GOOD PRACTICES IN SME

Replacing the heat source

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Why should the heat source be replaced?

The heat source (usually a boiler) is the key element of the entire central heating installation. The heat source has an the greatest influence on the performance of the entire heating system and therefore on the cost of heating.

We usually replace the boiler with the most modern boiler with a higher efficiency. Sometimes a conventional boiler is replaced with a zero-emissions heat pump, characterized by the lowest per unit cost of heating (but also high investment costs). Both enable decrease heating costs while also decreasing CO_2 and pollutant emissions into the atmosphere. Replacing a coal boiler with a gas or biomass boiler also lowers greenhouse gas emissions.

The need to replace the heat source can also arise out of malfunctions of the old installation or stricter norm on fuel and boilers in the given territory.

Selecting a boiler, attention should be paid to its energy performance class, located on the energy label

Pic. 2 AleKotły: coal boiler

Pic. 3 kociolgrzejnik: gas boiler

Pic. 1 swatt: heat pump

Example for replacing a boiler with a high-performance boiler

The hot water production plant uses an old coal boiler with P= 50 kW and an efficiency of η_o=60%. What are the annual savings from replacing the it with a high efficiency (η_n=85%) boiler fired with eco- pea coal with a calorific value of W_o =25MJ/kg and a price of k=800 PLN/t? The boiler is in operation about t=4 000 hours annually.

The annual cost of feeding the solid boiler can be determined using the following formula:

$$\boldsymbol{cost = \frac{0,36 \cdot P\,[kW] \cdot t[h] \cdot k\,[\frac{PLN}{t}]}{W_o[\frac{MJ}{kg}] \cdot \eta[\%]}}$$

Annual cost of fuel for the old boiler:

$$\frac{0{,}36 \cdot 50kW \cdot 4\,000\ h \cdot 800\ PLN/t}{25\ MJ/kg \cdot 60} = 38\,400\ PLN$$

Annual cost of fuel for the new boiler:

$$\frac{0{,}36 \cdot 50kW \cdot 4\,000\ h \cdot 800\ PLN/t}{25\ MJ/kg \cdot 85} = 27\,106\ PLN$$

Annual savings generated by replacing the old boiler with a high-performance boiler:

$$38\,400\ PLN - 27\,106\ PLN = 11\,294\ PLN$$

Source: KAPE

Example for replacing a boiler with a heat pump

A building is heated by a gas boiler with P= 80 kW and an efficiency of η =90%. The boiler is operation about t=3 500 hours and is powered by natural gas with a calorific value of $W_o = 34MJ/m^3$ which costs $k = 2{,}30\ PLN/m^3$. How much will the building's owner save if the boiler is replaced with a heat pump with an average COP=2,5? The average cost of electricity is k_e =0,55 PLN/kWh.

The annual cost of feeding the gas boiler can be calculated using the formula:

$$\boldsymbol{cost = \frac{360 \cdot P\ [kW] \cdot t[h] \cdot k\ [\frac{PLN}{m^3}]}{W_o[\frac{MJ}{m^3}] \cdot \eta[\%]}}$$

Annual fuel cost for the gas boiler:

$$\frac{360 \cdot 80kW \cdot 3\,500\ h \cdot 2{,}30\ PLN/m^3}{34MJ/m^3 \cdot 90} = 75\,765\ PLN$$

The annual cost of powering the heat pump can be calculated using the formula:

$$\boldsymbol{cost = \frac{P\ [kW] \cdot t[h] \cdot\ k_e[\frac{PLNzł}{kWh}]}{COP}}$$

Annual cost of powering the heat pump:

$$\frac{80\ kW \cdot 3\,500\ h \cdot\ 0{,}55\ PLN/kWh}{2{,}5} = 61\,600\ PLN$$

Annual savings generated by replacing the gas boiler with a heat pump:

$$75\,765\ PLN - 61\,600\ PLN = 14\,165\ PLN$$

Source: KAPE