The Smart Home on the curriculum

Convert theory into practice with KNX

Winner
KNX Award 2012
Category
Young Award

On the KNX test stand, the students can configure and test functions with ETS as they would do in a house

This is how the house of the future will function: the building system observes constantly the energy requirement in each circuits, the energy produced by the photovoltaic system, which is compared with the time variable electricity tariff of the network provider and controls the loads so that they are as energy-efficient and cost-effective as possible. The Darmstadt University of Technology has adopted this in its curriculum.

KNX applications play a major role in converting theoretical knowledge about Smart Grid and Smart Metering into practical awareness. A test stand in the laboratory of the college simulates the technical functions of a complete house, including the generation of solar energy. The students can develop practical methods based on their theoretical subject matter. They get to know ETS and how bus devices are configured and installations are commissioned. As these types of activities are good for the further development of building automation, the idea and the implementation was presented with the KNX Young Award.

The touch screens on the test stands indicate whether the load management functions are as required

Creative ideas for load management

Halogen spotlights as well as switching and dimming actuators simulate the lighting in an apartment. Further lamps with a capacity up to 5 kW and sockets represent all types of loads. A small roller blind with an electric drive and its actuator represents the blind control system. The integration of household appliances in home automation can be practised using the tumble dryer and washing machine installed with miele@home-Technology. Energy loads including standby loads are determined, evaluated and represented via energy actuators and delta meters. This is carried out with a visualisation via a Busch-Jaeger comfort panel, which also links miele@home and the electronic household meters. Meter readings can be visualised via a flush-mounted Busch-Jaeger display connected via KNX RF. An interface to the KNX Eisbär software enables detailed control intervention and the export of measured values to a computer for research purposes. Remote operation with an iPad is also possible.

It is the task of the student to link installations with useful functions and to implement a load management system. This results in sophisticated solutions being implemented. KNX links the electrical loads of the lighting, the sockets, the household appliances and a self-developed KNX charging post for an electric vehicle with the photovoltaic system. With sufficient excess energy, household appliances or vehicle charging can be activated automatically. On the other hand, the loads are adapted to the time variable electricity tariff which is defined by the network provider VNB HSE. Via interfaces to the SMA inverters, the infeed can be reduced or the battery discharge can be controlled.

When choosing to incorporate KNX in the curriculum, the system was praised for its function and installation. According to the organizer, Lutz Steiner, "The fact that KNX Association provides support and suggestions within the framework of a scientific membership, is also a benefit compared to other systems".

Benefits provided by KNX in this project

- Promotes awareness of efficient energy consumption
- Students can convert their theoretical knowledge into practice
- Realisation of creative ideas due to versatile functionality
- Product functions well and is technically sound
- Visualisation and interfaces to other systems
- Support for scientific research through KNX Association

Technical refinements

- Self-developed KNX charging post
- Integration of miele@home and EHZ
- Detailed visualisation of the energy consumption and energy production
- Interfaces to SMA reducer box and SMA PV backup system
- Load management based on Smart Metering and Smart Grid

Functions:

- Lighting
- Blind control
- Heating, ventilation, air conditioning
- Energy management
- Visualisation
- Interfaces to other systems
- Remote monitoring/control

Scope

Number of KNX devices: 50, ABB, Busch-Jaeger etc.

Costs:

10,000 euros