

TotalConcept

2015

Total Concept method

may

Step 1. Creating the action package

Property name: Gonsiori 29, TallinnProperty owner: Ministry of Social AffairsConsultants: Estonian Society of Heating and

Ventilation Engineers

Year built: 1950

Building and its use

Area: 6 797 m² Heated area

Type of building: Office

The building was designed in 1945-1946 and construction was completed in 1950. The building is included in the National Registry of Cultural Monuments, XX century architecture.

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



Indoor climate

Standard EN 15251 "Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics" is recommended to be used to determine the parameters of the indoor climate.

Measurements of indoor temperature, relative humidity and CO_2 concentration showed that indoor temperature was mainly between 22-25 °C and CO_2 concentrations were below 800 ppm. Low CO_2 concentrations are caused by leaky windows which allow high infiltration rate.



2015

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. Building has gable roof with loose fill insulation on attic floor (approx. 350 mm). The basement floors are made of concrete and without thermal insulation. The windows were replaced in 2005 with double glazed windows with PVC frames.

Estimated thermal transmittance of building envelope:

External walls $U=0.6 \text{ W}(\text{m}^2\text{K})$ Attic floor $U=0.12 \text{ W}(\text{m}^2\text{K})$ Ground slab $U=2.7 \text{ W}(\text{m}^2\text{K})$ Windows $U=1.7 \text{ W}(\text{m}^2\text{K})$

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 is retrofitted in years 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.

Equipment

There are mainly standard office equipment in the building. Exceptions are the diner with large kitchen equipment and sauna with electric heater.

Control and monitoring system(s)

Heating sub-station is equipped with two local controllers: one for heating system and one for ventilation heating coils.

Energy and resource use before measures

ecific energy use before measures 248 kWh/m²,year	
Whereas	
Heat energy	126 kWh/m²,year
Electricity for building operation	122 kWh/m²,year
Electricity for tenants	kWh/m²,year

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

Electricity use per heated area was 117-129 kWh/a, 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%).



2015

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.

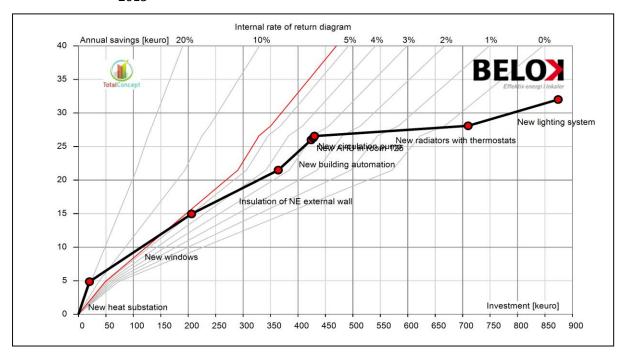
Additionally the insulation of NE external wall, install new building automation, replacement of ventilation unit in room 125, installation of new circulation pump, installation of new heating distribution system and installation of new T5 lighting system are proposed as possible measures. Those measures did not meet the profitability requirement but contributed to reduction in energy demand and therefore reduced energy costs.

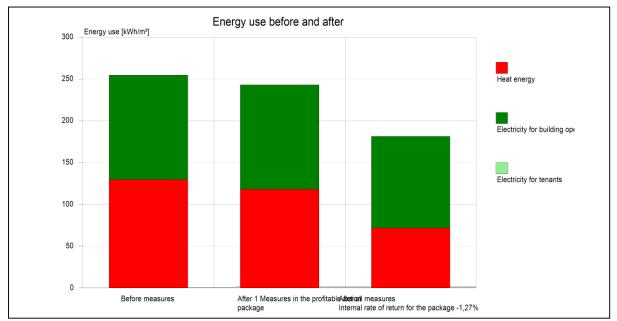
Summary of the measures in the action package

Me	asure	Investment cost keuro	Cost saving keuro/year	Energy saving MWh/year
1	New heat substation	20	4	79
2	New windows	186	10	164
3	Insulation of NE external wall	158	6	106
4	New building automation	60	5	81
5	New AHU in room 125	4	0.3	4
6	New circulation pump	2	0.2	3
7	New radiators with thermostats	280	1	25
8	New lighting system	164	4	90
-	Sum	874	31	552



2015





Results

The property owner's profitability demand is 5.5%. First two measures of action package are in the required range. The total energy saving potential of action package is approximately 29%. District heating use can be reduced by 390 MWh/year and electricity use by 105 MWh/year.