Using cattails for insulation

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Cattail (Typha) in various stages of processing. The insulation panel is shown above right. Credit: Fraunhofer IBP

A growing number of homeowners are insulating their walls in order to lower energy costs. They opt for the cheap variety, polystyrene. Yet there are environmentally-friendly alternatives: Cattails, for instance, are superbly suited as a natural insulation material.

Cattails have long been used for various purposes, like cleaning wastewater at sewage treatment plants, for detoxifying soils, as raw material for handcrafted wickerwork, as means of nutrition and, in traditional medicine, as a healing plant for various illnesses. Researchers at the Fraunhofer Institute for Building Physics IBP in Valley now want to use this gift of nature as a building material – to wit, for the insulation of outer walls or reinforcement of plaster. Dr. Martin Krus, Head of Test Center at IBP, testifies as to the numerous positive, construction-related properties of this renewable raw material: "As one of nature's swamp plants, cattails are resistant to molds and are very well equipped to deal with moisture. The leaves of the plant have a fiber-reinforced supporting tissue that is filled up with a soft sponge tissue. Through this special construction, they are extraordinarily stable and possess an excellent insulating effect. This effect is also preserved in the finished products." The researcher already has such a product. Working in close consultation with cooperation partner typha technik Naturbaustoffe, he developed a magnesite-bound insulation panel made of Typha (Latin for "cattail") that already has a patent application pending. The panel features a low heat conductivity of 0.052 W/mK (watts per meter and Kelvin). It delivers excellent fireproofing, soundproofing and heat insulation, and is relatively permeable, but sufficiently tight so that, with most applications, one can dispense with a vapor control barrier. Most of all, the material can cope with high pressure parallel to the panel surface. The researcher and his team were able to validate the excellent values of the Typha panel following one-and-a-half years of measurements conducted in a traditional half-timbered home in Nuremberg. Its outer walls, as well as the timber work, were retrofitted with Typha. "The local craftsmen were enthused by this sustainable material," says Krus.

Lowland moors regenerated by Typha cultivation

Despite the numerous advantages of Typha, so far this natural building material has yet to be installed on a wide scale, or industrially exploited.

"Cattails are highly prolific, especially in East Europe – mainly Romania and Hungary. The wetland plant is not being cultivated in this part of the world, so it would have to be imported extra," as the engineer relates an important obstacle. In this respect, he indicated that there would be suitable cultivation areas in Germany. For example, dried out lowland moors that were used for agricultural purposes for decades could be revitalized by cultivating Typha. Scientists have already shown that this is possible through the "Cattail Cultivation in Lowland Moors" project sponsored by the Deutschen Bundesstiftung Umwelt DBU (German Federal Environment Foundation) and headed by the Chair for Landscape Ecology at the Munich University of Technology. "Drained lowland moors are a source of CO2 emissions. Each year, up to 40 million tons of carbon dioxide are released in Germany by draining," Krus affirms. By comparison: Automobile traffic in Germany causes an annual release of 105 million tons of CO2. This process could be stopped, though, by cultivating cattails. The depletion is reduced and many nutrients remain in the soil. At the same time, cattail surfaces offer habitats for rare plants and animals. "Therefore, typha cultivation also contributes to environmental protection," says the scientist.

There would be no impediment to high yields, since cattails are extremely fast-growing. Krus acknowledges that the harvested typha has excellent sales potential. "The plant can be processed easily," stressed the researcher. The leaves are detached horizontally into rod-like particles and then shortened at the correct length of around seven centimeters. Next, they are sprayed in a drum with environmentally-sound mineral adhesives and brought into a heated press. Currently, this process is performed manually. The expert and his colleagues have not yet found a manufacturer willing to undertake serial production of the panels. "Certainly the typha panel would be extraordinarily competitive if they were produced in a series production process," the scientist asserts enthusiastically.

Based on the numerous positive technical properties and the complete recyclability into the materials cycle, typha offers a truly diverse range of potential uses. Because of the high flexural rigidity and simultaneously low weight, the material can be used for roof construction or as a lightweight sandwich element for flooring and intermediate ceilings. It can also be used to design door leafs, window and door lintels; it is likewise possible to replace timber beams. The IBP researchers themselves realized plaster reinforcement with seed parachutes by mixing the seed parachutes of the cattail plants into the lime plaster, to prevent the formation of fissures. "In principle, one could build an entire building out of Typha, if one excludes pipes, windows and the roofing," says Krus.

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