In-depth analysis required prior to retrofitting old buildings

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Passive technologies can maximise primary energy reduction and economic investment in existing buildings

Innovative technologies can be used to retrofit old buildings as a means to save energy. This is precisely what the Bricker project is aiming to achieve. Matteo D'Antoni is a senior researcher at the solar thermal heating and cooling team of the independent research centre at the heart of the Italian region of the Dolomites, called EURAC the European Academy of Bolzano. Here, D'Antoni, talks to youris.com about his research on dynamic simulation of building and how to harness the benefits of active and passive energy systems. His aim is to understand how to integrate various technologies in a building's energy concept to reduce its primary energy consumption.

How do you obtain energy savings and economic viability?

The key aspects are methodology and design. The strongest aspect of our research project is its methodology. That is, studying the rationale to introduce passive or active technologies in an existing building and its implementation. This is what makes it possible to replicate the results to other climatic contexts in Europe. Our objective is to reduce the primary energy emission by 50%. But we will only be able to ascertain this is the case for the three showcase buildings we have been studying by the end of 2015.

Could any environment-friendly public administrator equip the public buildings of their city with these technologies?

Most of these technologies are mature. They are already available on the market. The issue, once again, is the methodology. It is important that we establish guidelines that allow deciding if any solution we choose to adopt is really economically and energetically viable. Depending on the context and the buildings, some solutions that work in theory may not be the best ones. Some less economically onerous solution might lead to a quicker payback time.

It is a complex approach. One the one hand, we have to calculate how much primary energy can we save; on the other, how much it costs. Technologies have to be easy to install and maintain and incurring a limited investment cost. If they are expensive, we have to understand whether it makes sense to install them. And this analysis has to take into account the energy concept of a specific building replaced in its own environmental context.

What are the key steps in the process?

There are three steps in the process. First, we evaluate the energy consumption of the existing building. This is done through thermo-energetic dynamic simulations of the system installed in the building and of the structure of the building itself. This way, we obtain the baseline. In a second phase, we evaluate the integration of the so-called passive technologies to reduce the energy requirements of the building. The last phase is the implementation of active technologies, like solar technologies, to reach energy efficiency in large public non-residential buildings, such as schools, hospitals or offices. All these technologies have to be agreed with the building owners in order to guarantee technical and economic feasibility.

Could you give one example of passive technology?

For example, we have been working with an insulating system containing what are known as PCM (phase change material). This is a material contained in capsules capable of turning from solid into liquid while storing heat. It is like when water boils and until all the water is evaporated the temperature does not change. When this solid material becomes liquid, as the surrounding temperature changes, it stores the heat that can be released later on when needed. This results in a constant temperature inside the building, which can be for example, 25º in summer and winter. The capsules containing this special material are little spheres embedded in a traditional solid insulating panel.

What is your long-term ambition?

Besides the simulation for individual buildings, I would like to run a wide range simulation campaigns in various European climates. We could thus provide useful guidelines for the renewal of similar public buildings in different geographical contexts. It is in the interest of Europe that this project provides general indications to help replicate results everywhere.

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