

FEATURE

Number 6, June 2009

Thermal Insulation in a Desert Climate: Sustainable Construction in the Middle East – Using Polymeric Binders to Save Energy and Protect the Climate

The costs for energy and raw materials are rising worldwide, while resources are becoming scarcer. Even in regions with large oil reserves, people have started looking for ways to conserve energy. The greatest potential for saving energy in buildings is through the right insulation. Suitable thermal insulation not only optimizes the indoor climate, but also significantly lowers energy use. That's why WACKER's Dubai technical center supervises construction projects throughout the Middle East. In a pilot project, WACKER experts helped to fit a customized state-of-the-art exterior insulation and finish system to a building in Syria for the first time – to save energy and protect the climate.

**Damascus: one of the
world's oldest cities ...**

Oriental bazaars, narrow alleys and high minarets: Damascus, one of the oldest continuously inhabited cities in the world, is a cultural and religious center of the Orient and redolent of tales of 1001 Nights. Traces of settlement date back to 5,000 BC. Today, the capital of Syria has a population of 1.6 million, with around six million living in the surrounding metropolitan area. Typical Arabian architecture is best viewed in the picturesque old town, a UNESCO World Heritage Site since 1979.

"Recently, architecture has undergone a transformation," explains Dimitrios Moussios, business development manager at

... is now focusing on state-of-the-art construction

Wacker Chemicals Middle East in Dubai. A chemist by training, he is responsible for the Middle East regions, supporting customers from North Africa to Pakistan. Though Syria is an oil producer, its reserves are exhaustible. So, when the government announced that it intended to double oil prices, people started to rethink how they use energy. Now, Syrians are looking at ways to save energy and want to take appropriate measures.

Rethinking energy use

“Thermal insulation has become a hot topic,” explains Moussios.

Saving on heating costs – in Syria, too

Why insulate buildings in a land of deserts? What may seem paradoxical at first sight, is actually quite logical, explains the Greek-born Moussios. “Temperature differences in Syria are comparable to those of Central Europe. Outdoor and indoor temperatures normally differ by about 30 °C,” he explains. “It’s just that in Syria, temperatures range between 10 and 40 °C.” The climate in Damascus is continental, with hot and dry summers and mild, sometimes damp winters. Temperatures below freezing are not unusual. Not surprisingly, Syria’s main concern has been to save heating costs in winter. This is in contrast to other Gulf states, where exterior insulation and finish systems (EIFS) are mainly used to keep buildings cool in the summer heat. The systems are ideal for both purposes.

Thermal insulation blocks heat and cold

Moussios has often given talks on modern thermal insulation, explaining the advantages to planning authorities and decision-makers in Syria. “The talks,” he points out, “were a success – the Arabian state of Syria has carried out its first EIFS project.”

The benefits of EIFS are convincing

In close collaboration with Syria’s National Energy Research Center (NERC) and other local partners, some 500 square meters of facade at their sites were extensively renovated with

**The largest energy-
saving potential lies in
the right insulation ...**

**... whether against heat
or cold**

**EIFS: an intelligent
material composite**

state-of-the-art EIFS systems. The goal was to improve the building's energy balance, and so conserve energy and reduce operating costs. The reference building is the two-story kindergarten that takes care of the NERC employees' children.

The greatest potential for saving energy in buildings is through thermal insulation. The better a building is insulated, the less energy is needed to create a permanently comfortable interior climate – regardless of whether the building needs to be heated or cooled. Previously EIFS were mostly used in regions with cold and damp winters. But buildings in hot and dry areas, too, are increasingly being fitted with modern EIFS systems. And with good reason: a facade covered with an EIFS wards off heat very efficiently. Applied to a building's exterior, the EIFS will protect the walls from heating up unnecessarily on even the hottest of days. In addition, EIFS systems reduce temperature differences between indoor air and wall surfaces. By doing so, they significantly improve the comfort level inside – regardless of the weather outside.

EIFS are multi-layered material systems, with each layer fulfilling a different task. The most important thing is that they bond well to the substrate. And that is only possible with special dispersible polymer powders, such as VINNAPAS®, since modern insulating materials such as styrofoam sheets do not form a stable bond to cement. Only after dispersible polymer powder has been added can a strong and stable insulation system result.

Starting from the wall, the first EIFS layer is an adhesive

Improved adhesion and flexibility thanks to VINNAPAS®

mortar modified with VINNAPAS® polymer powder. The mortar levels irregularities in the substrate, creates a stable bond between the insulation board and the wall, and provides the system with the necessary flexibility. This bonding layer is followed by the thermal insulation board, which is made of rigid polystyrene foam or other materials. The thermal insulation board is protected from weathering and mechanical stresses by a reinforcing layer, consisting of a glass scrim fabric embedded in a mortar modified with VINNAPAS® polymer powder. The outermost layer is a decorative plaster or a paint coat.

WACKER researchers develop the right formulation ...

For the Syrian project, Moussios not only received technical support from colleagues at WACKER's Burghausen site, but also from the Dubai technical center. The tests in Dubai were particularly helpful in finding the right VINNAPAS® polymer powder. "The standardized tests in Germany were a considerable help as a first step, but we still had to examine the specific mix with modified raw materials at our Dubai laboratory," says Moussios.

... and offer advice to customers and partners for their application

WACKER technical centers serve as competence centers for applied construction chemistry worldwide. In Dubai, WACKER assists customers and partners during the development of novel products and applications for the Middle East. The focus is on VINNAPAS® polymer powder formulations to be used in polymer-modified dry-mix mortars for the regional construction industry.

The Dubai technical center will soon be moving into a new WACKER building, as Moussios explains: "At the new location,

**State-of-the-art service
at the Dubai technical
center**

we will be able to offer our customers even better service and cutting-edge test facilities.” One example is an EOTA weathering wall, with which we can test exterior insulations under the most extreme climatic conditions, in accordance with European Organization for Technical Approvals (EOTA) guidelines. In a walk-in climatic chamber, we will subject entire test facades to hours of heat, rain, UV and frost cycles, so that we can optimize VINNAPAS® formulations.

**WACKER experts advise
and train local partners
and authorities ...**

The new technical center will also accommodate a seminar room for up to 100 people. After all, WACKER has prioritized its role as a technical consultant for thermal insulation in the Middle East. “We advise architects, investors, engineers, state ministries and planning authorities about saving energy with EIFS systems,” continues Moussios. WACKER construction experts are also involved in drafting mandatory regulations, since the region lacks local specifications for such applications as EIFS. According to Moussios, “We first have to create quality awareness here. That includes, for example, taking EU standards and adapting them to local requirements.” There is also a strong interest in EIFS in Jordan, another country that is grappling with questions of energy and climate protection. Its planners are already holding talks with WACKER experts.

**... and boost quality and
climate-protection
awareness****Energy savings of up to
50 percent are expected**

In their Syrian reference project with NERC, WACKER construction specialists expect to lower energy costs by about 50 percent with EIFS. Although more exact figures will not be available for another year, the pilot project has already won over the Syrian Ministry of Energy, which wants to insulate further buildings. “We are working on a five-story office block with 2,500

EIFS are already a construction standard in the UAE

square meters of facade,” explains Moussios. NERC is even considering making EIFS obligatory for all new buildings.

WACKER Dubai construction experts are currently helping to draft new construction-related standards and legislation.

Some parts of the United Arab Emirates (UAE) have already gone a step further: the Emirate of Dubai has long been known for its rapid implementation of innovations. Since January 2008, all new construction projects must meet a local adaptation of the US LEED standard (Leadership in Energy and Environmental Design) for environmentally sustainable construction. Dubai is the first city in the region to do this and one of only a few in the world to commit itself to this standard. EIFS systems have been used successfully in the Emirates for over three years.

Construction projects increasingly rely on EIFS...

And the construction boom continues uninterrupted: according to Middle East Economic Digest Magazine, Dubai has projects worth some US\$310 billion either under construction or planned for the next ten years. One of the megaprojects is the Dubai Waterfront, where some 4,000 villas are set to be built.

... with tailored WACKER products

This is why Moussios is certain that “increasing numbers of investors from all over the world appreciate the benefits of intelligent EIFS systems in the Middle East – and thus those of WACKER’s tailored EIFS products.”

Background Information

EIFS: Ideal Thermal Insulation – A Multi-Layered System

EIFS consist of an “intelligent” material composite resembling a sandwich, the various components of which have completely different functions. Starting from the wall, the first layer consists of adhesive mortar modified with VINNAPAS[®] polymer powder. The adhesive mortar has two functions within the “sandwich.” First, it creates a stable bond between the insulation board and the wall. Second, it is able to level irregularities in the substrate. Additionally, the dispersible polymer powder gives the adhesive mortar enough flexibility to accommodate any sliding of the insulation board on the substrate that may occur with time. This first layer is followed by the thermal insulation board, which is made of rigid polystyrene foam or other materials. The thermal insulation board is protected from weathering and mechanical stresses by a reinforcing layer comprising a glass scrim fabric embedded in a cementitious dry mortar modified with VINNAPAS[®] polymer powder. The reinforcing layer is followed by an alkali-resistant glass scrim fabric that increases the EIFS’s mechanical stability. The outermost layer, which may be a decorative plaster, paint or a ceramic cladding, permits almost unlimited freedom of design.

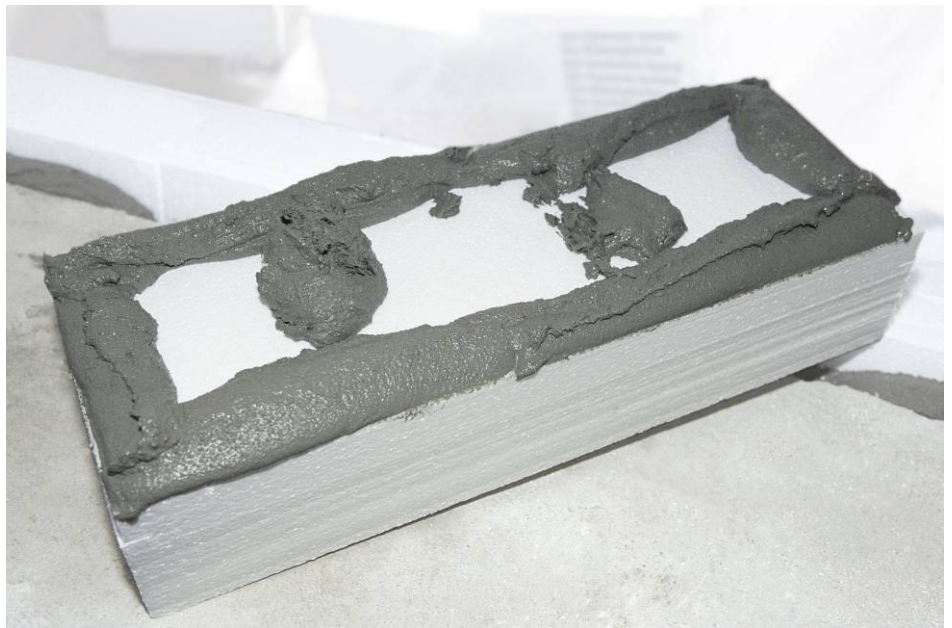
VINNAPAS[®] Polymer Powders and Dispersions

VINNAPAS[®] polymer powders and dispersions are thermoplastic, plasticizer-free polymers derived primarily from vinyl acetate and ethylene. In 1957, WACKER chemists succeeded in industrially manufacturing the first powder binder to be used as an additive for dry-mix mortars. Today, WACKER POLYMERS is the global market and technology leader for vinyl-acetate-based copolymers and terpolymers – marketed worldwide under the VINNAPAS[®] brand. VINNAPAS[®] polymer powders and dispersions are used mainly in diverse modern building applications such as exterior insulation and finish systems, construction and tile adhesives, screeds, self-leveling flooring compounds, plasters, repair mortars, grouts and cementitious sealing slurries.



Construction workers fit an exterior insulation and finish system to a house in Syria. In a pilot project, WACKER experts helped to develop an optimal adhesive-mortar formulation to suit the climatic conditions in Damascus (photo: Wacker Chemie AG).

VINNAPAS® polymer powder is added to the adhesive mortar to ensure a stable bond between the EIFS insulation materials and the wall (photo: Wacker Chemie AG).





Reference building in Syria: equipping buildings with state-of-the-art EIFS results in long-term energy savings and thus helps protect the climate (photo: Wacker Chemie AG).

Note:

*These photos are available for download at
<http://www.wacker.com/presseinformationen>*

For further information, please contact:

Wacker Chemie AG
Media Relations & Information
Nadine Baumgartl
Tel. +49 89 6279-1604
Fax +49 89 6279-2604
nadine.baumgartl@wacker.com

The company in brief:

WACKER is a globally active chemical company with some 15,900 employees and annual sales of around €4.3 billion (2008). WACKER has 27 production sites and over 100 sales offices worldwide.

WACKER SILICONES

Silicone fluids, emulsions, rubber and resins; silanes; pyrogenic silicas; thermoplastic silicone elastomers

WACKER POLYMERS

Polyvinyl acetate and vinyl acetate copolymers in the form of dispersible polymer powders, dispersions and solid resins used as binders for construction chemicals, coatings, adhesives, paints, plasters and nonwovens

WACKER FINE CHEMICALS

Fine chemicals, biologics and other biotech products such as cyclodextrins and cysteine

WACKER POLYSILICON

Polysilicon for the semiconductor and photovoltaics industries; solar wafers

Siltronic

Hyperpure silicon wafers and monocrystals for semiconductor devices