Kansas State University Engineering Extension

This packet of materials was prepared in order to help homeowners respond to rapidly increasing natural gas prices.

If you have questions or need help with specific problems after reviewing these materials, call one of the energy specialists at Engineering Extension, 1-800-KSU-8898. We welcome your comments for improving our services.

12 SIMPLE TIPS TO REDUCE HEATING COSTS

QUESTIONS AND ANSWERS ABOUT:

Rising fuel prices
Envelope changes
Space heating
Water heating

FACT SHEET TOPICS:

Energy-Efficient Windows
Selecting a Home Heating System
Residential Insulation
Residential Foundation Insulation
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ADDITIONAL RESOURCES SHEET

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12 Simple, No-Cost or Low-Cost Tips to Reduce Heating Costs

1. Reduce thermostat setting to 68 degrees.
Winter heating costs are closely related to interior temperature. Reducing your thermostat setting can save substantially on heating costs. Adding a sweater and a warm pair of socks can go a long way to increase comfort in a cooler house.

2. Set back thermostat at night and when house is unoccupied.
Setting the thermostat back 10 degrees at night or when the house will be unoccupied can save up to 15 percent on heating costs. While it is true the furnace will have to run more to reheat the house, the energy saved while the home is cooler more than offsets the extra run time to reheat the home.

3. Install a programmable thermostat.
Programmable thermostats provide the ability to lower the home temperature at night and during the day and still have the home warm when you get up or arrive home from work. The prices of programmable thermostats have come down and many can be found for less than $50. If you have a heat pump, a special setback thermostat is required for maximum savings.

4. Change furnace filter.
Dirty, clogged furnace filters lower the heater's efficiency by preventing proper airflow through the furnace. Low-cost filters are available from your local hardware store. How often you will need to change filters will vary, but you should check the filter monthly. When you purchase filters, always buy two so you have an extra one on hand. It helps to write the proper filter size on the outside of the furnace cabinet.

5. Have furnace cleaned and tuned.
Having the furnace cleaned and tuned helps assure a safe and efficient furnace. Tuning may involve resetting the fuel air mixture for proper combustion, and cleaning of the blower and burners to assure maximum airflow and complete combustion.

6. Let sunshine in south windows during day.
Open drapes on the south side of your home during winter days and close them at night. Sun angles are low in winter, allowing substantial solar heating through all south windows. You may want to trim vegetation that shades south windows. East, west, and north windows do not contribute to the winter heating effort.

12 Simple, No-Cost or Low-Cost Tips to Reduce Heating Costs

7. Check and replace weather stripping on doors and windows.
Air leaks around faulty weather stripping on doors and windows contribute to making interior spaces of your home uncomfortable and increase heating costs. Check for drafts and repair or replace worn stripping.

8. Close storm windows and doors.
Storm windows installed over primary windows are almost as good as double pane windows for reducing heat loss but only if they are kept closed. Make a check of all your storm windows to assure you have closed them when cold weather arrives.

9. Operate kitchen and bath vents minimally.
Bath and kitchen vents exhaust heated air and moisture to the outside. If your home is dry during the winter, you may not need to operate these vents at all. However, if you have condensation on windows, operate the vents to remove cooking and bathing moisture but be sure to turn them off.

10. Lower the thermostat set point on your water heater.
Water temperatures above about 125 degrees are not needed for most tasks. A simple way to check your water temperature is to carefully place the back of your hand under a steady stream of hot water—if it is too hot to keep there, it is too hot.

11. Install a water heater blanket.
Older water heaters may not have adequate insulation. Install an insulating water heater jacket. Be careful to follow manufacturer's recommendations and don't cover the thermostat.

12. Reduce hot water use.
Reducing hot water use is effective in reducing the cost of heating water. Low-flow showerheads reduce water and energy costs. Take showers rather than baths since showering, in general, takes less water than baths. Modern detergents are formulated to work in cold water so wash in cold water. Repair leaky faucets. This will save on water and water-heating costs.

Q & A
Rising Prices

1. Why have natural gas prices gone up so drastically this last year?

The retail price of natural gas has gone up between 30 and 45 percent in many areas of Kansas. There are several things that have driven prices up, said Gene Meyer, Extension mechanical engineer.

"First, there has been increased demand for natural gas," he said. "The economy has been good, there has been lots of construction and industry is producing at very high rates. This in itself uses more natural gas."

But there is a secondary effect, Meyer said. Because of the increased building and production, there is an unprecedented demand for electricity. Utilities have begun to construct natural gas-fired electric generation stations to meet this demand. Gas turbine units can be built quickly, are low in cost and do not face as many regulations as new coal-fired units. The high demand for gas caused by electric generation in the summer prevents gas producers from stockpiling gas for winter heating needs.

"The second issue that contributes to higher prices is the low rate of gas exploration in recent years," Meyer said. "Low gas prices have not provided the incentive for significant new drilling. However, with higher prices, there are now 50 percent more drilling rigs actively exploring for gas than there were a year ago. Nevertheless, industry warns that new gas fields are increasingly difficult to find and put in production."

2. Will propane prices increase with natural gas?

While about 50 percent of the U.S. supply of propane comes from natural gas and the other 50 percent from the refining of oil, the price is more closely tied to the price of crude oil, said Gene Meyer, Extension mechanical engineer.

"Oil prices have been climbing all summer and are presently above $35 per barrel, the highest in 10 years," he said. "In addition, supplies are lower than in past years. The Propane Council listed propane inventories as 5.5 percent below last year's and the lowest since 1996."

Propane prices are already high, but consumers should not wait for propane prices to drop. It probably won't happen this winter. Consumers should fill their tanks now, before the weather gets cold. In addition, consumers should make sure their propane appliances are working as efficiently as possible to ensure efficient use of their fuel, he said.

3. What uses the most natural gas in my home?

There are only a few natural gas or propane uses in a home and the patterns for natural gas and propane are very similar, said Gene Meyer, Extension mechanical engineer.

Approximately two-thirds of natural gas or propane used in a typical residence is used for space heating. The second largest user is water heating at about 25 percent. The remainder of gas use in a home goes to appliances such as clothes dryers, cooking stoves, and decorative lighting, Meyer said.

A few Midwestern homes have gas-fueled air conditioners. For those homes, air conditioning will be a significant use. Because gas use is highest for space and water heating, most conservation efforts focus on these uses.

4. What can I do to reduce overall gas use?

Because gas use is highest for space heating, a majority of your effort should focus there, said Gene Meyer, Extension mechanical engineer.

Water heating uses about 25 percent of the gas and there are opportunities there as well. Reducing gas use should take two strategies. The first is to reduce the need for space or water heating. Adding insulation, reducing infiltration, lowering home thermostat settings and water temperatures, and reducing the use of hot water are effective in reducing the demand for heat.

Meyer said the second approach is to convert the gas to heat more efficiently. This requires

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you keep the space and water heating equipment operating as efficiently as possible. Annual checkups and tuning are critical to maintaining efficiency. You may want to upgrade equipment with more efficient space and water heaters to help reduce gas use.

ENVELOPE CHANGES

5. I've already done the simple things like caulking, weather stripping, and turning down the thermostat. What else can I do to save energy and money?

Finding and sealing the less obvious air leakage paths is your next most effective step, said Bruce Snead, Extension specialist in residential energy at K-State.

These are likely to be found in the attic as holes around plumbing and electrical lines, and other gaps in framing. You will need to move the insulation out of the way to find many of these. Using a foam sealant, regular caulk and small pieces of foam board, seal all the penetrations you can. Look for other openings into both exterior and interior walls, including plumbing openings behind bath and kitchen cabinets, Snead said.

Be sure to replace the insulation and avoid leaving gaps between fiberglass batts.

If you have a basement, look for and seal the same kind of holes in the ceiling and floor framing that open into the interior cavities of the house, Snead said.

After your sealing is done, consider adding insulation to your attic. Your attic should be insulated to an R-38, or about 12 inches of fiberglass or cellulose. If you want to add attic insulation, cellulose can be blown directly on top of either fiberglass or cellulose. Many lumberyards will loan the equipment when you purchase the insulation from them.

If you want additional help, complete a do-it-yourself energy audit through our Web site links or hire a certified Kansas home energy rater. Check our Web site at http://www.oznet.ksu.edu/dp_nrgy/ees/, or call us at 1-800-KSU-8898 for a list of professionals.

6. Which areas in my home would benefit the most from insulation?

"Most heat lost in uninsulated homes is through the roof," said Richard B. Hayter, director of Engineering Extension at K-State.

Because the attic is usually accessible, it is an area that is easy to insulate. If your attic has not been insulated, you should first install a vapor barrier directly above the ceiling. Then place insulation up to an R-value of 38.

Some types of insulation have a vapor barrier attached directly to them.

"This insulation should be installed so that the vapor barrier is toward the warm side of the house in winter," Hayter said.

If you already have insulation in your attic, don't install another vapor barrier over the old insulation. You may, however, mix types of insulation, such as adding cellulose over fiberglass batts.

"Of equal priority to insulating an attic is to seal and insulate any exposed ductwork that runs through unheated areas, such as crawl spaces and attics," Hayter said.

These ducts should be insulated with a minimum of an R 11.

If the ducts are used during the summer for central air conditioning, the insulation should have a good vapor barrier on the outside of the insulation. This will prevent condensation from forming on the cold duct from the humid summer air.

The next priority is to insulate unheated crawl spaces either directly beneath the floor or on the foundation walls. If insulating below the floor, install the vapor barrier on the warm side in winter, or facing up.

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"Be sure that any plumbing in the crawl space is on the warm side of the insulation to keep the pipes from freezing," Hayter said.

Insulating foundation walls is appropriate only in unventilated crawl spaces. Insulation on these walls should run from the band joist of the foundation wall and extend at least two feet across the floor of the crawl space. The band joist is the board between the foundation wall and the floor of the room above the crawl space.

"The dirt floor of the crawl space should be covered with a polyethylene film," Hayter said.

Insulating basement walls is the next priority and is just as important as crawl space insulation when part, or all, of the basement wall is above grade.

"You can add furring to the wall, insulate between the furring, and add a finished surface, such as wood paneling," Hayter said. "Or you can attach rigid foam directly to the basement wall and cover it with a noncombustible material, such as gypsum board."

Although not generally considered a do-it-yourself project, installing wall insulation can be very cost-effective. This requires drilling through the siding or removing some of the siding and drilling through the sheathing under the siding. Knowledge of building construction is helpful to make sure that all wall cavities are filled with insulation. Wall insulation installed at the proper density and with no voids will not only significantly reduce conduction heat loss through the walls, but can reduce air leakage as much as 30 percent.

7. What should I look for when buying replacement windows and doors?

Windows and doors are the most frequently used items in the exterior shell of your home, and their durability, energy efficiency and maintenance are all-important concerns.

In windows, look for good tight construction with integral weather stripping between the sash and frame," said Bruce Snead, Extension specialist in residential energy at K-State. "Replaceable weather stripping is an advantage."

Operating hardware should be durable. If the windows have steel or aluminum frames, check to see if thermal breaks are used to reduce the possibility of condensation.

"We recommend double-glazing or insulating glass here in Kansas," Snead said.

Energy-efficiency ratings for windows may include both an air infiltration rate and a U-value, which is equal to 1 divided by the R-value. These figures are based on laboratory tests of standard units and, in general, the lower the U-value and air infiltration rate, the better the window.

"Be wary of advertisements using energy-saving claims without providing actual numbers based on standard test procedures," Snead said.

For replacement doors, a good unit will come prehung for easy installation. They will also have integral weather stripping at the head and jambs and adjustable weather stripping at the sill.

"Steel-faced doors with foam cores will have higher R-values than solid wood doors, but thermal breaks between the inner and outer skin are essential," Snead said.

8. I have good, tight-fitting storm windows over the primary windows in my home. Would it be cost-effective to install interior storm windows as well?

"Although a third glazing would certainly save energy, it may not save enough to justify the cost of the interior storm windows, especially if the windows are covered with heavy, close-fitting drapes or curtains," said Richard Nelson, Extension specialist in energy at K-State.

"Interior storm windows" or inner glazings are usually thin plastic sheets designed as a low-cost alternative to exterior storm windows.

If you already have exterior storm windows,

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the cost-effectiveness of interior storm windows is reduced, especially if your exterior storm windows are in good shape because they will not allow much infiltration.

"The cost effectiveness also depends heavily on the cost of the interior storm windows," Nelson said.

Some plastic sheets designed primarily to cut infiltration losses are inexpensive and probably would be cost-effective. More expensive decorative window treatments are difficult to justify strictly on economics.

9. The louvers below our whole-house fan are very cold and appear to let a lot of heat escape. How can I insulate the fan?

"The metal louvers under a whole-house fan offer little protection against heat loss to the attic in winter," said Doug Walter, president of Kansas Building Science Institute, Manhattan.

According to Walter, the most effective way to reduce heat loss is to build an insulated box that you can place over the entire fan from the attic side. You should seal the box tightly to the framework supporting the fan. You can attach insulation directly to the box or simply drape it over the box. Be sure to disconnect power to the fan so it can't be turned on inadvertently while the cover is in place.

"If access to your attic is too difficult to allow you to install such a box, you might want to consider attaching an insulated panel directly below the louvers," he said.

To make this an easy seasonal task, build a permanent frame around the louvers using 1x2-inch lumber to hold the insulated panel.

"You can cut the panel from five-eighths-inch rigid insulation board and cover it with white sticky-backed shelf paper to make it blend in with your ceiling," Walter said. "Four wing nuts mounted in the frame will hold the panel in place."

Walter added that taping a sheet of plastic under the louvers will help stop air leakage but will provide little insulation.

10. I'm having my attic insulated. What should I do to the access panel in my ceiling?

"These panels are often single pieces of sheet rock or plywood, neither of which has much of an R-value nor forms a tight seal," said Bruce Snead, residential energy specialist at K-State.

Snead recommends one (two, if possible) layers of six-inch fiberglass insulation stapled to the attic side of the panel. Keep the vapor barrier down, he cautioned, and staple only around the edge.

"You can also use five or six inches of foam board insulation. If you insulate the attic with loose-fill or blow-in insulation, you'll want to put up wooden or cardboard barriers to prevent the loose material from spilling down when you open the panel," Snead said.

It's also important to form an airtight seal around the edges of the panel with weather stripping. Also, caulk around the opening to close any gaps in the ceiling trim. If necessary, add a latch to pull the door tightly shut.

"The cost of doing this all yourself is around $3, and the measures should pay for themselves within one year," Snead said.

11. Which is better for insulating attics, fiberglass or cellulose?

"Both products are excellent insulating materials," said Bruce Snead, Extension specialist in residential energy at K-State.

Each can be effectively installed in attics. Cellulose is easier to install in attics, and it is lower in cost.

"It also has a higher R-value per inch thickness, and it is more effective in reducing air leakage," Snead said.

Fiberglass, however, is less subject to settling.

"Fiber glass is much easier to work with in

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cathedral ceiling construction and in new wall construction," he said.

12. How can I insulate my floored attic?

"You may use one of several approaches to insulate your floored attic," said Gene Meyer, Extension specialist in small business energy at K-State.

"One of the simplest methods is to drill holes in the flooring and then blow cellulose, mineral wool or fiberglass into the opening."

This method is like blowing insulation into walls. "You can use holes as small as one inch in diameter, but larger holes provide better coverage," Meyer said. "For each joist cavity, drill at least three holes. Holes should be located at both ends of a joist cavity and in the middle."

Another approach involves opening the center section of the floor and then using an insulation blowing tube. This tube is inserted through the floor opening between the ceiling joists (attic floor joists).

"The tube should be long enough to reach the far end of the joist cavity," Meyer said. "Blow insulation through the tube to fill the far end of the cavity. When insulation stops flowing, withdraw the tube about 18 inches." Flow will resume as the tube is withdrawn. Continue the process until the entire cavity is filled.

The blowing tube is typically a two-inch diameter, clear vinyl tube that is attached to the insulation blower's regular tube.

13. What is a home energy rating and who provides this service?

A home energy rating is simply a measurement of how efficient your home is at using energy. Home energy ratings involve an inspection of your home by trained energy professionals referred to as home energy raters. A home energy rating assigns your home a numerical score between 1 and 100 with 100 being the highest (most efficient) rating and, depending upon the home's score, provides certain suggestions regarding cost-effective improvements that could be made to the home to improve its overall energy efficiency, said Richard Nelson, Extension specialist in energy at K-State.

When evaluating a home for its overall energy efficiency, raters consider insulation levels, air leakage into the home, window efficiency, heating and cooling system performance, orientation of the home with respect to the sun and water heating. Home energy ratings usually cost between $100 and $300, Nelson said.

For more information concerning qualified home energy raters in Kansas, contact either the Energy Programs Division of the Kansas Corporation Commission in Topeka or Energy Extension Services at Kansas State University.

SPACE HEATING

14. I recently replaced my old furnace with a new high-efficiency furnace. It seems as if my new furnace runs a lot more than my old one did. Is it really saving me energy?

"In all likelihood, your new furnace has a smaller capacity than your old furnace," said Doug Walter, president of Kansas Building Science Institute, Manhattan.

"Furnace sizing procedures have changed considerably in the last few years," Walter said. "It's not uncommon to find older furnaces oversized by 50 to 100 percent."

Today, furnaces are oversized by no more than 15 to 30 percent.

"A smaller furnace capacity means the furnace will run more of the time to provide the same amount of heating a larger furnace provides," he said. "But because the fuel input is less, the smaller furnace uses no more energy than the larger furnace."

Because your new furnace is a high-efficiency model, it will save you energy by sending less heat up the chimney, even though it runs more.

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15. How much will I save on my heating costs if I replace my furnace with a new, high-efficiency furnace?

A new high-efficiency furnace will have an efficiency of about 95 percent, said Gene Meyer, Extension mechanical engineer.

The amount you will save will depend on how efficient your existing furnace is and how much you spend on heating. If your unit is over ten years old, it is difficult to estimate the efficiency of furnaces without an on-site inspection, Meyer said.

However, there are some clues as to the efficiency, he said.

"First, look at the flue. If it is made of plastic (PVC) pipe, it is already a high-efficiency furnace. Low flue-gas temperatures in high-efficiency furnaces (also known as condensing furnaces) allow for the use of PVC flues," Meyer said. "If the flue is metal, and the unit is more than 20 years old, it probably is about 65 percent efficient or less and you can expect to save about 30 percent if you upgrade to a high-efficiency furnace. If the existing furnace is between 10 and 20 years old, its efficiency is around 75 percent and you will save about 20 percent. If the unit was built after 1990, it will have a minimum efficiency of 78 percent and you will save about 18 percent."

To estimate how much of your heating costs you can save, total your gas bill for a year. Subtract 12 times your July gas bill to remove the amount you spend on water heating. What is left is the amount you spend on heating. Multiply the existing heating costs by the percentage savings possible from above to estimate your savings, he said.

16. Can I modify my furnace to obtain the efficiencies of some of the high-efficiency furnaces?

"No, you cannot simply modify or adjust your furnace to make it a high-efficiency or condensing furnace," said Gene Meyer, Extension mechanical engineer at K-State.

The design of the heat exchanger and the materials of which it is constructed are not intended for this application.

A high-efficiency furnace removes enough heat from the flue gas to cause the flue gas temperature to drop below the dew point. This type of furnace, often referred to as a condensing furnace, will have efficiencies greater than 88 percent.

17. What is a ground-coupled heat pump?

"A ground-coupled, or earth-coupled, heat pump uses the earth as a heat source for winter heating and as a heat sink for summer cooling," said Doug Walter, president of Kansas Building Science Institute in Manhattan, Kan.

The advantage of earth coupling is the improved operating efficiency of the heat pump.

Because the earth maintains a fairly stable temperature of 55 to 65 degrees at about six feet below the surface, the ground-coupled heat pump can extract heat from the soil, which is warmer than typical winter air temperatures, even though the soil temperature will continue to drop through the winter.

"In the summer, the earth provides a much more effective heat sink than hot air," Walter said.

Ground coupling is usually achieved by circulating water through a coil of piping buried in the earth. Or, if the water level is high enough, by pumping water out of a well, through the heat pump, and then back into another well, according to Walter.

18. Several new furnaces I've looked at have "power venting." What is this and why is it needed?

"High-efficiency furnaces cannot rely on natural draft to exhaust flue gases because too much

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heat is removed from the gases," said Doug Walter, president of Kansas Building Science Institute in Manhattan, Kan.

For that reason, a power-driven fan is used to force the gases out of the furnace and into the chimney.

Two methods are used: An induced-draft model draws the gases out of the combustion chamber and forces them through the flue. A forced draft model blows a mixture of fuel and air into the combustion chamber, which forces the combustion gases out.

"Power drafting not only aids flue gas removal in high-efficiency furnaces, but also helps to improve the efficiency of the furnace," Walter said.

Excess air for combustion can be reduced from that allowed for natural draft furnaces because the air flow rate is guaranteed by the fan. This improves combustion efficiency.

The fan blades also restrict heat flow through the chimney when the furnace is not operating, acting much like a flue damper.

19. What is the proper humidity level to maintain in a home in the winter?

No single humidity level is proper, but a range from 30 to 50 percent usually is adequate for comfort and health requirements, said Doug Walter, president of Kansas Building Science Institute in Manhattan, Kan.

When the outdoor temperature drops, however, you may have to reduce the humidity to as low as 20 percent to avoid moisture problems.

Maintaining a high indoor humidity during cold weather can cause hidden moisture problems in walls and ceilings as well as surface moisture on cold surfaces, which can promote the growth of mold and lead to wood decay.

Because windows are typically the coldest surfaces on a home's exterior, they are a good indicator of proper humidity levels.

"If the windows fog over lightly during the night and dry completely by midmorning, the humidity is probably adequate but not too high," Walter said. "If windows condense enough moisture to collect on the sill, the humidity level is probably too high."

20. I've seen and heard a lot of advertising about home heating equipment. Some ads imply gas furnaces are best, while others claim heat pumps are more efficient. Does "efficient" mean less costly to operate? Please explain the claims.

A more efficient appliance is not necessarily cheaper to operate although advertising copy often implies that it is.

"The efficiency of a gas furnace is the fraction of the available energy in the gas delivered to the home that is converted to heat," said Gene Meyer, Extension specialist in small business energy.

Some of the heat generated when the gas is burned goes up the chimney, but most of the heat is delivered to the house, Meyer said.

New gas furnaces typically have efficiencies in the range of 78 to 95 percent. That is, 78 to 95 percent of the energy that could be extracted from the gas is actually delivered to the house as heat.

"A heat pump can deliver more energy to the house as heat than it uses. The heat pump doesn't create energy. It simply transports energy from a source, such as outside air, and delivers it to the house."

Heat pumps are not rated by efficiency. They are rated by heating season performance factor (HSPF) or the coefficient of performance (COP). "The ratio of energy delivered to the energy consumed is called the coefficient of performance or COP, he said. The COP of an air-source heat pump changes as the weather changes, but on the average, an air-source heat pump delivers about 1.8 to 2.2 times as much energy to the house as it consumes", he said.

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The HSPF is also a ratio of energy delivered to energy consumed. However, the units of energy are Btu delivered and the units for energy consumed are kilowatt-hours (kWh).

"At the point of use, the heat pump is more efficient than the gas furnace," he said.

So how can a heat pump more efficient than a gas furnace and still cost more to operate?

"The two units are receiving their energy in different forms and at different costs," Meyer said.

"With a natural gas price of $7 per 1,000 cubic feet, a dollar's worth of natural gas has a heating value of about 143,000 Btu," he said. "That is, if you could extract all available energy from a dollar's worth of natural gas, you would have about 143,000 Btu. A typical new furnace at 80 percent efficiency can supply 115,000 Btu for each dollar spent on fuel."

Most heat pumps operate on electricity. Using 7 cents per kWh for the electric rate, a dollar's worth of electricity has a heat content of approximately 48,750 Btu, he said. A typical heat pump, delivering twice as much energy as it consumes, delivers about 97,500 Btu for each dollar spent on electricity.

Situations exist where a heat pump may be the best choice. For example, a heat pump is certainly preferable to electric-resistance heating, Meyer said. Some utility companies offer lower rates for electricity used for heating. These rates can make the heat pumps less expensive to operate.

Wood stoves are another example of how more efficient appliances are not necessarily cheaper to run, Meyer said. For example, many Kansans save on their heating bills by using wood stoves.

"A wood stove's efficiency may be as low as 30 percent, compared with 78 to 95 percent for a gas furnace. A wood stove, however, may be cheaper to operate if you have an inexpensive source of wood," Meyer said.

WATER HEATING

21. How much could I save by turning down or shutting off my water heater at night when everybody is asleep?

"Regardless of the type of water heater you have, the savings will be between $1 and $3.50 a year," said Gene Meyer, Extension specialist in small business energy at K-State.

The exact savings you could expect depend on the type of water heater and the fuel you use.

Unless the device that shuts off or turns down your water heater is inexpensive, shutting off the water heater will not be cost-effective.

"If, however, you will be away from home for an extended period, such as a weekend or vacation, the savings will be more significant," Meyer said.

A more effective approach to saving money and energy on hot water is to insulate your water heater with a 3½-inch thickness of fiberglass insulation.

"You can also buy water heater tank insulation kits that make insulating your water heater a little simpler," Meyer said.

22. How can I reduce my water heating costs?

There are several simple things that can be done to decrease the amount of energy you use to heat water in your home, said Richard Nelson, Extension specialist in energy at K-State.

Water heaters consume about 20 percent of the energy an average home uses, with more than one-third used in showering and 25 percent to wash clothes. Implementing certain energy-efficient measures, even small ones, can make a noticeable difference in your heating bill, Nelson said.

For example, make sure the water heater temperature is set to about 120 degrees and definitely no more than 130 degrees. In general, a

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10-degree reduction in water temperature has been shown to provide an 8 percent water-heating energy savings.

Another important and effective energy saving measure is to wrap the water storage tank with an R-12 insulation blanket, especially if the water heater is an older model. Consult the manufacturer's equipment guide to make sure an insulation wrap is recommended; it may not be on some newer models. Also, insulate all exposed hot water pipes with either foam or fiberglass wrap, Nelson said.

Finally, installing low-flow showerheads has been shown to save not only money in reduced water usage, but also saves energy as well.

These energy saving tips cost very little, but have the potential to not only lower the amount of energy used to heat water in your home, but also can save you money as well, Nelson said,

23. My water heater is 12 years old and I am considering replacing it. What should I look for when buying a new one?

In general, about 20 percent of the energy consumed by an average home is for water heating, said Richard Nelson, Extension specialist in energy at K-State.

Water heaters have improved significantly in the last 12 years and are much more energy efficient primarily due to more efficient combustion for gas models and added insulation. Because the average life expectancy of a water heater is about 13 years, it its important to consider purchasing one that is energy efficient since energy-efficient models mean reduced energy consumption, which results in lower energy costs, Nelson said.

Most water heaters and other home appliances come with a large yellow sticker called the ENERGYGUIDE. This sticker compares average yearly energy operating costs for different models and lets you see which ones are expected to cost the least over their lifetimes. Also, most water heaters come with an "Energy Factor" (EF) value, which is listed on a separate tag beside the ENERGYGUIDE. The EF is a decimal value between 0.4 and 1.0 and is the amount of energy supplied to the heated water divided by the water heater's total energy consumption. Gas water heaters have EF values between 0.5 and 0.7 while electric ones range from 0.75 to 0.95. Minimum EF values range from 0.51 to 0.56 for gas units, depending upon the size of storage rank, to an average of 0.89 for electric ones. Recommended EF values are 0.61 for gas units and 0.92 for electric water heaters, Nelson said.

All type of water heating units with higher EF values generally cost more initially, but because of the higher EF value, they will more than make up for this higher initial cost in yearly energy savings throughout the lifetime of the water heater, Nelson said.

24. High-efficiency gas furnaces are now widely available. Have there been any similar improvements in the efficiency of gas water heaters?

"To date, improvements in the efficiency of gas water heaters have been relatively minor," said Doug Walter, president of Kansas Building Science Institute in Manhattan, Kan.

About one-fourth of all the energy consumed by a gas water heater is lost through the surface of the tank and up the flue while the water heater is in its standby mode. These are called tank losses or standby losses.

Another one-fourth is lost up the flue while the water is being heated. These are called heat transfer losses. The remaining one-half is the energy that actually ends up heating the water.

"Most improvements in water heaters have been designed to reduce standby losses," Walter said.

These improvements include more and better quality tank insulation, thermosiphon traps to prevent hot water from thermosiphoning through

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the water heater, and flue dampers.

"Some heat transfer efficiency improvements also have been made by surrounding the combustion chamber with water on all sides, improving baffle design, and providing sealed combustion," Walter said.

The best of these water heaters operates at an average efficiency of slightly more than 60 percent, compared with an average efficiency of 50 to 55 percent for a standard, new water heater.

"You can eliminate standby losses entirely by using a tankless water heater," Walter said.

A tankless water heater has no storage. Instead, it heats the water instantaneously as it flows through the heat exchanger.

"These units can heat only a limited flow of water. But within the designed flow rate, they have unlimited capacity," Walter said. "Their average efficiency is equal to their heat transfer efficiency of about 75 percent."

Several manufacturers now offer high-efficiency models of storage water heaters. These units are 90 percent efficient, in effect making them condensing units.

"Any time the efficiency is this high, the flue gases are condensed," Walter said. "This requires the use of corrosive-resistant materials, such as stainless steel, which substantially boosts the cost."

The large, water-heating capacity of these units suggests they are intended for space heating as well as domestic water heating.

Additional Resources

WEB-BASED RESOURCES

The Energy Link Library at K-State has 15 home energy use topic pages where additional resources are listed for each topic.
http://www.oznet.ksu.edu/dp_nrgy/ees/

GENERAL INFORMATION

Engineering Extension Service at K-State
800-KSU-8898
www.oznet.ksu.edu/dp_nrgy/ees

National Association of Home Builders
800-368-5242
www.nahb.com

U.S. DOE Energy Efficiency and Renewable Energy Clearinghouse
800-363-3732
www.eren.doe.gov

U.S. DOE Building Standards and Guidelines Program
www.energycodes.org

Kansas City Metropolitan Energy Center
816-531-7283
www.kcenergy.org

Energy Star*
888-782-7937
www.energystar.gov

HEATING AND COOLING EQUIPMENT AND HOME APPLIANCES

Air-Conditioning and Refrigeration Institute
703-524-8800
www.ari.org

Gas Appliance Manufacturers Association
703-525-9565
www.gamanet.org

Association of Home Appliance Manufacturers (AHAM)
202-872-5955
www.aham.org

INSULATION

Cellulose Insulation Manufacturers Association (CIMA)
937-222-2462
www.cellulose.org

North American Insulation Manufacturers Association (NAIMA)
703-684-0084
www.naima.org

Polyisocyanurate Insulation Manufacturers Association (PIMA)
202-624-2709
www.pima.org

WINDOWS

National Fenestration Rating Council (NFRC)
301-589-6372
www.nfrc.org

National Wood Window and Door Association (NWWDA)
800-223-2301
www.nwwda.org

SOLAR ENERGY

American Solar Energy Society (ASES)
303-443-3130
www.ases.org

Florida Solar Energy Center (FSEC)
407-638-1000
www.fsec.ucf.edu

Solar Energy Industries Association (SEIA)
202-383-2600
www.seia.org <http://www.seia.org/>