

FEATURE SERVICE

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A Special Bond: Polymeric Binding Powder Fuses Cork and Slate to Form Natural Stone Flooring that is Warm Underfoot

The thought of wall or floor coverings on a roll usually calls to mind wallpaper or carpet. Transforming stone into thin, flexible sheets, by contrast, sounds more like the work of a magician. Nevertheless, a team of specialists from a number of different companies has joined forces with WACKER experts and managed to fuse wafer-thin natural stone with thin layers of cork. The result: a slate-cork composite that is warm underfoot and has been manufactured as an easy to lay click-lock flooring. Innovative and easy on resources, these new floorings are made possible by VINNEX[®], the specialized powder binder from WACKER.

Tiled floors – easy to clean, but cold

During the heat of summer, stone floors are refreshingly cool for overheated feet – as cooler weather sets in, however, going barefoot on cold tiles is unpleasant to say the least. So, although easy to clean, natural stone floors are found only in bathrooms and kitchens. Flooring in living areas and bedrooms usually involves more comfortable materials, such as carpet, cork or wood, which exude more warmth.

Slate and cork – fashionable and warm

State-of-the-art chemical and engineering expertise is now being used to turn cold stone floors into a comfortable, natural floor covering with completely new properties: as practical and easy to care for as natural stone, as pleasingly warm to the touch as carpet or wood, and yet as flexible and easy to lay as cork or prefinished parquet.

Holger Bienert, global market manager for natural-fiber compo-

**Wafer-thin slate sheets
bonded to cork...**

sites at WACKER, explains the idea behind this new flooring: “Our aim was to develop a real stone flooring material that wouldn't feel cold. We wanted it to have the same look, feel and quality of a floor made from solid slabs,” he says, “yet have the same advantages as parquet and cork flooring.” Bienerth holds out an unrolled sheet in his hands to demonstrate the success of this project: a wafer-thin sheet of Indian slate – just 0.8 millimeters thick – to which a thin layer of cork has been affixed, giving the stone its warm “feel.”

... yield a unique composite material

The new slate-cork flooring is a unique composite material based on natural cork, natural slate and an innovative powder binder. It takes numerous steps and a wide variety of processes, however, to turn natural slate into finished click-lock flooring that can be snapped into place. Five partners were involved in the joint project, each company a leader in its particular field of technology.

It all starts in India...

The first step on the road to the future stone flooring is in India, where the company R&D GmbH uses a special process to strip wafer-thin sheets from natural slate. Their experts are able to produce up to 500 sheets of ultra-thin slate from a slab of natural stone roughly 35 cm thick. First, they apply a fine adhesive fiberglass film to the stone. Pulling off the film produces ultra-thin layers of slate. “It is important here,” explains Gernot Ehrlich, CEO of R&D GmbH, “that the adhesive strength of the glue is greater than the cohesion between individual layers of slate.” An architect by training, Ehrlich invented and patented the method over 15 years ago – today, roughly 1,000 square meters of the slate sheets are produced in India each day.

**500 slate sheets from a
single slab**

The adhesion and stripping processes do, however, result in

**Binding powder and
cork smooth out surface
irregularities**

countless surface irregularities on the back side of the stone. These are smoothed over by affixing a thin, warming layer of cork to the slate sheet. The natural fibers do not adhere to the stone on their own, however, which is where VINNEX[®], a powder binder from WACKER, comes into play: a white, flowable powder based on vinyl acetate-ethylene copolymer, VINNEX[®] not only forms excellent bonds with natural fibers such as cork, leather, coconut and wood, but also adheres well to natural slate. “The natural-fiber materials have to be blended just right with binder for that to happen,” Bienerth explains.

**Homogeneous cork
blend is extraordinarily
comfortable**

This is where experts from Müller Kunststoffe GmbH & Co. KG of Lichtenfels, Germany, entered into the picture with their expertise in thermoplastic compounding. Müller takes cork provided by a German subsidiary of Amorim, the world market leader from Portugal, and converts it to a homogenous granulate. Experts then blend the cork dust with the WACKER powder binder. Certainly not child's play, as Michael Fischer, application engineer and development manager at Müller Kunststoffe, explains: “Cork contains a good deal of moisture and is very bulky.” The blending ratio represented yet another major challenge for the Lichtenfels company: 60 percent cork had to be perfectly mixed with 40 percent VINNEX[®] powder. “That would be like trying to mix one kilo of steel beads with one kilo of feathers,” Fisher points out. “The difference in volume is huge.” The final result is a highly homogeneous cork-polymer matrix known as a “cork polymer composite” or CPC.

Grains some three millimeters in diameter (also referred to as pellets) then move on to the next station: TPS TechnoPartner

**Cork polymer binds to
slate sheets...****... to produce a stone-
cork sandwich****A simple click-lock sys-
tem for easy laying****Natural flooring materi-
als are currently popular**

Samtronic of Göppingen, Germany. Here, the pellets are scattered via a scattering unit onto what is known as a double-belt press. Operating under pressure and at temperatures of roughly 180 degrees Celsius, this machine continuously compresses the CPC into an endless cork-polymer web. This is also the step where the natural-fiber web and the stone combine, with TPS experts pressing the cork web onto the ultra-thin slate sheets. “The cork-polymer composite perfectly evens out the irregularities in the natural stone,” says TPS CEO Bernhard Voith, who goes on to observe that “keeping the pressure and belt speed in balance is especially important.” The stone-cork sandwich passes through the heated zone of the 50-meter double-belt press at a rate of five meters per minute.

The last stage of the journey is in Switzerland, where Lico AG is waiting for the sandwich of stone and natural fiber. The cut sheets are taken to the company's production facilities, where they are affixed to traditional woodfiber boards using a water-based wood glue. A second thin layer of cork then completes the world's first warm stone flooring. Edwin Lingg, co-owner and CEO of Lico AG, emphasizes one particular advantage of the practical stone-cork flooring panels: “They are engineered as click-lock flooring, which means no joints and makes them easy to lay.”

Lico AG manufactures the innovative stone flooring and will in future be marketing it worldwide. Lico supplies customers – exclusively wholesalers and importers – in over 40 countries. “Germany is the primary market,” Lingg explains. Consumers in China, Russia, Dubai and Canada are also very fond of the natu-

Say goodbye to cold feet!

ral flooring. "Environmentally friendly products are also experiencing a boom in the United States," Lingg added. The trained metalworker is predicting a market potential of roughly 100,000 square meters in 2011 for the slate floors alone. "In the medium term we're looking at up to 400,000 square meters per year."

The developers of this innovative stone-cork sandwich have managed to create a stone floor that avoids the disadvantages of traditional stone floors while incorporating the benefits of natural fibers: "No more cold feet," says Bienerth with satisfaction. "The cork layer below the slate creates a pleasant warm feel." Not only does that make the flooring significantly more comfortable – the natural fibers also dampen the sound of feet. And as Bienerth goes on to explain, "The stone surface is also fire-proof, very robust and resistant to wear and tear, which makes it perfect for entryways, foyers, hotel lobbies and areas around furnaces and open fireplaces."

Comfort and sustainability in your home

According to R&D GmbH, their slate manufacturing process saves a considerable amount of material and preserves natural resources versus regular slate mining: the new flooring requires only a wafer-thin sheet of slate rather than a solid stone slab. As such, the cork-stone sandwich is not only in line with the need for sustainability, but also meets consumer requirements for more comfortable materials in their homes.



Ultra-thin, flexible slate-cork panels: Natural cork, Indian slate and WACKER's innovative VINNEX[®] powder binder combine to create novel flooring and wall-covering materials (photo: Wacker Chemie AG).

Natural cork and VINNEX[®] powder binder are blended together to form homogenized pellets known as cork-polymer composites or CPCs. VINNEX[®] also binds excellently with other natural fibers, such as coconut, leather and wood (photo: Wacker Chemie AG).





A machine known as a double-belt press is used to bond the cork layers to wafer-thin slate sheets under elevated pressure and temperatures of roughly 180 degrees Celsius (photo: Wacker Chemie AG).

Note: These photos are available for download at:

<http://www.wacker.com/presseinformationen>

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For further information, please contact:

Wacker Chemie AG
Presse und 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 company with some 15,600 employees and annual sales of around €3.7 billion (2009).
WACKER has 26 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, solid resins and their associated solutions used as binders for construction chemicals, coatings, adhesives, paints and nonwovens as well as for polymer materials based on renewable resources

WACKER BIOSOLUTIONS

Biotech products such as cyclodextrins, cysteine and biologics, as well as fine chemicals and PVAc solid resins

WACKER POLYSILICON

Polysilicon for the semiconductor and photovoltaic industries

Siltronic

Hyperpure silicon wafers and monocrystals for semiconductor devices