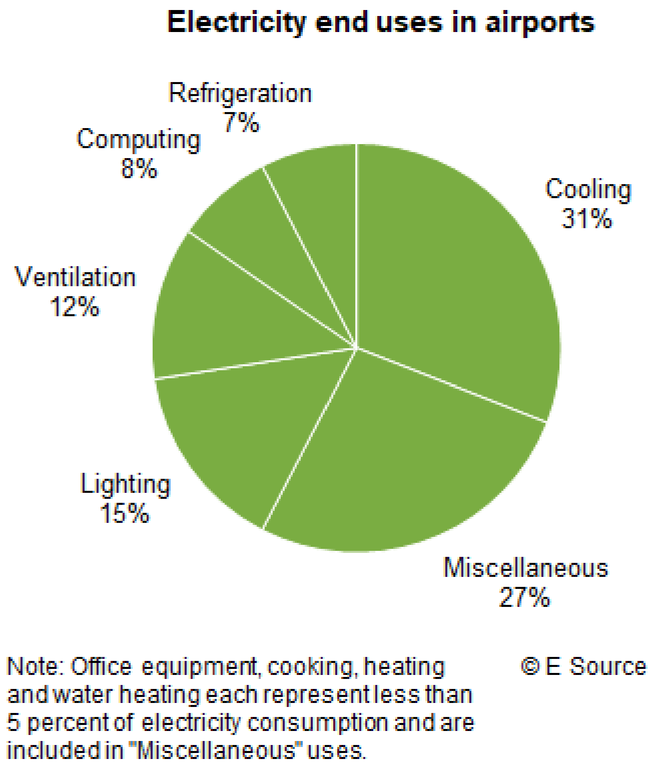
Managing Energy Costs in Airports

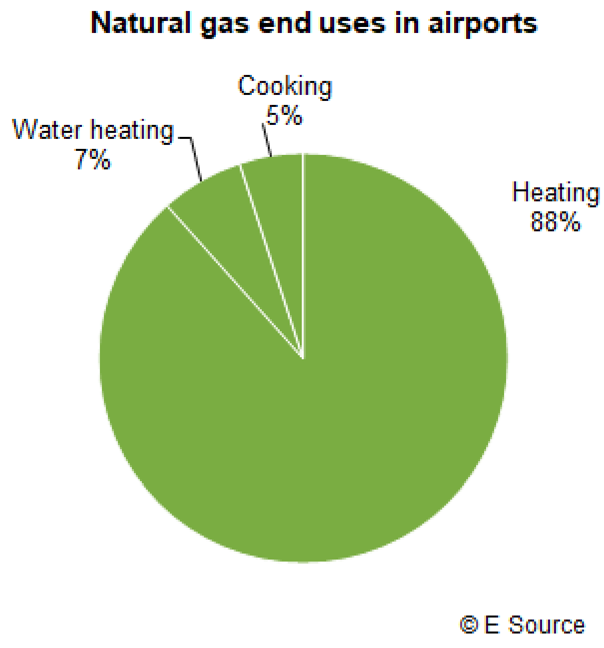
Energy comprises a large portion of operating costs for airports—as much as 10% to 15% of these facilities' entire operating budget. By implementing energy-saving measures, you can cut costs while also promoting a greener image. The measures detailed in this report are aimed at providing substantial energy savings with short payback periods. An average airport (a subset of the transportation complex sector) uses 19.7 kilowatt-hours (kWh) of electricity and 34.7 thousand Btu of natural gas per square foot annually, with lighting and cooling accounting for 46% of overall energy use (**Figure 1**).

Average energy use data

Figure 1: Energy consumption by end use

Major sources of electricity consumption in airports include cooling, lighting, and ventilation as well as a large number of miscellaneous sources, including computers and cooking equipment. For natural gas, the main end use is typically heating.





Top technology uses

- Heating
- Cooling
- Lighting

To better manage your facilities' energy costs, it helps to understand how you are charged for energy. Most utilities charge commercial buildings for their natural gas based on the amount of energy delivered. Electricity, on the other hand, can be charged based on two measures—consumption and demand. The consumption component of your bill is based on the amount of electricity, in kWh, that the building consumes during a month. The demand component is the peak demand, in kilowatts (kW), that occurs within the month. Monthly demand charges can range from just a few dollars to upwards of $20 per kilowatt and can be based on the highest peak recorded in the previous 12 months. Because it can be a considerable percentage of your bill, you should take care to reduce peak demand whenever possible. As you read the following energy cost-management recommendations, keep in mind how each one will affect both your consumption and your demand.

QUICK FIXES

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Many airport systems offer substantial energy-saving potential. Most of those savings would come from lighting and cooling end uses or from setting specific electronic equipment on timers so that it's only used when needed. As a result, airports can benefit greatly from a variety of strategies that are easy to implement and that are either free or cost very little.

Turning things down

Turning things down seems simple, but remember that for every 1,000 kWh you save by turning things off, you save $120 on your utility bill, assuming an average electricity cost of $0.12/kWh.

Delamping. Many airport areas are lit to higher levels than necessary, and when this is the case, delamping can help reduce costs without negatively affecting occupants. The Toronto airport, for example, was able to reduce the amount of light by 40% in its terminal by removing one T8 bulb from every two-lamp fixture. This eliminated 2,000 bulbs and their attendant costs for energy and replacement but did not trigger any customer complaints about inadequate lighting.

Flight information displays. Make displays more efficient by installing programs that sequence the displays on and off based on patterns of occupancy in an area. Additionally, when it's time for replacement, consider installing Energy Star–qualified displays (specifications can be found on its Signage Displays page) to save even more energy.

Office equipment. Desktop computers can use more than twice the energy of a flat-screen monitor, so it's important to power down or put to sleep computers that aren't in use. The Energy Star Power Management program's article 6 Ways to Reduce IT Costs discusses several possibilities, including free software that automatically places active monitors and computers into a low-power sleep mode through a local area network. Use smart power strips to shut off plugged-in devices like printers and monitors when there are no users present, and install computer power-management software to provide further savings.

HVAC operation and maintenance

Regularly scheduled maintenance and periodic tune-ups save energy and extend the useful life of HVAC equipment. Create a preventive maintenance plan for your airport that includes regularly scheduled tasks such as cleaning, calibration, component replacement, and general inspections. Ensure that information on setpoints and operating schedules is readily available for reference when equipment is checked or recalibrated.

HVAC settings optimization. Ensure thermostats are set correctly so different parts of the building are at the appropriate temperatures at the appropriate times. Use HVAC controls to reduce ventilation in areas that aren't in use.

Economizers. Many air-conditioning systems (other than those in hot and humid climates) use a dampered vent called an economizer to reduce the need for mechanically cooled air by drawing cool outside air into the building. But if the economizer isn't regularly checked, the linkage on the damper can seize up or break. An economizer that's stuck in the fully open position can add as much as 50% to a building's annual energy bill by allowing hot air in during the air-conditioning season and cold air in during the heating season. Have a licensed technician check, clean, and lubricate your economizer about once a year, and repair it if necessary. If the economizer is still operating, have the technician clean and lubricate the linkage and calibrate the controls.

Steam trap inspection and maintenance. Steam traps remove water from the steam distribution system once it has cooled and condensed in a radiator or other heat exchanger. This heat-recovery process saves energy because the steam will release its heat to warm the air before it's cycled back into the boiler.

However, mechanical steam traps can become stuck open, which wastes heat, since "live" (or still heated) steam is being released. They can also become stuck in the closed position, which leads to a buildup of condensate in the system and can cause significant damage (this type of failure is less common and more easily diagnosed than when traps are stuck open).

According to the US Department of Energy's (DOE's) tip sheet Inspect and Repair Steam Traps (PDF), without maintenance, 15% to 30% of the installed steam traps in a steam system may fail within 3 to 5 years. This is significant, since a single failed trap can waste more than $50 per month, and airports can have hundreds or even thousands of steam traps. Install steam trap monitors to get notified when they fail; each one can monitor up to 16 steam traps. Knowing when one steam trap fails can be especially important because when one steam trap fails, it can lead to the failure of others that drain into the same line. There are some general warning signs that steam traps may be failing:

- The boiler room is unusually hot
- The condensate receiver is venting an abnormally large amount of steam
- Water seals on condensate pumps are failing quickly
- Sustaining boiler operating pressure is hard
- Maintaining low pressure in return lines is difficult
- Water hammer (when slugs of condensate accelerate quickly in the pipes) occurs—this can cause serious damage to equipment and pose a safety hazard

Chiller maintenance. Cleaning the chiller's coils can greatly increase its efficiency. If the coils are dirty, the heat-transfer efficiency will decrease, and that, in turn, will significantly decrease the efficiency of the unit. For a 10-ton unit, a $50 cleaning will typically pay for itself in two months and yield an additional $200 in savings over the course of the year. To see if a chiller could benefit, check the temperature difference between the return and supply chiller water. This should generally be about 10° to 15° Fahrenheit (F). If the difference is much lower, it's likely due to low efficiency and indicates the system could benefit from cleaning and maintenance.

Chiller sequencing. Operators often run more chillers than necessary for a given load. Because every chiller has a range of loading conditions wherein it operates most efficiently, turn some chillers off to keep the remaining ones in their most efficient zone—typically, above the 30 to 50% loading mark, since chillers are far less efficient when operating below 30% of full load. As cooling loads increase, bring additional chillers online when the others are leaving their most efficient loading zone. If one chiller is significantly smaller than the rest (often referred to as the "swing" chiller), it can be brought on- and off-line first to keep the larger chillers more fully loaded. More chillers should not be turned on until the chillers currently running are at full load.

Multiple cooling towers. Just as it's advantageous to run as few chillers as possible, it's also advantageous to run as many cooling towers as possible. Most chilled-water plants have excess capacity, so that one or more cooling towers aren't operating during low-load hours. To make the most of existing cooling towers, run condenser water over as many towers as possible, at the lowest possible fan speed, and as often as possible; fan motors use less energy than the tower, and the water is still cool. If two cooling towers run at half speed (instead of one at full speed), together they would reject slightly more heat than the single-tower operation while drawing only half the power.

Cooling tower maintenance. A dirty or corroded cooling tower is often the root of inefficiencies in these systems. To avoid this, cooling towers should be cleaned and maintained annually.

Air-conditioning temperatures. With a thermometer, check the temperature of the return air going to the air conditioner and then check the temperature of the air coming out of the register nearest the unit. If the temperature difference is less than 14°F or more than 22°F, have a licensed technician inspect the air-conditioning unit.

Cabinet panels and condenser coils. On a quarterly basis, do a maintenance check on your rooftop air-conditioning units: Make sure the panels are fully attached with all screws in place, and also check to see that gaskets are intact so no air leaks out of the cabinet. If chilled air leaks out, it can cost $100 per year in wasted energy per rooftop unit. In addition, check condenser coils quarterly for debris, natural or otherwise, that can collect there. Thoroughly wash the coils at the beginning or end of the cooling season.

Airflow. Hold your hand up to air registers to ensure that there's adequate airflow. If there's little airflow or if you find dirt and dust at the register, have a technician inspect your unit and ductwork.

Boiler combustion area. According to the DOE's Building Technologies Program report Efficient Hospital Boilers Result in Financial, Environmetal, and Safety Payoffs (PDF), decreasing excess combustion air by 15% can lead to a 1% increase in boiler efficiency. Tuning the combustion area entails checking the systems for efficiency opportunities. For example, repairing air leaks will prevent excess air from escaping and keeps the combustion area cleaner.

LONGER-TERM SOLUTIONS

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Airports rely on a variety of durable equipment that will eventually be upgraded or replaced. Though lighting and HVAC are the most likely areas for targeted upgrades, savings can be found in many places. There are even savings to be gained from appliances such as washers and dryers. Though these long-term solutions inherently require more effort, they are more likely to dramatically increase the efficiency of your facility. Ask your utility representative for more information about incentives for such projects.

Before implementing these kinds of projects, it's a great idea have an energy inspector conduct a walk-through audit. Our recommendations should ideally be used as guidelines in conjunction with an energy audit of at least level 2 (as defined by ASHRAE standards). Level-2 audits provide detailed energy calculations and financial analyses of proposed energy-efficiency measures.

Commissioning

Commissioning is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained according to the owner's operational needs. This process can cut energy bills by 10% to 15% or more, and often provides a simple payback period of less than one year.

The term "commissioning" applies to new buildings—when it is performed on an existing building that hasn't been commissioned before, it's called retrocommissioning; when it's applied to a building that has been commissioned before, it's called "recommissioning." It's best to recommission buildings every three to five years to maintain top levels of building performance. You may also be able to do monitoring-based commissioning, also called "ongoing commissioning," in which monitoring equipment is attached to systems and left in place to allow for continuing diagnostics.

Spaces should always be commissioned when there's a change in what they're being used for. As part of your contract, require your commissioning agent to provide instructions and documentation that can be used for future staff training and maintenance checklists. Since all systems in the building affect each other, all systems should be commissioned at the same time to avoid inefficiencies.

Building automation systems

Building automation systems (BASs) can be expensive up front, but they can contribute to large recurring savings. A BAS controls a building's HVAC, lighting, security, and other systems from one central location, which can increase efficiency and allow for easier monitoring. By monitoring temperature, lighting, and pressure, the BAS can operate systems only when they're needed, and use the least possible energy when they're running. BASs can also be useful for monitoring-based commissioning—data analysis software or a third-party diagnostic service can help to identify operational anomalies.

To save energy, a BASs can:

- Only run systems when required—the BAS will decide which equipment needs to be running based on weather conditions and a schedule of building occupancy.
- Ensure that the systems within the building are running at minimum capacity.
- Decrease peak demand—when the power draw of a building reaches a set number, the BAS will reduce power to designated systems, such as lighting.

It's important to commission your BAS and get the settings right to realize all of the energy savings possible. For example, optimizing the system's sensors can increase its efficiency.

Lighting

Lighting plays a major role in airport operations; it typically makes up 15% of an airport's total energy costs. Not only is it crucial for primary airport functions such as terminals, parking, roadways, taxiways, and runways, efficient modern lighting can also provide non-energy benefits such as stress relief for travelers through tunable color temperatures.

Lighting controls. Automatic lighting controls such as occupancy sensors, timers, photosensors, and dimmers save energy and help reduce maintenance costs. Occupancy sensors and timers can reduce lighting energy consumption by up to 50% in offices and other areas that aren't open to the public, and they may be a good choice in public areas that have little traffic. Timers may be the best bet for energy savings in areas with higher occupancy but predictable schedules. Terminals generally follow predictable schedules, and lighting controls can be adjusted based on the published commercial flight schedule for a given period. For example, E Source found that the energy management system at Port Columbus International Airport in Columbus, Ohio, is programmed to turn off lighting and mechanical systems in gate areas where no flights are scheduled so that energy is not wasted on unoccupied areas of the building.

LEDs. Although LEDs have the potential to save a lot of energy in airports, they do have some drawbacks in certain applications. Despite the technological advances, successful use of LEDs still requires care in selecting products that will meet specific illumination needs, match manufacturer claims, and be compatible with any controls that are employed.

For example, terminals, parking lots, roadways, and taxiways all offer opportunities for LED deployment, but LEDs may have issues when used as runway lights in colder climates since they do not give off heat and frost must be cleared off. They may also initially be too bright for pilots to land safely—to deal with this, the Federal Aviation Administration's (FAA's) Design and Installation Details for Airport Visual Aids circular requires a switch from 3-step to 5-step regulators to allow for better dimming control.

In addition to energy savings, LEDs require less maintenance than other lighting options. They boast a life ranging from 25,000 hours to more than 100,000 hours, depending on the application. The competition ranges from 1,000 hours for incandescent lamps to as much as 70,000 hours for induction lighting. For conventional lamps, such as incandescent, fluorescent, or high-intensity discharge (HID) lamps, life is defined as the hours of operation after which half of a representative sample of lamps can be expected to fail. In contrast, LEDs don't generally fail outright; rather, their output declines over time, so the industry defines LED life as the point at which the light output has declined to 70% of its original value.

Fluorescent lamps. If your facility uses T12 fluorescent lamps or commodity-grade T8 lamps, relamping with high-performance T8 lamps and electronic ballasts can reduce your lighting energy consumption by 35% or more. Adding specular reflectors, new lenses, and occupancy sensors or timers can double the savings. Paybacks of one to three years are common. LEDs, in the form of replacement tubes, retrofit kits, or new fixtures have also become a viable option, offering considerable savings even compared to the best fluorescent options—but products vary widely in performance, so select carefully.

Daylighting. A design strategy that uses a mix of natural and artificial light sources can increase comfort and reduce energy costs. The elongated structure of airport terminals that's necessary for airplane gate access lends itself well to daylighting. The addition of low-emissivity window glazing will reduce both glare and solar gain, and light pipes and skylights can bring sunlight into interior spaces on top floors. During construction, translucent roofing material can also be incorporated to let more light in.

Ballasts and daylighting controls can reduce the amount of electric light used when daylight is present, and appropriate window shading and separate shades on high windows are relatively low-cost retrofit options.

As a bonus, natural light also provides other benefits besides energy savings, such as reducing stress for travelers.

Smart lighting design in parking lots. Parking lots are often overlit—an average of 1 foot-candle of light or less is usually sufficient—which may mean there's potential to save energy by delamping, adding dimming controls, or adding occupancy sensors. For example, the Toronto Pearson International Airport used some of these options to reduce the lighting in its parking garage by 25%, yielding significant energy savings.

Overlit parking areas not only waste energy—they can actually be dangerous if drivers have trouble adjusting their eyes between highly lit and dark areas. However, a balance should be struck to prevent safety concerns involved with underlighting.

The most common lamps used for outdoor lighting are HID sources—metal halide and high-pressure sodium. In recent years, fluorescent lamps, CFLs, and induction lamps have also become viable sources for outdoor lighting, offering good color quality and better control options than HID sources. LEDs are also rapidly becoming a good choice because they offer efficiency and long life, and their light can be precisely directed, which limits light pollution. As the technology matures, LED costs are decreasing and their performance continues to improve.

Apron lighting. Replacing HID lighting on aprons—the spaces where aircraft are parked, loaded and unloaded, refueled, and boarded—with LEDs can save energy, decrease maintenance needs, and increase safety. Using LEDs gives the airport more control over the amount of light being produced and the distribution of that light; placement and brightness of the LEDs will depend on the size of the aircraft being lit. When considering upgrading to LED apron lighting, some general recommendations include:

- Use fully shielded light sources
- Look for lamps with light temperatures of 3,500 kelvins (K) or lower
- Shape the LEDs' beams to efficiently light areas
- Consider dimming to reduce energy use during periods of low activity

Taxiway lights. Replacing taxiway lights with LEDs can save both energy and maintenance costs. For example, according to the DOE report LEDs Ready for Takeoff at Louisiana Airport, Hammond Northshore Regional Airport replaced about 250 incandescent lights along its taxiway with LEDs, and it estimates its annual energy savings will be between

$10,000 and $15,000.

Using LEDs also makes it easier for the airport to turn the taxiway lights off when there are no flights coming in and they're not needed. With incandescent lights, the likelihood of the lightbulb blowing out is higher on initial start, so if an airport turns lights off in those in-between times, they run the risk of blowing lights when they're turned back on.

LEDs reduce maintenance costs as well since they have longer lifetimes and are more durable than incandescent lights in the outdoors. The FAA's Design and Installation Details for Airport Visual Aids circular details material, placement, and height requirements.

Bridge navigation lights. Because navigation lights on bridges within an airport complex have many requirements, including being visible from a mile away in varying conditions, LEDs can be a good choice to replace incandescent lights in this usage. LED light is more focused, shining only in the intended direction; incandescent light goes in all directions, which means that roughly half of it will be projected onto the surface of the bridge. LEDs also use less energy, last longer, and require less maintenance. In addition, LEDs are more durable and resistant to vibration, which means they can withstand many conditions that would break the filaments in incandescent lights.

Security lighting. Using occupancy sensors with outdoor security lighting can save energy and improve security. Energy savings come from the fact that lights can be off until motion triggers a sensor; the sudden presence of light can draw the attention of any security guards who are monitoring camera feeds, giving an added level of security.

LED exit signs. If you haven't yet upgraded to LED exit signs, doing so can decrease energy and maintenance costs. They can also increase safety since LED exit signs are brighter than traditional versions.

Flight information displays. Consider replacing inefficient monitors with Energy Star–rated displays to save energy. A flight information display system (FIDS) might also be worth investigating. These systems use flight data to estimate occupancy in various areas and turn off displays in unoccupied spaces.

Refrigerated display cases. Replacing the fluorescent lights in refrigerated cases with LEDs can reduce energy costs. LEDs have lower power demand and longer lifetime, and they don't emit as much waste heat into their environment as fluorescent lights do, which means the refrigeration systems can work more efficiently. In addition, LEDs can create a more even distribution of light to make the case contents more appealing, and they can be programmed to dim during low traffic periods to reduce energy use.

Heating

Boilers. The energy performance of existing boilers can be enhanced with stack gas heat recovery (also known as condensing heat exchangers).

If you're considering replacing your boilers, look at condensing boilers, which are higher efficiency and can last for as much as 25 years longer than standard noncondensing boilers. A condensing boiler captures and reuses waste heat released from flue gas, which means it has to use less energy when heating water. Although condensing boilers are more expensive than noncondensing ones, the average simple payback period is five years with a 20% return on investment.

Another thing to consider when replacing boilers is to ensure that they're the proper size for the load required by the airport—a value that could have changed significantly since the last boiler was installed. It can also be beneficial to install multiple smaller units rather than running larger units at inefficient part-load levels.

Other boiler efficiency adjustments include:

- Installing an economizer to preheat air before it enters the combustion area, therefore requiring the boiler to use less additional fuel
- Adding water recovery equipment, such as a deaerator, which removes dissolved oxygen in the feedwater and eliminates carbon dioxide, allowing the feedwater to be cycled back into the boiler, saving heat, energy, and water
- Insulating your pipes to reduce heat loss

Blowdown control. Boilers use a blowdown function to remove solids in water that fall to the bottom of the tank and form a sludge that lowers the boiler's heat-transfer ability; these dissolved solids lead to foaming and carryover into steam, reducing the boiler's efficiency. Installing a blowdown control system can help ensure the efficiency of this process by monitoring the amount of water discharged in relation to the amount of dissolved solids present.

Solar water heating. Solar water heating—in which water is passed through panels mounted on the roof, heats up, and is then passed through a heat exchanger where it warms potable water for space heating or domestic uses—may be particularly effective in smaller airports, and can even help with melting snow. Solar water heaters can also be used to preheat boiler feedwater.

Ventilation

Variable-frequency drives (VFDs). VFDs can be added to pumps and fans in HVAC systems, saving energy by allowing motors to adjust their output to fluctuating heating and ventilation needs. VFDs can save the most energy in spaces with lower ventilation requirements; they can decrease power drawn by fans by up to 50%.

Energy recovery ventilation (ERV). Proper ventilation is essential for maintaining good indoor air quality, yet it places an additional burden on heating and cooling equipment, which must condition air that will soon be exhausted from the building. ERV systems capture thermal energy and moisture from the exhaust airstream and transfer it to the intake (outside) airstream, saving energy and potentially improving humidity control as well. The magnitude of these benefits varies depending on climate, but geographic locations with hot, humid summers are particularly well suited to ERV systems.

Demand-controlled ventilation (DCV). Instead of ventilating space at a constant rate designed to accommodate the maximum number of customers, a DCV system ensures that the amount of outside air drawn in for ventilation depends on actual occupancy at any given time.

Efficient fan motors. The efficiency of fans can vary widely depending on design, from as low as 40% to as high as 80%. HVAC fans are often good candidates for energy-efficiency retrofits because they have long operating hours and wide-ranging efficiencies. When replacing fans, choose ones that fit the space and function they'll be used for so they can operate most efficiently.

Displacement ventilation (DV). Traditional air supply systems—in which air is supplied and returned at the ceiling—can be inefficient, because some of the ceiling air can return right after it's been put in to the room, before it's had a chance to cool the intended space. And repairs for traditional systems are generally costly since the system is housed in the ceiling. In DV systems, cool air is instead supplied near the floor; when it comes in contact with occupants, it absorbs the heat. This warm air rises to the ceiling and is taken out of the room at the ceiling exhaust.

DV systems decrease energy use and increase efficiency of ventilation systems in airports, particularly since most airports are largely made up of open spaces with high ceilings.

Since DV systems are only applicable for cooling, a separate heating system would be required, so DV systems are best in warmer climates.

Cooling

Chillers. Chilled-water systems are custom-designed for each application, and employing efficient auxiliary equipment and operating strategies can often be more important than selecting the chiller itself. Centrifugal and screw chillers tend to be the most efficient versions on the market, but other types are available, including screw, scroll, and reciprocating chillers. Annual energy costs of a chiller can amount to one-third of the purchase price.

Water-side economizers. A water-side economizer evaporatively cools water in a cooling tower and delivers it to a building's chilled water coils via a flat plate heat exchanger. In colder climates, the opportunity for "free" cooling with a water-side economizer typically exceeds 75% of the total annual operating hours, whereas in warmer climates, such free cooling may only be available during 20% of the operating hours due to temperature and humidity. Typical simple payback periods from energy savings range from 2 to 5 years.

Cogeneration and heat recovery

It's important for airports to have alternative energy sources since a power outage can lead to a costly cascade of security delays, missed flights, shut-down reservation systems, and baggage handling delays. Cogeneration systems, also called combined heat and power (CHP), provide both heat (for space or water heating) and power.

In 2005, responding to blackouts in the Northeast that followed electric industry restructuring, Toronto Pearson International Airport installed a 117-megawatt (MW) combined-cycle gas cogeneration plant. The plant has two turbines whose capacity is more than twice the airport's peak load. This provides a backup should one turbine shut down and allows the airport to sell about half of the electricity it generates back to the grid. The plant also provides all of the airport's hot water, and the facility saves money by diverting some waste heat from the boilers to run efficient, steam-charged chillers.

Reliability is an additional benefit of cogeneration. Because backup generators aren't used often and aren't always well maintained, they're more likely have problems when they're needed. CHP systems are used every day, so they're generally much better maintained.

Building shell

Windows. In addition to providing lighting, windows affect heating and cooling loads. The airport's location will play an important part in which window options will be most efficient. If cooling loads are dominant, glazing that transmits adequate light for daylight activity while minimizing solar heat transmission is best. In buildings where heating is the major energy load, glazing should be carefully chosen to minimize heat loss and, in some cases, configured to increase passive solar heat gain while maximizing daylighting.

Cool roofs and green roofs. Although most heat gain in a facility comes through the windows, eliminating heat gain through the exterior roof and walls can be a cost-effective and low-risk way to reduce cooling loads and peak demand. One of the most effective strategies is to use light-colored walls and roofs, called cool roofs.

Another approach is a green roof, which has grasses or vegetation on top in order to reduce heat absorption. For example, O'Hare airport in Chicago has realized a 30% reduction in annual heating and cooling costs by installing its Vegetated Roofs, according to the Chicago Department of Aviation. Green roofs are generally not as effective as light-colored roofs for purely reducing cooling costs, but they can be a better choice for climates that require large amounts of cooling in summer and heating in winter. Additionally, green roofs provide non-energy benefits such as sound absorption for heavy airport equipment, reduced stormwater runoff, and improved air quality.

Baggage conveyors and other motorized systems

Baggage systems consist of hundreds of motors and belts, which together constitute a large electric load, and upgrades can create significant energy savings. Using efficient motors on escalators can also reduce maintenance and lead to energy savings.

Baggage systems. The most comprehensive and cost-effective way to save energy for mechanical system upgrades is through a whole-system approach. Efficient belt systems have teeth instead of relying on friction to hold the belts, saving energy and resulting in fewer bearing failures because less lateral force is placed on the drive. In addition to cutting down on energy costs, an efficient driveline may reduce initial costs by allowing a smaller motor size.

Adding VFDs can result in significant energy savings when the baggage conveyors aren't required to operate at full speed, but this upgrade should not be done in isolation. It's important to think about the whole system—speed controls will only reach their full savings potential if all elements of the system are specified for variable-speed operation.

Since baggage systems run intermittently, they are good candidates to be controlled by a BAS. Baggage-handling systems at the Toronto and Columbus airports have been separated into energy management zones that can be shut down if the gates they serve aren't in use.

Escalators and walkways. Escalators and walkways consume a tremendous amount of energy in airports. Technologies are available for reducing escalator energy use, from intermittent drives that reduce escalator speed while passengers aren't present to LED lighting and regenerative braking for down escalators. Research suggests that the energy savings potential for escalators and walkways in the US is in the range of 10% to 40% per unit. Key components affecting energy use include motors, controls, and lighting; intermittent drives can be effective in decreasing energy use of escalators that aren't constantly in use.

Elevators. Energy consumption can be reduced by installing more-efficient elevators, but because simple payback periods may be as long as 15 to 20 years, it's rarely practical to install efficient elevators for the energy savings alone. It can be more effective when undergoing large renovations. Modern elevators have other non-energy benefits, such as high performance and improved reliability.

Appliances and office equipment

Depending on airport size, there may be areas that have refrigerators, washers, dryers, and vending machines. For these sorts of appliances, look for Energy Star versions that maintain higher levels of energy efficiency. The Energy Star program also has an Office Equipment page where it covers ways to cut utility bills for monitors, printers, scanners, copiers, fax machines, and power adaptors.

Other options

Renewable energy. In many airports, photovoltaics (PV) have the potential to offset considerable electricity costs. Denver International Airport has installed 10 MW of solar PV in four different installations. The solar panels generate 16 million kilowatt-hours per year and offset about 7% of the airport's energy consumption.

Parking lots in hot, sunny areas are particularly good places for PV panels—place them on top of canopy structures and they can do double duty, providing shade for cars while also producing electricity. In some cases, installing a small PV array and battery to power an obstacle beacon may be less expensive than burying electrical wires. It’s important to note that solar reflective glare can be an issue for plane approaches, so PV projects require glare analysis.

Vehicle upgrades. Converting the fleet of airport vehicles—such as ground-service equipment and shuttle buses—from gas to electricity demonstrates a commitment to the environment and local air quality. When possible, electric-battery vehicles should be charged at night, during off-peak hours—talk to a utility representative to learn more. Non-energy benefits include cleaner, quieter airport operations, which can result in happier employees and travelers.

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