

Early Energy Management Projects: Eliminate Leaks— Both Mass and Energy

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In response to the request for early energy management projects that have good paybacks, are easy to implement, and don't irritate anyone, it is suggested that facilities consider the formation of an in-house maintenance program to eliminate mass and energy leaks in building systems.

One definition of a leak is "any means of unintended entrance or escape," and this general definition suits the purpose of this letter. Building owners, operators, and occupants are all familiar with leaks that can be seen, such as water leaking from pipes and condensate drain pans that stains ceiling tiles, or felt, such as air infiltrating a drafty window near a desk. People are less familiar with energy leaks; these can cause similar problems and have comparable costs. This letter presents some examples of leaks, associated losses, and paybacks.

Water leaks commonly occur at joints and fittings where pipes change direction or make connections to other devices such as valves. These are obviously easy to spot. A leaky component in a hydronic HVAC system will cause a water leak (chilled, hot, or condenser water) that can result in wasted energy usage from a boiler cooling tower or pump, as well as create chemical treatment costs. These leaks are unnecessary, and building occupants should either know that they exist or that they have been remedied. The result of eliminating these leaks will be lower operating costs and cleaner, safer, mechanical areas.

Air leaks in HVAC distribution systems commonly occur at interconnections between sections of ducts, at transitions, and near the supply air fans where duct pressure is highest. Other air leaks are common in the building envelope around doors and windows. Air leaks are usually detected indirectly, due to their sound, the sensation of a draft, or the observance of an open window or door. A leaky component in

an air distribution system or building envelope will cause a conditioned air leak that wastes fan energy and energy associated with conditioning the leaked air. The result of eliminating these leaks will be lower operating costs and a more comfortable building.

For the purpose of this letter, the phrase “energy leaks” refers to thermal energy losses. These are more difficult to detect and are not observed directly by typical occupants. They occur where materials separate two masses at different temperatures. For example, the walls of a metal building may leak energy when the ambient air temperature is considerably higher or lower than the conditioned indoor temperature. Window frames and glazing may leak energy into or out of a building in similar conditions. Pipes and ducts with sections where insulation has failed (or that were never originally insulated) may also allow energy to leak into or out of the pipe or duct. This may cause more problems. For example, when chilled water pipe insulation fails, it can cause moisture to condense from air in a plenum on the surface of the pipe and drip onto ceiling tiles—causing property damage. These energy leaks waste HVAC system energy by requiring the system to condition spaces and compensate for leaks that are not part of a building’s design.

The remedies are straightforward. Repair water leaks; perform regularly scheduled duct pressure testing and repair ducts and equipment with excessive losses; ensure windows and doors close properly and have good weather stripping; and repair or install insulation.

Savings will vary by building due to variances in operating hours and the difference between maintained indoor conditions and outdoor climates. The US Department of Energy’s Industrial Technology Program hosts the IAC database containing details of energy management recommendations. Of the top 10 recommendations, six are related to eliminating leaks and establishing maintenance programs. These six recommendations save an average of over \$6,000 per year each, and they are expected to pay back in approximately three months. The repair of steam and compressed air mass and energy leaks will provide even better savings, typically by an order of magnitude. There are many similar recommendations with equally attractive returns in the IAC database.

The fact that leaks are unintended makes their repair and elimination a project that will not only not irritate occupants but reduce existing annoyances from drafts and leaks. Add to this the energy savings and ease of implementation, and the result is an excellent in-house energy management project that will result in better building performance and occupant comfort.