

ENERGY EFFICIENT SOLUTIONS IN THE CONSTRUCTION OF ADMINISTRATIVE BUILDINGS

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Annotation. The characteristics of energy losses in buildings are given. The main directions and methods of increasing the energy efficiency of administrative buildings are described.

Novelty. To minimize the dependence in the energy sector and save resources, it is proposed to design energy-efficient administrative buildings. Building engineers can determine the key energy loss characteristics of a building and area to effectively control emissions. Heating, ventilation, and air conditioning (HVAC) systems and lighting consume the most energy in commercial buildings. HVAC devices consume almost 35% of the building's energy supply, which limits its efficiency [1]. Lighting consumes about 17% of an office building's energy supply. People can reduce excessive energy consumption by upgrading old systems and isolating rooms. The purpose of this analysis is to determine the main HVAC and energy parameters and methods of improving their efficiency.

Based on the analysis of scientific sources [2-4], ways to improve the energy efficiency of buildings are given.

1. Insulation of doors and windows. In winter, heat escapes from buildings through cracks and crevices. It is necessary to insulate the doors and windows of office buildings to prevent energy losses associated with HVAC. Frame edging with sealant can create a barrier between indoor and outdoor temperatures. The material should fit snugly against the inner border, shrinking when the door or window is closed. Sealing effectively reduces building utility costs by minimizing heating run time. Builders can also install revolving doors in buildings to improve energy efficiency. This feature allows people to enter while keeping the door closed at all times. Revolving doors are about eight times more energy efficient than conventional designs.

2. Install smart thermostats. Autonomous thermostats are connected to conventional HVAC systems, maintaining an energy-efficient temperature in the room. They use the Internet of Things to access Wi-Fi connections. Intelligent thermostats read local weather forecasts in real-time, adjusting the conditions in the room and relying on the difference in outside air temperatures.

Using natural weather conditions to maintain the room's temperature reduces the energy consumption of the HVAC system. Autonomous thermostats are also connected to motion sensors, adjusting the temperature depending on the number of people in the room. They can turn off the system in an empty building, helping people save money during non-working hours.

3. Increase sunlight. Builders can also add features to commercial structures that improve natural lighting, reducing energy losses from incandescent lamps. Adding skylights can improve the building's access to sunlight. Installation of south-facing windows also improves internal lighting without creating glare.

In administrative buildings, you can additionally increase energy efficiency by installing solar windows. The devices contain transparent solar cells that convert sunlight into emission-free energy while providing natural lighting. When buildings receive some of their energy from autonomous sources, they can further reduce utility costs and emissions.

4. Develop, not extract. Engineers can also design an energy-efficient office building using space optimization methods. Building the structure upwards, instead increasing plane size, reduces the consumption of electricity and materials. When people build taller and narrower buildings, they reduce the space of the shell.

Reducing the shell increases the efficiency of the HVAC system, preventing the influence of the temperature difference of the outside air. Workers in commercial buildings can also increase

energy efficiency and space efficiency by stacking materials for storage. When people gather together, they increase the floor area and reduce energy losses from heating, ventilation, and air conditioning systems and lighting.

5. Use modular construction methods. Another method of developing an energy-efficient administrative building is modular construction. The construction method uses off-site construction tactics to improve the insulation, casing, and compaction of the structure. Modular construction methods also use less energy, since workers can develop several projects in one place.

They further reduce material waste by increasing efficiency by reusing damaged or unused components. All construction materials remain on the construction site, which reduces emissions during transportation. After the engineers design each module, they will deliver the parts to the construction site.

When the parts arrive, builders assemble the entire project, tightly tying each part together. Researchers have found that modular buildings are more energy efficient, as they have less loss of air conditioning.

6. Add intelligent lighting systems. Smart lighting systems are similar to the thermostat technology mentioned above, as both devices use intellectual systems. The light is connected to motion detection sensors, turning off the system in empty rooms. In addition, intelligent technology connects to the building owner's smartphone or tablet, helping him remotely control interior lighting.

A significant part of the energy losses is due to the fact that people inadvertently leave the systems on. When intelligent devices independently turn off the light, they take the load off the building's occupants. Builders can also connect systems to LED lamps, which further reduces energy consumption.

LED lamps reach an average of 90% efficiency, which makes them 80% more efficient than conventional incandescent lamps. They also last almost 10 times longer than other lamps on the market, which reduces energy losses during production.

Conclusion and results. The article highlights six main ways to increase the energy efficiency of administrative buildings: insulation of doors and windows, installing smart thermostats, increasing sunlight, increasing the height of the buildings, using modular construction methods, and adding intelligent lighting systems. Each of the proposed methods makes it possible to increase the energy efficiency of administrative buildings, and their complex application will significantly reduce the consumption of energy resources.

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