New Building Materials for Ireland

Irish air and soil are plagued by microscopic fungi (i.e. *Phytophthora infestans*, a funguslike water mould, which decimate potato plants with a disease known as late blight, resulted in a severe potato famine in 1841-1851 [*The Mold that Wrecked Ireland* https://www.britannica.com/story/the-mold-that-wrecked-ireland]). Spores of mould fungi are contained in the air in fairly large quantities and actively multiply in conditions of high humidity. In Ireland we can see that mould fungi particles as a plaque are easy to guess by the black, white, blue or green coating that appears on various surfaces – walls, ceilings, stairs, window slopes and so on.

In the "canned" state of the building, fungi migrate with the air currents until they reach conditions conducive to the active phase of life and reproduction, i.e. a moist and comparatively warm environment. A fungal colony can form even from a single spore. Under ideal conditions for mould, the reproduction cycle from one spore to offspring takes no more than 2 days.

The porous structure of building materials provokes the spread of mould deep into the surface. Fungi not only spoil the aesthetics of the room, but also contribute to the development of a number of diseases in humans as mould can cause intoxication. Penetrating into the digestive system, mould causes serious disorders of the gastrointestinal tract. Affecting the mucous membrane, it becomes the cause of allergic reactions. Direct infection with spores through tactile contact is especially dangerous for people with poor immunity. Long-term exposure to mould fungi on the body causes severe pathological disorders – dermatological abnormalities, such as irritation of the mucous membrane, damage to the respiratory tract, reaching bronchial asthma, and even provocation of the activity of cancer cells.

How to deal with mould in the apartment? Special household chemicals are needed to the rescue to clean the house, which requires a long time and should be done regularly. And this also means that the air in the apartment will be constantly polluted with volatilisation from chemicals.

So, the question arises, how to reliably protect homes from pervasive mould?

We offer a new building material on the surface of which microscopic fungi does not grow. The material is unfavourable for the settlement and growth of spores, and therefore it can be considered an ideal building material for use in the territory of Ireland.

Mixes, panels and construction business

The initiators of the project offer a business aimed at introducing new types of insulation: packaging of **mag-bi** mixtures for insulation, plaster, putty and primer.

Besides, the construction of buildings on the basis of **mag-bi** will be at least 30% cheaper than the construction of buildings made of conventional building materials. In addition, one house can be built in 7-10 days.

Currently in Ireland there are about 95,000 Ukrainian refugees and they do not places where to leave. Homeless and unemployed Irish people are protesting to the government because the government is delaying the construction of social housing for these people. So, our offer is just in time.

Packaging of mag-bi mixes used for:

- erection of walls and ceilings of low-rise buildings,

- insulation of walls and ceilings of existing houses,

- repair of walls and ceilings of destroyed houses,

- external and internal plastering of walls and floors of buildings under construction and existing houses,

- external and internal puttying of walls and ceilings,

- liquid insulation of walls, ceilings and roofs, heating pipes,

- thermal insulation primers of walls and floors.

1. Production

1.1. Packing of materials. To pack mag-bi materials, you must have:

- a production facility equipped with electricity up to 60 kVA, lighting, packaging equipment, a loader, storage facilities a) for raw materials and packaging and b) for packaged materials.

The raw materials for obtaining new mixtures and **mag-bi** products are environmentally friendly components: caustic magnesite (crystalline rock – refractory material), bischofite (natural salt solution), organics: hemp, coniferous sawdust or straw, mineral additives to enhance strength characteristics , moisture resistance, etc.

There are no problems with the purchase of raw materials in Ukraine and in the world.

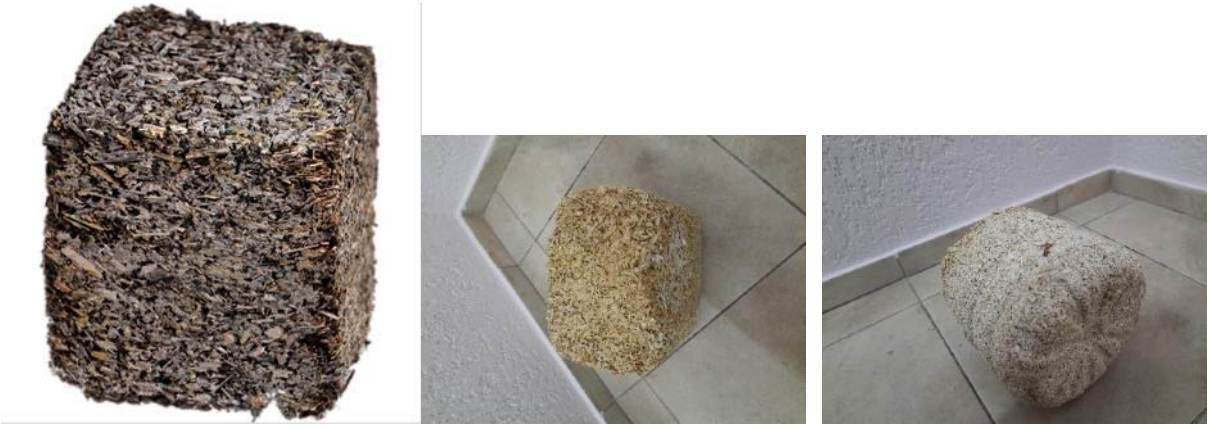

Fig.1. Mag-bi insulation based on: a) hemp, b) rice husks, c) sawdust.

2. Characteristics of mag-bi insulation:

- is at the same time **constructive**;
- **extra strong** (tensile strength 5-50 MPa in compression, 0.5-2.0 MPa in bending, 2-6 MPa in tension);
- durable (one can give a guarantee of 100 years);
- **light,** density is 0.28-0.35 g/cm^3 (with rice husk then density is 0.72-0.78 g/cm^3);
- **fireproof**, i.e. non-flammable and non-flammable. It is able to withstand an open fire with a temperature of 1000–1200 °C for 45-60 minutes. This property is ensured by the fact that organic matter is protected from external influences by bischofite;
- has a **high sound** and **noise absorption** (sound absorption coefficient from 0.17 to 0.6 at a sound frequency of 125-2000 Hz);
- has a **very low thermal conductivity** of 0.06 -0.12 W / (m•°C). With a wall thickness of 30 cm mag-bi insulation, it corresponds in terms of thermal conductivity to 50-60 cm to a wall made of wood or 100-200 cm to a brick wall, depending on its quality. A wall made of mag-bi insulation does not need additional insulation even in the northern regions;
- **stable** (does not crumble) **during earthquakes**;
- **resistant** to acids, alkalis, oils, salts and organic solvents;
- **vapor permeable** (that is, breathable, has a good vapor permeability that is about 0.11 mg / (m*h*Pa) and provides passive air exchange up to 35% and regulation of humidity in the room). In a room made of mag-bi insulation, there is never dampness, a fungus does not start (bischofite is a strong antiseptic). Insulation hemp bonfire absorbs moisture well, without affecting the quality of the insulation, and also gives it away well;
- **plastic**. Insulation wall reinforced with hemp or other needle fillers made of organic matter (flax fire, straw) has high plasticity, i.e. with an increase in ultimate loads, a wall made of mag-bi insulation does not break, does not crack like foam concrete, aerated concrete or brick. When deformed, a wall made of our insulation easily restores its original shape, it is not subject to cracking from shrinkage of an already built house, as well as from ground vibrations, seismic activity, temperature changes and other factors;

- **porous.** Thanks to the large-pore structure, the walls made of mag-bi insulation allow you to maintain a comfortable temperature, provide good air exchange, which contributes to a good indoor climate;
- has a **high adhesion to any materials**: concrete, asphalt, metal, tile, wood. Possessing high adhesion up to 3 MPa, mag-bi insulation in the wet state "sticks together" well with Larsen studs and other materials, creating a monolithic structure of the house, protecting the studs themselves from external influences (temperature, atmospheric, etc.).
- **mold, insects, rodents, microorganisms do not start;**
- **high frost resistance**, not less than 50 cycles;
- **shrinkage during** construction is not more than 0.2-1%;
- **ecologically pure.** Insulation for 80-90% consists of hemp stems and fibres (flax, straw, etc.). Environmentally friendly: the composition of the material, as well as its production, are safe for human health and the environment. During its production, as well as during disposal, there is no environmental pollution by thermal emissions and gas emissions;
- when making walls and ceilings from mag-bi insulation, they must be **plastered and puttied.**

3. Offers and funds required

The initiators of the project propose to the British side to create a joint venture with the organisation of production in the UK and Ukraine on equal (or contractual) terms.

For one production enterprise one requires to purchase the necessary packaging equipment (the price is 60,000), a loader and a charger for it (15,000), renting a room (10,000), electrical wiring, lighting, preparation for work (35,000) and working capital (360,000), and additionally unforeseen expenses (50,000). So, **the total amount is 270,000 pounds**. **For 2 enterprises the needed funds are 540,000 pounds.**

At each enterprise, the number of main employees is 5 people when working in one shift, office workers are 7 people.

The project pays off within 18 months.

4. Business

Packaged mixtures for insulation, plaster, putty and primer will be sold for:

- companies building frame houses, which will use the mag-bi insulation and its application in external and internal walls and ceilings;
- companies involved in the restoration of houses and buildings destroyed by war or natural disasters;
- companies involved in repair work in houses under construction and already built houses.

5. Additional business

A company engaged in the production of mag-bi mixtures can, if it has a license, itself build residential buildings, as well as schools, kindergartens, shops, etc. based on a frame made of Larsen racks, manufactured mixtures and organic materials.

6. Theme development

In the future, the company can master the production of warm mag-bi window sills from mag-bi mixtures and sawdust in the presence of a vibrating table and the required number of matrices. And also in the future also window frames made of this resistant insulating material.