



Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy an Energy-Efficient Commercial Ice-Cube Machine

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

Federal Supply Sources:

- Defense Logistics Agency (DLA)
Phone: (215) 737-3659
DSN 444-3659
- General Services Administration (GSA)
Phone: (817) 978-2505
www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- Air-Conditioning and Refrigeration Institute (ARI) publishes the *Directory of Certified Automatic Commercial Ice-Cube Machines and Ice Storage Bins*.
Phone: (703) 524-8800
www.ari.org
- The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) publishes the *Refrigeration Handbook*, which contains an instructive chapter on ice makers.
Phone: (404) 636-8400
www.ashrae.org
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation^a

Condenser Type	Ice Harvest Rate (lbs. per 24 hrs.)	Energy Consumption (per 100 lbs. ice)	
		Recommended	Best Available
Ice-Making Head			
<i>Air-Cooled</i>	101-200	9.4 kWh or less	8.6 kWh
<i>Air-Cooled</i>	201-300	8.5 kWh or less	7.9 kWh
<i>Air-Cooled</i>	301-400	7.2 kWh or less	6.5 kWh
<i>Air-Cooled</i>	401-500	6.1 kWh or less	5.8 kWh
<i>Air-Cooled</i>	501-1000	5.8 kWh or less	5.4 kWh
<i>Air-Cooled</i>	1001-1500	5.5 kWh or less	5.0 kWh
<i>Water-Cooled</i>	201-300	6.7 kWh or less	5.9 kWh
<i>Water-Cooled</i>	301-500	5.5 kWh or less	4.7 kWh
<i>Water-Cooled</i>	501-1000	4.6 kWh or less	3.8 kWh
<i>Water-Cooled</i>	1001-1500	4.3 kWh or less	4.0 kWh
<i>Water-Cooled</i>	> 1500	4.0 kWh or less	3.5 kWh
Self-Contained			
<i>Air-Cooled</i>	101-200	10.7 kWh or less	9.7 kWh
<i>Water-Cooled</i>	101-200	9.5 kWh or less	6.8 kWh
<i>Water-Cooled</i>	201-300	7.6 kWh or less	7.3 kWh
Remote Condensing			
<i>Air-Cooled</i>	301-400	8.1 kWh or less	7.9 kWh
<i>Air-Cooled</i>	401-500	7.0 kWh or less	6.1 kWh
<i>Air-Cooled</i>	501-1000	6.2 kWh or less	5.4 kWh
<i>Air-Cooled</i>	1001-1500	5.1 kWh or less	4.5 kWh
<i>Air-Cooled</i>	> 1500	5.3 kWh or less	4.4 kWh

Definitions

The ice harvest rate (capacity) is the amount of ice produced in 24 hours.

Energy consumption is measured in accordance with ARI Standard 810.

Ice-making head units do not contain integral storage bins, but are generally designed to accommodate a variety of bin capacities. Storage bins entail additional energy use not included in the reported energy consumption figures for these units.

Self-contained units contain built-in storage bins.

Remote condensing units transfer the heat generated by the ice-making process outside of the building (comparable to split system air conditioners).

a) This Recommendation covers machines generating 60 grams (2 oz.) or lighter ice cubes, and does not cover flaked, crushed, or fragmented ice makers.

The federal supply sources for ice-cube machines are the Defense Logistics Agency (DLA) and the General Services Administration (GSA). DLA sells ice-makers through its “Customer Value Contracts” program. GSA offers ice-cube machines on Schedule 73-III, as well as through its on-line shopping network, *GSA Advantage!* Select a model that meets the recommended level for that type and capacity. For a contractor-supplied ice-cube machine, specify an energy consumption rate that meets the Efficiency Recommendation.

Where to Find an Energy-Efficient Ice-cube Machine

The choice of which type of ice maker to purchase has significant energy implications. Generally, water-cooled models are more efficient than air-cooled. Another advantage of water-cooled models, as well as remote condensing units, is that the heat removed in ice making is discharged outside the building, thereby not adding to air-conditioning costs.

Buyer Tips

Potable water used directly in the ice-making process (including melting and release of cubes) ranges from 15-45 gallons per 100 lbs. of ice. Some self-cleaning models may use three times this much water, but save on labor costs for cleaning. Water-cooled units use a significant amount of condenser water; much of this can be recycled by using a cooling tower (as opposed to a “one-pass” system). At average federal prices, the cost of water represents only 10-30% of the electricity cost to make ice. However, water use may be a consideration for ice cube machines in some areas with high water costs or limited supplies. Data on water use are available in the referenced ARI directory (see “For More Information”).

Oversizing of ice-cube machines can raise energy consumption unnecessarily due to excess standby losses. Your choice of ice-making capacity should reflect actual ice-cube demand.

Sizing

Ice-Cube Machine Cost-Effectiveness Example (Air-Cooled Ice-Making Head, 800 lbs./24 hrs.)			
<i>Performance</i>	<i>Base Model</i>	<i>Recommended Level</i>	<i>Best Available</i>
<i>Energy Consumption per 100 lbs.</i>	8.0 kWh	5.8 kWh	5.4 kWh
<i>Annual Energy Use</i>	8,000 kWh	5,800 kWh	5,400 kWh
<i>Annual Energy Cost</i>	\$480	\$350	\$320
<i>Lifetime Energy Cost</i>	\$2,750	\$2,000	\$1,850
<i>Lifetime Energy Cost Savings</i>	-	\$750	\$900

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed ice-maker life of 7 years. Future electricity price trends and a discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

Cost-Effectiveness Assumptions

Annual energy use in this example is based on the standard Air-Conditioning and Refrigeration Institute (ARI) test procedure for an air-cooled unit of capacity 800 lbs./24 hrs., producing 100,000 lbs. per year. The Base Model is the least efficient 800 lb./24 hrs. ice-maker available. The assumed electricity price is 6¢/kWh, the federal average electricity price (including demand charges) in the U.S.

Using the Cost-Effectiveness Table

In the example shown above, an ice-maker that just meets the recommended level, with an annual energy use of 5,800 kWh, is cost-effective if its purchase price is no more than \$750 above the price of the Base Model. The Best Available model, with an annual energy use of 5,400 kWh, is cost-effective if its price is no more than \$900 above the price of the Base Model.

Metric Conversions

*1 lb. = 0.45 kg
1 gallon = 3.8 liters*

What if my Electricity Price is different?

To adjust the Lifetime Energy Cost Savings in the table above, multiply the dollar figures listed by this ratio: $\left(\frac{\text{Your price in } \$/\text{kWh}}{6.0 \text{ } \$/\text{kWh}} \right)$.

