

New building services systems for AMAG Automobile- and Motors' central spare parts warehouse



## Building automation with planning freedoms

→ The sophisticated retrofitting project for the central parts and accessories warehouse of the AMAG Group can be regarded as exemplary for the high building automation standards in Switzerland. AMAG, based in Zurich, is Switzerland's official importer for VW, Audi, Seat, Skoda and Porsche and is also one of the country's largest companies. The project to refurbish the building automation systems in the central spare parts warehouse focused on two aspects: application of an integrated automation platform including standard software, and cooperation based on partnership between all parties involved in the project.

Building automation has a long tradition in Switzerland. Building automation is not only used for simple infrastructure measures such as electrical power in buildings, but extends to all areas with the aim of making the use of the building as convenient and efficient as possible. High-tech building automation is often implemented in industrial facilities. This also applies to upgrading of outdated technology to modern technical standards, such as the retrofitting project of the AMAG Group. The following companies were commissioned to implement the complex project: Thomas Lüem Partner AG, who had already undertaken electrical design work at various AMAG locations over the last few years, Bühler+Scherler AG, who were responsible for the implementation of building automation systems, and Beckhoff Automation AG as the control equipment supplier.

### A project with many unknowns

The goal was to modernize the building located in Buchs near Zurich, which was originally constructed in 1957 (which had since been enhanced several times with more modern technology standards) and to install a forward-looking building infrastructure that could cope with any future changes. The biggest challenge for retrofitting projects of this magnitude is the fact that project tasks have to be implemented during normal operation of the building, i.e. the individual components such as lighting, HVAC and the whole infrastructure, including electrical installation and communication systems, have to be replaced successively, with the exact time and scope of the individual tasks often difficult to plan in advance. In addition, the documentation for the existing inventory is often unsatisfactory,



Individuals involved in the project (from left to right):

Dominique Urech (Project Manager at Engineering and Planning Consultancy, Thomas Lüem Partner AG based in Dietikon near Zurich), Thomas Bischofberger (Director for Automation at Bühler+Scherler AG, consulting engineers based in St. Gallen).



CX1000 Embedded PCs deal with building control tasks at AMAG's central spare parts warehouse.

with the only available plans often dating back to the time when the building was originally built. Such circumstances require a scalable and flexible technical platform.

### Necessity and scope of the tasks

The first step in the project realization was the complete replacement of the outdated lighting system. This revealed the necessity of further work in connection with emergency lighting and low/medium-voltage switchgear. The same applied to the communications infrastructure linking the IT equipment. "As the HVAC equipment was being replaced, new systems were installed and integrated into the automation concept on a weekly basis", said Dominique Urech, Project Manager at Thomas Lüem Partner. "This required a high degree of flexibility on the part of the project partners."

The automation concept is based on a coherent platform consisting of Beckhoff products and Microsoft standards, integrating control of all electrical and building services components as well as building automation reporting and alarm systems. The technological basis is provided by SOAP (Simple Object Access Protocol, a platform-independent WebServices communications protocol) for communication, the .NET standard from Microsoft, and web technology. All intelligent stations have their own IP addresses and are networked via Ethernet TCP/IP with servers storing the so-called meta data. From these meta data, the individual intelligent components can independently retrieve data and actions for ensuring the required functions.

As a special requirement, the automation concept must be able to communicate with the existing infrastructure of the central AMAG IT system, located in Buchs building – to which, all AMAG sites in Switzerland are coupled. In addition, the building automation system is also to be used for facility management, with DALI Bus Terminals from Beckhoff, which can be used for lighting control. The FM could even extend to the individual facilities of the AMAG Group, because according to Urech the building automation system could, in principle, be used across the group through networking, based on integrated infrastructure technology.

### Integrated hardware and software

Integrated interfaces are used with the aim of realizing a consistent building automation system. "We wanted to avoid incompatibilities in the automation technology of the lighting and HVAC systems that would force us to use two separate control systems and two monitors in the control center", said Urech, explaining the decision to use an open and flexible automation platform. "In the next step, we will add a new fire alarm system."

The control platform with CX controllers that enables implementation of the SOAP concept was a crucial factor for the contract being awarded to Beckhoff. "Communication of the control system via SOAP was a basic requirement for the contract, which only Beckhoff was able to meet", said Urech. Gerhard Meier, Managing Director Beckhoff Automation, Switzerland, said: "We had already tested the SOAP technology intensively during other automation projects such as the headquarters of Microsoft Germany at Munich, and we were able to provide information from successful implementations in our quotation."

An additional factor was the fact that the CX1000 Embedded PCs offer the required coupling depth for the retrofitting project. After all, analog process signals from temperature, brightness, rain and wind sensors also have to be dealt with. This results in new control strategies for peripheral equipment, such as light management, the heating control etc. In addition, many control strategies are "cushioned" with time functions.

### Bus Terminals enable special functions

Emergency lighting, which in the past was an independent installation segment, is also integrated via the DALI Bus Terminals. "This strategy enables us to adapt emergency lighting flexibly to the different emergency situations in the building or to changing escape routes", said Urech. After all, shelving units in the vast 40,000 m<sup>2</sup> central depot are often modified or relocated, which in the past meant that emergency lighting had to be reinstalled on a regular basis. Modifications of this nature can now be handled from the control center via software. These system components are obviously protected through UPS or emergency power equipment. "The available emergency power capacity", said Project Manager



Dipl. Ing. Gerhard Meier is Managing Director of Beckhoff Automation AG, Schaffhausen. "Building automation has been a tremendous growth area for us, particularly through projects in Western Switzerland", said Gerhard Meier. Notwithstanding the well-established business relations in this application area, the Beckhoff subsidiary is succeeding in positioning itself in the market and, in collaboration with partners, to win projects against renowned competitors. Meier stressed that Beckhoff handles both new projects and retrofitting projects. According to Meier, crucial factors are the diversity of the Beckhoff product portfolio and Beckhoff's innovative building automation solutions. "In addition to our standard range, we offer special building automation Bus Terminals, e.g. for EIB, LON, MP-Bus, DALI and EnOcean, and also for monitoring analog process parameters such as temperature and pressure, plus direct control of actuators. Another factor is that we are able to draw on Ethernet-based IPC controllers that are scalable both in terms of the technology and price, which can be configured and programmed based on a integrated and standardized engineering platform", said Meier.

Urech, "can even be measured online as a basis for deciding whether to dim and continue to operate the complete lighting system at 20 % output, for example. Currently, we are already using seven CX1000 controllers with TwinCAT PLC as the runtime system and additional building libraries from Beckhoff as well as special control libraries from Bühler+Scherler AG. Five more CX1000 controllers will be installed shortly. Special sensors such as movement sensors are integrated into the automation system via EIB Bus Terminals. Currently 860 data points are monitored via Beckhoff Bus Terminals. According to Urech, this number will have increased to about 2,500 data points on completion of the project. In addition, two Beckhoff C3640 built-in PCs with 15" screen are used for status displays and for visualization of the energy management system. They are coupled to the control system from Bühler+Scherler AG, which is based on a separate server and the WebFactory software system. By the way, the Bühler+Scherler AG project engineer based in St. Gallen can also visualize the system status remotely via the WebFactory server and an ISDN modem. Ethernet TCP/IP is used as backbone at the AMAG spare parts warehouse. The optical fiber bus is based on a ring topology. This means that each control cabinet



C3640 Industrial PCs are used for energy management visualization purposes.

features a switch that also acts as a media converter. This arrangement offers practical benefits, as Thomas Bischofberger, director for automation at Bühler+Scherler AG, explains: "During commissioning or service, we can access the network directly via a laptop, without having to interrupt a network connection."

### Conclusions

The project management is characterized by excellent cooperation between the client and the electrical design team, and between the three automation partner companies. Numerous project changes, independent of the retrofitting or new utilization requirements, can easily be accommodated due to the design concept and the flexible automation platform. "It is quite reassuring to know that the client's design aims can be implemented simply by selecting associated automation components, without requiring fundamental modifications of the concept", said Dominique Urech. Thomas Bischofberger added: "We have to make life as easy as possible for the electricians. If all they have to do is plug in patch cables, there isn't much that can go wrong with the system."

The overriding aim of using an integrated building automation platform has been implemented consistently. This strategy also proved useful for engineering, because the associated costs can be quite significant in building automation applications. Completion of the project is scheduled for the end of 2007.

The conceptual capabilities of the solution have not yet been exhausted. According to Urech, the next steps will examine options for extending the energy management system to cover the whole AMAG group. Facility management is another option he intends to discuss with the client. Such functionalities are made possible – notwithstanding the frequent design changes – by the PC-based Beckhoff platform and consistent reference to software and communication standards.

- > AMAG [www.amag.ch](http://www.amag.ch)
- > Thomas Lüem Partner AG [www.tlp.ch](http://www.tlp.ch)
- > Bühler+Scherler AG [www.buhler-scherler.com](http://www.buhler-scherler.com)
- > Beckhoff Switzerland [www.beckhoff.ch](http://www.beckhoff.ch)