LICBDC's Guide to Going Green

LIC GREEN

Chapter 2:
Upgrading and Maintaining Your Facility

1. Making your building more energy efficient

Start by hiring a contractor to assess your equipment and systems. The contractor may recommend equipment get a tune up, or be upgraded with newer and more efficient models that will pay for themselves through lower energy bills. This process is sometimes called retrofitting.[1] This section of the guide helps building owners and operators through the retrofitting process.

Hire a Professional

Funding from NYSERDA can pay for 50% of the retrofitting. If you use pre-approved consultants, they are paid by NYSERDA. Consultants that are not pre-approved will be paid after the study has been approved ***and*** completed. Be sure to apply for funding prior to conducting the assessment. Please see the additional resources in this chapter for tips on hiring the right professional, and for online funding applications.

http://www.nyserda.org/programs/Technical_Assistance/ReferralForm.asp
http://www.nyserda.org/Funding/1197PON.pdf

The strategy for any retrofitting should include checking, tuning up, and upgrading the following:

- Lighting
- Building envelope
- Controls
- Heating and cooling systems [2]

Lighting

Dirty light bulbs reduce light quality by more than 10%. Imagine the savings on your next energy bill by simply cleaning your bulbs! If you have occupancy sensors, calibrating them can reduce energy use by 50% or more.[3] See the Lighting section of this guide for more details.

Things to consider about lighting:

- Is a scheduled lighting maintenance policy in place?
- Are spaces provided with the proper light levels?
- Have all automatic controls been calibrated? [4]

Building Envelope

The building envelope, or shell, separates the interior and exterior of the building. It includes the foundation, roof, walls, and doors and windows.

A building assessment can address air leaks through the building envelope, which can cause discomfort and increase heating and cooling costs. The strategy is simple: locate all leaks, and seal them. [5] Basic efforts, such as applying weather stripping on doors, and sealing and caulking windows are very safe. More advanced efforts to make a building nearly airtight can cause damage if done incorrectly, and require professional services. Questions to discuss with your contractor during your assessment:

- Are any areas particularly drafty?
- Are any areas routinely serviced?
- Do the windows and doors close and seal properly?
- Are the windows and door frames adequately caulked?
- Is weather stripping installed on windows and doorways?
- Is there any wet or deteriorating insulation that needs to be replaced?

Controls

Tuning up the controls of your commercial building's HVAC system can save up to 30% on annual heating and cooling costs.[6] Review building operating schedules so that HVAC systems heat and cool the building properly during work hours and reflect Daylight Savings Time. To save energy, set the temperature back when the building is unoccupied.[7]

Questions to ask the contractor before tuning up HVAC system controls:

- Are temperature and humidity sensors calibrated and operating properly?
- Are damper and valve controls functioning properly?
- Are there any leaks in the pneumatic control systems?
- Do equipment schedules reflect occupancy and seasonal changes?
- Can any equipment be scheduled to operate during utility off-peak hours?
- Can temperatures be set back during unoccupied times? [8]

Heating and Cooling Systems

After making sure your heating and cooling systems are properly cleaned, have your contractor properly tune up the heating and cooling systems to maximize efficiency. [9] Ask them to check the chiller water temperature, and to clean all chiller tube surfaces.

The boiler is the heart of the heating system. Its air intake should be correctly set. Steam traps which remove air and condensation from the system should be checked frequently for leaks. All boiler surfaces should be regularly cleaned.

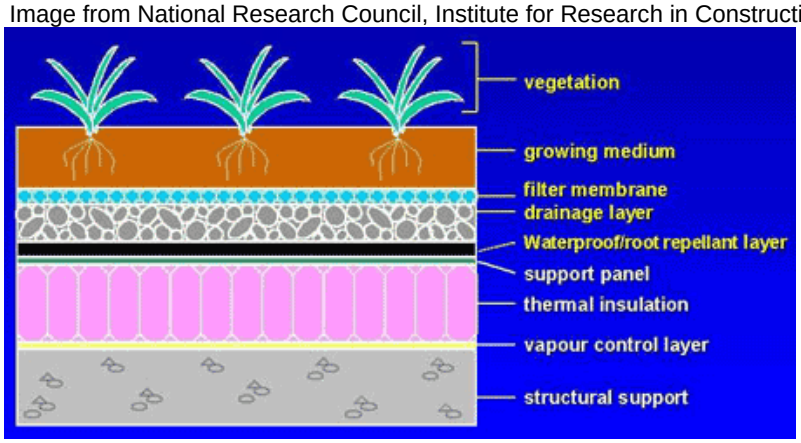
2. Building Envelope

As explained above, the building envelope includes the foundation, roof, walls, and doors and windows. This section discusses energy efficient building envelope renovations including green roofs, cool roofs, energy efficient windows, and insulation.

Green Roofs

Green roofs can be installed upon industrial, commercial, office and residential buildings.

Image from National Research Council, Institute for Research in Construction



Benefits

- Extending rooftop lifespan. Green roofs can last 2 to 3 times as long as typical roofs because they protect underlying roof structures from the stress of overheating. On a 90 degree day, a green roof is about 80 degrees while a black roof is 175 degrees.
- Improving air quality and reducing the urban heat island effect. Normal black roof surfaces absorb and generate heat, which contribute to making New York City 5-7 degrees warmer than surrounding areas.
- Managing stormwater. Green roofs hold rainwater, potentially lessening the burden on city drainage systems after storms, and reducing flooding. [10]

Types of Green Roofs

Intensive green roofs have a deep base of soil of a foot or more. They require more structural support and can sustain a wide range of plant species. They are less common than extensive roofs because they require more maintenance, and are more costly. [11]

Extensive roofs are much shallower, typically only 2 to 4 inches deep, and are easier to install and maintain.[12]

Cost and Credits

Green roofs can cost approximately $8-15 per square foot, depending on the

Intensive and Extensive Green Roofs

Characteristic	Intensive Green Roof	Extensive Green Roof
Soil	Requires minimum of one foot of soil depth	Requires only 1 to 5 inches of soil depth
Vegetation	Accommodates large trees, shrubs, and well-maintained gardens	Capable of including many kinds of vegetative ground cover and grasses
Load	Adds 80-150 pounds per square foot of load to building structure	Adds only 12-50 pounds per square foot depending on soil characteristics and the type of substrate
Access	Regular access accomodated and encouraged	Usually not designed for public accessibility
Maintenance	Significant maintenance required	Annual maintenance walks should be performed until plants fill in
Drainage	Includes complex irrigation and drainage systems	Irrigation and drainage systems are simple

Source: Schloz-Barth, Katrin. 2001. "Green Roofs: Stormwater Management From the Top Down." Environmental Design & Construction. January 15.

project size.[13] But with energy savings and reduced roof replacement, green roofs can pay for themselves over time. There are also many tax credits available for green roofs.

Building owners in New York City who install green rooftops receive a significant tax credit. With the passage of Assembly bill A.11226 building owners who install green roofs on at least 50% of available rooftop space can apply for a one-year property tax credit of up to $100,000. The credit would be equal to $4.50 per square foot of roof area that is planted with vegetation, or approximately 25% of the typical costs associated with the materials, labor, installation and design of the green roof.[14] Green roofs also qualify for a federal tax credit under the Energy Policy Act of 2005.

In 2005, Silvercup Studios installed 35,000 square feet of extensive green roof units on top of its Long Island City facility. Currently, it is the largest green roof in New York City.[15] The project grew out of a Balmori Associates study that targeted Long Island City, with its many flat-topped industrial buildings, as a promising green roof development site.[16] With the help of LICBDC and other green-roof advocates, a $500,000 grant was secured from Clean Air Communities, a non-profit agency working to develop strategies to reduce air pollution and increase energy efficiency in low-income areas of New York City.[17, 18]

Use the Green Roof Savings Calculator to determine the cost of your green roof project compared to conventional roofing systems and adapt it to multiple scenarios. www.greenroofs.org

Where to start

Visit Sustainable South Bronx at www.ssbx.org, Alive Structures at http://www.alivestructures.com/ or http://www.greenroofs.org/ for more information.

Cool Roofs

Normal dark roofs absorb heat reaching summertime temperatures of 150 to 190°F.[19] Most cool roofs, because they are either white or have highly reflective surfaces, never reach 120°F even in the summer.[20] Cool roofs will literally cool your building and reduce your air conditioning bill. While not offering the stormwater reduction benefits of green roofs, cool roofs cost much less and are easier to maintain. There are many types of cool roof materials. http://www.epa.gov/heatisland/mitigation/index.htm

Costs and Credits

In New York City a cool roof may save your company approximately $17 per 1,000 sq. ft. of roofing area in air conditioning expenses each year (if not more because of rising electricity charges).[21] Cool roofs can last 10 to 20 years, cost $0.75 to $1.50 per square foot (compared to the traditional roofing cost of $1.25 per square foot and the cost of a green roof of $15 per square foot), and can pay for themselves over time through energy savings. Cool roofs can also qualify for many of the same tax credits as green roofs under the Energy Policy Act of 2005 and for reduced loans from NYSERDA.

Where to Start

Beside the EPA resources, check out the cool roof calculator from the Department of Energy. http://www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm

Windows

To reduce energy costs, invest in high performance *Energy Star* windows or follow some of these tips from the Department of Energy.

Cold Climate Window Tips[22]

- Repair and weatherize your current windows. Use a heavy duty, clear plastic sheet on a frame or tape clear plastic film to the inside of your window frames during the winter months. The plastic must be sealed tightly to the frame to reduce air infiltration.
- Install tight fitting, insulating window shades on drafty windows.
- Close blinds at night and open them during the day.
- Keep windows on the south side of your building clean to let in the winter sun.
- Install exterior or interior storm windows, which can reduce heat loss by 25% to 50%. Storm windows should have weather stripping on all moveable joints.

Warm Climate Window Tips

- Install white blinds to reflect heat away from the building.
- Close curtains on south and west facing windows during the day.
- Install awnings on south and west facing windows.
- Apply sun-control or other reflective films on south-facing windows to reduce solar gain.

Insulation

Your contractor should check the insulation of your building. Older buildings may lack insulation, sharply lowering a building's energy efficiency. Insulation can decrease your energy bills by up to 30%. [23] Insulation's effectiveness is measured by its R-value – the resistance to heat flow. The higher the R-value, the more effective it is. See: http://www.eere.energy.gov/consumer/your_home/insulation_airsealing/index.cfm/mytopic=11510

3. Heating, Ventilating, and Air Conditioning

Heating, ventilating, and air conditioning (HVAC) account for 40 to 60% of the energy used in buildings. Improving HVAC systems can cut energy costs and promote a healthier environment for employees. This section of the guide and the *Additional Resources* section at the end of the chapter help facility owners select the best HVAC equipment to upgrade their system.

Energy Star tells you when it's time:

- Your heat pump or air conditioner is more than 10 years old.
- Your furnace or boiler is more than 15 years old.
- Your equipment needs frequent repairs and your energy bills are going up.
- Some rooms in your building are too hot or too cold.
- Your building has humidity problems.
- Your facility has excessive dust.
- Your heating or cooling system is noisy.

Heating

A space is heated directly through radiation of heat or indirectly through heating air or water that is circulated through the space.

Heating technologies include:

- Combined heat and power
- Heat pumps
- Geothermal heat
- Solar heat
- Furnaces and boilers
- Radiant floor heat

Combined Heat and Power (CHP)

Combined heat and power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source. By installing a CHP system designed to meet the thermal and electrical base loads of a facility, CHP can greatly increase the facility's operational efficiency and decrease energy costs.[24]

The EPA report about Combined Heating and Power (CHP) can be accessed at:
http://www.epa.gov/chp/documents/catalog_of_%20chp_tech_entire.pdf

To determine if CHP is a good match for your company's facility, go to:
http://www.epa.gov/chp/project-development/index.html

Heat Pumps

Heat pumps move heat from outside to inside buildings or vice versa. There are two types of heat pumps. They are air-source heat pumps and ground-source heat pumps.

Geothermal Heating

Geothermal systems use a loop of underground water piping to transfer heat from the earth below, where it's cooler, to your building. According to the EPA, geothermal heat pumps can reduce energy consumption—and corresponding emissions—up to 44% compared to air-source heat pumps and up to 72% compared to electric resistance heating with standard air-conditioning equipment.

Solar Heating

Solar photovoltaic panels turn sunlight into electricity. To be effective, they require excellent access to sunlight. Solar thermal systems are another form of solar energy that is less

expensive and suitable for roofs with only moderate access to sunlight. They use either air or liquid to capture the sun's heat. These solar energy systems are used by over 1.5 million homes and businesses in the U.S. Commercial systems, which range from $30 to $80 per square foot of collector area, typically come with warranties of 10 years or more, and should easily last decades longer.

Boilers

A boiler is a vessel or tank in which heat from fuel combustion generates hot water or steam. Buildings have their own boilers or have steam or hot water piped in from a central plant.

Radiant Floor Heat

There are three types of radiant floor heat: radiant air floors; electric radiant floors; and hot water radiant floors. Fuel savings of 15% to 20% over forced air systems are possible.

Electric radiant floors will become more cost effective if time-of-use rates are available. Time-of-use rates allow you to charge the concrete floor with heat during off-peak hours. If the floor's thermal mass is large enough the heat stored in it will keep the building comfortable for eight to ten hours without any further electrical input. This saves a considerable number of energy dollars compared to heating at peak electric rates during the day.

Cooling

Cooling technologies for buildings include absorption cooling, chillers, and dessicant dehumidification:

Absorption Cooling

Absorption cooling is most frequently used to air condition large commercial buildings. This method may make sense when electric rates are high. Consider it when an old electric chiller is due for replacement.

Chillers

Chillers produce chilled water to cool air distributed throughout the building by pipes. In large facilities the equipment used to produce chilled water for HVAC systems can account for up to 35% of a facility's electricity use. Consider chiller replacement when existing equipment is more than ten years old.

Dessicant Dehumidification (Drying the air)

Dessicant dehumidification systems remove moisture from outdoor ventilation air while allowing conventional air conditioning systems to deal primarily with temperature control. They also recover energy from conditioned air that is normally exhausted from buildings, thus cutting costs. Moreover, better control of humidity prevents moisture, mildew, and rot damage to building materials.

NYSERDA Incentives for HVAC Upgrades

Many HVAC upgrades are pre-qualified for funding by NYSERDA.
http://www.nyserda.org/programs/Existing_Facilities/pdfs/PQ%20HVAC.pdf

Please visit http://www.nyserda.org/programs/hvac/analyze.asp for more information.

Finding a Contractor

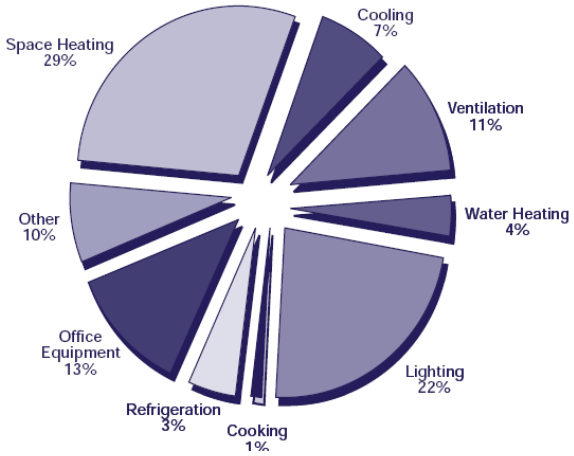
A list of NYSERDA participating HVAC contractors can be found at: http://www.nyserda.org/programs/hvac/participating_contractors.pdf. Look for the specific help with locating HVAC contractors in the Additional Resources portion of the section.

Find a North American Technician Excellence certified contractor for your HVAC project at: http://www.acca.org/nate/consumers/

Energy Star lists Ten Tips for Hiring a Heating and Cooling Contractor: http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac

4. Lighting

Building Energy Use by Type[25]



As much as 40% of the summer air-conditioning load is to cool the heat produced by inefficient lighting.[26]

This section of the guide contributes low-cost, easy steps to maximize lighting and reduce energy bills. Upgrading office lighting is one of the easiest ways to save energy and money now.

Artificial lighting consumes almost 15% of a building's total electricity use. The US DOE says lighting is the biggest energy expense for retailers, accounting for 37% of total energy use in US retail buildings.[27] The use of new lighting technologies can reduce lighting energy use in homes by 50–75%. China, the European Union and Australia have begun phasing out inefficient incandescent light bulbs altogether.[28]

Lighting upgrade options include:

Fluorescent Lamps

Fluorescent lamps provide the same amount of illumination as incandescent lamps. They use only 25%–35% of the energy and last about 10 times longer than incandescent lamps. The most popular are compact fluorescent lamps (CFLs). CFLs work much like standard fluorescent lamps. While they cost 3–10 times more than comparable incandescent bulbs, they last 6–15 times as long.

CFLs are most cost effective and efficient in areas where lights are on for long periods of time. You will experience a slower payback in areas where lights are turned on for short periods of

time, such as in closets and pantries. Because CFLs do not need to be changed often, they are ideal for hard-to-reach areas.

The following table shows how you can save money using CFLs. It assumes the light is on for 6 hours per day and that the electric rate is 10 cents per kilowatt-hour.

Cost comparisons between CFLs and incandescents[29]

	27 watt compact fluorescents	100 watt incandescent
Cost of lamps	$14.00	$0.50
Lamp life	1642.5 days (4.5 years)	167 days
Annual energy cost	$5.91	$21.90
Lamps replaced in 4.5 years	0	10
Total cost	$40.60	$103.55
Savings over lamp life	$62.95	0

Occupancy Sensors

Occupancy sensors - indoor lighting controls - detect activity within a certain area. They provide convenience by turning lights on automatically when someone enters a room. They reduce lighting energy use by turning lights off soon after the last occupant has left.

Timers

Should an employee forget to turn off a light after work, timers will automatically turn it off at a specific time.

Dimmers

Dimmer controls provide variable indoor lighting settings for incandescent and fluorescent lamps. When you dim the lamps, wattage and output are reduced helping to save energy.

Lighting upgrades that are pre-qualified for NYSERDA funding:
http://www.nyserda.org/programs/Existing_Facilities/pdfs/PQ%20Lighting.pdf

Some tips for reducing energy with lighting:

- If you are not in the room, or there is adequate daylight, turn lights *off*.
- Install task lights where needed and reduce ambient light elsewhere.
- Use energy-efficient lighting components, controls, and systems.
- Use ENERGY STAR labeled lighting fixtures.
- Use fluorescent and/or CFLs in lighting fixtures.
- Use occupancy sensors to automatically turn lights on and off, as needed.
- Consider light wall colors to minimize the need for artificial lighting.
- Turn off CFLs when you are going to be out of the room for over 15 minutes.
- Put up posters reminding staff to turn off the lights before they leave.
- Ask overnight cleaning staff to make sure all lights are out.

Create a Manual

To sustain an efficient, high-performance lighting upgrade it is helpful to assemble an operations and maintenance (O&M) manual. Use it as both the lighting management policy and a central operating reference for building management and maintenance staff.[30] Review the O&M manual

with the staff responsible for lighting maintenance. Make training mandatory for all new maintenance personnel. Proper operation and maintenance tasks, responsibilities and procedures should be built into job descriptions and incorporated into annual performance reviews.

5. Water

Tiny water leaks, over time, can result in wasting hundreds of gallons each year. This section helps building owners and operators understand how to reduce water waste, which is often greater than realized. See *Additional Resources* for water conservation case studies.

The first step is a water audit to analyze a facility's water use and identify ways to make it more efficient. Audits review domestic, sanitary, landscaping, and process water use. Hire a professional or conduct your own with free water audit software at http://www.awwa.org/Resources/Content.cfm?ItemNumber=590.

These tips reduce water use:

- Recycle sanitary wastewater for non-potable use. New York City currently provides incentives for the private development of Best Management Practices (BMPs) through DEP's Comprehensive Water Reuse Program. http://www.nyc.gov/html/dep/html/ways_to_save_water/index.shtml
- Buy equipment that stops using water automatically when turned off.
- Reduce the amount of water used per flush by placing a sealed plastic jar filled with water or another heavy object that won't cause damage in the toilet tank.
- Switch to low flush toilets or waterless urinals.
- Fix leaks.
- Install low flow faucets in kitchen and bathroom sinks.

Tips to reduce the amount stormwater runoff:

- Sweep sidewalks and other impervious surfaces instead of washing with a hose.
- Install permeable sidewalk and road surface materials instead of conventional impermeable asphalt and concrete to allow rainwater to drain into the soil.
- Maximize other permeable surfaces and vegetated areas, such as lawns and landscaped areas, and install rain gardens to absorb extra water after rains.
- Consider planting grass or other suitable plants on rooftops *(see building envelope section for more details)*[31]
- Request a tree be planted for free by NYC in front of your property, and support Million Trees NYC, a PlaNYC initiative: http://www.milliontreesnyc.org/html/involved/request_a_tree.shtml
- For more resources, see Stormwater Infrastructure Matters (S.W.I.M.) http://swimmablenyc.info/

6. Renewable Energy

Using the Sun

New buildings can be designed to maximize use of sunlight for interior heating and lighting in winter and minimize solar exposure in summer. Rooftop solar equipment can be used for either heating or cooling purposes.

For more information about the wide range of solar technologies, visit the Department of Energy's solar page at http://www1.eere.energy.gov/solar/technologies.html. For examples of large corporations using solar power, see Additional Resources.

NYSERDA's Clean Power Estimator software allows businesses to enter their utility bills, measurements of available sunlight at your site, and all available incentives and tax credits to generate a customized estimate of the costs and savings of installing a solar photovoltaic (PV) system, which transforms sunlight to electricity. Go to:
http://nyserdaweb.cleanpowerestimator.com/nyserdaweb.htm

Buy Green Electricity

Even if it is not possible to productively install solar equipment at your facility, you can purchase electricity generated by wind power in New York State through Con Edison Solutions.
http://www.conedsolutions.com/business/greenpower/default/

7. Indoor Environmental Quality

Many office buildings have significant sources of indoor air pollution which can be mitigated with properly operating ventilation systems. Improving your building's indoor air quality can contribute to reducing absenteeism and employee illness.

Everyone in the office can help improve indoor environmental quality by:

- Not blocking air vents.
- Complying with the office and building smoking policy.
- Cleaning up all water spills promptly, watering and maintaining office plants properly and reporting water leaks right away.
- Disposing of garbage promptly and properly.
- Storing food properly.
- Notifying your building or facility manager immediately if you suspect an indoor air quality problem.

Office managers and tenants can:

- Place office furniture, partitions, and equipment by keeping in mind the air circulation, temperature control, and pollutant removal functions of the HVAC system. Do not block air vents with furniture or equipment. Do not place

computers and other heat-producing equipment near or under an HVAC sensor device system. Heat from the computers can trigger cooling, even if the actual temperature for occupants is cool.

- Coordinate with building management in situations where responsibility for design, operation, and maintenance of the HVAC system is shared by multiple tenants.
- Establish an effective smoking policy.
- Avoid procedures and products that can cause problems such as: solvents, adhesives, cleaners, and pesticides. Be sure there is adequate ventilation for office equipment as well as printing and/or photographic processes.

Additional information can be found at http://www.epa.gov/iaq/pubs/occupgd.html

New Construction

Leadership in Energy and Environmental Design (LEED)

When constructing a new facility, consult with your architect or engineer to design it for maximum energy efficiency and performance. A popular green building certification from the U.S. Green Building Council (USGBC) is the Leadership in Energy and Environmental Design (LEED) program. LEED certification is widely known and recognized. There are other certification providers available as well. Some advocates say that green building ratings should not be based on predicted levels of energy consumption, but on repeated, verified measurements of energy consumption after the building is occupied. [32]

Image from Green Building NYC: www.greenbuildingsnyc.com

In Long Island City, Court Square Two, the $290 million 528,000 square foot CitiGroup building, received a LEED Gold rating. The building will use wind power. Nearly 90% of its structural steel came from post-consumer recycled materials. It has efficient plumbing systems and a stormwater recycling system that conserves two ***million*** gallons of water a year. Workstations were designed so that 90% of employees can enjoy outside views.[33] Citi has committed to reducing its greenhouse gas emissions globally by 10% by 2011 and by beginning to open LEED certified retail branches.

USGBC provides a comprehensive list of links:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=76.

For NYSERDA new construction funding opportunities, see:
http://www.nyserda.org/Funding/pon1222coned.pdf

Next steps in energy efficiency are discussed at:
http://www.energysavingscience.com/

Additional Resources

Tips for upgrading HVAC equipment

- Never purchase equipment whose capacity is larger than what you really need. Over sizing equipment both increases capital cost when you install it and operating costs.
- When selecting a new cooling system purchase a high-efficiency unit as long as its lifecycle costs are lower than that of standard efficiency systems.
- Purchase *Energy Star* rated air conditioners or heating units.
- Consider energy recovery ventilation systems to reclaim waste energy from the exhaust air stream.
- In humid climates consider supplemental dehumidification.
- Consider specifying economizers which can draw in fresh air from the outside when the temperature outside is lower than the temperature inside.
- Install programmable thermostats and use automated settings.
- For facilities that have heat-generating processes such as cooking, or onsite distributed generation equipment, consider heat recovery as a way to capture free waste heat and use it to offset facility heating and cooling costs.
- Consider installing radiant heating for areas such as warehouses and garages, as well as exterior areas that require heating, such as patios and waiting areas because it warms objects instead of the air and requires less fuel.[34]

Lighting

NYSERDA can help find a lighting specialist. See http://www.nyserda.org/SCLP2/findAllies.asp
A technical guide is available at: http://www.nyserda.org/SCLP2/technicalguide/index.asp

Case Studies of Water Conservation:

The Port Authority of New York and New Jersey upgraded restroom facilities at LaGuardia Airport to increase the efficiency of toilets, faucets, and showers. The Port installed a leak detection system, ultralow-flow toilets, high-efficiency aerators for faucets, and flow restrictors on showerheads. These improvements yielded annual water savings of almost $160,000 after an initial capital outlay of $90,000.

Unilever, which produces more than 400 brands of home, personal care, and food products, performed a water audit of a laundry detergent factory in 1995 after which it embarked on a program to increase efficiency including: rainwater collection, wastewater reuse, and educating employees on the economic and environmental importance of water conservation. The improvements save the company more than $100,000 a year.

In 2004, **TOTO USA** sought to increase the water conservation at its production facilities. It started a program to recycle the water it uses to manufacture vitreous china products at its ISO 14001–certified manufacturing facility in Morrow, Georgia. Monthly water use was reduced by 18%, which is equivalent to 3 million gallons per year.

Corporate Examples of On-Site Solar Generation:

FedEx Corporation recently constructed a solar array on the rooftops of two buildings at its facility at Oakland International Airport. The 904-kilowatt array provides approximately 80% of FedEx's peak load demand and, in so doing, reduces FedEx's energy bills and the risks associated with unstable or rising fossil fuel prices.

Oroville Wastewater Agency operates a 520 kilowatt on-site solar array capable of fulfilling nearly 80% of its wastewater treatment plant's energy needs. On Earth Day 2003, the Sewerage Commission-Oroville Region received a $2,342,502 rebate check from Pacific Gas & Electric (PG&E) for its array—the largest renewable energy system rebate in PG&E history.

AT&T Park, home of the San Francisco Giants, recently installed 590 solar panels in three different parts of the stadium. The panels produce up to 122 kilowatts of renewable energy for PG&E customers in San Francisco. This is the equivalent of about 40 residential solar systems. As the first Major League Baseball stadium to feature solar power the installation provides a high-profile platform to showcase the importance of clean energy and energy conservation in addition to generating renewable energy.

Coors Field, home of the Colorado Rockies, has begun construction of a solar energy system. The 46 panel, 9.8 kilowatt system can provide more than 14,000 kilowatt hours of energy, which could offset the energy consumption of their LED scoreboard for over a year.[35]

Improving your building's indoor air quality can boost productivity and the bottom line by reducing employee illness and absenteeism.

The adverse health effects of poor indoor air quality can be staggering. A number of well-identified illnesses such as Legionnaire's disease, asthma, hypersensitivity pneumonitis, and humidifier fever have been directly traced to specific building problems.[36] Additionally, occupants can develop "sick building syndrome" that has these symptoms: dry or burning mucous membranes in the nose, eyes, and throat; sneezing; stuffy or runny nose; fatigue or lethargy; headache; dizziness; nausea; irritability and forgetfulness.[37]

Sources of office pollutants include: environmental tobacco smoke; asbestos from insulating and fire-retardant building supplies; formaldehyde from pressed wood products; other organics from building materials, carpet, and other office furnishings, cleaning materials and activities, restroom air fresheners, paints, adhesives, copying machines, and photography and print shops; biological contaminants from dirty ventilation systems or water-damaged walls, ceilings, and carpets; and pesticides from pest management practices.[38]

Lockheed Martin's green building included measures that improved indoor environmental quality and resulted in reduction of absenteeism by 15%.[39] Green building strategies can result in increases in occupant performance of 6 to 26%.[40]

A recent Lawrence Berkeley National Laboratory study reported that feasible and commonly recommended improvements to indoor environments could reduce health care cost and work losses from communicable respiratory diseases by 9 to 20%; from reduced allergies and asthma by 18 to 25%; and from other nonspecific health and discomfort effects by 20 to 50%.[41]

According to a study by William Fisk, for the United States, the estimated potential annual savings and productivity gains are $6 to $14 billion from reduced respiratory disease, $1 to $4 billion from reduced allergies and asthma, $10 to $30 billion from reduced sick building syndrome symptoms, and $20 to $160 billion from direct improvements in worker performance that are unrelated to health.[42]

Employees can be the largest expense for a company. If an employee earning $50,000 a year, misses two days of work per year because of indoor air quality related health problems, the cost to the company could be $400 per employee per year compounded by loss of productivity. If you have 50 employees out sick for two days because poor indoor air quality, you would be wasting $20,000 a year, compounded by loss of productivity.

References

[1] Center for Energy and Environment http://www.mncee.org/programs_bldgs_facilities/commissioning_retrofitretrofitting/index.php
[2] Ibid.
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] All of the following tips are from the EPA Energy Star Guide
[10] EPA http://www.epa.gov/hiri/strategies/greenroofs.html
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