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Low Cost Energy Saving Tips

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How does energy move?
1) CONDUCTION

- Heat moves through a substance. For example, a metal container holding a hot beverage will conduct heat to your hand quickly. You need a hot pad with a hot cast iron frying pan but not with a frying pan that has a handle that is wooden.

- REMEDY for conduction -- INSULATION

How does energy move?
2) CONVECTION

- When a fluid is heated by a hot surface, it expands. It rises and cooler fluid takes its place. Similarly, as a fluid gets cold, it contracts and sinks. This rising and sinking creates "convection currents." This is why a window may feel drafty, even though it is well-sealed.

- REMEDY – IMPEDE AIR FLOW

How does energy move?
3) RADIATION

- A hot object radiates energy to a cooler object, e.g., the sun radiates energy to the earth. The amount of energy radiated or absorbed depends on the characteristics of the surface of the radiating and absorbing bodies, as well as the difference in their temperatures. A thin coating of a reflective radiation barrier vs. a dark heat-absorbing substance can change the amount of energy gained or lost by a factor of 10.

- REMEDY – COATINGS AND FILMS

More about Radiation

- The night sky receives radiation from roofs and through windows, loosing building heat. The sun provides energy to these same surfaces during the day. Reflective surfaces reduce heat gains and losses.

- The surface properties vary with the wavelengths being emitted or absorbed. White reflects all visible wavelengths, but many white surfaces are ineffective for ultraviolet or infrared wavelengths. When painting your roof white, it is best to use a “highly reflective” paint such as ceramic-based paint.

Greenhouse Effect

- Windows allow visible and UV (high energy wavelengths) through but do not let lower energy wavelengths (infrared) through. Thus, energy comes in, heats a space, and cannot get out. The greenhouse effect makes solar thermal systems (hot air, hot water) very efficient.

Ways to Retard Energy Movement

- Insulation – fiberglass, foam, blown cellulose, wool, wood
- Sealed gaps, usually air
- Reflective coatings, strategically placed (roof coatings, roof-underside coatings, window treatments)
- Combinations (e.g., aluminum-clad foam insulation, storm windows with reflective films)

Enhancing Performance by Making Energy Move or Keeping it Focused

- Condition air only where it is needed (mini-splits)
- Radiate heat to where it is needed (heat the people, not the room – radiant heaters)
- Use fans to improve personal comfort or to enhance ventilation. Point the fans at people or put them in windows to draw or exhaust fresh air

Things to Keep in Mind When Conserving Energy

- Carbon monoxide can build up if a building is too well sealed.
- Mold can grow when a building is too well-sealed.
- Some “solutions” cause new problems. For example, electric instantaneous water heaters improve efficiency a bit, but they draw current during peak periods and cause brown-outs and premature failure of motors and electronics.

Another Consideration -- Water

- For its weight, water is the best substance for holding heat. Therefore, conserving hot water is one of the best ways to conserve energy.
- Heat recovery from draining water is the most cost-effective way to preheat fresh water.
- Solar hot water is the most efficient use of the sun's energy.
- Heat pump water heaters for spaces with year-round dehumidification needs put "waste" heat generated by dehumidification to use as "domestic hot water."

More on Water -- Evaporation

- For its weight, the evaporation of water is the best way to dissipate heat. Large refrigeration systems are based on the evaporation of water. Evaporation is why fans feel so good. Evaporations is why dogs pant so much in the summer.
- Dehumidification is important for comfort because personal evaporation is enhanced. Dehumidification is also important in preventing mold growth.

"Embedded Energy"

- It takes energy to process, package, and transport things. Furthermore, the products may have detrimental effects other than through energy use.
- One area for reducing environmental and energy impacts is cleaning products.
- Plastic bottles and disposable paper products are also a significant burden on the environment.

The Most Versatile, Low Impact Cleaning Products

- White vinegar (distilled from fermented food) in water
- Murphy Oil Soap (wood, especially floors)
- Borax (surfactant, removes mold, deters insects)White distilled vinegar (made from grain, not petroleum)
- Baking soda (mildly abrasive, and with vinegar, it fizzes)
- Castile soap (low impact, use as directed)
- Bon Ami (low impact, use as directed)

Websites for “Green” Cleaning Products

- www.growingagreenfamily.com
- www.all-recycling-facts.com
- www.cleaninggreenonline.com
- www.lesstoxicguide.com
- www.ewg.org
- www.squeakygreencleaning.com

Around the House Examples

- 1) Wash windows with vinegar and water (newspaper leaves no lint)
- 2) Put vinegar into dishwasher and washing machine rinse cycle to reduce mineral build-up.
- 3) Wipe grease off (warm) oven with vinegar or Murphy Oil Soap.
- 4) Clean faucets with vinegar.
- 5) Soak showerhead 1 hr. with vinegar to remove calcium build-up.
- 6) Remove soap scum with heated vinegar, Murphy's or Borax, but switch to Castile soap which leaves no soap scum.
- 7) Remove mold under kitchen sink and in shower with vinegar and Borax.
- 8) Clean floors with vinegar, Murphy's and Borax combo (Borax also deters insects and prevents mold).
- 9) Unclog drains: ½ cup baking soda, chase with cup vinegar, after fizzing stops pour in cup water
- 10) Use baking soda on toilets.
- 11) Dusting oil: add drops of olive oil to vinegar
- 12) Garbage disposal: clean, deodorize and sharpen blades with ice cubes and lemon peels

Cleaning Improves Performance

- Dryer vents
- Refrigerator coils
- Air filters
- Fuel injection systems and carburetors for vehicles

Tips: Odds and ends

- Junk mail – go to www.dmachoice.org to stop most junk mail
- Thermostat – each energy-saving degree avoids about 1,000 pounds/year of carbon dioxide emissions for a typical household
- PVC wrapping – substitute unbleached waxed paper and re-used plastic containers
- Buy goods with recycled content
- Use your recycling bin, but use it properly (It takes energy to remove garbage from recyclables).
- Line dry your clothes. They will last much longer.

Lesser-known Weatherization Tips

- Seal ductwork around registers
- Use plastic bags to fill large or small gaps
- Seal fireplaces that are not used – you may have an updraft rather than a downdraft
- Put radiant barriers and insulation between radiators and outside walls

Window Treatments

- Light reflecting or light absorbing mesh, films/coatings, blinds, drapes
- Seal gaps (caulk, clay rope, plastic bags)
- Add insulating layers (plastic film, honeycomb blinds, drapes)
- Reduce convection currents with valences

In the Kitchen

- Conserve hot water.
- Buy local foods (embedded energy).
- Boil no more water than you need.
- Make solar tea instead of boiling water.
- Use covers and a low heat setting/flame to reduce evaporation.

Reduce “food miles”

The physical and environmental costs of food transportation (fuel, emissions, damage to infrastructure, accidents, etc) are devastating.

- How many **food miles** do you rack up in your cart each trip to the grocery store? Do you take notice? What can you do about it?
- **Buy local and organic food.** DC has many local food sourcing options including local/seasonal farmers markets, food co-ops, and CSAs (Community Sponsored Agriculture) that offer food shares for up to 10 months out of the year and deliver!

Reduce use of plastic containers

- Use refillable plastic bottles and containers.

In the US 18M barrels of oil are used to make 2M tons of plastic water bottles.

Hot water heaters

- Insulate pipes coming out of the hot water heater
- Insulate the tank
- Lower the thermostat setting to the lowest that meets your needs.

Reduce Phantom Loads

- Unplug unused or seldom used items
- Plug related items to a power strip and turn it off when not in use
- Turn computers off or use sleep or hibernate modes; turn off monitor when not in use; use laptops or energy star computers

Improve Efficiency of Radiators

- Keep paint to a minimum because paint insulates. If you apply paint thinly with a rag, you can get interesting aesthetic effects.
- Put reflective (e.g., aluminum) and insulating (e.g., foam, cardboard, wood) materials between the radiator and the wall to reduce heat loss through the wall.
- Use ceiling fans on a low setting to avoid hot air accumulation at the ceiling level.

Lighting

- Use mirrors to reflect daylight to where you want it.
- Use UV filters in windows to protect furnishings instead of closing curtains or blinds
- Use CFL's for lights that stay on a lot but avoid them for short uses and reading lamps. Dispose of them as hazardous waste. LEDs are the most efficient and best overall for the environment. Use them as much as you can.

What about Paper?

- The paper industry in the US is the 4th largest contributor to CO2 emissions. Rotting paper products constitute 25% of trash in our landfills and creates methane gas, which is 23 times more toxic than CO2.
- Use recycled paper products which use 44% less energy, 38% less CO2, 50% less water waste, 49% less solid waste and save trees. For example, if each US household used recycled toilet paper 423,900 trees would be saved annually.

Ways to Reduce Paper Impacts

- Stop junk mail: 5 months of your life is spent in dealing with junk mail! $320M is spent annually in local tax money to dispose of junk mail. 4 tons of junk mail = 100M trees and 28B gal of H2O.
- Avoid disposal paper (napkins, towels).
- Get bills, pay bills, read the news online.
- Buy paper with recycled content.
- See www.carbonrally.com.