



TULLE (France)

**Refurbishment of two 19th century apartment buildings.
75% energy saving.**

Project data

Location, address:	Tulle, rue Pauphile	
Region:	Corrèze	
Surroundings:	Nearby the city centre, on the river shore, small buildings and individual houses.	
Climate:	Continental and cold	
Heating degree days:	2600	
Year of construction and renovation:	1845	Refurbishment : 2004 - 2005
Typology:	Two 4-storey apartment buildings	
No of dwellings:	53 (25 in building 1, 28 in building 2) + common spaces (conference rooms, offices, kitchen, collective boiler room, laundry,....)	
Total floor area:	1 400 m ² of living area and 400 m ² of common spaces	
Owner:	POLYGONE SA (social housing company)	
Architect and Builder:	Arch. Pisset / Jubertie, BET IGETEC	
Costs of energy saving measures:	The cost of the entire programme is 1.75 M€ of which 0.45 M€ for energy saving measures	
Renovation financed by:	State	0.33 M€
	Region	0.22 M€
	City	0.35 M€
	The rest is financed by own fund	

Objectives and Results

2 very old apartment buildings (in the former time it was a watermill) were refurbished and transformed into a home for young workers. This project was initiated with 2 main priorities: increase the accommodation facilities and reduce running costs through energy saving measures.



Figure 1: Before and after the renovation (building 1).

Renovation concept

Key renovation features

- Extra insulation
- Super low energy windows
- Condensing gas boilers
- Optimised lighting systems and daylight
- Water and electricity savings

State-of-the-art

Before renovation	After renovation
<p>Constructions [U-values: W/m²K]</p> <p>Single glass wooden frame windows [5.2]</p> <p>Atrium window</p> <p>Stoned walls [2]</p> <p>Chimney</p> <p>Artificial light</p>	<p>Constructions [U-values: W/m²K]</p> <p>Double glass aluminum frame windows [2.7]</p> <p>Roof box (natural light + smoke ejection + insulation)</p> <p>Wall Insulation (Placostyl) [0.31]</p> <p>Attic insulation (Placostyl) [0.17]</p> <p>Chimney dismantled and pipes blocked</p> <p>Openings for natural light</p> <p>Insulation reinforced (thermal bridge removed on north windows and on waist water evacuations)</p>
<p>Installations</p> <p>Natural ventilation</p> <p>Electricity</p>	<p>Installations</p> <p>Mechanical ventilation</p> <p>Collective Gas boiler for heat and Domestic water</p> <p>Optimised lighting systems and daylight</p>

Energy saving and monitoring

Energy consumption **before** renovation:
KWh/m²/year: **578**
Energy Index:

Energy consumption **after** renovation:
KWh/m²/year: **144**
Energy index:

Percentage saving¹: **75%**



Additional information

- The refurbishment of the 2 buildings was made in 3 phases. 1 year before the refurbishment started, vacant apartments were not rented. Then, the residents of the first building were moved to the second building until the end of the work. Finally, the same process was applied to the second building. This organisation enabled to minimize trouble caused to tenant.
- 53 apartments were completely renovated including the creation of 6 apartments for disabled people (persons with reduced mobility).

Lessons learned and conclusions

The state of degradation of buildings drove to important delays (24 months of works instead of 15 as initially planned) and in some additional costs (notably in term of reinforcement of structures and floors). Modifications were sometimes necessary to adapt the project to existing structure.

References

<http://www.polygone-coop.fr/site/tulle.pdf> (in French)

¹ Compared to the situation before renovation