Integrated control system ensures trouble-free parking lot management

Optimizing utilization of available space in conjunction with minimizing traffic searching for parking spaces – including monitoring and operation – represents a complex control task. Municipal service provider Amersam has successfully solved the parking lot problem in the Catalan city of Reus in northern Spain. The parking lot management solution, which is based on an integrated system that coordinates all requirements such as acquisition of the available parking space, vehicle guidance to the parking area, billing, fault management and various building management functions, operates trouble-free and cost-effectively.

Amersam is a municipal service company that deals with various infrastructure tasks, including management and operation of the six multi-story car parks, on behalf of the City of Reus. The city, with a population of 100,000 has around 2,000 parking spaces in multi-story car parks and additional short-term parking spaces in so-called blue parking zones. The size of the underground garages varies between 90 and 900 parking places. Amersam was faced with the task of making the operation of car parks with less than 250 places profitable. The company implemented a fully automated control and monitoring system based on a Beckhoff control platform, which enabled the integration of existing systems.

Optimized parking space management based on a universal control platform

On average, a parking space is used by four cars per day. The effective utilization is just below 70 percent in the blue parking zones and around 30 percent in the underground garages (the latter mainly during the day). A team of three technicians is available for the integration and automation of the parking lot management system. A control center not only deals with the traffic searching for parking spaces via a telematics system, but also with monitoring and controlling the ticket machines and automatic cashiers, the logging of free and occupied spaces, automatic plate number recognition, video surveillance (CCTV), alarm and motion

The City of Reus has around 2,000 car parking spaces in six public multi-story car parks. In addition, there are short-term spaces in so-called blue zones. On average, a parking space is used by four cars per day. The effective utilization is just below 70 percent in the blue parking zones and around 30 percent in the underground garage parks.

The car park control system in the City of Reus in northern Spain shows motorists which of the six multi-story car parks have parking places available.

detection, control of lighting, ventilation and fire protection systems, as well as the intercoms.

According to Satyan Thomee, software developer at Amersam, the computers continuously receive approx. 4,000 tags, mainly via a glass fiber network based on a star topology with TCP/IP protocol that covers the whole city.

The company started using control components from Beckhoff in 2006 for integrating the different applications. In addition to several analog and digital I/O modules, a total of 10 CX1000 Embedded PCs and five BC9000 Ethernet Bus Terminal controllers are used for control and monitoring tasks.

The attached Bus Terminals log temperatures, presence and other parameters via infrared and ultrasonic sensors. RS232/RS485 communication modules report free and occupied spaces in real-time. Relay terminals control barriers and access to certain spaces. Access to the various buildings is controlled via biometric systems or contactless Mifare memory cards, which are based on radio communication. Connection of the ticket machines via RS485 enables fault reporting directly to the control center.

Beckhoff CP72xx series Control Panels, which are installed at the entrance to the multi-story car park, show drivers where to find the next available parking space, minimizing traffic in search of a parking space.

DALI control system enables efficient energy use

The DALI (Digital Addressable Lighting Interface) lighting control system saves up to 50 percent electricity in the multi-story car parks. The light intensity inside and outside is measured via a 0…10 V signal, and the lighting levels inside the multi-story car parks are adjusted accordingly. Each cark park is divi ed into independently illuminated zones. The required zones are illuminated based on the data from the motion detectors, so that dark areas are avoided and car park users feel safe.

Integration of existing systems into the Beckhoff control platform

Due to the openness of the Beckhoff control platform, the existing systems for the individual multi-story car parks could be integrated into

A team of three technicians is available for the integration and automation of the parking lot management system. (left to right) Leonardo Blázquez, in charge of IT; Satyan Thomee, software developer; and Alfred Blasi, control room supervisor

Control center staff can monitor cars entering and leaving the buildings and the available parking lots and control the utilization of the car parks.

the new control system. The existing devices came from different manufacturers and use various communication protocols and fieldbus systems such as PROFIBUS, Modbus, CANopen, etc.

Leonardo Blázquez, who is in charge of IT at Amersam, explained that TwinCAT automation software from Beckhoff and the function blocks in TwinCAT act as a kind of "middleware" for homogenizing the data from the different facilities for the main system. Amersam currently uses Ethernet as the fieldbus system for communication between the central controller and the peripherals. In the future, the company intends to switch to EtherCAT from Beckhoff.

An investment that was well worthwhile

The investment in the automation, which accounts for approx. 10 to 15 percent of the overall project costs, quickly paid for itself: "The efficient management of the multi-story car parks led to significant cost savings and therefore lower prices for the benefit of the citizens," said Leonardo Blázquez.

Future enhancements only require software adaptations

The City of Reus intends to increase the number of its multi-story car parks to nine, which thanks to the automation can be achieved without additional staff. "Integrating a new car park into the system requires

modifying approx. 20 percent of the software, which once again illustrates the advantage of software function blocks," explained software developer Satyan Thomee.

As a socially-committed company, Amersam promotes employment of disabled staff, so that the systems have to be convenient to operate for people with a range of capabilities. A special periphery was established that supports staff through simple procedures or the option of visual adjustments without generating additional costs. "The decision to use the Beckhoff platform permits us to use open standards and a simple configuration for operating the applications. Over the four years since we started using the Beckhoff products they have proven their reliability," said Leonardo Blázquez.

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