Cost efficiency

Just a few years ago, we were not thinking about the costs of energy or building maintenance because the prices were stable and fairly low. The Russian invasion of Ukraine has fundamentally changed this. Faced with limited resources, we started to notice a need to improve the energy performance of buildings, which not only is our own obligation but also has economic and environmental significance for future generations.

DOES IT PAY OFF AND HOW MUCH DOES IT COST?

Let's try to answer a few important questions:

» how have energy costs changed over the last few years?

» how have building maintenance costs increased over the last 5 years?

» does the first stage of the thermal upgrade, i.e., building insulation, make economic sense?

» how are the cost changes perceived by owners of buildings with and without thermal insulation?

To provide an accurate answer to these questions, we have analysed the maintenance costs of typical residential buildings built in various periods of the 20th century:

» "cube" houses from 1965, without thermal insulation of external walls with a heating system based on a coal-fired boiler and gravity ventilation,

» "barn" houses from 1987, with thermal insulation of external walls according to the specifications applicable at the time they were constructed, also with a heating system based on a coal-fired boiler and gravity ventilation.

The results of the analysis are presented in reports prepared by the Małopolska Energy Efficient Building Laboratory of the Faculty of Civil Engineering at the Cracow University of Technology available at **www.poznajstyropian.pl**.

CHANGES IN ENERGY PRICES OVER THE LAST FEW YEARS

Table 1 below shows the changes in the unit prices of energy carriers over the last 5 years*):

In particular, this refers to the prices of bituminous coal, which is the most popular heat source in Poland. According to the Central Register of Emissivity of Buildings (CEEB), out of almost 9.8 million already registered heat sources, 5.5 million (56%) are fired with solid fuel, and the most frequently used fuel is still coal and coal-derived fuels. There are 2.7 million pieces of such sources.

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ENERGY PRICES AND MAINTENANCE COSTS OF A TYPICAL BUILDING FROM THE 1960s.

The price we pay for heating our houses is closely related to the prices of energy sources. For instance, let's take a look at a "cube" house from the 1960s with an area of approx. 127 m^2.

Over the course of the last 5 years, the prices of energy used to heat this type of house in winter increased significantly – by 283% in the case of bituminous coal and by 66% in the case of natural gas. For the household members, assuming the energy demand does not change, this would increase the annual costs by PLN 9974.12 and PLN 3758.48, respectively.

THERMAL UPGRADE – DOES IT SEEM VIABLE ECONOMICALLY?

The impact of the thermal upgrade on energy demand has been analysed on the example of the thermal upgrade using polystyrene facade boards with a thickness of 16 cm. After the installation of thermal insulation, the energy demand decreased almost by half, directly translating into smaller bills, for buildings heated with both bituminous coal and gas. The tangible savings last year for a house heated with a boiler fired with bituminous coal amounted to more than PLN 7200 – **table 2**.*)

MOST IMPORTANT CONCLUSIONS

Thermal upgrade helps reduce energy demand **by almost half** (depending on the building type).*)

» Lower cost of purchasing the heat source (solid fuel boiler, gas boiler, heat pump).*)

» Savings on bills connected with the cost of an "oversized boiler" (partial thermal upgrade of the house without prior installation of thermal insulation results in the selection of a heat source with a higher capacity, increasing the costs of purchase and operation).

*) based on the MLBE report.

Visit the website to find out more www.poznajstyropian.pl

TABLE A 1

ITEM	UNIT	DEMAND	HOUSE HEATING COST – UNINSULATED CUBE		COST DIFFERENCE 2022 vs. 2017	PERCENTAGE INCREASE OF HEATING COSTS
			2017	2022		
BITUMINOUS COAL	(PLN/year)	6.64 t	PLN 5,473.01	PLN 15,447.13	PLN 9,974.12	283 %
NATURAL GAS	(PLN/year)	37,210.42 kWh	PLN 5,694.08	PLN 9,452.56	PLN 3,758.48	66 %

*) based on a report by

TABLE A 2

ITEM	UNIT	DEMAND BEFORE	DEMAND AFTER THERMAL INSULATION	DIFFERENCE	HOUSE HEATING COSTS 2022		DIFFERENCE
					WITHOUT THERMAL INSULATION	WITH THERMAL INSULATION	
BITUMINOUS COAL	(PLN/year)	6.64 t	3.5 t	-47 %	PLN 15,447.13	PLN 8,150.06	PLN 7,297.07
NATURAL GAS	(PLN/year)	37,210.42 kWh	19,592.72 kWh	-47 %	PLN 9,452.56	PLN 4,977.14	PLN 4,475.42

* based on a report by