Deliverable D 5.02.3

Refurbishment of public building

Within the EU-Project "Sustainable Energy Management Systems"

Contractor: European Commission within the Concerto II Initiative in the 6 Framework Research Program.

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Organizations name of lead contractor for this deliverable: Gmina Słubice/Poland.

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Refurbishment of public building.

Within the framework of work package 5.02 the thermal refurbishment of one public buildings belonging to the commune Slubice is planned. This building will then be equipped with a biomass heating system. As a result of an analysis of needs and possibilities for the commune a Primary School Building in Kunowice, Slubicka Street 18, has been chosen to carry out the refurbishment works there.

The school is situated in an old building which was built in the 1920s. It is built in traditional architecture style, has a stone foundations and gable roof covered with clay tile. The attic is partly used; while the peak of the roof does not have thermal insulation.

The commune of Słubice commissioned an energy audit in order to carry out the assignment. Authorized auditors (Janusz Szymczyk, Gorzów Wlkp.) delivered the results of the audit which was done on the 14th September 2009.

Building description according to audit report:

Number of storeys: 2 + cellar

Cubature: 1755 m³

Net building area: 498 m ²

Heated area: 436 m²

Number of pupils: 85

Number of rooms: 10

Heating system: traditional hard coal-burning oven, poor technical condition with low efficiency.

Heating systems in rooms: hydro-heaters

Domestic hot water heating: 60l electric boiler

Kind of ventilation: natural

Energy parameters of the building:

Parameter	Before thermal renovation	After thermal renovation
Heat transfer coefficient – walls U (W/m².K)	1.151	0.216
Heat transfer coefficient – roof U	1.080	0.80
Heat Power of heating system kW	36,5 kW	20,7 (38,0*)
Annual heat demand necessary to heat the building (GJ/a)	230,3 GJ/a	58,7 GJ/a (230,0 GJ/a*)
Annual heat demand necessary to heat domestic water	47,9 GJ/a	47,9 GJ/a
Annual heat demand necessary to heat the building kWh/m²/a	128,63 kWh/m²/a	32,81 kWh/m²/a
Decrease in demand for thermal energy (%)		**61,7 %**

*in the middle of preparation for thermal renovation the authorities of the commune decided to build a small gym in the future. Energy needs of this object have been taken into consideration by drawing up a plan of rebuilding a boiler room.

To achieve the improvement of the energy parameters of the building and to save thermal energy the audit report shows the following catalogue of measures:

- Installation of ventilation controlled by ventilators

- Insulation of exterior walls - to reach U= 0,216 (elevation polystyrene, thickness 12cm, glued without joints)

- Roof and Attic insulation to reach U= 0, 80 (polystyrene, thickness 12 cm, blown in mineral wool and foil)

- supporting the heating of domestic water by using solar heating systems (this solution is disadvantageous because of the long summer holiday break) or air heat pumps

- Improvement of heating efficiency by installation of biomass heating system as described in D5.02.4 in detail.

The total estimated costs of refurbishment works according to the audit report were **89.455,00 PLN.** The amount was paid from school equity funds, commune funds and from a credit raised for the thermal

renovation. The air heat pump was financed by the SEMS budget. Refurbishment works were carried out in 2010 -2011. The air heat pump was installed in January 2012. It is a water and air pump from the manufacturer ARISTON and features an integrated buffer tank (capacity 80l). The coefficient of performance (COP) is 3,8. The pump meets school needs for domestic hot water supply for sanitary purposes through the use of waste heat transferred from the boiler-room.

Primary School Building before refurbishment

Building after refurbishment

Observations before the thermal renovation had shown a big loss of thermal energy. The main reason for this was the poor wall insulation, leakiness and a lack of roof insulation

The commune of Słubice makes efforts to carry out thermal renovation in other public buildings. At the beginning of 2011 an energy auditor for other educational buildings was chosen during a competitive tender. The audits were carried out and the reports were delivered in February 2011. Because of a very difficult financial situation of the commune the authorities decided that the thermal renovation will first take place at kindergarten no. 4 in Bohaterow Warszawy Street 8, in a nursery in Wojska Polskiego Street 15a, in a grammar school no. 1 and in a primary school no. 1 in Wojska Polskiego Street 1.

In autumn 2011 a project office was chosen during a tender and it has to prepare documentation which is necessary to obtain a construction permit and a special permit for construction works. The commune is going to apply for EU funds from the Lubuskie Regional Operational Programme 2007 – 2013 (LRPO) to finance the investment. If the funds will be granted from LRPO the commune plan to carry out works by the end of 2012 and savings will be achieved in a heating season 2012/2013.

Characteristics of the buildings based on the energy audits

Building	Number of storeys	Building area in m²	Building cubature m³	Heating System	Heat transfer coefficient –walls		Heat transfer coefficient - ceiling		Heat demand GJ/a		Heat power in kW		Savings in %
					before	after	before	after	before	after	before	after	
Kindergarten no. 4	3	826	2478	Heating fuel	0,886	0,182	0,679	0,154	641,0	376,0	105	76,8	**38,5%**
Nursery	2	1011	2634	Heating fuel	0.886	0.172	0,800	0,168	423,0	184,0	90,9	60,1	**44,6%**
Grammar school no. 1				City network									
Primary school no. 1				City network									

Kindergarten no. 4 Bohaterów Warszawy Street

Nursery, Wojska Polskiego Street 15a

Foto Grammar school

Foto Primary school no. 1