Towards greater energy efficiency with a full renovation of a residential building on the example of Vilde 70

Minsk, 21.05.2019.a.
Initial data

- Vilde tee 70
- 54 apartments on nine floors
- primary material - silicate stone
- architect R. Karp
- year of completion 1970

The building has two halls and 54 apartments with a total area of 3583 m².

Energy performance class F, $\text{WEU} = 229 \text{ kWh/(m}^2\text{a)}$
Weighted energy use 229 kWh/(m²•a)
Before renovation
Main goals of the renovation

• To ensure a healthy interior climate and consequently the well-being of the residents by achieving the following ventilation exhaust flow rates in accordance with the EVS-EN standard for interior climate:
  – **in 2-bedroom apartments** at least 15 l/s in the bathroom and 8 l/s in the kitchen.
  – **in apartments with 3 or more bedrooms** at least 10 l/s in the toilet, 15 l/s in the bathroom and 8 l/s in the kitchen.

• To achieve energy class C, calculated energy class ETA **128 kWh/(m²*a)** in order to reduce living costs for the residents and minimize the emission of greenhouse gases.
Completed tasks

- **Insulation of the facade and the roof** (walls 150 mm silver-EPS, roof 300 mm), closing of the balconies. **Closing of the open entryways** running through the building on ground floor, replacement of the front and back door. **Replacement of all the windows** of the building and installation of the new windows in line with the existing facade (triple pane glazing, U-value of the whole window at least 0.9).

- **Full replacement of the heating system**, including replacement of heaters (Purmo Compact with Purmo Air intake collectors) with introduction of thermostats and ventilation openings in the external walls.

- **Building of a ventilation heat recovery system with heat pumps** using the pre-existing exhaust ducts. The openings of the ducts located in bathrooms, toilets and kitchens were fitted with regulation elements.

- **Replacement of elevators**, renovation of hallways.

- **Installation of 15 kW photovoltaic power station** on the roof.

- The functioning of all systems can be monitored and controlled via web-browser based system in real time.
Size of investment and loan payments

• **Sum of the whole investment is 1 424 637 €, 564 445 €** or approximately 40 % of which was covered by Fund Kredex reconstruction grant.

• Monthly **loan payments are 1,25 eur/m²**.
After renovation
After renovation
After renovation
After renovation
The operating principle of fresh air intake heater system
Adjustable valves in kitchens, bathrooms and toilets
Ventilation unit with a heat exchanger on the roof
Heat pumps in the boiler room
<table>
<thead>
<tr>
<th>Date</th>
<th>Vilde 70</th>
<th>Vilde 68</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.2018</td>
<td>0.56</td>
<td>1.66</td>
</tr>
<tr>
<td>02.2018</td>
<td>0.66</td>
<td>1.76</td>
</tr>
<tr>
<td>03.2018</td>
<td>0.50</td>
<td>1.79</td>
</tr>
<tr>
<td>04.2018</td>
<td>0.17</td>
<td>0.88</td>
</tr>
</tbody>
</table>

The costs on heating water and communal electricity were similar in both buildings.
Cost burden of residents of Vilde 70 before and after renovation of the building based on energy consumption and loan payments

<table>
<thead>
<tr>
<th>3583 m²</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating, DHW, and communal electricity (eur)</td>
<td>51067</td>
<td>46094</td>
<td>30199</td>
<td>17691</td>
</tr>
<tr>
<td>eur/m²/month</td>
<td>1.19</td>
<td>1.07</td>
<td>0.70</td>
<td>0.41</td>
</tr>
<tr>
<td>Loan payment (eur/m²/month)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.97</td>
<td>1.25</td>
</tr>
<tr>
<td>Repair fund (eur/m²/month)</td>
<td>0.42</td>
<td>0.42</td>
<td>0.10</td>
<td>0.13</td>
</tr>
<tr>
<td>Costs (eur/m²/month)</td>
<td>1.61</td>
<td>1.49</td>
<td>1.77</td>
<td>1.79</td>
</tr>
<tr>
<td>Increase in costs (eur/m²/month)</td>
<td>-0.18</td>
<td>-0.30</td>
<td>-0.02</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Facts about the results of the renovation

During the last year, the energy generated by the heat pumps has covered 76 % of the heating and DHW energy needed. Mean COP of the heat recovery system is 3,18; COP of heat pumps 3,82

11 % of the communal electricity was covered by the electricity produced by the PV system. 73 % of the produced electricity was used internally and 27 % was sold back into the grid.

Final conclusions about the results can be made in January 2020, when the energy performance class of the building is published.
Thank you for your attention!

Anvar Kima
apartment association manager level 4
technical consultant at KredEx
member of the board at EKYL
anvar.kima@gmail.com
+372 504 7860