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Feature

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A Climate Change at Home

When temperatures plunge in winter, prices for natural gas, heating oil and electricity always go up. However, suitable thermal insulation can help to optimize the indoor climate and slash energy costs by up to 60 %. WACKER offers solutions in the form of polymer binders for customized exterior insulation and finish systems (EIFS) that make for an ideal indoor climate and effectively counter rising energy prices.

In the past, only thick walls helped

Protecting our immediate environment from the vagaries of the weather has been a recurring theme throughout the history of mankind. Heating in winter is not a solution in itself; to shield themselves from summer heat, our ancestors had to rely on thick walls. In winter, these were equally effective at preventing rapid heat loss.

Air-dried bricks insulate well …

The principles of thermal insulation were known even by the Pueblo Indians, who would build their houses with air-dried bricks (known as adobe bricks) made of clay and sand. In dry areas, adobe bricks heat up in the sun and radiate the heat into the environment during the night. Thanks to this effect, the buildings remained cool during daytime and were warm at night. In the 16th century, the art of making adobe bricks spread from Peru and Mexico to Spain, where, as in northern Africa and the Middle East, they are still used today for building houses.

This ancient Indian technology had many merits, but adobe bricks cannot meet the demands of modern building

… but they don't like moisture

construction. Their lack of resistance to moisture is just one of the reasons why the bricks would soon cause problems in our latitudes. Then there is the issue of thermal insulation; against the background of ever rising energy prices, this has now taken on a new dimension. For the greatest energy-saving potential is in thermal insulation, completely irrespective of whether a building needs to be heated or cooled.

Why cold walls are unpleasant …

Heat loss via radiation is usually underestimated. And this, although it is precisely the surface temperatures in our immediate surroundings, such as walls, floors or ceilings, that have a crucial influence on our personal comfort. The U value, as it is generally called, serves as a yardstick for heat losses by transmission. It describes the heat flow in watts (W) that passes through all the layers surrounding a building element, over a surface area of 1 m², due to a temperature difference of 1 K (W/m²K). The smaller the U value is, the less heat is lost by the building element.

… and the U value important

"The U value is a means of providing realistic information on the heat losses by various building elements or combinations thereof," explains Klaus Bonin, technical expert at WACKER's Construction Polymers business unit.

For outside walls, the U value is an important parameter for realistic estimations of heat losses and energy-saving potential. A well insulated building will have U values between 0.3 and 0.4 W/m^{2}K, while poorly insulated walls may have U values well above 1.5.

External insulation and finish systems (EIFS) are the simplest and most reliable method of preventing energy

Save 65,000 liters of crude oil …

losses. In Germany, around 650 million m² of facade were covered with such systems between 1973 and 2004. The resultant energy saving amounts to the annual equivalent of roughly one million metric tons of heating oil! Independent studies were also performed on typical detached and duplex houses with 24-cm walls to calculate the long-term effect of an EIFS. It was found that over a period of 40 years, the annual energy consumption would be slashed from roughly 24,200 kWh to 9,600 kWh. Seen over the entire period, this is equivalent to a saving of about 65,000 liters of crude oil. With that amount of fuel, a car could travel an average of 830,000 km.

… and 216 tons of CO_2

Added to that is the fact that heating is not only expensive, but also pollutes the environment. An EIFS system, to continue the calculation above, would result in a saving of altogether 216 tons of carbon dioxide. EIFS thus satisfy all the criteria of sustainability.

Poor insulation traps summer heat

In many regions of the world, winter heating costs are much less than in Central Europe due to a warmer climate. But warmer climates also take their toll. For example, poorly insulated houses can become unpleasantly hot in summer. The night affords little relief because massive walls store the sun's warmth and radiate it again both inwards and outwards when the outside temperature drops.

In other words: an air-conditioning system is a must for anyone living in countries like Spain, Italy or China and wishing to have a certain level of comfort at home when outside temperatures are high. But air conditioners often run

Air conditioners run 24 hours a day

24 hours a day in regions with hot summers, and thus guzzle huge amounts of energy. And that costs a lot of money. After all, air conditioners run on electricity, so that cooling a building in summer is more expensive than heating it in winter.

An effective way to ward off the heat …

To start with, EIFS were used mainly in the cooler regions of Europe to save winter heating costs. “They are now becoming increasingly popular in other climatic regions, too,” sums up expert Bonin. For good reason: for example, a facade covered with an EIFS wards off heat very efficiently. The EIFS is applied to the exterior and thus prevents the wall material from heating up unnecessarily in mid-summer. New buildings can be designed with EIFS right from the start, but they can also be applied to old buildings under renovation.

… thanks to perfectly matched components

The high flexibility of an EIFS is due to a clever combination of materials. The core element of an EIFS is a combined adhesive, assembly and coating system in which heat-insulating materials such as polystyrene, rock wool, slabs of expanded mineral materials or even cork panels are fixed to the outside walls of a building and then coated. Through its VINNAPAS® polymer powders, WACKER has played an integral role in the development of exterior insulation and finish systems since they first came on the market. This is because insulating materials such as polystyrene board do not form a stable bond with cement. “By contrast, adhesive mortar with just three to four percent of VINNAPAS® added to it will form a stable and permanent bond with the polystyrene board,” explains Bonin. Improved adhesion to all other substrates is obtained, too, from

concrete through to brick or wood.

Allergy sufferers can breathe again

Since EIFS reduce the temperature between the air in the interior of a building and the wall surfaces, they greatly improve the building's living quality. The movement of hot or cold air caused by a radiator or an air conditioner means that the air circulates continuously within the rooms. As a result, dust, bacteria and excrement from household dust mites are stirred up and impair the quality of the respiratory air. The polluted air can trigger allergies and burden mucous membranes.

Poor heat insulation exacerbates these problems. In this case, relatively cold outside walls generate an impression of draught, although windows and doors are closed. An EIFS also suppresses the formation of condensate, thus helping to prevent the formation of mold – which poses a health risk – on walls and ceilings.

Added value beckons

The benefits of modern exterior insulation and finish systems are not limited to reduced energy costs and a healthy indoor ambience. EIFS also add considerable value to an object. As confirmed by the German EIFS Technical Association, these systems have the supplementary bonus of effectively protecting masonry from moisture-damage and cracking. Irrespective thereof, EIFS offer a broad range of options for adding aesthetic value to a building because every facade can be designed individually. It is of no consequence whatsoever in this context whether EIFS are to be applied to old buildings under renovation or to a large, modern building that is still on the drawing board.

An energy pass that documents losses

To make apartments more attractive to potential tenants, to preserve the value of buildings and, simultaneously, to protect the environment and help prevent climate change, the European Union has reached agreement on a building directive based on the use of energy passes. Buildings will be required to have an energy pass as from 2006, and every new apartment tenant or potential buyer of a property will be entitled to see it. This pass will document the extent of the building's energy losses, where they occur and how they can be reduced.

A small input prevents huge energy losses

One thing is certain: for property owners who have provided their buildings with an exterior insulation and finish system, the EU energy pass will be a recommendation that is hard to beat. Widespread use of heat-insulation systems is, moreover, a major milestone on the way to an energy policy focused on the conservation of resources. There is no doubt, after all, that fossil fuels are far too precious to be burned in unlimited quantities. By investing small amounts to provide buildings with efficient thermal insulation, however, huge energy losses can be prevented.

Background information:

Ideal Thermal Insulation – A Complex System of Several Layers

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® dispersible polymer powder. The adhesive mortar has two functions within the “sandwich.” For one, it creates a stable bond between the insulation board and the wall. For the other, it is able to level irregularities in the substrate. The added polymer powder also imbues the adhesive mortar with the necessary flexibility, enabling it to accommodate any slight shifting that may occur with time between the substrate and the insulation board. This layer is followed by the thermal insulation board, which may consist optionally of rigid, expanded polystyrene (EPS), 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 mechanical stability of the EIFS. The outermost layer, which may be a decorative plaster, paint or a ceramic cladding, permits almost unlimited freedom of design.

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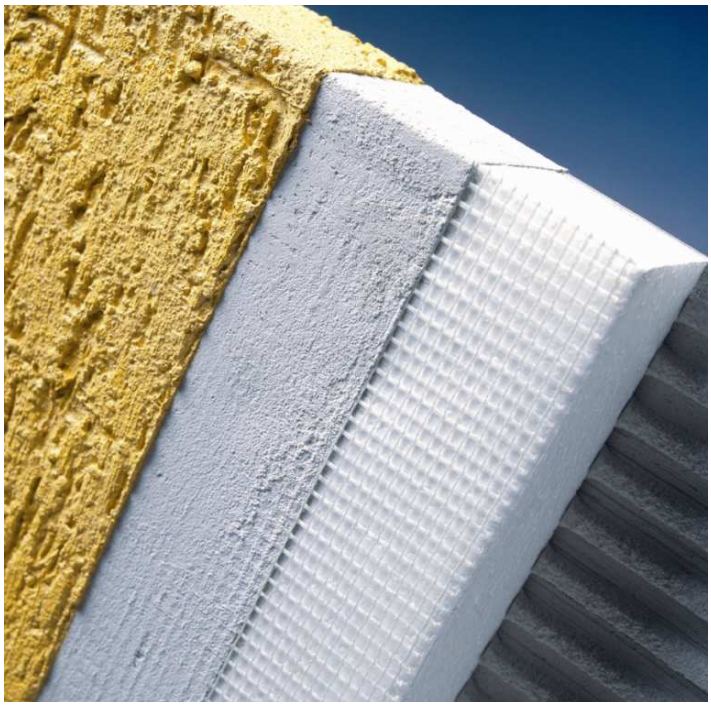
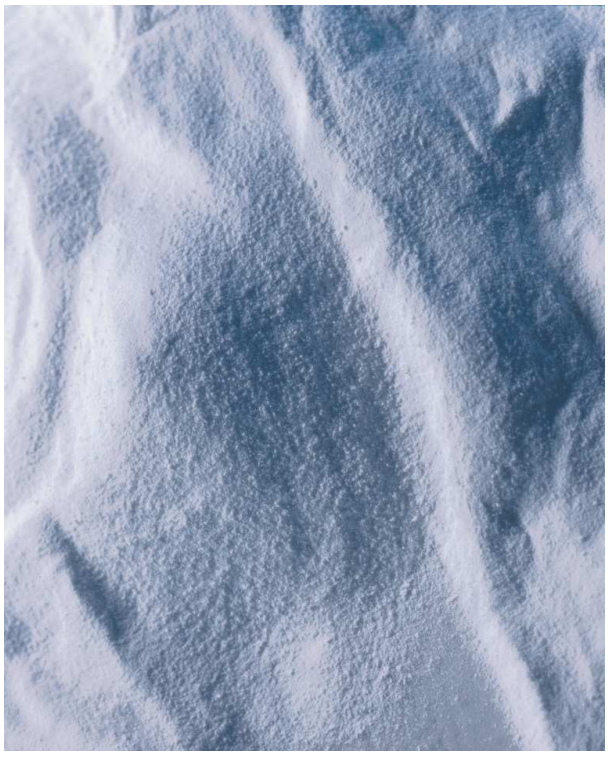


Sample of an EIFS: The adhesive, the expanded polystyrene board, the base coat with embedded glassfiber mesh, and the finish coat can be clearly seen (photo: Wacker Chemie AG).



VINNAPAS® dispersible polymer powder (photo: Wacker Chemie AG).

Insulation systems can be easily implemented when renovating old houses and brickwork and thus retrofit a high level of thermal insulation (photo: Wacker Chemie AG).

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The company in brief:
WACKER is a globally active company with approx. 14,400 employees and annual sales of around EUR 2.76 billion (2005, according to IFRS).
WACKER has 22 production sites worldwide and a global sales network of around 100 subsidiaries and offices.

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