



## Collecting eggs made easy

Networked Eaton easyE4 devices simplify the implementation of a distributed control system for an egg collection and conveyor system

**Location:**

Vechta, Germany

**Challenge:**

Implement a reliable, distributed control system for an egg collection facility in Spain that can be easily operated by the local staff.

**Solution:**

Seven Eaton easyE4 devices that communicate via NET within an Ethernet network.

**Results:**

A cost-effective, flexible control solution that does not require a lot of programming. The operators on site can easily change standard parameters via the integrated display.

*“The easyE4 is simple to install and the configuration is quick and easy, which means that even small projects of greater complexity can be realized quickly.”*

*Leon Hellbernd,  
electrical engineer at Hellbernd  
Elektrotechnik GmbH & Co. KG*

**Background**

Since its establishment in 1991, Fienhage has focused on the development and production of housing systems for laying hens. Today, the equipment supplied by Fienhage, which is based in Lutten near Vechta in Germany, is in demand all over the world. To date, the owner-operated company has completed around 10,000 projects across 100 countries. Fienhage's product range covers much more than just aviaries and breeding nests, it also includes feeding and drinking systems, air conditioning and lighting systems as well as egg conveying, and packing systems equipped with modern automation technology that significantly simplifies the work of agricultural companies.

Hellbernd Elektrotechnik from Vechta is one of the companies that design and build the switchgear needed for Fienhage's systems. Hellbernd

has many years of experience designing and building switchgear, control systems and electrical installations for private and commercial clients. For more than six years, Hellbernd has not only been building the switchgear for the systems manufactured by Fienhage but has also handled the maintenance and installation of the company's production facilities.

**Challenge**

**A simple control solution with a high degree of operational reliability**

“For Fienhage, it is important that its products come with simple controls that can be operated by anyone,” says Daniel Böske, who is responsible for the planning of electrical engineering projects at Hellbernd. “In addition, operational safety and ensuring that the products offer good value for money are at the top of the list of requirements.”



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Naturally, these criteria also applied to the control system design that Hellbernd developed for a Fienhage egg collection and conveyor system that will be installed at a poultry farm in Spain. The farm consists of five hen houses as well as a large facility where the eggs are collected, sorted and placed in egg cartons. A conveyor “catches” the eggs laid by the hens in each building. The conveyors from the five hen houses transfer the eggs to a transverse belt, which then transports them to the sorting hall. To be able to assign the eggs to the respective hen houses, each of them must be checked one after the other.

“The aim of the project was for the entire egg-collection process to be centrally controlled from the egg collection and sorting facility,” explains Daniel Böske. “However, in order to carry out maintenance and cleaning work, it also had to be possible to operate the conveyors locally in each hen house.” If all the eggs from one of the hen houses have been collected (i.e. the respective conveyor is empty), this information needs to be displayed in the sorting facility, so that the conveyor in the next hen house can then be selected directly. This avoids idle periods in the sorting facility. “An additional challenge in this project were the very long cables that needed to be connected in a fault-free and highly reliable manner,” adds Mr. Böske.

“Implementing this control task using a hardware solution – for instance via switches that control each actuator individually – would have been complex and expensive,” explains Leon Hellbernd. “In order to send commands and receive signals, we would have had to lay a corresponding number of control lines from the sorting facility to the individual conveyors. What’s more, the hardware components would have required a lot of space.”

## Solution

### The facility is controlled by seven networked easyE4s

This is why Hellbernd decided to use the easyE4 from Eaton. This powerful control relay enables the efficient implementation of control systems for a wide range of industrial and building applications. It combines a high level of flexibility with easy handling and offers all the features of a small PLC while being considerably more cost-effective.

Hellbernd used a total of seven easyE4 for the egg collection and conveyor system: While one easyE4 acts as master, the other six control the five conveyors in the individual hen houses as well as the transverse belt. “The integrated display on the master control relay can be used to specify whether the other easyE4s should be addressed or not,” says Mr. Hellbernd. “Under the command of the master, the subordinate control relays process their own commands and then transmit information back to the master or to the other easyE4s. In automatic mode, the Eaton selector



switch on the master control cabinet is used to select the hen house in which the conveyor should operate. An M22 signal lamp, also from Eaton, which is located above the conveyor indicates whether the eggs from a hen house have already been collected, are currently being collected or if a fault has occurred.

“The six easyE4s, each of which controls one conveyor, count the pulses of the revolutions of the conveyor drive,” explains Leon Hellbernd. “Based on the number of pulses, the easyE4 recognizes when a conveyor section has completed its run, meaning that all the eggs have been removed and the conveyor is empty. The control relay forwards this message to the master so that the conveyor in the next hen house can be started.” It is also possible to set the required speed of all the conveyors in the master cabinet.

All the control relays are connected via Ethernet and communicate via NET. “Each easyE4 runs its own program,” explains Leon Hellbernd. “It executes the commands from the master, checks its inputs and reports if there are any faults. The fault signals

are displayed as NET variables, so that the other control relays receive information about the respective status without the need for any further evaluation." The control relays continuously query the variables of all the other connected easyE4s, so that if one of them fails, the other devices can act accordingly and will report the incident. "Since up to eight easyE4 devices can communicate with each other via NET within the same network, no additional higher-level controller was necessary for this application," emphasizes Mr. Hellbernd. This helps to cut costs and makes setting up the system much easier.

The easyE4 is designed to be a flexible solution for applications of varying complexity. Thanks to its integrated inputs and outputs, even the basic device can be used to control simple tasks. The basic device can be adapted to more complex tasks by means of up to eleven expansion modules, so that a maximum of 188 I/Os are available. In this project, Mr. Hellbernd used this option because it was also necessary to output analog signals. In the egg collection system, each of the easyE4s in the hen houses is connected to the pulse generator (which acts as a sensor) and to the drive of the respective conveyor (which acts as an actuator). The extension modules can be connected via the "easyConnector" at the front: According to Leon Hellbernd, "The installation of the extension modules is very easy and saves a lot of time compared to other systems."

The Eaton easyE4 is programmed using the intuitive Eaton easySoft7 software. Users can choose between four programming languages, meaning the circuit diagram can be created using the function block diagram (FBD), the ladder diagram (LD), Eaton's own 'easy' programming language EDP or by means of structured text (ST). "I chose structured text for this project because I personally find it easier to understand, which allows me to work a lot faster in this language," says Mr. Hellbernd. The devices can also be programmed using the integrated keyboard and display: as Mr. Hellbernd notes, "The keyboard works great and is easy to use. We also use the display to visualize messages based on the three available background colors."

As the egg collection system will soon be installed in Spain, the ability to perform remote maintenance via Ethernet is an additional benefit for Fienhage. In addition, program updates can be easily installed via the micro SD card adapter in the basic device. This not only saves travel expenses for future maintenance work but also enables the staff on site to make process adjustments themselves.



In addition to the easyE4 control relays, Hellbernd also used numerous other devices from Eaton for the system, including DC1 frequency drives for the conveyor drives, miniature circuit breakers, compact starters, contactors, M22 indicator lights and acoustic sensors, as well as the main switches for installing the doors and the selector switches for DIN rail mounting. Leon Hellbernd added: "The fact that the products are matched to each other and can be easily linked together simplifies the control panel design. And, of course, it is also visually more attractive if the products all have a uniform appearance."

## Result

### Small projects can be realized quickly

Using the easyE4 allowed Hellbernd to reduce the wiring, save space inside the control cabinet and implement a distributed control system without any great programming effort – and at a relatively low cost. Leon Hellbernd concluded: "The easyE4 is simple to install and the configuration is quick and easy, which means that small projects can be realized quickly. A further advantage is the integrated display, which gives our customers a detailed overview of errors and allows them to change the basic parameters themselves thanks to the user-friendly operation of the devices."



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