

## EBOB — Energy Efficient Behaviour in Office Buildings Newsletter Oct, 2003

EBOB News is a newsletter from the project EBOB-Energy efficient Behaviour in Office Buildings. The aim is to inform about the project and contribute to increase the interest and knowledge in the area of energy savings combined with human behaviour. The newsletter is intended for building owners and facility managers, but also partners involved in the process of making a building energy efficient.

### Introduction

It is well known, that office buildings are responsible for a considerable share of the total European energy use, and that the potential energy use reductions of this share, are substantial. Refurbishing existing offices and energy efficient measures in new office buildings can help us to save substantial amounts of energy and indeed many energy saving projects have been realised. When designing and building energy efficient office buildings there are four main areas to consider:

- Building technology
- Installation technology
- Smart control of installations
- Interaction between behaviour aspects and energy saving technology

While considering all these areas, the EBOB project focuses on two of these important parts; smart control of installations and interaction between behaviour aspects and energy saving technology. In these areas there are needs of more research and testing. The different parts in the EBOB project are shown in figure 1.

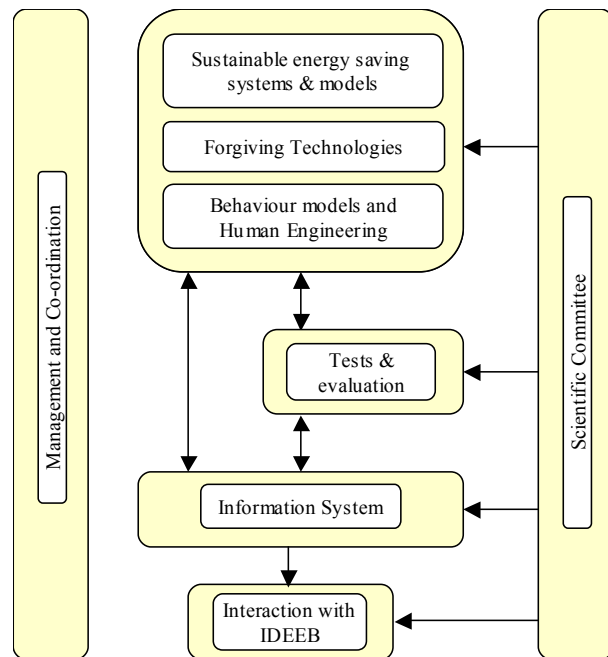


Figure 1. General layout of the EBOB project

The overall goal for the EBOB project is to create new technical and socio-economic solutions to make energy efficient behaviour easy for the end-users in existing and new office buildings. The project will develop a model and tool, and the result will show how to make effective use of energy possible. The focus will be existing buildings, but with a possibility to apply the result when designing new buildings.

## The consortium

Combining human behaviour with technology formed the basis when creating the consortium of the project. Thus, companies and institutes were carefully selected as to have competences in all areas involved. Figure 2 shows the participants in the project.

The partners each represent an important part in the total building and refurbishing process. The partners are industrial partners from the very early planning phase, over the construction and hand-over phase to the operational phase, as well as researchers of smart control, human engineering and computer interface design.

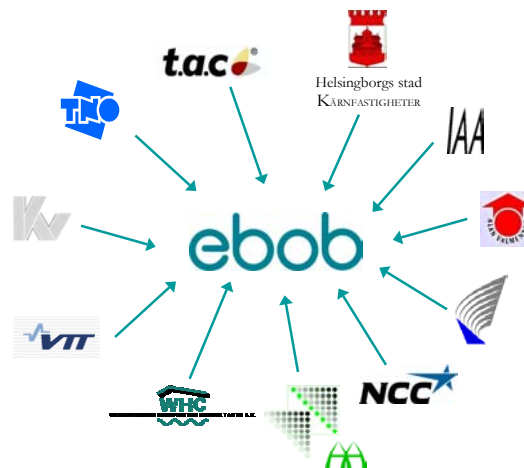


Figure 2. the participants in the EBOB project

## Technology level

There is a great potential of improving the comfort, and at the same time save energy, in many of the existing buildings in Europe. However, a question that was discussed early in the project was at which technology level in buildings we should aim. Most functions, e.g. controlling temperature, dimming lights, controlling blinds and air flow etc are available today but to a different extent depending on the status of the building. In EBOB we have decided to integrate the best of these existing functions in an energy saving way and to create a good interactive user

interface to control them. By creating five different scenarios, one basic and four additional (i.e. requiring new installations to some extent), we can offer flexible solutions to all kinds of buildings, from a building with hardly no technology implemented to very high-tech buildings.

The aim is to make it easy for the user to act energy efficient. This means taken into account the user habits when defining the technology level and control strategies. This is what we call forgiving technologies.

## User interface

How can we create models and tools that make it easy for the user to act energy efficient? An intensive brainstorm session early in the project resulted in five identified key questions:

- How can we motivate office workers?
- How can we use this knowledge?
- What is the relation between behaviour and energy efficiency?
- What is the relation between user requirements (or 'wishes') and energy saving targets?
- How can we inform people?

This led to the user interface being the focal point early in the project. Even if the system behind it and the control strategies are important and make a difference in controlling a building, the user interface is the way in which we can interact with the user and take into account issues like user-understanding of energy savings and indoor climate issues, motivation and control. Potential users have now evaluated the user interface and the feedback has been looped back into the development project. By the summer of

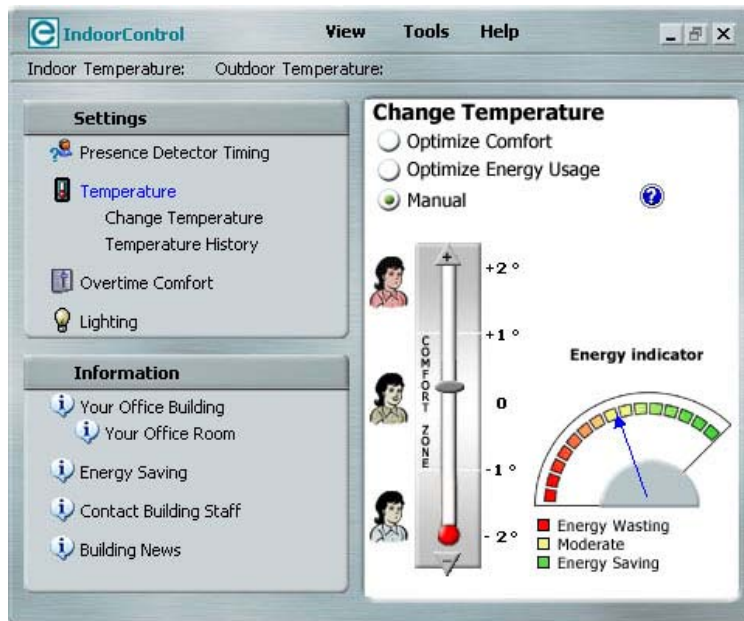


Figure 3. Prototype of the EBOB user interface. (May 2003)

2003 we had a prototype version ready for implementation. Figure 3 shows the prototype.

The user interface will be available on a computer screen. From the screen the user can control the near indoor climate and will receive feedback, e.g. changing temperature, fresh air, and lighting, have a sense of control and get energy related messages. There is also the possibility for the user to put the system in automatic control mode where the control software itself decides on how to best reach the expected comfort and energy saving levels.

## Feed back from users

When we develop the tools (e.g. the user interface) it is important for us to have feed back on the prototype. One way to have this feedback is to ask the users about it. Therefore we have also developed two questionnaires that will be completed by office workers and facility managers working in different buildings in four countries. The questionnaire (including the webpage) is now in the stage of final conclusion. We will use it for developing prototype 2 and for adaptations in the simulation model.

The questionnaire is accessible via a web page in five different languages. The questionnaire is divided into eight 'chapters':

- Personal information
- My office
- Temperature
- Windows
- Lighting
- Control
- Using a computer
- Energy Saving

We tried to include most "EBOB-parameters" (such as how the user experience the indoor climate, if they would like to save energy if they could, etc.) in the questionnaires and at the same time trying to avoid a very large list of questions. One of the key elements in the questionnaires is the 'opinion questions'; what people think about energy savings, comfort, and possibilities to control.

## Simulations and testing

Parallel to the prototype work and pilot testing preparations, work has commenced to make simulations of buildings by applying the scenarios for

technology level identified. Since there was no tool readily available to do the simulations, TNO (Netherlands's Organisation for Applied Scientific

Research) started from an existing in-house tool and modified and adapted it to the new needs. The purpose of the simulations is to evaluate the economical



Figure 4. Test building in Helsingborg

consequences of the different parts of the proposed EBOB solutions in the scenarios. This will help make better cost/benefit analyses possible when considering implementing EBOB solutions to real buildings. As a starting point, and to be able to compare real measured values with simulated values, a building in Helsingborg owned by Kärnfastigheter will be used in the simulation model (figure 4).

There are actually simulation tools developed on two levels, single room and building level. The results from calculations with simulation model on room level will be used to obtain input parameters for the simulation model for the whole building.

## Cooperation with IDEEB

Another project with financing from the European Commission is IDEEB – Intelligently Designed Energy Efficient Building. The EBOB and the IDEEB projects carry out complementary research about energy saving measures including an advanced control system. It is therefore

useful for both projects to follow each other's progress for experience exchange and to improve the knowledge and skills of the participants in both projects. The two projects treat different aspects but within the same area and therefore they have the same target group for dissemination of the results.



Figure 5. The IDEEB-EBOB Workshop in The Hague, May 22<sup>nd</sup>.

One of the parts in the cooperation has been to arrange a joint workshop, which took place in The Hague in May 22<sup>nd</sup>. (Figure 5.) The workshop started with presentations of different work packages in both projects, and was followed by discussions in small groups. The questions to be answered were how do the projects could benefit from each other, and suggestions of possible cooperation in the following work. All participants

agreed that both projects would benefit from exchanging experiences, and several

areas for future cooperation were proposed.

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## Work the next period

In September the project results so far, was presented to the European Commission at a meeting in Brussels, the Midterm Assessment meeting. We had an approval to continue the project according to the proposed activities. The work will now continue with improving the user interface and simulation models, information system and to integrate the work into the final toolbox. This toolbox will

contain guidelines showing how and when to use the results of the EBOB project in the building or refurbishing process. Further testing of the user interface in parts of buildings, analysing data from questionnaires, testing simulation model, analysing theoretical demand with measured energy use will give input to the rest of the work. In the end a real site total demonstration will be prepared.

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## Contact:

Interested to learn more about the project? Please look on the project web site, [www.ebob-pro.com](http://www.ebob-pro.com) or contact the coordinator at NCC:

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Figure 6. The EBOB project participants