

# *The most sober tower in the world*

The Elithis Tower in Dijon has been heralded as 'the most sober building in the world'. Even more striking than the building is its visionary builder, Thierry Bièvre. 'Energy savings are driven by brainpower rather than by technology.'

| by *Hughes Belin*

For the past ten years, Elithis Engineering, which employs 70 people, has specialised in energy efficient fluid technology for buildings. But the goal of Thierry Bièvre, the company's ceo, goes further. He wants to become 'the leader in energy performance in buildings in France by 2010'.

When his company needed more space to develop, he decided that rather than reinforcing the old adage that cobblers' children are badly shod, he would put his money where his mouth is and 'test' the products he was selling to others on himself. 'There is a lot of talk in France but very few people have actually acted on their words', he notes. And so in 2003, he made the decision to build a "positive energy" building. But it was never going to be just a building that consumes less energy by putting in a bunch of solar panels. 'By taking out one's cheque book, it is possible to transform a building that is an energy sieve into a positive energy building', Bièvre explains. The Elithis Tower, the result of his efforts, started in 2006 and completed in April 2009, is above all sober. Energy efficiency takes priority over using renewable energy.

His aim was to combine aesthetics, urban integration, comfort, and energy efficiency in an environmentally friendly building at the same cost as a traditional building. So the specifications had to be very strict. 'Brainpower was used to compensate for any funds required over and above the cost of a traditional building.'

each of the players at every stage. Nothing was left to chance. The solutions all came from experts in the different areas: acoustic specialists, carpenters, concrete specialists, etcetera, most of them being local to the area, because as Bièvre puts it, 'sustainable development always begins locally'. The result: the master builder was

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It's unusual for a specialist engineer to become the master builder, but Bièvre's first stroke of genius was to turn the organisation upside down so that he, a lower ranking heat engineer, became the master builder. He describes this as a return to the semantic roots of the term 'engineer' as someone creative. Elithis then introduced a system of "lateral management". Rather than passing the project from one collaborator to the next (like a hot potato), Elithis discussed the specifications and potential solutions with

able to keep tabs on cost throughout the process, more useful space was created and numerous innovations were introduced.

## Local product |

'What we did was to line up a series of micro-solutions', explains Bièvre. The architect, Jean-Marie Charpentier, had to start by ensuring that the building would fit into its environment. Squeezed between an office building and the Dijon Congress Palace, it's hard to imagine how a construction site of this dimension could



The Elithis Tower in Dijon

fit into such a small space. The tower has a surface area of 500 m<sup>2</sup> and is ten stories high. Interestingly, the building next door – which has the same height of 33.50 m, has only 9 stories.

This is not the only surprising feature. The shape of the building is the result of in-depth research into how best to integrate all the elements that are imposed on the site: the direction of the sun, the shade cast on adjacent buildings, the impact of wind currents. The result is a compact, aerodynamic building with a reduction in energy consumption of almost 50%. Additional measures and innovations inside the building reduce energy consumption even further, to 20 kWh/m<sup>2</sup>, 11 times less than a comparable conventional building. Emissions of CO<sub>2</sub> are a factor of 6 lower.

The facade is covered by a copper-coloured shield which is in fact a steel grid that only lets light in from a certain angle depending on the position of the sun, to save on lighting and to reduce the heat from the summer sun. No materials are wasted and the grid only

covers those parts of the tower that are exposed to the sun. The architect was so successful in integrating all elements of the specification that his plans required no modifications. Bièvre is persuaded that this new system of integrating fluid technology and energy performance earlier in the process ‘frees the architectural design process’. He says, ‘we didn’t draw the building, we wrote it down for the architect.’

Fiercely proud of his roots, Bièvre wanted his building to be a “local product”. However, certain technologies, such as the heat recovery system for use in the adiabatic thermodynamic processes, had to be imported from Germany. Bièvre believes that as head of a company he has a duty to work towards energy sobriety. The Elithis Tower was an ‘explorative journey’ through the jungle of ideas, limitations and hurdles. ‘There’s no need to sponsor an expedition to the North Pole.’ Everyone in the company was involved in the project. There was a lot of input from the younger staff: all the ideas relating to energy efficiency came from engineers with less than a

year’s professional experience. ‘They didn’t hold back at all, even going so far as to propose utopian solutions. It’s a bonus for the company: there is no limit to their creativity.’

Certain innovations have even been patented. These include a computer-driven controlled air circulation system which allows for heat peaks to be anticipated by sensors and mitigated with minimal use of energy. In fact each person is able to set his own level of physical comfort as the sensors are individual. The system controls microvents in the façade which allow for what is called ‘triple flow’ ventilation. There is fresh air coming from outside through the vents, hot or cold air coming from inside as in any building, and exhausted air going through another circuit to a heat exchanger under the roof, after which it is used for air conditioning.

### Measuring devices |

The Elithis Tower abounds with measuring devices: a weather station on the roof, sensors, and plugs for



Staircase in Elithis Tower



every possible use, all connected to a centralised computer in order to monitor the energy consumption of heating, cooling, lighting, computers, etcetera. The Tower is completely windproof and offers complete control of airflow in the building and therefore control of the temperature and the need for heat or air-conditioning. The building was even tested under pressure and all air leaks were identified and blocked.

The building is also very compact. The space between the floors is smaller than in other buildings. To achieve this, the engineers had to be extremely creative: starting with the limited space they looked for technologies to fit the space rather than vice versa. They were surprised with the number of options available and were able to choose the least expensive. In our building practices we always tend to 'leave space for flexibility and changes', explains Bièvre, 'but also for mediocrity'. Bièvre did not allow mediocre solutions for his tower.

The lighting inside the building comes from natural light and lamps that are only switched on when absolutely necessary. The computer rooms are cooled by a heat exchanger air-conditioning system. Rainwater, from the rain catcher on the roof, is used in the toilets. The roof is also home to 560m<sup>2</sup> of photovoltaic panels which generate

82 MWh of electricity per year. Could these innovations be applied to existing buildings? Definitely, says Bièvre. We are restricted primarily by our inability to influence the bioclimatic conditions of existing buildings, i.e. their orientation and their shape. 'For the rest, everything can be applied.' Bièvre feels that energy savings are driven by brainpower rather than by technology. Even if we don't achieve the same level of performance as a zero-emission new building, we

lift. Doing the cleaning at midday also saves on lighting.

A mounted television screen at the foot of the building displays the energy consumption and CO<sub>2</sub> emissions. 'We need to communicate our errors, although for the moment we are reducing more than expected', says Bièvre. The Elithis tower, equipped with more than 1,600 sensors, is also intended as a laboratory. All consumption will

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will reduce the ecological footprint by thinking of solutions without having to demolish existing buildings. 'The main ecological challenge will be to reduce buildings' energy bills.'

#### The human factor |

But despite these innovations, the Elithis tower is not a 100% energy-neutral building. A further 20 kWh/m<sup>2</sup> needs to be saved to achieve this. That's where the human factor comes into play: users will have to be willing to adapt their behaviour to make the building fully energy-neutral. This involves switching off the lights when leaving a room or using the stairs rather than taking the

be closely monitored and used for scientific publications. The project has already been covered in more than forty conferences. 'Nobody believed me', says Bièvre. The Elithis tower cost the same to build as a comparable conventional building (€7 million).

The Elithis Tower is called "the most sober tower in the world". Elithis has shown that if you want to go that extra mile, you have to draw on all your scientific and technical knowledge and see past your own specialist field. This is possibly the most important lesson learnt from this adventure, led by a company chief who acts first, and speaks later. ■