Mushroom farm:

Protecting greenhouses and preserving the crop

How automation and notification system from Ajax tripled production efficiency

Challenge

To protect mushroom greenhouses and automate climate control with notifications

Solution

Ajax integration with the farm environmental monitoring system

Products

Hub, MotionProtect, DoorProtect, WallSwitch, StreetSiren

Partner: **Ensa Teknoloji**

Client

Mushroom Cultivation Facility

Ajax turned the passive environmental monitoring system into an active control system with alarm generation and reporting. Read the article to learn the details.

Mushroom cultivation is extremely sensitive to the environment, as even small changes in humidity or temperature significantly affect the harvest. Such attention to the climate is also critical for the food industry, wood processing, paper production, etc.

Special detectors monitor climate indicators, but for full control, you need to build a system that actively responds to changes and protects the harvest on several levels.

Challenge

To protect mushroom greenhouses and automate climate control with notifications

The farm is located in the Turkish city of Bolu. Mushrooms are cultivated in special grow tents with an area of 120 sq m each, and the total area of the farm is 4,560 sq m. There are 38 such greenhouses. The temperature outside the greenhouses varies throughout the year, from -9°C in winter to +31°C in summer. But in hermetic greenhouses, a stable temperature and humidity level is maintained.

It was necessary to provide physical protection of the greenhouses from intrusion, to build a notification system and to ensure that the greenhouse climate does not deviate from optimal performance.

The main goal was to protect the object.

It was necessary to provide comprehensive protection of greenhouses against intrusion and theft. Farm security service must be immediately notified of any hint of unwanted intrusion.

The second important goal was to provide action automation and a notification system.

On a mushroom farm, continuously monitoring climate indicators in the greenhouses is extremely important because even a slight deviation can ruin the harvest.

The problem is that specialized agricultural detectors do not instantly notify about indicator deviation from the norm. The technical service of the farm does not receive notifications centrally, and the system does not automate actions to normalize the climate.

The project had such challenges:

- to protect greenhouses from intrusion,
- to automate system actions to preserve the harvest,
- to build a notification system.

Why Ajax

- Ability to integrate with a wired climate system.
- Ability to integrate with ventilation, heating, and irrigation devices.
- Reliable outdoor security devices.
- Stable and flexible notification system.

Solution

Ajax integration with the farm environmental monitoring system

To protect greenhouses with Ajax devices and integrate them into the specialized farm environmental monitoring system to provide active climate control with automated actions.

Intrusion protection

The territory is guarded by the security service of the farm, which must be instantly aware of threats.

Opening detectors, motion detectors and street sirens were used to protect the greenhouses from intrusion. 38 kits of Ajax devices were used to protect 38 greenhouses: Hub, MotionProtect, DoorProtect, and StreetSiren.

The DoorProtect opening detectors was installed on the entrance doors of the greenhouses. The detector identifies the first signs of intrusion, and the farm security team is immediately notified. It detects opening with the help of a reed switch, which works together with a magnet and reacts to magnetic field changes.

Next, behind the first door to the greenhouse, a MotionProtect motion detector is waiting for the intruder to confirm the intrusion. It is attached to the wall opposite the entrance door and immediately notifies the farm security team when it detects the first signs of movement.

The detector is located in the part of the greenhouse that is not isolated from the outside temperature. Still, MotionProtect detects movement without any errors, even in temperatures from -10°C to +40°C. It’s enough for the climate of Bolu. The detector automatically adjusts the sensor to detect motion in heat and cold accurately.

Thus, the MotionProtect motion detector backs up the DoorProtect opening detector. It is common practice for one detector to verify the triggering of another detector to eliminate false alarms. On the farm, notifications are turned on when each of the detectors is triggered. Even if an intruder enters the greenhouse not through the door, they will not hide from the motion detector.

Loud StreetSiren is activated in case of alarm. The siren has the IP54 enclosure protection class and operates in temperatures from -25°C to +50°C.

In addition, guards receive notifications on their smartphones via the Ajax Security System mobile app for iOS and Android. They immediately see which detector has been triggered and which greenhouse should be checked.

Hub controls the operation of connected devices. The control panel is installed in a radiotransparent plastic box inside the greenhouse. It communicates with devices via the Jeweller radio protocol, collects encrypted information about detector operation, and transfers the entire system to backup frequencies and channels in case of jamming.

Climate control automation: Scenarios and notifications

The next challenge is to build an effective control system with Ajax devices.

Without automation, the system only measures the necessary indicators but cannot normalize the microclimate and does not take preventive actions if something goes wrong. The Ajax system helped to automate such actions and build a notification system.

“The main customer requirement was not just security devices. They wanted to build a complete farm management system with automation scenarios and measurements. Environmental monitoring solutions are passive — they measure and store data but do not alert users of critical situations. So, we combined two systems — the microclimate control system and Ajax. Thus, passive monitoring has become proactive”

Ali Çalik, CEO of Ensa Technology and Security Systems LTD

Automated actions with Ajax

People cannot work without special equipment at such a climate-sensitive facility, as it is too risky for the crop. The system must continuously maintain indicators at the required level. Also, the system protects the crop from human errors in extraordinary situations.

Specific agricultural detectors of the mushroom farm measure the following indicators:

- high temperature,
- low temperature,
- high humidity,
- low humidity.

When each indicator reaches a pre-configured value, the system activates heating, ventilation, irrigation, etc. In this way, it does not allow indicators to deviate from the optimal values.

The following Ajax devices were used for automation: the DoorProtect opening detector, the WallSwitch power relay, and the Hub control panel.

The wired agricultural detectors were connected to the DoorProtect via an external terminal with normally closed (NC) contacts. The farm environmental monitoring system is configured in such a way that each detector is responsible for a single indicator, and this detector is connected to DoorProtect. This means that one DoorProtect is responsible for the reaction to high temperature, another for the response to low temperature, etc.

In its turn, the WallSwitch power relay is connected to the mains of the ventilation, irrigation, heating, and air cooling systems.

For example, if the wired detector of the environmental monitoring system identifies a certain high-temperature value, its contacts are closed. DoorProtect detects a short circuit and transmits data to Hub, and the control panel sends a command to WallSwitch to close the electrical circuit. This turns on air cooling.

Ajax devices helped automate the systems of:

- ventilation,
- irrigation,
- heating,
- and air cooling.

The system is configured so as not to allow risk indicators of the microclimate. The personnel will be notified if the system records values close to abnormal.

Configuring notifications with Ajax

The indicators of the greenhouse microclimate should never go beyond the norm. This is ensured by two levels of protection:

1. Automated actions to maintain optimal temperature and humidity indicators.
2. Human input if indicators approach critical values.

The second level of protection is provided by the notification system. If any microclimate indicator approaches a critical value, StreetSiren will be activated in the greenhouse, and the farm workers will receive a notification in the Ajax app. If StreetSiren is triggered, the greenhouse needs attention from the staff.

DoorProtect is used for notifications. It transmits alarms to Hub, which then activates the siren. The backup agricultural detectors control the critical level of indicators.

StreetSiren is activated in the following cases:

- when the Ajax system detects an intrusion into the farm,
- when one of the microclimate detectors identifies that the indicator has reached critical values, and human input is required.

The siren is activated, and a notification is sent to the Ajax Security System mobile app. Every farm worker has the app on their smartphone. When they hear an alarm, the employees go to the greenhouse and solve the problem.

It took a week to install and configure the system: the installers worked simultaneously with the construction workers.

The settings were configured in the PRO Desktop app used to monitor and administer the Ajax systems.

“Ajax has given us an immersive experience. It is not just a security system but a unique integration platform for any system where you want to implement notifications and use automation scenarios. Ajax has infinite possibilities for different applications in different fields of activity”

Ali Çalik, CEO of Ensa Technology and Security Systems LTD

The result

After the farm implemented an Ajax system, production efficiency increased dramatically from 15% to 42%. The investment in the project was recovered in less than five months.

A special compost mixture is used to cultivate mushrooms. According to the international standard, one ton of compost should yield 30% of the mushroom crop in 45 days (or 300 kg). But the client managed to increase this indicator by 15%. Thanks to the implemented project, the efficiency of the farm exceeded the international standard, and the yield increased three times.