Zukunft Bau

STRUCTURE / STRUCTURE SHORT REPORT

Title

Title long version: „NANDRAD Plug & Run Green Building Simulation Engine"

Occasion / starting position

The scope of the project was to generate a modern building simulation tool with applicability in German building design process. In this approach, the authors identified substantial demands on applicable simulations program in practice:
The simulation should be performed dynamically and should consider thermal building storage sufficiently accurate. The building should be modelled with the help of a three dimensional graphical modelling interface. Building services should be integrated into building simulation. Further, thermal comfort should be taken into consideration.

Subject of the research project

The authors implemented this demands inside the prototype programs NANDRAD and BIM HVACTool. The scientific NANDRAD solver program was extended by hydraulic network and plant component models with focus on detailed heat transfer, thermal delay of heaters/storage components and pipe conduction losses. This approach generates the building feedback to building service concepts on a high level of detail.
The commercial program BIM HVACTool includes a three dimensional graphical model interface for building. It was extended by support of NANDRAD solver simulation. Additionally, the detailed heater modelling and the modelling of hydraulic networks inside the building was implemented including a three dimensional graphical representation. In particular, the authors highlight the implementation of an automatic procedure for the generation of pipe installation inside the three dimensional building view.

Conclusions

The authors successfully demonstrated the workflow of integrated graphical building modelling with BIM HVACTool and simulation in NANDRAD. The workflow can be generalized to other combinations of a commercial graphical interface and a scientific simulation solver.

Key data

Short title: Simulation Engine

Researcher / Project Management:

Total cost: 300.390,10 € €

Share of federal subsidy: 182.390,10 €

Project duration: 24 months

IMAGES/ FIGURES:

Figure 1: Bild1.png
BIM HVACTool: Distribution network inside the building (left); building cubature (right)

Figure 2: Bild2.png
BIM HVACTool: Integration of panel heating systems

Figure 3: Bild3.png
BIM HVACTool: View factor calculation with View3D

Figure 4: Bild4.png
NANDRAD: Integration of panel heating systems as active heat source inside a wall layer (left) und wall discretization (right)

Figure 5: Bild5.png
NANDRAD: Schematic representation of the NANDRAD distribution model as a graph of linked calculation modules

Figure 6: Bild6.png
Ergebnisse: Delayed heating for a test example with underfloor heating and ideally regulated valves