
BUILDING THERMAL SIMULATION AND CONTROL MODELS

The energy and comfort simulations of the demonstrator buildings play a central role in the TIBUCON project.

The simulation results are used to develop and assess an advanced control system running on the TIBUCON measurement data. This will be customized to respectively the existing residential apartment buildings at San Sebastian and the multi-tenant office space in Warsaw.

Thanks to the detailed info from the wireless sensor network and the intelligent control algorithms, the heating and cooling systems can be better controlled. This will lead to an improved comfort and/or a lower energy consumption.

Also in the final assessment of the TIBUCON project, the building energy simulations are used to normalize the measured results. Energy consumption and indoor comfort will be measured before and after the installation of the TIBUCON system. However, since weather conditions and user behaviour (indoor environment) are not constant, such a normalization is necessary to compare the building performance before and after TIBUCON.

TRNSYS17 is used as the dynamic building energy simulation program. Figure 1 shows the residential demonstrator building in the Sketch-up plug-in that makes it possible to model the geometry and solar gains of the building in detail. Information about the building facade, internal heat gains (user behaviour) and HVAC system are added afterwards.

Figure 2 shows the simulation environment in which all building, inhabitant and system models are coupled. The estimations made during this process will have to be validated with measurement results during the following months. However, it is already possible to show clear trends and options.
Figure 4 shows the indoor temperatures of the four top apartments in one of the high rise buildings at the Lorea site (depicted in Figure 3). Due to the vertically serially connected radiators in that building, causing overheating of the lower apartments and critically cold top apartments, water temperature and flow is crucial but difficult to control. Also the orientation of the apartments has a distinctive influence due to the variance of solar gains, causing underheating at the north (beige) and west (turquoise) orientated apartments.

Energy saving and/or comfort improving solutions are suggested based on the simulation, and preliminary results are showed in Figure 5. The blue diamond depicts the current situation at the LOREA buildings; a low comfort is combined with a relatively high energy consumption. The green triangles show a solution that greatly improves the comfort, while the red squares show a energy saving solution. However, a combination of both (purple and orange dots) is the most interesting and a variation of control parameters makes it still possible to choose the whether the focus is more on comfort or energy consumption (depicted by the curved line).

As mentioned before, a lot of assumptions had to be made when modelling the building and heating system. A necessary validation of our models will be made possible with the data from the TIBUCON sensor prototypes currently under construction. The final sensor network will further improve the comfort and energy consumption predictions, after which the building ESCO can make a thorough choice of heating system investments.

Jeroen Van der Veken [Katholieke Hogeschool Kempen]
PAST EVENTS


This event was dedicated to Public Private Partnership in research, including Energy-efficient buildings initiative. The topics for the next competition for research projects were posted. Juliusz Żach representing Mostostal Warszawa made the presentation about TIBUCON project as an example of currently going projects.

This presentation and the video is available on our project website: http://tibucon.eu/news.html

ECTP – E2BA – Eracobuild conference 2011, Warsaw, Poland, 4 - 5 of October.

This 5th Conference of the European Construction Technology Platform, combined with a Conference of the Era-Net Eracobuild, showed how the Construction sector contributes to EU2020 ambitions and illustrated the ECTP objectives to develop Innovative Buildings and Infrastructures to construct Europe’s future, to innovate through research and integration of inputs from other sectors using appropriate tools (such as PPPs) in the next Common Strategic Programme, and to conduct two major European Initiatives: E2B (Energy-Efficient Buildings European Initiative) and reFINE (Infrastructure Networks of Europe Initiative). Tibucon project was presented by Piotr Dymarski representing Mostostal Warszawa.

This presentation is available on our project website: http://tibucon.eu/downloads.html
ICT for sustainable homes 2011,
Nice, France, 24 - 25 October 2011

ICT for sustainable homes is an international conference and exhibition organised every year in Nice, France by Sigma Orionis in cooperation with the Beywatch project funded by the European Commission’s DG Information Society and Media.

This conference and exhibition on “ICT for sustainable homes” aims at providing companies, research laboratories and other organisations involved in ICT based products and services for the home with a key opportunity to meet and network, to be informed of latest developments and find fresh ideas, to identify promising technologies and markets, to find potential partners, to initiate or strengthen projects. During this conference Jon Mabe representing Tekniker made general presentation about Tibucon project and Piotr Dymarski representing Mostostal Warszawa made presentation about Potential Energy Harvesting Solutions for use in the Built Environment.

All presentations are available on our project website: http://tibucon.eu/downloads.html