

KNX Standard Enables Significant Energy Savings

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When one thinks of building system engineering, one thinks of KNX. This includes the comfort of controlling shutters, blinds, lighting system, audio system, heating system, air-conditioning system and more. However, the fact that this comfort also comes with an additional advantage, the energy savings of up to 50%, has not been proven reliably so far.

Current studies prove that the application of KNX technology can significantly reduce the energy budget.

The achievement of a higher comfort standard through bus systems in buildings has been a long known fact. The fully automated home is often mentioned in this context controlling all energy consuming building systems like lights, heat and ventilation to the users' demands. Studies which were presented at the KNX Scientific Conference 2006 in Vienna showed additional potential of the building control system.

To prove this, the University of Trento in Italy and the University of Bremen in Germany equipped buildings and rooms with KNX controls for the heating and lighting. The logged data was evaluated and a "normal" case was compared to the "KNX" operation. To explain in more detail, we will take a closer look at the KNX project at the University of Bremen. The following numbers and results are taken from the presentation of Prof. Dr.-Ing. Manfred Mevenkamp, project manager and dean of the faculty of electrical engineering and information technology at the University of Bremen. (Note: see the project description of the University of Trento under

the chapter "Scientific Partner" on page 32 in this issue of the journal).

Energy Savings up to 50 %

About 33% of the entire energy consumption of residential and commercial buildings is used for heating. From a certain point on, this high energy demand can only be reduced with an intelligent control system – like KNX. In structurally weak buildings high energy savings can be achieved with constructive measures like a better building envelope insulation. In a list with the different energy demands of buildings types, building which are built to „passive building“ standards lead the way.

The project of the University of Bremen is based on a modern building infrastructure, the center for Information and Media Technology (ZIMT) in Bremen which was constructed in 2002. The building has a specific energy demand of 60-75 kWh/m²a. Prof. Dr.-Ing. Mevenkamp's project group chose two identical classrooms for their experiments.

One of them was equipped with standard thermostats for the heaters and the other one was equipped with KNX control. The KNX controlled room was installed with window switches, valves on the heaters, a room temperature control system and a heating meter with M-Bus interface and M-Bus-KNX-Gateway. The logged data of the comparison test covered the periods from the beginning of 2002 until the end of 2005. However, the rooms weren't fully used until the middle of 2004. The result of the data analysis is very positive as the KNX controlled room could save up to 50% energy as compared to the room with standard installation.

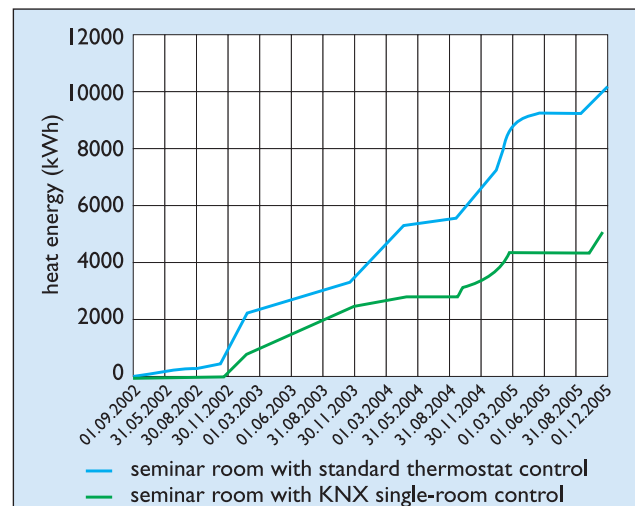


Heat meters with M-Bus interface and M-Bus-KNX-Gateway

Heating Comfort Remains

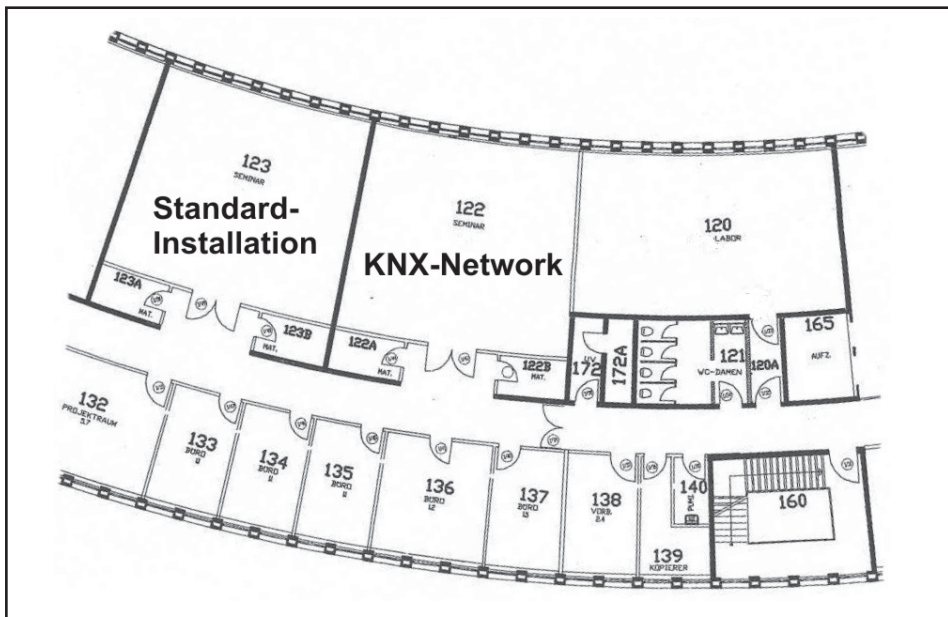
Critics who think the KNX system is slow reacting and could not provide the same heating comfort as a standard system which runs continuously are mistaken. As part of this

test run, the average and actual room temperatures were also analyzed. The KNX room had 0.3°C higher average temperature even though the heating energy demand was just half of the room with the standard installation. The dynamic hea-



Heating energy consumption

The logged data of the comparison test covered the periods from the beginning of 2002 until the end of 2005. However, the rooms weren't fully used until the middle of 2004. The "KNX controlled" room could save up to 50% of the energy as compared to the „normal“ room.



Seminar rooms, ZIMT, first floor

Choosing the Right Components

With regard to the choice of components, it is important to mention that the use of the combined sensor with presence detector initially seemed to be the most attractive solution. However, it did not deliver the exact illumination values of a dedicated lux sensor because the value can be influenced by incoming daylight or other light sources.

Therefore, the project team decided to use the slightly more expensive alternative and installed two dedicated lux sensors that delivered promising results. In addition, the people responsible for the project noticed a lack of standardized guidelines for daylight controlled lighting systems. This concludes that KNX building controls not only increase the living comfort but also play a significant role in reducing energy costs. The tests provide the proof: the use of KNX may reduce the energy for lighting and heating demand of up to 50%. This strong argument should convince even the last skeptics of the KNX building control system. If one considers rising energy prices, the small investment into a home and building automation seem to be very reasonable, especially if they pay off within a few years and offer the expandability for additional comfort functions.

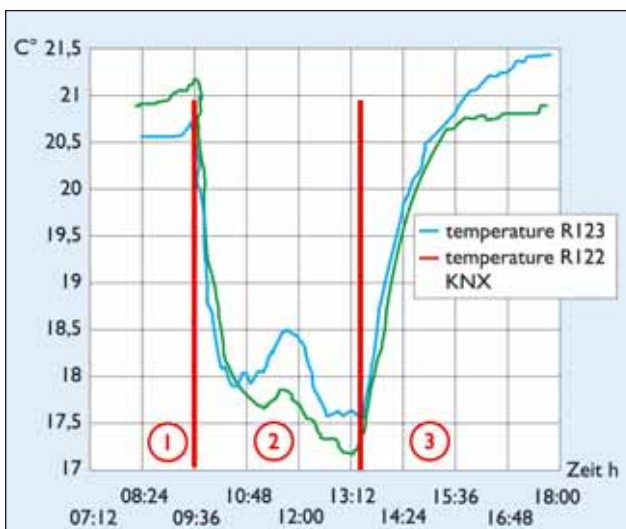
www.iia.hs-bremen.de/KNX-Energieeffizienz

ting behavior of both rooms do not differ that much, which means the on/off curves are almost identical with regards to temperature and time. To increase the effectiveness and efficiency, the heating periods were controlled by a schedule, which depended on the occupancy plan of the room. Therefore, no heating energy was wasted for a room that was not in use. But that was not all: savings potential of up to 50% was possible with the lighting system.

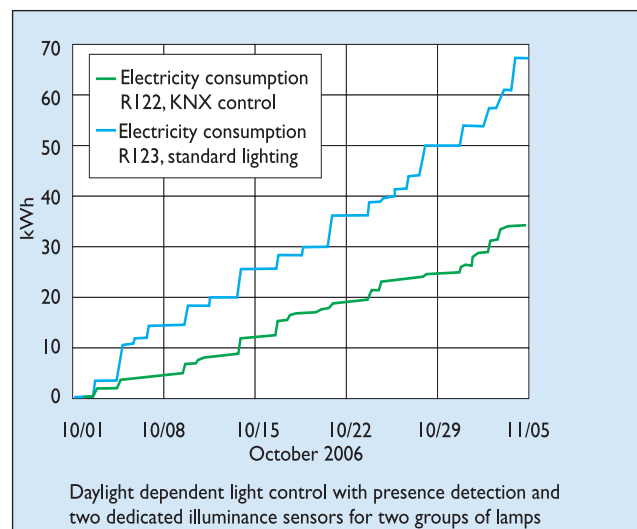
Energy Savings of the Lighting System

The yearly energy demand for the lighting system in the same building is 500 MWh/a and is therefore higher than the heating energy demand with 435-485 MWh/a. Additional energy costs of the University of Bremen could be reduced with the application of KNX controlled lights. Factors that influenced this test series were the following: presence of occupants, the daylight level, glare and the necessary illumination at the student's work desks. The same rooms that were used for the heating energy compari-

son were equipped with presence sensors, two light sensors (for two groups of luminaires) and dimming actuators. The two light sensors were necessary as the area closest to the window was treated differently than the area closest to the interior wall. As compared to the standard operation (manual on/off switching) energy savings of up to 50% could be reached. There was no energy demand base line, i.e. there was always a steady but small power demand because the sensor technology required energy.



Room temperature dynamics



Comparison of electricity demand

Daylight dependent light control with presence detection and two dedicated illuminance sensors for two groups of lamps