to find certified combination ovens. Go to www.energystar.gov/productfinder/product/certified-commercial-ovens/ to get started.



⁴ Alliance for Water Efficiency. March 2017. *Commercial Kitchens Water Use Efficiency and Best Practices Guide*. www.allianceforwaterefficiency.org/impact/our-work/commercial-kitchens-guide.

⁵ ENERGY STAR. ENERGY STAR Commercial Kitchen Equipment Tools, Materials and Resources. Commercial Food Service (CFS) Equipment Calculator. www.energystar.gov/partner_resources/energy_star_training_center/commercial_food_service.

Equation 1. Water Use of Combination Oven (gallons or liters per year)

$$= \text{Water Use Rate of Combination Oven} \times \text{Pan Capacity of Combination Oven} \times \text{Daily Cycles} \times \text{Days of Facility Operation}$$

Where:

- Water Use Rate of Combination Oven: Gallons or liters per pan per cycle
 - Pan Capacity of Combination Oven: Number of pans
 - Daily Cycles: Cooking cycles run per day
 - Days of Facility Operation: Days per year
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Water Use After Replacement

To estimate the water use of a replacement combination oven, use Equation 1, substituting the replacement combination oven's per-pan water use. ENERGY STAR certified combination ovens use 0.5 gallons (1.9 liters) or less per-pan per cooking cycle. The water use rate of specific ENERGY STAR certified models can be found by downloading ENERGY STAR's list of certified combination ovens.⁶

Water Savings

To calculate the water savings that can be achieved from replacing an existing combination oven, identify the following and use Equation 2 below:

- Current water use as calculated using Equation 1.
 - Water use after replacement as calculated using Equation 1.
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Equation 2. Water Savings From Combination Oven Replacement (gallons or liters per year)

$$= \text{Current Water Use of Combination Oven} - \text{Water Use of Combination Oven After Replacement}$$

Where:

- Current Water Use of Combination Oven: Gallons or liters per year
 - Water Use of Combination Oven After Replacement: Gallons or liters per year
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⁶ ENERGY STAR, ENERGY STAR Certified Commercial Ovens, *op. cit.*

Energy Savings

By switching to an ENERGY STAR certified combination oven, facilities also save a significant amount of energy by reducing the water use and steam generation associated with the use of the combination oven. These energy savings will further reduce the payback period and increase replacement cost-effectiveness.

California Energy Wise has an energy, water, and cost savings calculator, which can be used to calculate the savings potential from replacing many types of commercial kitchen equipment, including combination ovens.⁷ ENERGY STAR similarly maintains a Commercial Food Service Equipment Calculator to estimate energy and cost savings from installing ENERGY STAR certified equipment, including ovens.⁸

Payback

To calculate the simple payback associated with the water and energy savings from replacing an existing combination oven, consider using the California Energy Wise or ENERGY STAR tools described above. To calculate it by hand, consider the equipment and installation cost of the replacement combination oven, the water savings as calculated using Equation 2, the energy savings calculated using the California Energy Wise or ENERGY STAR calculator, and the facility-specific cost of water, wastewater, and energy.

Additional Resources

California Energy Wise. Energy Cost Calculators. <https://caenergywise.com/calculators/>.

ENERGY STAR. Commercial Ovens. www.energystar.gov/products/commercial_ovens.

ENERGY STAR. ENERGY STAR Commercial Kitchen Equipment Tools, Materials and Resources. Commercial Food Service (CFS) Equipment Calculator. www.energystar.gov/partner_resources/energy_star_training_center/commercial_food_service.

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

⁷ California Energy Wise. Energy Cost Calculators. <https://caenergywise.com/calculators/>.

⁸ ENERGY STAR. ENERGY STAR Commercial Kitchen Equipment Tools, Materials and Resources. Commercial Food Service (CFS) Equipment Calculator. www.energystar.gov/partner_resources/energy_star_training_center/commercial_food_service.

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