

How Internet of Things Technologies Helps HVAC Systems

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In brief

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Centralized engineering support of buildings and structures began to be used even more than 100 - 150 years ago when the first heating boilers instead of wood-burning stoves and reservoirs for water supply appeared in houses. Throughout recent history, building engineering has been modernized every decade. Thus, the first fans, supply and exhaust ventilation units, water heating units, air conditioners, and air dryers appeared. The next step was the invention of automation systems, which turned primitive regulators into high-tech modules. Today, Smart HVAC systems are becoming more widespread, which are based on the Internet of things and provide both full automation and control over the state of engineering equipment at home. Among other advantages, such automation modules also provide a rational use of energy resources. This, in turn, entails cost savings for the facility owner.

How does the Internet of Things work when integrated with HVAC?

In recent years, IoT has been increasingly used to automate household appliances and ensure control over their smooth operation. The scanner, sensor, or transmitter is installed directly on any engineering equipment. The touch screen, thermostat, keys, or other controls will allow you to set the desired temperature or turn on / off the unit - a heating boiler, air conditioner, boiler, or other engineering equipment. When the consumer needs to lower or increase the temperature in the room, he enters the mobile application on his smartphone or tablet and quickly changes the operation parameters. In this case, the smartphone performs the role of an executive device that receives data from a physical object and then signals the unit's state to the user and makes it possible to change the operating parameters. This technology, based on the Internet of Things, allows you to control the operation of a heating boiler or boiler and a refrigerator, stove, washing machine, and even a simple lamp in a lamp. Transmitting and executive devices are connected both through a wired connection and wireless data transmission nodes, for example, via Wi-Fi or Bluetooth. Thus, anyone who has the application and is logged in as a user can easily manage the engineering support of the building from anywhere in the world where there is an Internet signal.

What operating components and assemblies do HVAC include?

The smart HVAC system, regardless of the type of engineering equipment, connection, and other parameters, includes the following main components that are interconnected to ensure the normal operation of all engineering equipment of the building, as well as remote control:

- The main detail is the sensors that respond to temperature and air humidity, and their operation may depend on a pre-set period. Sensors can also analyze the number of people in the room, determining the need for oxygen or energy resources at the current time. Sensors are installed directly on the control module of the heating, ventilation, or air conditioning device, integrated into the main algorithm of each unit. Data is transmitted via wired or wireless communication to the actuator from the sensors.
 - The HVAC system control panel is necessary to activate the sensor and switch its operating modes. Controllers can be installed both in the software of the executive device and separately, for example, next to the electrical panel. responsible for the power supply and safety of the engineering equipment of the building.
 - A personal computer, laptop, smartphone, tablet, and any other mobile gadget with a screen that allows you to read the information in real-time and take action by setting a specific set of commands for feedback from engineering units.
- All sensors and controllers are inextricably linked to the control panel of the unit itself. This allows the consumer or operator to send a return command from his mobile device, which will be read and recognized by the duplicate receiving module. At the final stage, the user's command in the form of a signal activates the heater, fan motor, and other device mechanisms.

What are the benefits of implementing an HVAC system in building engineering?

Most modern engineering companies that install, connect, and commission engineering equipment in buildings and structures for various purposes strongly recommend their customers to use the HVAC system, as it provides a large number of undeniable advantages:

- Savings on the consumption of energy resources, thanks to their rational consumption.
- HVAC is configured so that energy consumption is provided exactly in the amount required by the environmental parameters.
- During the operation of the equipment, as well as during the change of modes and power, both the temperature and humidity of the air are taken into account, and such important parameters as the content of carbon dioxide, general air pollution, the number of people in the room, time of day or seasonality.
- Automated switching of the settings of each device, due to which a special power engineer on duty is no longer required to control the engineering equipment of the building, and the work does not depend on the human factor.
- Errors that often lead to increased costs and other unpleasant consequences are almost eliminated.
- The intelligent application allows both to monitor the operation of each heater or air conditioner and to change their settings differentially, which makes it easy to raise the temperature in one room and provide a cool microclimate in another, that is, when installing HVAC, zoning of the devices is provided.
- It is essential to simplify the balancing of the system at different times of the year, which was previously a problem for every engineer when switching heating systems in thermal centers from winter to summer mode, and vice versa.
- Automated control over the consumption of all resources and providing a comfortable microclimate, depending on the time of day. No longer will business owners have to pay extra for running central air at night in an empty office or store at the end of the working day.
- More and more specialists and engineers are appearing on the services market who are ready to take such systems into balance, which will provide full control over the condition of the building equipment around the clock. Please note that these operators tend to charge low rates, as the staff does not have to make time-consuming detours and manually change settings.
- The same applies to the diagnostics of units - information about the breakdown is instantly sent to the actuator's screen, which provides increased maintainability of engineering systems.

Among the disadvantages of this equipment is only the need for one-time costs for the premises owner, which pay off already in the first year due to significant energy savings. According to statistics, in recent years, only in the UK, the number of new customers of companies involved in installing HVAC systems is at least 0.5 million people per year, and this figure continues to grow rapidly. According to numerous opinion polls, up to 80% of customers are delighted with their new building management and engineering systems, which proves the effectiveness of HVAC.

What problems can arise with an HVAC system, and how can they be avoided?

1: Intruders infiltrate the system

Solution: HVAC is based on IoT, that is, on the operation of a data transmission channel. The more secure a given communication bridge, the less likely cyberattacks occur. Some users, owners of large businesses, whose zeal is associated with the turnover of many funds, seek to create VPNs that completely protect the entire system from the outside world.

2: The sensor and the actuator are incompatible with each other.

Solution: This problem often happens when the owner of engineering systems tries to save money and tie up new generation switches, actuators, scanners, or mobile applications to already existing modules installed many years ago. Experts warn that for the normal operation of all systems in the building, only fully compatible programmable modules, sensors, and actuators are required.

3: Problem with reading information by the operator.

Solution: It is recommended to choose or develop only applications that work interactively, with graphical diagrams, and have straightforward controls. This eliminates the need to involve highly qualified staff to control the performance of engineering equipment.

4: Incorrect operation of sensors.

Solution: It should be noted that sensors and actuators are independent of each other and operate according to individual algorithms. Before starting work, it is necessary to configure them correctly, set the desired pace, and ensure full synchronization of actions without delays. Thus, the HVAC system greatly facilitates the work of operators who control the functioning of engineering equipment in a building of any category. Furthermore, after integrating automated IoT modules into each unit, the facility owner will experience cost savings within a few months.

References

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