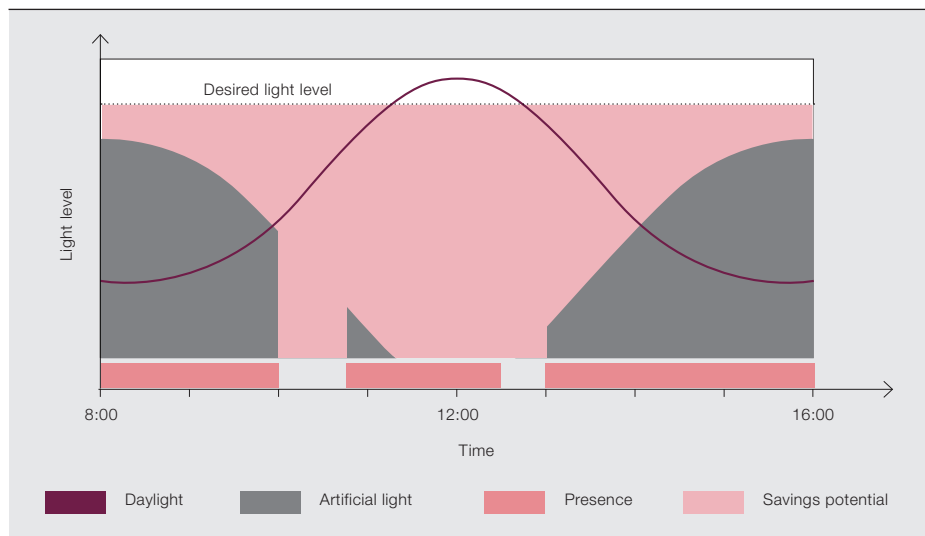


Building better

Technology to make buildings intelligent

THOMAS RODENBUSCH-MOHR, ANTHONY BYATT – Constant IT advances, rapid urbanization, climate changes and the rise of alternative energy technologies are four major trends that are driving a furious development of building automation technology. While intelligent buildings and smart homes were until comparatively recently the stuff of science fiction, they are now a reality and are well-placed to offer the energy efficiency, comfort and security people seek. ABB's KNX line of products helps make the intelligent building a reality.



The world is undergoing change of a magnitude hitherto unseen. And in 2008 a landmark was passed: For the first time in history, more people were living in cities than in rural areas. This trend toward urbanization is accelerating: In the 20th century the population of cities grew more than 10-fold and the United Nations predicts that two out of three people born in the next 30 years will live in cities [1]. This rapid urbanization is a major driver of building automation evolution. Climate change, energy policies and the rise of alternative energy technologies are three further drivers. The intelligent building, or smart home, is the result of this evolution.

Intelligent buildings – once futuristic concepts – are now a reality and are becoming big business. As an illustration of this, Google, one of the biggest data companies on the planet, recently paid over \$3 billion for Nest Labs, a specialist in indoor heating control. The building automation business as a whole is already worth tens of billions of dollars worldwide – and should turn over \$50 billion by 2018 [2].

Building automation can deliver many benefits – for example, energy efficiency, flexibility, comfort and security. For

private residences, the latter two usually are the most important, whereas for commercial buildings, energy efficiency and flexibility usually have priority.

Automation saves energy

Buildings, commercial and residential, are responsible for a significant portion of the world’s energy consumption. Fortunately, savings of 20 percent or more can be relatively easily unlocked by making the continuous monitoring of energy usage an integral part of a building’s automation system. Experts in the field see a particular potential for savings in commercial buildings because the users of these often feel detached from the management of systems such as heating and lighting, and are thus less motivated to intervene to save energy; a comprehensive automation of such buildings circumvents the effects of this disinterest.

Connects via KNX

“If you want to control it you have to measure it,” is an old adage that is very applicable to energy use in buildings. In order to have any sort of energy optimization, the energy flows in a building have to be understood. ABB’s i-bus® KNX devices do just that.

KNX Association created KNX technology, which is a worldwide standard for all applications in home and building control. This technology finds use in applications ranging from lighting and shutter control to various security systems, heating, ventilation, air conditioning, monitoring, alarming, water control, energy management, metering as well as household appliances and audio.

KNX-based installations can make dramatic savings in energy consumption, resulting in payback times of typically three to five years – a much shorter time than other energy-saving measures such as insulation or insulated glazing.

ABB has developed a range of devices for intelligent building control applications that interface via the KNX bus. The ABB i-bus KNX energy module, for example, is used to measure the electrical current consumed by various devices directly at the point of use and report the readings to a visualization system.

Title picture

The Contemporary and Modern Art Museum of Trento and Rovereto, Italy, has made significant energy savings using ABB’s i-bus KNX.

In 2008 a landmark was passed: For the first time in human history, more people were living in cities than in rural areas.

2 Rebuilt after a disastrous fire, ABB's i-bus KNX helped this school reduce its energy bills by almost a third.



This and other ABB i-bus KNX devices – such as light controllers, switch actuators, dimmer actuators, blind/shutter actuators, fan coil actuators and controllers, gateways and so on – provide the muscles and nervous systems necessary for fine-grained monitoring, control and actuation throughout the building.

Such installations can help make dramatic savings in energy consumption, resulting in payback times of typically three to five years – a much shorter time than other energy-saving measures, such as insulation or insulated glazing. Further, ABB i-bus KNX technology allows rapid reconfiguration of the building if requirements change or the room layout needs to be modified.

The potential for energy savings in intelligent buildings can be well illustrated in the area of heating and lighting.

Lighting is usually one of the single biggest consumer of energy in commercial buildings. However, constant light schemes can reduce lighting bills considerably. In such a scheme, a light sensor measures the natural light level so the controller can top this up with the amount of light needed to achieve the desired lighting level and no more → 1.

Further, a presence detector can be used to minimize the illumination (and heating) in unoccupied spaces. Such

schemes can result in an energy consumption 30 to 40 percent below that of a manual light control setup. Similar savings are to be found when shutters or blinds are automatically controlled to reduce heating and cooling costs.

Regulation regulations

In many jurisdictions, minimizing the energy footprint of a building is no longer just an option: Building automation systems are rapidly becoming a key element in allowing various energy aims to be achieved – whether they are national or supranational targets, or building-code related – and are therefore becoming written into law. Germany, for instance, has new laws related to energy savings that reference DIN V 18599, which explicitly includes building automation. In addition, some countries insist on an energy performance evaluation and certification when a property is bought or sold.

Further standards – like DIN EN 15232, which handles the energy efficiency of buildings and the influence of automation on it – provide a good guide for architects and planners.

The rapidly-evolving regulatory framework, coupled with an ongoing boom in the building automation sector provides fertile ground for ABB's i-bus KNX, which has already enabled high energy

3 The Busch-priOn



efficiencies to be achieved in multiple sites.

Cutting bills

ABB is executing its own sustainability program to optimize the energy efficiency and ecological quality of complete industrial sites. ABB's sites in Germany, for instance, have reduced energy consumption by 35,000 MWh compared with 2007 levels. The initiative is being copied by other ABB sites in Europe: In the ABB plant in Odense, Denmark, for example, a three-story building has been equipped with 645 KNX components to regulate heating and cooling and to provide constant lighting. In the larger offices, a reduction of 13 percent in electrical energy consumption has been achieved.

In the Museum of Modern and Contemporary Art of Trento and Rovereto, in Italy, a KNX system reduced the annual power consumption by 456 MWh – which translates into 28 percent, or some \$100,000 – in its first year of operation. In a school in Neckargemünd, Germany, a 525-component KNX setup reduced the energy bill by close to one-third → 2.

Smart and comfortable

In residential buildings, comfort and security assume a significance at least as great as energy efficiency does in commercial buildings. Bedrooms should be cool, but the living quarters comfortably

4 The Busch-ComfortTouch



warm; lighting levels should always be appropriate; blinds and shutters should open and close according to the weather or time of day; security cameras should be convenient, discreet and easy to operate; and so on. Busch-Jaeger, a member of the ABB Group, has a range of ABB i-bus KNX products to help realize this vision of the smart house.

Because most of ABB's products are not aimed at the domestic market, it is unusual for them to be visible in homes, so special care has been given to the optical design of the Busch-Jaeger devices as well as to their functionality. The Busch-priOn®, for example, is an ergonomically designed central control unit residents can use to monitor and control an entire living area: Light scenes, timer, blind and heating control – all these functions can be performed intuitively using a rotary control element and a display → 3. The Busch-ComfortTouch® combines the functions of a building control system with those of an information and entertainment center – light dimming and switching, blind control, temperature regulation, security camera viewing, music playing, video viewing, etc. are all combined in one unit → 4-5. The integrated audio and video players are enhanced by a connection to the Internet, which also allows control of the entire system from a remote location via smartphone and tablet apps.

ABB has developed a range of KNX-compatible devices that interface via the KNX network to the building automation system.

Intelligent buildings were once futuristic concepts but are now a reality – and are becoming big business.



Smart homes in the smart grid

In the future, smart homes will be part of the smart grid, which will allow ABB i-bus KNX devices to communicate with the utility and display, for example, the current electricity tariff. Depending on the particular tariff in operation, domestic devices could be programmed to switch on or off, or a decision could be made about feeding power back into the grid – from a domestic photovoltaic installation or electric car battery, for example. ABB already offers products that do this automatically.

Global drivers

The coming decades will see buildings increase in technological sophistication: They may be made from concrete that can sequester carbon dioxide; their sides may be covered in photovoltaic films; automated vertical mini farms on their roofs will deliver fresh, local produce to those living below; solar installations will provide the zero-emission building's power and hot water; rainwater reuse, perhaps coupled with insulating green roofs, will be part of a city-wide smart water, sewage and irrigation system. All this has to be connected, monitored and controlled by smart technology.

It is clear, then, that cities, and the buildings in them, are at the start of a dramatic period of evolution. As the world becomes more urbanized and more densely populated, intelligent

building technology will become ever more important to enable the demands of society to be balanced against the need to conserve energy, reduce greenhouse gases and house billions of people with the energy efficiency, comfort and security they seek.

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References

- [1] Editorial staff, "Street-Savvy: Meeting the biggest challenges starts with the city," *Scientific American*, pp. 26-29, Sept. 2011.
- [2] PRNewswire (2013, Feb. 7), *Building Automation & Controls Market worth \$49.5 Billion – Global Forecast by 2018*. [Online]. Available: <http://www.prnewswire.com/news-releases/building-automation--controls-market-worth-495-billion---global-forecast-by-2018-190161681.html>