



**Sladki Vrh  
(Slovenia)**

**31 % energy saving**

**Total living expenses lower than before renovation**

**All users have chosen for energy saving measures**

### **Project data**

Location, address:	Sladki vrh 5b;
Region:	Maribor
Surroundings:	East of the country;
Climate:	Continental
Heating degree days:	3200
Year of construction and renovation:	1973 (constructed); 2003 (renovated)
Typology:	Apartment building
No of dwellings:	30 dwellings
Total floor area:	1780
Owner:	Various private owners
Architect and Builder:	Žižek Rupert s.p.
Costs of energy saving measures:	Façade € 36.000, windows ~ € 55.000
Renovation financed by:	The owners, state subsidy



**Figure 1: Apartment building on Sladki Vrh 5b after renovation**

### **Renovation concept**

#### **Key renovation features**

- Insulation of facade
- High efficiency insulation glazing and frames

### State-of-the-art

#### Before renovation

Constructions [U-values:  $W/m^2K$ ]

- Non-insulated facades [1,4]
- Windows (double glazing, wood frame) [2,7] <sup>1</sup>

#### After renovation

Constructions [U-values:  $W/m^2K$ ]

- Insulation of facades [0,36]
- Replaced windows 70% [1,3]

### Energy saving and monitoring

Energy consumption before renovation:  
KWh/m<sup>2</sup>: 130

Energy consumption after renovation:  
KWh/m<sup>2</sup>: 90  
Percentage savings<sup>2</sup>: 31%

### Additional information

- The building was designed and built in the period when there was no regulation on thermal insulation and energy efficiency in buildings. The building codes related to brick structures resulted in U values of approx. 1,4  $W/(m^2K)$  for outer wall and the window technology normally applied in that time (double glazed cast windows) resulted in U values of approx. 2,7  $W/(m^2K)$  with normally high air leakage.
- The recommended measures were the following:
  - thermal insulation of the outer walls and
  - replacement of existing windows with energy efficient windows.

### Lessons learned and conclusions

- The project is interesting because of the organisational aspect. The success was guaranteed by the co-operation and financial contribution of the occupants and by availability of state subsidies for refurbishment of apartment buildings. After the refurbishment the heating costs are lower and the thermal comfort level higher improved. The improved aesthetic value contributed also to the raise of the building value.

### References

[1] Building management: Franci Perko s.p.

<sup>1</sup> Total U-value of glazing and the window frame

<sup>2</sup> Compared to the situation before renovation