Property name:	Pärnu Koidula Gümnaasium
Property owner:	City of Pärnu
Consultants:	Estonian Society of Heating and Ventilation Engineers

Total Concept method

Step 1. Creating the action package

Building and its use

Year built: 1978
Area: 8 184 m² Heated area
Type of building: School

School building has a I-shaped ground plan, partly 2-storey and partly 4-storey classrooms building, sports hall, a wrestling hall and the swimming pool. This work addresses only the classrooms building and sports hall, swimming pool and a wrestling hall is not covered in this study.

Since it is a school building, the building is mainly in use during the day and only on weekdays.

Indoor climate

The indoor climate was not monitored. Previously performed analysis concluded that indoor climate did not meet the requirements. Moisture issues and mould problems indicate that ventilation system is insufficient. The heating system did not had the thermostatic valves and therefore it was estimated that the building was 1-2 ° C overheated.

The status of the building and its technical systems before measures

Building envelope

Floors are built directly on the ground and are not insulated.

Exterior walls are built from autoclaved aerated concrete large-blocks (320 mm), which are insulated with 50 ... 100 mm expanded polystyrene and partially covered with plaster system and partially with profiled tin sheets.

Windows are replaced with new plastic frames and double glazed windows. Doors are also replaced.

Heating

The building has a one-pipe heating system, without thermostatic valves. The whole system is outdated and has exceeded its normative lifetime and requires full replacement.

The heating system is connected to the district heating network with substation. Substation was updated in 2004 and is in good condition.

Ventilation

New ventilation system with heat recovery was built in 2006 but that system had some major problems. Ventilation duckts are under- or overdimensioned and airflow rates did not meet the standards. The ventilation system also had electric heating coils for heating ventilation airflow.

It is estimated that the existing ventilation ensured 2/3 of necessary air change. Based on the design project, ventilation system had a SFP 2,5 kW / (m^3 / s) and the heat recovery ratio of 0.65.

Cooling

There is no cooling system.

Lighting

There are no specific data about lighting system, but because of the large amount of electrical systems is not renovated, it can be assumed that the lights consumed considerably more electricity compared to the modern energy-saving lamps.

Equipment

Since it is a school building, the building does not have a special energy consuming equipment. Teachers' offices have the usual office equipment such as a computers, printers, copy machine. Computer classes have computers.

Control and monitoring system(s)

There is no central control or monitoring systems.

Energy and resource use before measures

Specific energy use before measures	168 kWh/m²,year
Whereas	
Heat energy	122 kWh/m²,year
Electricity for building operation	46 kWh/m²,year

Specific energy consumption of analysed school building is generally in the same range as other school buildings in Estonia. The relatively high consumption of electricity is due to the electric heating coils of the ventilation system.

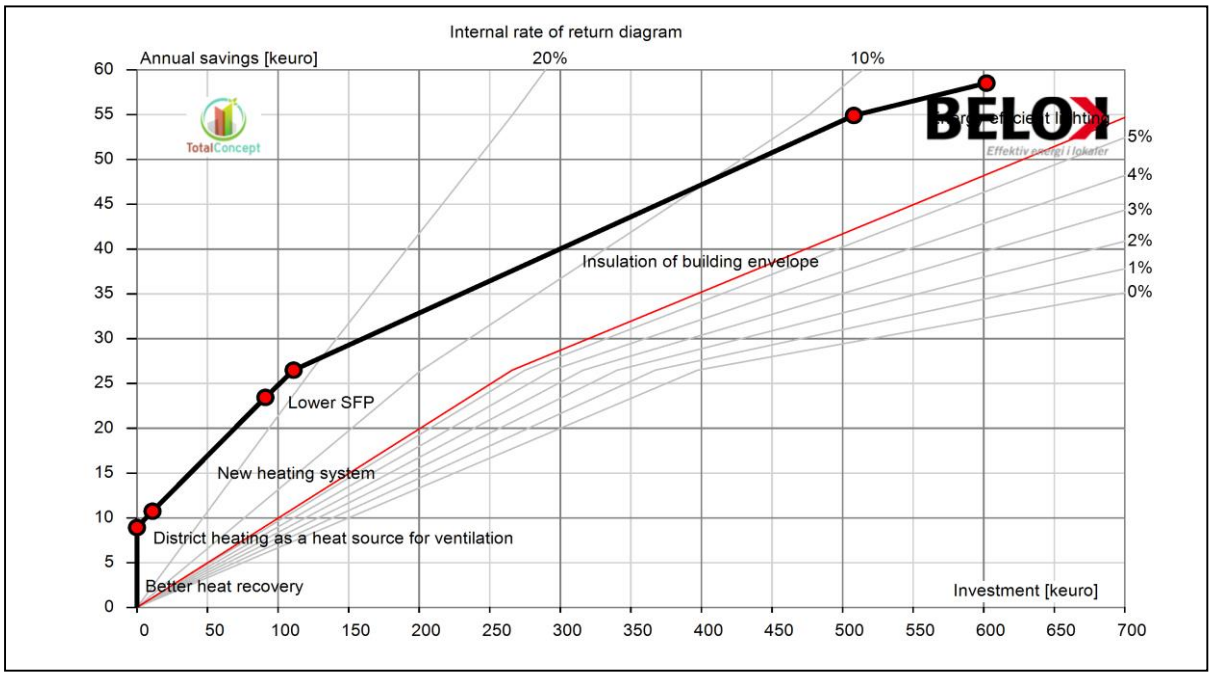
Identified energy saving measures

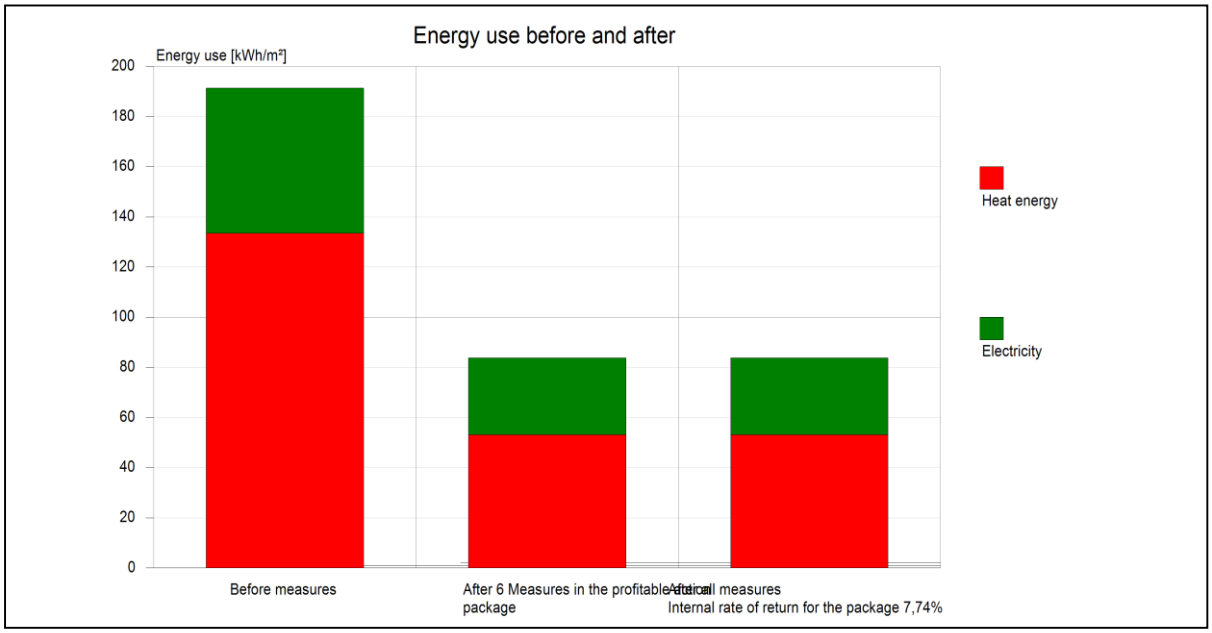
The proposed package consists of the following steps:

- improving ventilation system heat recovery
- use district heating as a heat source for ventilation heating
- reduction of ventilation system SFP
- new heating system
- insulation of the building envelope
- energy efficient lighting

Summary of the measures in the action package

Measure		Invesment cost keuro	Cost saving keuro/year	Energy saving MWh/year
1	Better heat recovery	0	8	104
2	District heating as a heat source for ventilation	11	1	-2
3	New heating system	80	12	216
4	Lower SFP	20	3	33
5	Insulation of building envelope	397	28	508
6	Energy efficient lighting	94	3	20
-	Sum	602	58	879





Results

After the implementation of the package, the heating energy consumption is reduced by 60% and electricity consumption by 47%. Based on the results of the calculations of the total energy consumption decreased by 56% and provided annual savings of 54.5 kEUR.