

### Case Study

### Industry Sector Building Technologies Division

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#### **Siemens participates in the construction of the new National Technical Library building**

**At the beginning of July, the public could see for the first time the premises of the National Technical Library (NTK), which was built in less than three years, on the campus of the technical colleges in Prague. Siemens participated in the construction of the modern and exceptionally technically interesting building, providing data integration of critical technologies and supplying the building automation system as well as the fire detection system.**

The new technical library accommodates roughly 1.5 million books and magazines in total. An interesting thing: the books that will be available to visitors would fill an approximately two-kilometer long line of shelves. The ground plan of the building, designed by the Projektil architekti studio, has a rounded-square shape and symbolically represents a technical textbook. The architects' intention was to create a simple-shaped building whose integral part would consist of revealed technological features. The technicians' goal was to design and implement an energy-saving and operationally economical building.

On the six floors over the ground, apart from the library services and shelves with circulating books, visitors will also have available a café seating 150, four computer labs, 272 relaxation places, and 18 team and 27 individual study-rooms (two of them are suitable for wheel-chair users and another two for people with vision impairment). A night study-room will be open seven days a week after the other NTK parts have closed, while a lecture hall seating 232 and an exhibition hall are offered as well. On the three floors under the ground, apart from the service technologies and book depository, there are 299 parking spaces for cars and 200 bicycle stands.

In the library, approximately 180 employees will work in open-space offices in the eastern part of the building. Several smaller offices are available for the NTK management. The library management estimates the yearly attendance at 900,000 people, who can use 1,224 study places and more than 250 PCs with Internet access. The entire building is also covered by the WiFi

wireless signal. In addition to the librarians, the installed RFID (Radio Frequency Identification) technology will take care of servicing the visitors quickly and protecting the book stock.

The graphic and design solutions in the building's interior are also interesting. Apart from untraditional decoration in the form of a multi-colored floor in the atrium and witty drawings in its galleries, visitors will be impressed by intentionally revealed technological features on the ceilings of individual floors (the mains cable for lighting and sensors were not hidden in soffits) and by modern pieces of furniture such as tables, chairs and sofas located in all library spaces.

The ceremonial opening of the National Technical Library has taken place on 9 September 2009. However, the NTK has already been offering its services in a limited version – as of 3 July, readers can return books checked out at the former State Technical Library via the so-called return box placed in front of the new building.

### **An intelligent, cost-effective building**

The NTK building is equipped with many modern technologies that should create as comfortable an environment for the visitors as possible. Simultaneously, particular emphasis has been put on the low energy demands of the building and its economical operation. Untraditional materials and technically unique solutions were often used in the construction. A typical example of this is the facade with an outer skin made of tempered glass sections. Even the fire extinguishing system is untraditional; a potential fire is extinguished by water mist sprinkling. Compared to traditional sprinklers, the water consumption is approximately ten times lower at the same extinguishing efficiency, and therefore the system is much friendlier to paper materials.

Another modern and unique technical solution is the building's heating and cooling system, fitted directly onto the steel-concrete supporting structure. The thermoactive building component system (TABS) functions in the following way: at night, hot water runs through its pipes – the surrounding concrete mass absorbs heat, which it then "radiates". In summer, when it is necessary to cool the building, everything functions similarly – only cold water is fed through the necessary pipes.

By accumulating coldness in the building's construction during nighttime hours, it is possible to significantly decrease the cooling unit's installed output and simultaneously use cheaper electricity for cooling the building. In the building, a total of 19 independent TABS circuits are installed, with independent control, enabling optimized operation of the building's various parts (circulation, offices, exhibition hall, etc.). The control system prevents humidity condensation on the ceiling surfaces in the cooling mode. When the surface temperature drops below the required value, the cold-water regulating valve at the inflow closes. Furthermore, the system monitors the TABS

circuits' temperature fall – if the minimum temperature difference is reached (the TABS circuit is charged), the regulation valve at the inflow closes.

The system of so-called natural ventilation is intelligent as well. It includes 500 windows, 200 of which are equipped with an electric drive, and a sophisticated system of CO<sub>2</sub> sensors which continuously inform the control system about the concentration of this gas in individual areas of the building. If the concentration of carbon dioxide is too high in a certain section of the building, the electric drives automatically open the windows. Thus, there is usually no need to ventilate the interior by using air-conditioning, which is demanding in terms of electricity consumption. Air-conditioning is switched on only when the natural ventilation system cannot ventilate the building on its own. All of the aforementioned technologies are automatically controlled from the control room; however, the users of offices and open-space rooms can manually configure the auxiliary radiators located under the windows and open windows without an electric drive. It goes without saying that if the staff accidentally leaves a window open in the room, the performance of the under-window heating goes down.

### **Energy efficiency concept by Siemens**

Within the framework of the NTK's construction, Siemens was commissioned to design and supply the building's Desigo system for building automation and the Sinteso fire detection system.

The Desigo system for Building automation consists of over 3,600 hardware data points, and all monitoring and control of subordinate technologies is performed from one management station. The monitoring and operation of air-conditioning units, district heating relay station, heating (and cooling) technologies, natural ventilation system windows, 180 lighting circuits and low-voltage switchgear status signaling is integrated into the Desigo management system. Moreover, additional important facility management systems are data-integrated into the Desigo system, such as fire detection, intrusion and access control, variable speed drives, UPS (uninterruptible power supply), diesel generator, air conditioners, chiller, humidifiers, heat consumption meters etc.

The NTK building is protected against fire by the latest Sinteso fire safety system. It is composed of three FC2040 control panels interconnected by an FCnet system bus, which includes another two smaller FC2020 control panels. The following types and numbers of Sinteso C-Line detectors are connected to the control panels: 856 optical smoke detectors, 12 heat detectors, 105 manual call points, 6 linear smoke detectors, 1 passive air sampling smoke detector for air-conditioning duct equipped with an S-LINE multi-sensor smoke detector, and 1 active air sampling smoke detector Titanus ProSens. In some places, the detectors' color was adjusted so that it affects the interior as

little as possible. In the entire building, the fire control installations are controlled by 48 input/output line modules. There are 69 alarm sounders installed to signal the fire alarm acoustically.

One of the five control panels on the FCnet system bus is configured as a CAP (Central Access Point), enabling communication for all stations on the FCnet system bus via LAN (through BACnet protocol) with OPC server MK8000. A danger management system configured as OPC client monitors and controls the entire Sinteso fire detection system.

An interesting feature of the NTK building's fire safety is the protection of the main atrium with water walls against the potential fire spreading from adjacent parts of the building. They are launched by a detection network consisting of the intersecting rays of six linear smoke detectors, configured to three zones with two-detectors dependency. In the case of fire, detection of both linear smoke detectors of the same logical unit triggers the water wall, which prevents the spreading of the fire and burning fumes from the adjacent premises. The mutual logical interconnection of two linear smoke detectors increases the reliability of the signaled alarm and prevents the activation of the water wall by malfunction or by erroneous detection of a single linear smoke detector.

### **A green building**

From an architectural and technical point of view, the NTK building is undoubtedly one of the most interesting non-residential constructions in the Czech Republic. Moreover, it complies with the modern green building concept's criteria, which include lower operating costs, quieter equipment operation and more frequent air exchange (i.e. higher quality air compared to traditional air-conditioning). The profile of a green, energy-saving building is then completed by plants on the roof that grow by spreading (they do not have to be taken care of). Among other things, the plant growth helps slowly drain away water from intense rains.

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