HOT IN THE CITY – NACHHALTIGE SANIERUNGSKONZEPTE FÜR DEN GEBÄUDESTAND

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Abstract

The operation of ten thousand Austrian office and administrative buildings ensures an enormous annual consumption of energy, where climatisation plays a central role. The cooling in office and administrative buildings in the European Union show a demand of 193 PJ, which is a crude oil equivalent of 4,608 million tons (EU, 2000). A challenge in particular would be to integrate the problematic of "creating a comfortable temperature at workplaces" in the building standards. The increasing application of computer and office accessories and high solar loads lead to an obvious increase of room temperatures and comfort limits, which leads to interference of the work productivity of the employees. These circumstances lead to the definition of the COOLSAN project. The project aims at applying sustainable refurbishment concepts and to reach a comfortable indoor environment at lowest possible energy demand, with an application of renewable energy sources.

To reach the defined goals were, the first part of the project, 15 existing buildings with problematic summer operations documented. In the second phase were two of the 15 buildings selected and sustainable cooling concepts where prepared. A dynamical building simulation, which include potential of load reductions and sustainable energy sources as cooling source, was used to analyse and evaluate these cooling concepts.

The work on this building documentation has clearly shown the necessity and potential for sustainable refurbishment concepts for summer operation of office and administrative buildings. The documentation of the buildings has further shown that the yearly electricity consumption has increased with an average of 5-10% and that many office users often have to work in the summer time with temperatures reaching 32 °C. The continuously increasing electricity consumption (presently ~ 180 kWh/m²a for the documented buildings) is explained by the increasing density of computer application (40-50 % of the entire electricity consumption arrive from computer equipment) on the one hand and by the increasing application of air conditioning apparatus to increase the comfort or assure a problem free office environment (cooling of server premises) on the other.

Solar load, with about 50% (corresponds to 30 W/m² office building) of the cooling load, contribute with the highest amount. Reasons for this are generous glazed areas and the user behaviour. Person and computer loads each make out to about 20% of the total load and lighting plus ventilation correspond to rest 10%.

The detailed analysis of the building "Landhaus" in Bregenz and the "Oberlandesgericht" in Linz have shown that optimal load reduction measures (shading, computer equipment, lighting, storage mass) in combination with an efficient night ventilation can be enough to reach a predominant comfortable indoor climate.

The study of the sustainable cooling concepts has shown that a building with an optimised cooling (target value 30 W/m²) can sufficiently be cooled over a ventilation

system with an incoming temperatures of 20°C and a ventilation rate of 2 h^{-1}. The incoming temperature could lie 2K higher when applying cooling through panel cooling. The results of this project will be the base for refurbishment measures in both of the studied buildings. Further should they serve as example and guidelines for further projects.