



Technical Support Activities

ProEcoPolyNet, Task 3.3

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Project: Office Building, Vienna

ProEcoPolyNet (PEP-NET): Network for the promotion of RTD results in the field of Eco-building technologies, small Polygeneration and renewable heating and cooling technologies for buildings.

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1 Summary

The Austrian Energy Agency supported an International project developer of Austria in a critical phase of a real estate project development. The challenge was to ensure the energy supply of the building. The problem was that the power supply line could not supply the amount of energy originally planned for the building. Thus, the project developer decided to have a detailed look at the building in order to save energy demand and energy load. Furthermore, the project developer tried to find other solutions such as using a combined heating and power plant at the building site.

The Austrian Energy Agency provided information about several alternatives in order to decrease cooling load and consequently energy demand for cooling. This information was gathered by means of a detailed energy simulation (software TRNSYS) carried out by the Graz University of Technology.

In the end, a few proposals to decrease energy demand and energy load were accepted. However, the support for the building developer was too late in order to change major elements like the façade. The building developer decided to increase the potential of electricity load in order to ensure the installation of all possible building installations for all possible renters. Reduction of electricity or cooling load has to be part of an early planning stage in order to ensure the implementation in the detailed planning phase.

A few weeks after finalising the support, our contact person of the project developer informed us that this building was sold before the construction phase was finalised. Thus, the project developer decided not to implement any energy saving measures as usually planned after the consulting activities because of saving investment costs – running costs are not important any more.

2 Project Identification

Project identification

- Utilisation: Office, catering, commercial
- Total effective area: Approx. 13,000 m²
- City: Vienna

3 Project Description

The office project combines a futuristic-looking office design with efficient and flexible floor space solutions on seven levels. It's location on a main axis for public and private transport maximises the appeal of this project. The building is relatively small for an office building with 13,000 square metres of floor space.

4 Supporting activities

4.1 Initiation of supporting activities

Phase of first consulting activities:

Conception of need	Feasibility studies	Conceptual design	Design/building approval	Construction
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During the planning phase of the office building, the project developers were informed that electric energy load for the whole building couldn't be provided by the electric energy provider in Vienna.

There were three solutions:

- Building a new power supply line to provide the office building
- Reduction of electric energy power to use the existing power supply line
- Construction of a power plant for the office building (block heat and power plant)

The project development considered both strategies, reduction of electric energy load and construction of a power plant.

Considering reduction of energy load and demand was the entry for consulting the project developer at this project.

4.2 Consulting Activities

The construction company which carries out the project development of this office building also holds a facility management department. The head of this department invited the Austrian Energy Agency (AEA) to inform the project developer about solution to reduce electric energy load in the building.

In the first meeting, the project developer informed about the framework situation of the project. AEA illustrated general approaches to reduce electric energy load in the building. AEA proposed to carry out a detailed energy simulation at the building. The project developer agreed. AEA subcontracted this task to the Institute of Thermal Engineering at Graz University of Technology (IWT). IWT used the energy simulation software TRNSYS.

Besides this, the project developer initiated discussion about the construction of a power plant and using geothermic energy.

In the second meeting, AEA was invited to, the project developer informed about several solutions. Especially the development of a power plant and general approaches to reduce internal loads.

In the third meeting, AEA and IWT presented the result of the energy simulation. IWT calculated different scenarios in order to find optimal solutions for the building. Some recommended modifications are mentioned hereafter (these recommendations were described more detailed in the simulation report):

- Integration of heat-absorbing glasses

- Downsizing of window area
- Reducing of internal heat loads
- Integration of shading systems

The project developer tried to apply a few energy saving measures but did not change the general building concept.

A few weeks after finalising the support, our contact person of the project developer informed us that this building was sold before the construction phase was finalised. Thus, the project developer decided not to implement any energy saving measures as usually planned after the consulting activities because of saving investment costs – running costs are not important any more.

4.3 Innovative eco-buildings technologies

The project developers were informed about general innovative approaches to reduce internal energy load, especially to reduce cooling load to avoid or minimise the chiller. This information contained different aspects

- Reducing internal loads (lighting, appliances, etc.)
- Construction measures (storage mass concept, variochrome façade, etc.)
- Passive cooling approaches
- High efficient cooling solutions

The list of solutions is part of the annex 1.

Results of the energy simulation IWT proposed to use heat-absorbing glass and integration of effective shading system (but stressed to consider the every-day use of shading systems by applying an automatic regulation)

4.4 Results

In the end, supply side won. The project developers decided to increase electric energy load by constructing a block heat and power plant. Advices how to reduce energy were rarely implemented.

The involvement of AEA for this planning process was too late. The planning phase was close to an end, detailed and implementation planning phase started. The project developer wouldn't think about energy saving if there was now problem with electric energy load.

Furthermore, by selling the project before construction was finished, every energy saving measures were cancelled.

5 Conclusions

Awareness rising at project developers and architects is very important. The architect should have instructions to build energy efficient building with low energy load. If energy experts are

involved to late in a planning process, there is almost no chance to find an optimal solution for the building. Reducing energy demand is very difficult at this stage. More easier is to find energy supply solution with renewable energy sources. But this is a matter of costs and not of an ecological approach of the building developer.

In this case, the most crucial point happened after consulting activates. The building was sold. The investor-user dilemma appeared. The investor was not interested in building operation anymore and cancelled all energy saving measures. This investor-user dilemma is (still) a major obstacle in building energy efficient buildings.

6 Annex

6.1 Annex 1: Concept list for reducing cooling demand (in German)

Handout for possible energy saving measures to reduce cooling load for office buildings.

Kühlkonzepte

Vorschläge für Reduktion der Kühllast beim „Büro Projekt“

HINTERGRUND

Durchschnittlicher Anteil interner Lasten bei bestehenden Bürogebäuden

- 50 % Solareintrag
- 20 % EDV
- 20 % Personen
- 10 % Beleuchtung und Lüftung

MASSNAHMEN

Verringerung der internen Lasten

Beleuchtung: geeignetes Beleuchtungskonzept

- geringe Anschlussleistung für Nennbeleuchtungsstärke
- tageslichtgesteuertes Konzept mit intensiver Tageslichtnutzung

Energieeffiziente Geräte

- Geräte (Drucker, Kopierer, Fax) geeignet aufstellen oder in einem Raum mit Kühlung
- Eigener Serverraum

Bauliche Maßnahmen

Erhöhung der speicherwirksamen Baumasse

- mind. mittelschwere Bauweise mit einer speicherwirksamen Masse von 300 kg/m²

Verschattungseinrichtungen

- Wesentlich: Zum einen guter Sonnenschutz, zum anderen auch gute Tageslichtnutzung

Variochrome Fassade

- Fassade die den g-Wert (Energiedurchlassgrad des Fensters) verändert

Effiziente Kühltechniken

abhängig von der Kühllast

Nachtlüftung

- Tagsüber nur hygienische Grundlüftung

- Hohe speicherwirksame Masse erforderlich
- Nachts höherer natürliche oder mechanische Lüftung zur Auskühlung der speicherwirksamen Masse

Kühltürme

- Die vertikale Anordnung des Kühlturms erlaubt die Nutzung des *Kamineffekts*, der bewirkt, dass die in dem nach unten und oben offenen Kühlturm stehende Luft erwärmt wird, dadurch aufsteigt und frische Luft nachzieht. Daher ist eine mechanische Förderung des Luftstroms nicht unbedingt erforderlich

Luftansaug – Erdregister (Erdreichwärmetauscher)

- Im Winter Erwärmung, im Sommer Kühlung der Zuluft

Erdwärmesonden

- Bohrungen notwendig
- Kühlen direkt in einem geschlossenen Kreislauf (Bauteilkühlung, Lüftung)
- Heizung durch Wärmepumpe (konventionelle Heizung, Lüftung)

Wärmepumpe

- „Entnimmt“ Wärme dem Raum und gibt diese nach außen oder für andere Anwendungen (z.B. Warmwasserbereitung) ab

Solare Kühlung

- Adsorption: Gebäude und Räume werden gekühlt, indem man der warmen Raumluft durch Adsorption an geeigneten Materialien Wasser entzieht und sie damit kühlt (Verdunstungskälte). Damit die Adsorptionsmaterialien wieder Feuchtigkeit aufnehmen können, werden sie durch Wärme getrocknet, die der Sonnenkollektor liefert. Der gleiche Sonnenkollektor kann also im Sommer zur Kühlung und im Winter zur Heizungsunterstützung eingesetzt werden.
- Absorptions-Kältemaschinen

KÜHLLASTABDECKUNG

Geringe Kühllast (< 150 Wh/m²d)


- Lüftungskonzept, z.B. Nachtlüftung

Mittlere Kühllast (150 – 250 Wh/m²d)

- v.a. hybride Kühlsysteme (z.B. Grundwassernutzung)
- Nachtlüftung als Querlüftung bei großer, auskühlbarer Gebäudespeichermasse
- Kühltürme

Hohe Kühllast ($> 250 \text{ Wh/m}^2\text{d}$)

- Kältemaschinen
- Detaillierte Systemsimulation erforderlich



Versorgungssicherheit
Wettbewerbsfähigkeit
Nachhaltigkeit
Perspektiven

