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Market potential and business opportunities for mayor renovation of non-residential buildings with the use of the Belok Total Concept method in Nordic countries

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Abstract

The BELOK Total Concept is a method that motivates property owners to carry out larger energy renovation projects with maximum energy savings in a cost-efficient way. The purpose of the present work is to clarify the benefits and business opportunities in using the Total Concept method. In order for the method to be used on a larger scale, there must be commercial interest from the different companies to provide services with the method. The target groups are among others engineering companies with energy consultants, design engineers and architects, contractors and technology providers, energy controllers and ESCO companies. The article provides a market analysis of possibilities and barriers for energy renovations that have been carried out in Finland, Denmark and Sweden together with experiences from pilot buildings where the Total Concept method has been applied. The estimated annual market volume of renovation in the three Nordic countries is estimated to be about 4 million m² and the total investment volume up to 280 MEUR per year. For the key actors involved in the Total Concept method the annual market volume is estimated to be about 70 MEUR. Furthermore, a new relevant key function relevant for the process, called a Total Concept Manager, has been identified.

Keywords - Total Concept, renovation, non-residential buildings

1. Introduction

In order to reach the 20-20-20 EU-targets it is essential to increase the ambitions of the property owner's to make renovation towards nearly zero-energy buildings in the non-residential building sector.

The BELOK Total Concept method aims at motivating property owners to carry out larger energy renovation projects in the non-residential building sector. The core aim of the method is to achieve maximum energy savings in

a cost-efficient way. The Total Concept method was initially developed by the group BELOK in Sweden. BELOK is a network between 19 large Swedish non-residential real estate companies and is supported by the Swedish Energy Agency. The Total Concept method has now also been introduced to other Nordic countries [1].

The Total Concept method has a potential to be an incentive for large scale energy renovation projects. However, in order for the method to be used on a larger scale, there must be commercial interest from the different stakeholders and key actors involved in the process that will start to apply the method and provide services. In Sweden experiences are that more and more building owners would like to do renovation according to the Total Concept method but it is difficult to find companies with required skills to perform the service. There is a need to present the possible market potential and business opportunities for providing services with the Total Concept method.

2. The Total Concept method

Total Concept is a method for improving energy performance in existing non-residential buildings and applies a refined systematic approach to the work with energy issues in buildings, with the aim of achieving maximum energy savings in a cost efficient way. The method is based on carrying out a package of energy saving measures.

When forming a package of measures both single cost-efficient measures (“low hanging fruits”) and costlier measures are considered. The profitability of a package of energy saving measures is presented on an internal rate of return diagram (see Figure 1). In such a diagram every identified energy saving measure, that implies a certain investment cost € and results in a certain decrease in the annual operating cost €/a, is represented by a line in the diagram with a certain length and slope. The slope represents the internal rate of return which the investment creates. A package of measures is formed by arranging the different energy saving measures after profitability and calculating a common internal rate of return for a number of simultaneous measures, taking into account different economic lifetimes of the measures. The number of energy saving measures that will be included in the cost-efficient package of measures is dependent on the criterion that the internal rate of return for the whole package must fulfil the investor’s demand on profitability. The most economically profitable measures will assist the less profitable measures while the complete action package will fulfil the profitability frames set by the building owner. This way of working has shown that total energy savings more than 50% are possible. This is the essence of the Total Concept method.

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work with energy issues in buildings, with the aim of achieving maximum energy savings in a cost efficient way. The method has been developed by taking into account the economic realities which the building owner needs to consider [2].

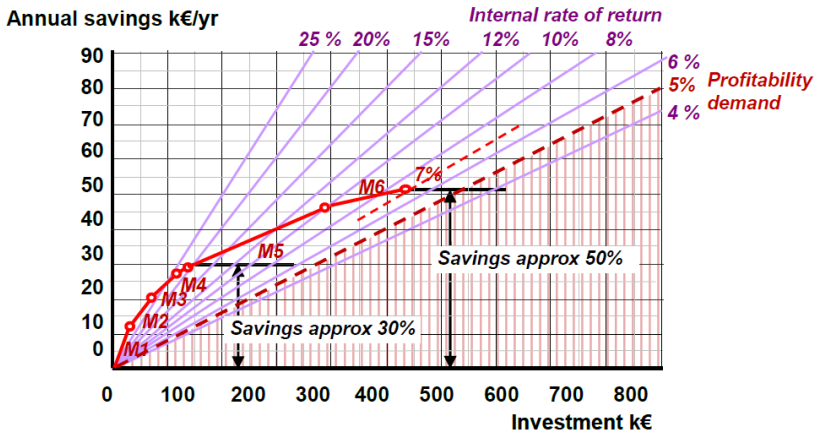


Fig. 1 Presentation of a package of measures with six measures (M1-M6) in an internal rate of return diagram.

In the example shown in Figure 1, the profitability requirement is that the internal rate of return must be at least 5%. The complete action package, including six different measures, M1 – M6, meets this demand with an internal rate of return of 7% and leads to a halving of the annual energy costs, which approximately corresponds to a halving of the use of energy. On the other hand, if only the measures that were profitable on their own were carried out (measures M1 – M4) the savings would have been only 30%.

In order to quality assure that the expected saving actually will be reached, a systematic approach is important through the complete renovation process of the energy retrofit. The work process of Total Concept has therefore been structured into three main steps.

Step 1- Creating the action package, is a pre-study and planning phase of the energy renovation project where a comprehensive inventory is carried out in the building to identify all conceivable energy saving measures. Various calculations and an analysis based on the compiled data lead to a package of measures and provide an informed basis on which the owner of the building can make decisions.

Step 2- Carrying out the measures includes implementation of the package of energy saving measures in the building. The focus here is on the quality of the work, and to make sure that designed intent will lead to the

expected energy savings. Here functional and performance checks are significant in order to reach the expected results.

Step 3- Follow-up of the implemented measures, including measuring and checking procedures to ensure that the expected result of energy performance has been achieved. The energy use during at least one year after renovations is compared to the energy use before implementation of the action package.

3. Objective

The strategic goal of with this project is to inspire companies to start business with providing services with the Total Concept method. The objective is to provide information on the market potential, possible barriers and opportunities and an identification of service providers needed for the Total Concept method. The results will give some ideas of the benefits and business opportunities of the method.

4. Method

The work is based on a market analysis of possibilities and barriers for energy renovations that have been carried out in Finland, Denmark and Sweden [3] together with experiences from pilot buildings in each country where the Total Concept method has been applied. Additionally, two kinds of interviews were carried out with a number of stakeholders and key actors involved in the renovation business in these three countries. Six stakeholders were interviewed about their view on current market conditions and their experiences with major energy retrofitting projects as well as the potential of the Total Concept method in the market. Seven potential service providers, the key actors, were interviewed on their point of view on the current market situation as well as the potential business opportunities with the Total Concept method.

5. Total Concept Manager : a new key function

For a company that provides services based on Total Concept, the main resources needed is to have qualified employees with the required skills. Previous experiences have shown that it is important to maintain a holistic approach over the entire renovation process in order to assure a good quality and that the planned savings are achieved. Previously, it has often been the client's responsibility to manage the whole process through all steps, but for many property owners this can be a challenging task. Therefore, a new key function is suggested, called a Total Concept Manager, which may very well be an energy specialist from an external company. The main function of a Total Concept Manager is to coordinate the tasks and activities carried out during all the three steps of the Total Concept method and coordinate the hand-over between steps and the different key actors. In Sweden some consultancy companies are already working with a Total Concept Manager

concept in different projects, the function is called “Energisamordnare”. A similar role, called “Energi Coordinator”, has previously been developed and exposed in Denmark.

Energy renovation based on the Total Concept method follows basically the same procedures as in any renovation process. However, there are a number of additional tasks to carry out in each step.

For Step 1 the service provider needs to have equipment needed for comprehensive auditing on site and a verified software for energy simulations of the building and its technical systems. Carrying out Step 1 is more comprehensive than traditional pre-studies and methods used in energy renovations, because the quality of work carried out in Step 1 is crucial for the reliability of the outcomes in Step 2 and 3. It is important for the client to be aware of it and for the service provider to explain, what will be delivered and included in the price.

Step 2 has large focus on quality assurance of the work carried out. If the expected energy savings will not be met the whole point of carrying out a Total Concept project could be lost. The commissioning phase is therefore, somewhat more detailed and involves a number of additional functional and performance checks. For example, at the coordinated functional tests also performance tests are added to the control scheme. For the commissioning phase measurement and monitoring equipment is needed.

Step 3 takes part during the operational phase, where the building has taken to full use after final inspections. However, at the beginning of this phase some additional testing may be needed when the building is in full operation, e.g. load dependent functional testing.

6. Reasons and barriers for energy renovation

There can be various reasons why a building owner wants to carry out a renovation project. The results from interview showed that the most common reasons for major renovation are change of (large) tenants, the deterioration of existing systems or building’s envelope, as well as problems with indoor climate. The second reasons are grants or subsidies, tenant adjustment or environmental or energy certification. Higher market value or energy use reduction are seldom occurring reasons.

In the commercial building sector there is often a need for a total renovation for buildings built before 1970, but in practice total renovation is carried out when there is a change of larger tenants, every 15 or 20 year. In public non-residential buildings a major renovation is often carried out after approximately 20-30 years. Minor renovations take place about every 5 to 10 years or when there is a changes in use of the building.

In addition, the results from interview showed that energy reduction, is not considered to be a main reason for initiating major renovation projects. Energy is relatively cheap in Nordic countries and therefore this is an obstacle for starting energy renovations. However, some owners may be

influenced by a more environmentally friendly profile. The property owners, especially private ones, are very much profit oriented. According to the interviewed Swedish stakeholders the most important motivation for energy renovation is to obtain a profitable and sustainable project. The market requires simple economic arguments to show that energy renovations are a good business. For instance, according to one of the interviewed stakeholder the investment in energy saving measures of 20 MEUR over the last three years lowered their organisations annual energy costs about 10 MEUR and increased the value of their property portfolio of about 200 MEUR. This simple example shows that the investments that can be experienced to be large at the time of renovation, can be very profitable.

Besides low energy prices there are many other barriers for energy renovations. One of the barriers seems to involve a risk of not receiving the whole profit from the energy measures. This is particularly relevant then the tenants pay their utility bills. Without a special agreement, benefits of an investment may go directly to a tenant and not to the property owner.

There is a demand for energy retrofitting projects but in many cases the results are restricted with budgetary limitations or difficulties to get required investment. According to the interviews in Finland in many cases the clients do not realize that the additional cost for energy efficiency improvements is often just minimal part of the total renovation cost and even though energy saving measure would be profitable, it may be taken away from the plans to keep the total renovation investment in a given budget.

The differences between the required investment for the building upgrade and for energy savings is also often blurred. Even though there would be profitable energy saving measures, the whole renovation is considered to be unprofitable.

Furthermore, a fear of carrying out long-term investments and lack of good economic models for analyzing long-term investments are considered as barriers for energy renovations.

Disturbance of the tenants during the construction work is also considered as an obstacle for major retrofitting. Building owners typically choose to undertake inexpensive retrofit strategies, because the intervention is minimal, tenants can remain in the building during construction.

7. Drivers for the Total Concept method

A central drawback for major refurbishment of buildings is that economically benefits cannot be predicted reliably. A way to overcome economical/non-technical barriers for investment in energy performance improvements in non-residential buildings is to assure the reliability of the assessment results. The Total Concept method offers a method and a financial tool that can provide the information required by establishing a platform for decisions on investments in energy-saving measures. The Total Concept method can be included to the overall renovation process of the

building, in which case the additional investments required for achieving better energy performance of the building will become more cost efficient.

Energy renovations in buildings can be considered as long-term investments since energy measures often have long economic lifetimes. Therefore, economical models that reflect the potential of these investments should be used and at the same time they must be easy to understand for the decision makers. In the Total Concept method an internal rate of return model is used for profitability analysis. When forming a package of measures also future relative energy price changes and different economic lifetimes of the measures in the package can be taken into account.

The Total Concept method provides a holistic approach in the process of improving building's energy performance, which assure that the energy renovation process can be monitored and quality assured.

8. Market potential

Figure 2 illustrates an overview of the size of the current non-residential building stocks in the three Nordic countries. The area of existing non-residential buildings is estimated to be in total about 377 million m². With the assumption that 1% of the area will be annually renovated based on the Total Concept method, the actual annual volume of renovation will be about 4 million m².

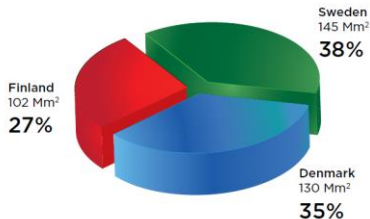


Fig. 2 Size of the current non-residential building stock distributed in between the three Nordic countries: Finland, Sweden and Denmark.

Experiences from the Total Concept projects performed in Sweden shows that the total cost for carrying out a pre-study and preparations (Step1) has been about 3 - 4 €/m². Cost for carrying out a package of measures (Step 2) has been in average about 70 €/m² and follow-up work (Step 3) about 1€/m². The investment cost for measures is depending on the situation of the building before measures as well as the measures to be carried out.

Figure 3 illustrates an overview of required investment for the action package in Step 2 for the different projects carried out or planned to be carried out in Sweden [4]. On the left it is illustrated the expected energy savings in percentage.

The annual savings expected from these projects is in average about 7 €/m² and internal rate of return of the action package is in average about 10%.

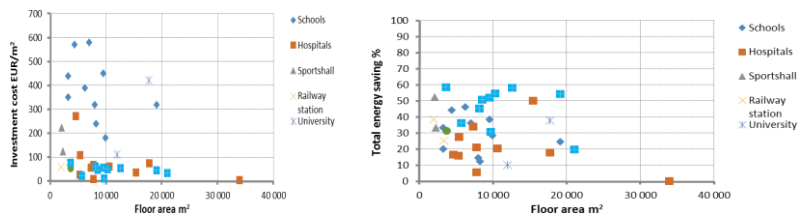


Fig. 3 Left: Required investment cost for the package of measures in Step 2. Right: Total energy savings in Total Concept projects. Based on projects carried out or planned to be carried out in Sweden.

Considering that the estimated annual volume of renovation in the three Nordic countries is 3.77 million m², the estimated total investment volume on the Total Concept projects will be up to 280 MEUR per year. In the next 30 years the total investment potential on the Total Concept projects is about 8.400 MEUR based on the estimation that during the next 30 years the Total Concept is well established on the market in all three countries.

For the key actors involved in the pre-study and preparation phase in Step 1, design work and project coordination in Step 2 and follow-up in Step 3 of the Total Concept method the annual market volume is estimated to be about 70 MEUR and in 30 years about 2100 MEUR.

9. Competing methods

Analysis of the market competitors for the Total Concept method presumes that the client has decided to carry out an energy renovation project. The most competing alternative for any method is that the client does not do anything at all.

Based on the market analysis, in the three countries, there are currently no other similar methods to the Total Concept method on the market (no new entrants) that considers the holistic approach. The main competition for projects based on the Total Concept method seem to be traditional energy renovation projects that include more comprehensive auditing in a pre-study phase and “ESCO” projects.

It should also be emphasized that EPCs often include short-term contracting comprising only renovation of building services systems and in very limited extent the building envelope. This means that often only “low hanging fruits” are carried out in, limiting the energy saving potentials.

The Swedish Energy Agency has supported the development and uptake of the Total Concept method, resulting in increased market acceptance and

legitimacy. This is considered an advantage to be accepted by other property owners and other stakeholders in Sweden. Furthermore, the Danish Energy Agency has (in August 2015) initiated the preparation of a new general standard of planning, execution and monitoring energy renovation of large buildings. It is expected that the principles of the Total Concept method will be implemented as a standard for non-residential buildings, so that the method can be exposed and demanded.

10. Key actors for business opportunities

Renovation projects based on the Total Concept method offer new business opportunities for a number of key actors in the building sector. The main target group here are:

Engineering companies with energy consultants who are working with energy performance improvement projects and have experts and competence for detailed energy auditing of non-residential buildings. They can both provide services for different tasks or the role of a Total Concept Manager.

Engineering companies with design engineers and architects who can carry out the detailed design work for proposed energy saving measures. Many engineering companies with design engineers have experts also for the pre-study phase and design and monitoring phase of the renovation project.

Contractors and technology providers who can participate in the construction phase in carrying out energy saving measures.

Existing ESCO companies and energy supply companies, who already are providing EPCs and ESCs for the property owners and who can adapt the Total Concept method to their business model.

Energy Controllers who work in-house for the property owner's organization or is an external service provider for the property owner's company. They could take the role of a Total Concept Manager and/or deliver some of the tasks in the pre-study phase.

11. Conclusion

The Total Concept method provides for the property owners an opportunity to access an essential part of the great energy savings potential in existing non-residential buildings in a commercially profitable way. The method applies a holistic approach in the process that will minimize the risk of not reaching expected energy performance. A method with such a holistic approach for energy renovations seems not to be available on the market, especially not in Finland and Denmark.

Main drivers for companies to develop services based on the Total Concept method are to get differentiation compared to competitors to win bidding competitions for projects, to get higher hourly rate (more profit), to get larger projects (higher volume of hours per single project) and to deliver a higher customer value. These benefits will be especially advantageous for

the service providers that take the initial risks and start developing services when the Total Concept is new on the market.

The main business opportunities for the potential key actors include increased number of renovation projects and building up a strong in-house technical competence that can be used to cost optimize the work in future projects. As the projects based on Total Concept method are more comprehensive compared to projects with alternative methods then higher price models are justified, which can be motivated with higher accuracy of the results. On the other side there is a higher demand on skills needed on the key actors when carrying out different tasks, which for many key actors can be seen as a barrier for starting to develop services. One solution to this would be to provide developed tools and guidelines for quality assurance of the process.

Raising awareness about the Total Concept method is important for creating the potential demand from the clients' side. As there are already or will be a number of demonstration projects carried out in the Nordic countries, they can serve as good examples.

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References

- [1] M. Mynen, A. Svensson, Å. Wahlström, A.-J. Almås and M.-L. Maripuu, "Economical baselines for energy ambitious upgrading of nonresidential buildings", Proceedings of the 7PHN Sustainable cities and buildings, København, 20.-21. August 2015
- [2] Total Concept, 2014, The Total Concept method -Guidebook for Implementation and Quality assurance, Version 1.4: January 2016, www.totalconcept.info
- [3] Total Concept, 2014, Energy Renovations of Non-residential Buildings in Northern European Countries - National non-technical barriers and methods to overcome them.
- [4] M.-L. Maripuu, Å. Wahlström and E. Abel, "Swedish experiences of using Total Concept for refurbishment towards nearly zero-energy buildings", Proceedings of the 7PHN Sustainable cities and buildings; København, 20.-21. August 2015.
- [5] M.-L. Maripuu, Å. Wahlström, P. Pasanen, A. Afshari, P. Krawczyk, "Strategies for commercialization of the BTC method", Report of the BELOK Total Concept project, 2016.