



▲ Stefan-Andres-Gymnasium Schweich

Photo © Olaf Herzog

# Fresh air and energy efficiency for bright minds

## Needs-based control and energy savings thanks to building automation

With a special guidance year which helps pupils to choose between grammar school and secondary school education, the Stefan-Andres-Gymnasium school has a modern educational concept. The building automation system for the new school buildings should therefore be equally modern. After all, the 1,600 pupils who learn there every day use a lot of energy and require a great deal of fresh air. In classrooms in particular, the concentration of CO<sub>2</sub> in the air is often too high. This not only leads to uncomfortable conditions in the room but also makes it harder for pupils to concentrate. The automation technology from Saia Burgess Controls (SBC) combined with the building management in BACnet standard creates an optimal learning climate. In addition, the system complies with the Energy Saving Ordinance (EnEV).

It took just under three and a half years to construct the new Stefan-Andres-Gymnasium building. The technical building services (TBS) were planned by Ingenieurbüro Christian Förster. As the system integrator, RAUCHER Building Automation GmbH was responsible for setting up the building automation sys-

tems and programming them in accordance with customer requirements. The aim was to control and regulate all the technical systems in the building from central so-called information focus points but also to be able to operate specific functions such as blinds or lighting in the individual rooms too.

### Outline

#### Requirements

Setting up a building management system which offers an overview of the premises and allows centralized operation of all TBS groups with a particular focus on ventilation, lighting and shading.  
Installing an individual room control system allowing energy-saving, convenient operation.

#### Implementation

- ▶ 15 PCD3.M5340
- ▶ 5 PCD7.D457VTFC panels
- ▶ Visualization of the system via 5.7" Micro Browser panel in the control cabinet door and via the web
- ▶ Saia PG5 2.1

By installing five information centers at the high school, it allows another advantage of performing service during active school operation without disturbing classes. «In order to meet the specific needs of a site with several buildings and frequently changing time plans, we installed an end-to-end building management system based on the brand-neutral BACnet standard throughout the school. Although this wasn't planned when we started the project, it has the key advantage that the entire building automation system can be managed from a central operating point. The tasks include administering time plans and setting target values for rooms as well as higher-level alarm management and recording and analysing trend data in order to optimize comfort and energy consumption during the school day. During the planning phase, the requirements as regards building automation can change – this was the case with the Stefan-Andres-Gymnasium in Schweich. Thanks to their great flexibility, however, the SBC products could be adapted quickly and easily to the new circumstances and the building management technology. That's why we rely on the automation specialist SBC», said Stefan Hauter, Project Manager at the SBC system partner RAUCHER, explaining some of the benefits of building automation in educational institutions.

## Individual room control – centrally managed

Presence sensors that indicate when people are in the room as well as temperature

and air quality sensors which monitor the current conditions in the room allow the heating and ventilation systems at the Stefan-Andres-Gymnasium to be adjusted as necessary. Weather stations with global irradiance sensors control blinds depending on the position of the sun. If teachers or pupils would like to open windows, the window contacts detect the open windows and turn down the heating accordingly. As a result, no energy is used unnecessarily and rooms are only heated when necessary. The feel-good temperature can also be adjusted centrally by the school caretaker, making excessively hot or cold classrooms a thing of the past.

The entire system is linked to a network made up of five information focus points with a total of 15 automation stations from SBC. This network covers three parts of the building including the canteen and the school library. All interfaces come together in a global monitoring system. As a result, details of all TBS processes can be retrieved

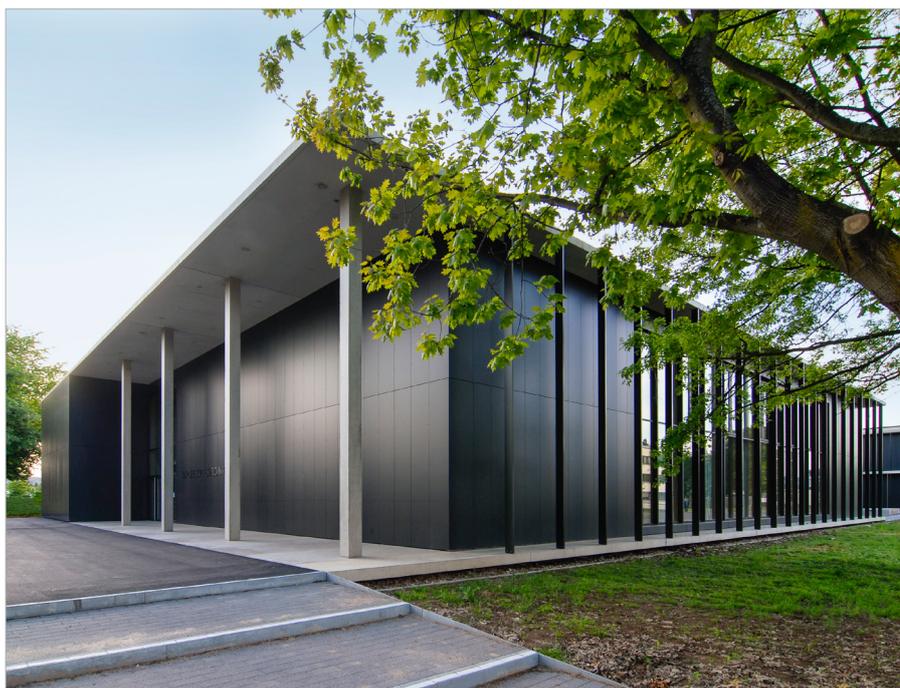
centrally via a web-based visualization system. The caretaker can retrieve not only all data and consumption figures but also alarm messages on his computer. The first building houses the canteen whose functions come together in a control cabinet. The other two school buildings each have two control cabinets which control ventilation, heating and individual room conditions. Each control cabinet is equipped with a web panel (PCD7.D457VTCF). This makes it easier to maintain and repair the system.

## Fresh air for fresh ideas

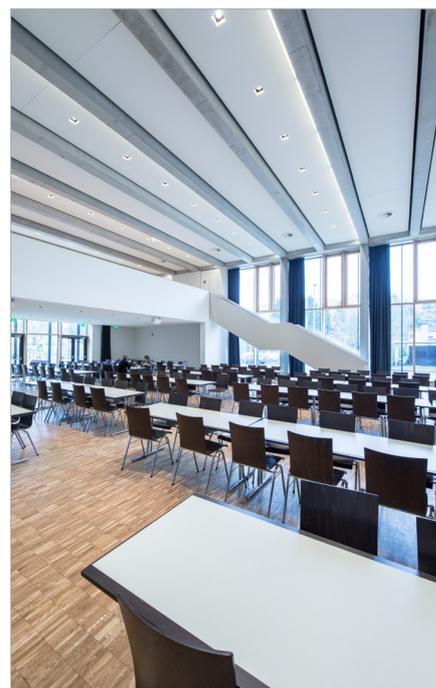
Pupils' learning success and productivity also depend on the air in the classrooms. An adverse climate can decrease the ability of individuals to concentrate and absorb information. Most noticeable however when the air quality has already deteriorated. Motion detectors, when people are present, will automatically activate the supply- respective-

«Thanks to their great flexibility, SBC products can be adapted quickly and easily to the new circumstances and the building management technology.»

Stefan Hauter,  
Project Manager at SBC system partner  
RAUCHER Building Automation GmbH



▲ Depending on the situation, the weather stations interact with the sensors within a building and provide a signal as to whether the blinds need to be activated or whether it is too windy and they need to be raised.  
Photo © Olaf Herzog



▲ Ventilation at high school is controlled by motion sensors. Depending the size of the room, the necessary amount of fresh air is given  
Photo © Olaf Herzog

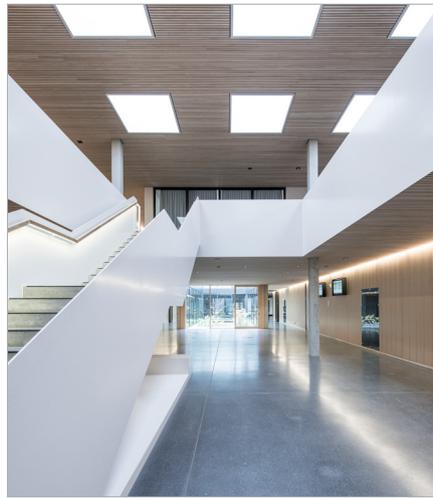
ly exhaust fan to eliminate poor air quality that can affect the ability to concentrate. A timer also determines at what fixed points in time fresh air is needed. This is the case for example every morning before school starts. However, specific time plans can also be set up and can be adapted flexibly and individually. The amount of air which is fed into a room depends on its size and function. The higher-level SBC control system passes on this information to the volume flow controllers. As a result, the air in classrooms, the school library or the canteen can be regulated as necessary.

## The last person turns off the light

In public buildings, lights are often left on even though no one is there. Here too, presence sensors are a useful solution when it comes to saving electricity. They ensure that lights are switched off automatically no later than ten minutes after the last person left the room. The new control system at the Stefan-Andres-Gymnasium also dims the lights depending on the level of daylight. If, however, a film is shown or someone gives a presentation during a class, the blinds can of course be operated manually from inside the classrooms.

## Safety and fire protection

In the event of an alarm – triggered for example by a system breakdown or a smoke alarm – the caretaker receives a message which can be checked on the computer or using a mobile device. It is immediately obvious where in the system the fault has occurred, which makes it easier to rectify



▲ In public buildings in particular, significant energy savings can be achieved with the help of automation and building technology.  
Photo © Olaf Herzog

the problem. If a smoke alarm or the fire alarm system goes off, the room ventilation system is automatically switched off, the incoming and outgoing air flaps are closed and a message is sent to the relevant control cabinet. This means greater safety in the event of a fire.

In case of a power interruption, the cabinets and automation station are turned off immediately. Thanks to an internal back-up battery no data will be lost and the installation will resume to its normal operation after power had been restored. Additionally, the building management computer is fitted with an interruption free pack-up power source (USV). This way, short power interruption can be bridged.



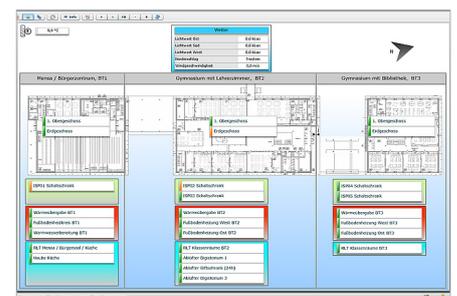
▲ In each of the new school buildings, there are automation cabinets where the various system groups come together. As a result, maintenance can be carried out centrally without disrupting teaching in the classrooms.  
Photo © Ing.-Büro Christian Förster GmbH

## Meeting the requirements of the EnEV

New buildings, especially public ones, need to meet exacting requirements as regards energy savings and efficiency. The Energy Saving Ordinance (EnEV) stipulates energy-efficient systems for new buildings in order to comply with the ever lower key figures set out in the ordinance. On January 1 2016, the maximum value for annual primary energy consumption was reduced, as was the upper limit for calculated mean thermal transmittance coefficients. This means that if a school is rebuilt or renovated on a large scale, a building automation system adapted to the particular circumstances and requirements can help to achieve these key figures as it did at the Stefan-Andres-Gymnasium in Schweich.



◀ To save energy and for greater efficiency, presence sensors ensure that the light is on only if someone is in the room.  
Photo © Olaf Herzog



▲ On the Web-View for the building management at the «Gebäudeleittechnik der Ingenieurgesellschaft für Gebäudeautomation mbH (INGA)» alarms or error messages are instantly recognized. This ensures greater safety and is also easy to use.  
Photo © RAUCHER Building Automation GmbH

## The challenge

Since the 2009/2010 school year, the Stefan-Andres-Gymnasium school in Schweich has offered a special guidance year which helps pupils to choose between grammar school and secondary school education. With the support of the State of Rhineland-Palatinate, the local authorities in the Trier-Saarburg district together with the community of Schweich invested in a new building which includes a canteen and a centre for the generations and communication. The building automation system is designed to allow all TBS groups in all three parts of the building to be operated from a central point, in particular lighting and shading. In order to maximize convenience while reducing energy consumption, an individual room control system was proposed.

## The solution

Ensuring particularly low energy consumption and providing an optimum learning environment were key considerations when constructing the new building. For greater user-friendliness, there are central signals for lighting and shading and the system can be overridden by users in each individual room. In the end, an automation and building management system with overview plans in the form of layouts and higher-level time plans was installed. This combines and coordinates all system groups in an optimum manner.

## Summary

An intelligent instrumentation/control and automation system helps to save energy and provide a good learning environment. A graphical display of all key information and automation stations also makes the system easier to operate. The use of cutting-edge Saia PCD technology at the Stefan-Andres-Gymnasium helps the systems run in an energy-efficient, sustainable manner. The clear, centralized structure makes it easier to search for faults and makes the entire system very easy to manage.

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## Project

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