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Perspectives for insulation material out of home-grown regenerative raw materials

The use of home-grown regenerative raw materials as insulation material has increased in the last years. But consumer uncertainty as to the properties of such insulation, as well as its high price in comparison with conventional insulation materials have been obstacles to their wider acceptance. A study at the FAL in Brunswick [1] has shown that a sustained acceptance of insulation from home-grown regenerative raw materials is dependant on the synergy of technological advantages for manufacturer and consumer, environmental advantages for society and from product price.

A survey amongst manufacturers has indicated that about 3% of the insulation materials market volume is filled by products made from regenerative raw materials. From this, the greatest share is taken by wood and recycled materials. This market has increased continually in the last five years and it is estimated that it will grow by up to 10% more [1]. It's plain to see from the industry that the market for regenerative raw materials for insulation is linked to a great extent with the market for lower-value goods (recycling materials, agricultural by-products and waste timber) and influenced by it. Recycling materials and by-products are not only cost-efficient, they also have a very advantageous ecological profile. The future for agricultural main products (such as fibre from flax and hemp) in the insulation material industry is probably limited. This would mainly be because of economic grounds (high costs, limited domestic production capacity). In contrast to this, there are already

large amounts of waste timber, agricultural by-products (flax discards and straw) and secondary raw materials such as cellulose and jute on offer.

Heat conductivity of insulation material based on regenerative raw material

In order to be competitive, insulation material made of regenerative raw material must have properties comparable to conventional insulation. Laboratory tests of the insulation value of various agricultural raw materials prove that flax fibre is one of the few home-produced raw materials that can, for instance, directly replace mineral wool. The laboratory studies also show, however, the potential of very many materials which are more economical such as straw and recycled jute. If a 10% to 12% increase in the heat conductivity was accepted (in comparison to the accepted conventional materials such as mineral wool) and ,with this, a thicker insu-

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Keywords

Insulation material, renewable raw materials, features, fields of use

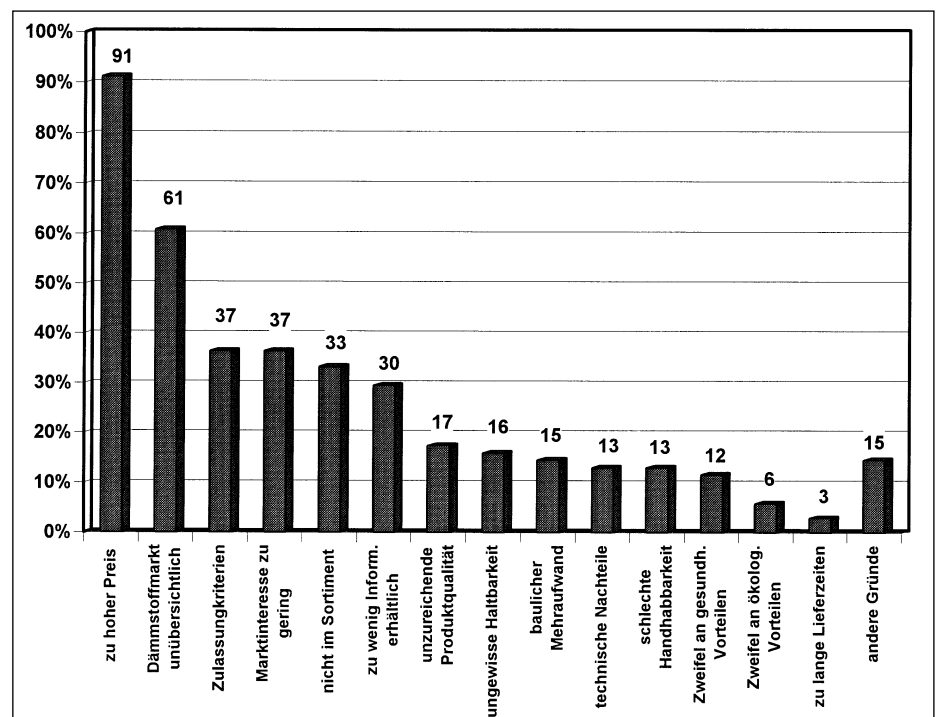


Fig. 1: Assessing the difficulties when using insulation material from renewable raw materials

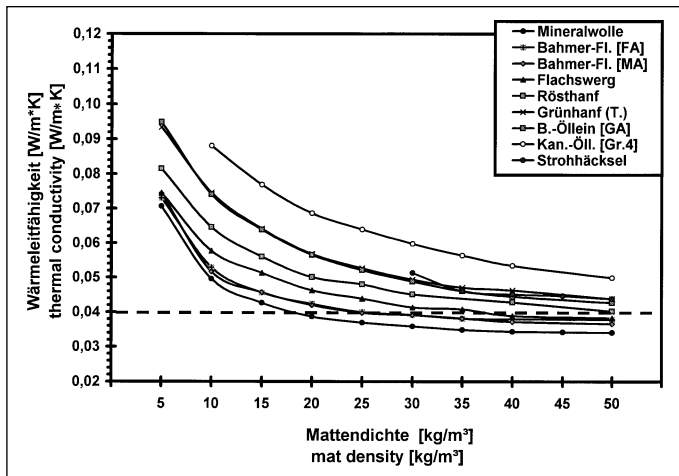


Fig. 2: Thermal conductivity of different fibre materials

lation layer applied, very much more economical raw materials from field and forest come into consideration. The wide variety of products made with a wide range of different materials now on the market, all of which are able to fulfil the building/physical demands (local authority planning and building permissions) indicates the potential that lies in this region [2, 3, 4].

Advantages for heath and surrounding climate are among the main grounds why natural insulation materials are chosen by many customers. According to the current level of knowledge, however, such advantages cannot in general be proved without doubt. In contrast, one or two building/technology advantages are often missed. In general, bio insulation material is denser and has a higher specific heat capacity compared with conventional materials. This brings advantages for heat and sound insulation which are seldom, and often only unclearly, used as marketing arguments for the products [4]. Clear demonstration of these technical advantages would have a strong influence on a purchase decision.

Economical analysis

The economic analysis indicates that, for instance, the cultivation and production costs of insulation material from mixed fibre flax by far exceeds the raw material costs of waste timber and recycling material. Further, the industry producing bio insulation material is known for its over-capacity, especially in the processing of binding-fibre products. Taking the fixed costs as 45% of total manufacturing costs (manufacturing costs being currently 75 to 90% of the production costs) there lies a substantial margin for cost reductions through improved utilisation of production capacity [1]. A further opportunity for reducing costs lies in improved preparation and processing of raw material. There's still a great need for research in this area. The raw material price is under compe-

tion pressure too - although this represents only about 10 to 25% of the total production costs. Under experts it's agreed that the high price for bio insulation material at the moment (two to four times that of conventional materials) is the main obstacle to the expansion of its use.

Ecological evaluation

The environmental influence of insulation material production is closely linked with the energy consumption. In total, insulation from regenerative raw material has an energy advantage in the production compared with conventional products, one which, however, especially with felt products, does not turn out as high as the oft-used description „Very small primary energy demand” suggests (flax insulation material: 350 to 600 MJm⁻³, Glasswool: (~1100 MJm⁻³) [1]. The energy advantage is reduced further when a rational energy use takes place for the conventional product and cost-efficient primary energy carriers (e.g., natural gas) are used. The ecological profile of bio insulation materials is strongly influenced by the disposal and re-use possibilities. Because of the long period of use involved, there has been in general hardly any experience on recycling or disposal of insulation materials up until now, and hardly any experience in this line with bio insulation materials. The study indicates that the most suitable disposal method for most of these materials is thermal re-use.

Conclusion

A main target of the study [1] was the identification of solution concepts that point the way as to how the industry for regenerative raw material insulation can be supported. The results indicate that there is no simple recipe for success for the further improvement of sales opportunities for insulation materials out of home-grown regenerative raw materials. It has to be pointed out espe-

cially that, not only do these primary product insulation materials have to compete with conventional insulation materials, but also with bio insulation materials made from recycled products and secondary raw materials that offer similar technological and ecological properties (e.g., cellulose flakes: WLF group 040, fire class B2) and, so far, can be manufactured with at less cost (cellulose flakes: 100 to 120 DM/m³; flax insulation material: around 400 DM/m³) [1]. For future support and encouragement, a few guiding points can be put forward, however. A concentration of raw material, available in the necessary amounts to allow an expansion of insulation material manufacturing, appears practical. Encouragement should be aimed at investigation and utilisation of future roles for the technological and ecological properties of bio insulation materials which have had less attention up until now. Scientifically data regarding such properties are a convincing requirement for successful marketing in the long and medium term. Decisions regarding future development will be decisively influenced by the wishes and capabilities of the manufacturers to work together in marketing, e.g., as an association. The same close cooperation will be required in other areas too, for instance in working together within standardisation committees and in negotiations with important authorities. Attention should also be paid to renovation of the statutory controls for official approval and classification so that new innovative products - while protecting the safety standards - can be better encouraged compared with in the past.

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