

# When public buildings get smart: New technologies and tailor-made solutions for users

December 4 2015, by Clara Attene

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Cooling and heating public buildings remains an expensive and a mostly unresolved issue in Europe. According to the nonprofit think tank Buildings Performance Institute Europe, Spain has about 11.2 million square metres of public buildings that need to be retrofitted by 2020 if they are to comply with the E.U. criteria. And France, the U.K. and Italy have record areas of 22, 14 and 13.7 million square metres respectively.

This data alone allows us to grasp just how wide-ranging solutions for hospitals, schools and offices need to be. A European research consortium is testing some innovative solutions in three [public buildings](#) located in different climatic zones: Turkey, Belgium and Spain.

In the Turkish city of Aydin, a hospital owned by the Adnan Menderes University will implement a trigeneration system. Parabolic trough solar collectors will be used to heat a fluid to produce hot water, an adsorption chiller will provide air conditioning and an Organic Rankine Cycle (ORC) unit will generate both heat and electricity.

The adsorption chiller generates cooling from heat sources through silica gel or zeolite desiccant, instead of mechanical compression. The ORC creates energy by processing an organic thermal fluid, which reaches its boiling point at lower temperatures than pure water.

"These technologies cut costs by using waste heat and renewable energy,

instead of using lots of electricity. They also work with environment-friendly fluids, with zero or very low impact on the ozone layer, and they avoid CO<sub>2</sub> emissions," says Fredy Vélez, from the Energy Department at Cartif Technology Centre.

The research is carried out under the European project BRICKER, which is developing innovative, energy-efficiency technologies in existing public buildings.

In Spain and Belgium, "smart integration" between improved biomass boilers and ORC units will be tested for cost-effectiveness, high efficiency and low emissions.

The innovation lies in how the biomass boiler plants at the demo buildings will be able to fully adapt to the running of ORC units. For example, they will be able to work with a wide range of biofuels and with solar energy in a hybridisation mode in the case of the Spanish demo building.

"In Spain, for an 8,480 m<sup>2</sup> office building owned by the Government of Extremadura in Cáceres, we selected a 500kW combustion plant fed with wood chips, but also able to work with other biomass such as olive kernels or pellets," says Javier Antolin, from the Cartif Technology Centre.

"At the Belgian site, which is a college located in Liège, a 1500 kW pellet-fed boiler will be installed. This large capacity is required so that the boiler can cover not only the ORC requirements, as in the case of the Spanish demo, but also some of the building's heating needs," he says.

Energy-eating buildings are a global issue. According to the United States Environmental Protection Agency (EPA), every year, buildings in the country account for 36 percent of domestic energy demand and 65

percent of electricity demand.

The MIT SENSEable City Laboratory is studying a "customised climate" in buildings. An infrared heating system, called Local Warming, tracks the presence of people in a space and generates a collimated infrared energy beam, which follows the steps of users. The system allows energy savings of up to 90 percent. A further development will allow each person to customise his/her 'climate area' in the building.

"European and US buildings have different problems in terms of dimensions and efficiency," explains Carlo Ratti, director of the laboratory. "In Europe, older buildings are smaller and sometimes less efficient, while the USA still suffers from the big McMansion wave. But in both cases, a staggering amount of energy is wasted on heating or cooling empty offices or partially occupied buildings." The McMansion architectural style, born in the 1980s, is characterised by oversized homes and an attempt to produce a luxury effect.

Today, according to Ratti, homes also benefit from smart thermostats such as Nest, property of Google, and these are like low-hanging fruit: "They are very easy to install," he explains, "and can make a traditional heating system responsive to people's habits and seasonal changes. They are primarily being used in private homes but they would work very well in public building too."

**More information:** [www.bricker-project.com/](http://www.bricker-project.com/)

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