

Property name: Gonsiori 29, office building
Property owner: State Real Estate Ltd.
Consultants: Estonian Society of Heating and Ventilation Engineers

Total Concept method

Step 3. Follow-up

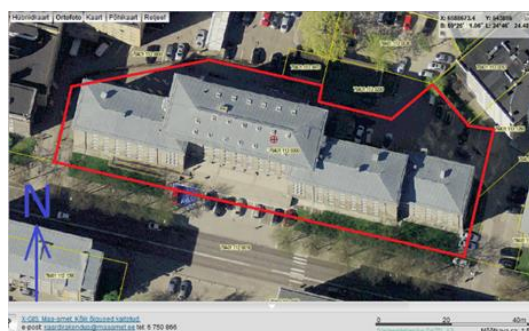
Building and its use

Year built: 1950
Area: 6769 m² heated area
Type of building: Office Building

The building consist of four wings. The building consists mainly of offices for the Ministry of Social Affairs. The building is included in the National Registry of Cultural Monuments, XX century architecture.

The building is used as an office for the ministry and is mainly used from Monday to Friday 8:00-18:00.

The triggering factor for renovation was to improve indoor air quality, as old windows caused cold draughts and cold radiation and old lights were flickering.



Indoor climate

The staff complains of poor indoor air quality, especially cold draughts from old windows and flickering lamps. Indoor temperature and air change rate is acceptable on the Class 3 in EVS-EN 15251.

The status of the building and its technical systems before measures

Building envelope

The building has a limestone foundation. External walls are plastered brick walls. The building has gable roof with loose fill insulation on the attic floor (approx. 350 mm). The basement floors are made of concrete and without thermal insulation. The windows are replaced in 2005 with double glazed windows with PVC frames.

Estimated thermal transmittance of building envelope:

External walls $U=0.6 \text{ W(m}^2\text{K)}$

Attic floor $U=0.12 \text{ W(m}^2\text{K)}$

Ground slab $U=2.7 \text{ W(m}^2\text{K)}$

Windows $U=1.7 \text{ W(m}^2\text{K)}$

Heating

Building has district heating with one sub-station. The existing distribution system has the one-pipe and two-pipe system with radiators. Radiators are partially equipped with thermostatic valves. Heating system is unbalanced.

Ventilation

Ventilation system was retrofitted in the period 2004-2006. Current system is mechanical supply-exhaust ventilation system with heat recovery. Catering facility on the first floor has mechanical supply-exhaust ventilation system

without heat recovery.

Cooling

Ventilation units have direct expansion cooling coils. There are also 8 room based air conditioning units in the building.

Lighting

Office premises have mainly type T8 fluorescent lamps. Switching of the lighting in the offices are controlled manually. Hallway lighting is switched of automatically

Energy and resource use before renovation and baseline for energy savings

Specific energy use before measures 248 kWh/m², year

Whereas:

- Heat energy 126 kWh/m², year
- Electricity 122 kWh/m², year

Space heating energy consumption (adjusted with degree-days) per heated area was 123-131 kWh/year, which is two times higher than in modern office buildings in Estonia.

Electricity use per heated area was 117-129 kWh/year, which is in same range as in modern office buildings in Estonia. Main electricity users are lighting (30%), office equipment (26%) and air conditioning (21%). Existing situation is applicable as a baseline.

Identified energy saving measures

Eight energy saving measures were identified during the auditing. However, only two of them meets the property owner's profitability requirement 5.5% internal rate of return.

It is proposed to install new heating substation and replace existing windows. Those two measures as a package is in the range of the profitability requirement 5.5% internal rate of return.

Additionally the insulation of NE external wall, install new building automation, replacement of ventilation unit in room 125, installation of new circulation pump, installation of new heating distribution system and installation of new T5 lighting system are proposed as possible measures. Building owner decided to realize two energy saving measures.

Summary of the measures in the action package

Results

With the help of the Total Concept method, an action package with eight energy efficiency measures were found profitable. The measures are ranked after profit in Table 1.

Table 1. Cost and energy savings for the various measures

| Measure | | Investment cost [kEuro] | Cost saving [kEuro/year] | Energy saving [MWh/year] |
|---------|---------------------|-------------------------|--------------------------|--------------------------|
| 1 | New windows | 237 | 10.1 | 164 |
| 2 | New lighting system | 145 | 3.7 | 90 (heat +67 MWh) |
| - | Sum | 382 | 13.8 | 188 |

Summary of the outcome and follow-up in Step 3

Figure 1 shows the measurement outcomes in Step 3 compared to estimated baseline in Step 1 and calculated values in Step 2. There is no split between electricity for building operation and tenants.

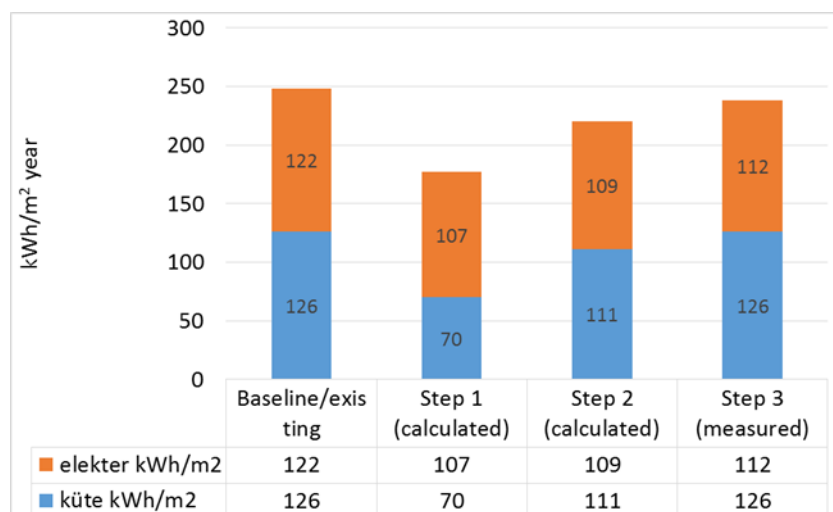


Figure 1. Outcome after Step 3 compared to baseline.

According to the measurement outcomes of Step 3, the total net energy use is about 238 kWh/m². We expect net energy use to be further reduced due to operational experiences.

The action package carried out in Step 2 was estimated to reduce the net energy use about 12 % compared to the energy use before renovation/baseline. Measured outcomes in Step 3 show the savings to be about 3.5 %.

The actual profitability outcomes are summarized in Table 2. Figure 2 shows the calculated profitability for the action package in Step 2 together with the true profitability calculated after Step 3. The calculated profitability for the package in Step 2 was 0.2 %.

Table 2. Summary of the outcomes of the action package carried out compared to estimations made in Step 2.

| | Step 2 | Step 3 |
|--|------------|-------------|
| Total net annual energy savings: | 12 % | 3.5 % |
| Calculated energy savings – electricity: | 109 MWh/yr | +1 MWh/yr |
| Calculated power savings – electricity: | 90 MWh/yr | 65 MWh/yr |
| Total annual cost savings: | 14 kEUR/yr | 6.4 kEUR/yr |
| Energy investment cost: | 382 kEUR | 382 kEUR |
| Internal rate of return for the package: | 0.2% | - % |

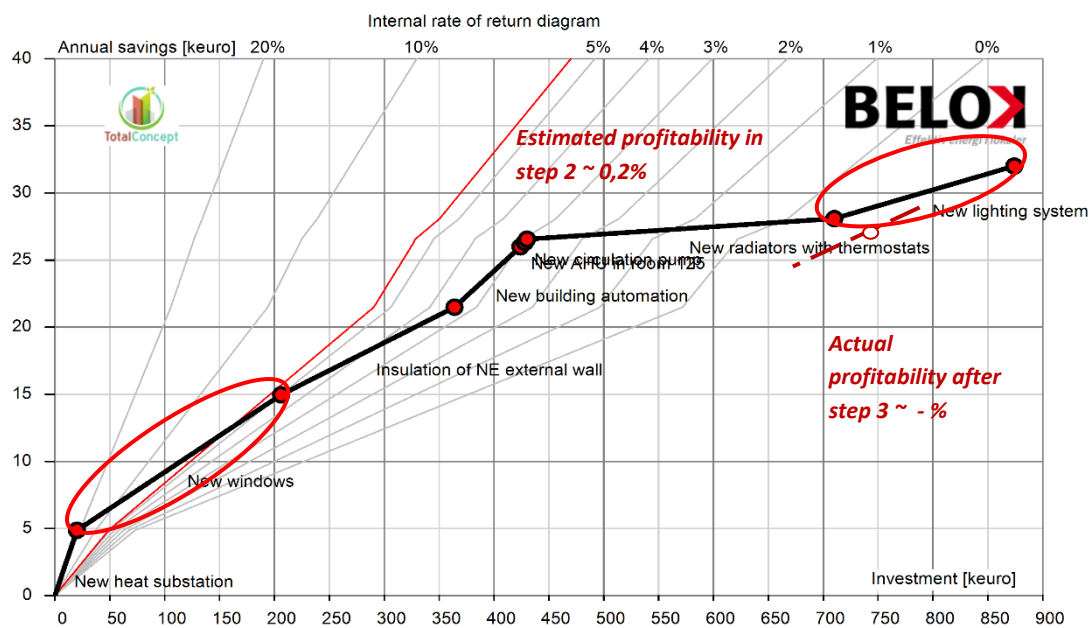


Figure 2. Outcomes of the profitability of the action package carried out at the Gonsiori 29, office building. Relative energy price increase is 2 %.