BUILDING ENERGETIC, COMPUTER MODELING AND MODEL CALIBRATION

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Assignment of basic aims:

- energetic certification – the tool for determination of energetic class of building
- determination of minimal requirements for energy economy for new buildings
- determination of minimal requirements for energy economy for so called big buildings in scope their significant reconstruction
- establish energetic certification as compulsory
- establish regular control of cooling systems in buildings

From the simplest look of energetic certification of building we can divide corded energetic demands into:

- cover of thermal loss or decreasing of thermal gains, so energy for heating and ventilation (65%)
- assignment to prepare of warm water (17%)
- assignment to prepare cooking (6%)
- utilization of various electrical appliance (lighting, television etc.) (12%) (A)

2. COMPUTER MODELING VS. ENERGETIC ECONOMY OF BUILDING

With the consideration about existing CAD software, which are using architects and builders we have to solve the task of the computing EEB in two phases:

- covering of thermal loss or decreasing of thermal gains
- other electrical appliance

In the first step we solve computing (or assessment) properties of outer building surface (OBS). The EEB is dependent very significantly from this surface. From the list of energy (A) is apparent, that in our climatic conditions two thirds of all energy makes energy for covering of thermal loss (TL) possibly decreasing of thermal gains (TG), in other words, energy for heating and cooling.

If we consider the climatic conditions as fixed, non-suggestible factor, we can state that the extent of TL (TG) as decreasing necessary energy for heating and ventilation is dependent on conditions which are determined by:

- urbanistic influences
- architectonic influences
- influences of construction conception and physical-technical properties of built work
- properties of technical facilities (optimize object's micro-climate) (B)

3. WHY THE COMPUTER MODEL?

In the principle we can distinguish two basic approaches how to determine (simulate) wanted building parameters:

- create physical model
- computer model

For the comparison advantages (disadvantages) of both approaches we compared existing physics lab of buildings with the possibilities computer modeling and computer simulations.

Associated physics lab of buildings (Faculty of civil engineering, Department of land constructions building)

4. SIMULATION

Simulation of heating process of whole building is often very demanding for computer capacity. Model of building heating is very complex, therefore is this task solved by separate rooms. There is possible to use existing software tools, which are able to simulate heat transfer (with respect to thermal bridges, thermal transfers etc.) These software are usually based on FEM (Final Element method). We decided for COMSOL Multiphysics 3.3 because it is use friendly and it has support to import model from CAD software (CADS).

5. COMPUTER MODELING AND SIMULATION BENEFITS

Benefits from software model cration:

- possibility to create complex model
- recursively usable sub-results or results
- simple modification of existing model

Benefits from software modeling (OBS) for EEB:

- building side orientation
- influences of surroundings (buildings, trees, etc.)
- optimal deployment of windows, doors, rooms etc.
- invest vs. corded energy economy (EE)

Benefits from software modeling (heating interior) for EEB:

- dimension and deployment of heating (cooling) facilities
- optimization of heating (cooling) process
- optimal furniture deployment – optimal heat circulate

CONCLUSION

Nowadays the trend of building designing is focused on reaching the highest comfort level with the respect of energy economy. The possibilities of facility controlling and mentioned EE are nearly unlimited. But the known fact is still valid: well designed building with minimum control is better as bad designed building with the best control. Therefore is very important to have a maximum information from simulations (in designing phase), which can back influence (improve) the design process and subsequently the building characteristics. This approach demands attendance of various experts from each technology used in building, but the result (from EEB view) will be very much better as mainline approach.