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Classification of Insurance Insulation Materials. Structure, their Main Types, Composition, Properties and Energy Efficiency. Organic Insulation Materials. Inorganic Insulation Materials

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ABSTRACT: Insulation materials - these are materials designed to prevent heat emission into the environment from residential, industrial buildings, and various heating units (boilers, heat exchangers). In some cases, these materials protect against the penetration of heat (e.g., in refrigerators).

It is known that in conditions of our Republic the thickness of the walls is 1.5-2 bricks (38 to 51 cm). If the exterior walls of the building could be made of insulation materials, their thickness not exceeding about 10 cm, However, due to the low strength of these materials they are stacked between the reinforced concrete wall panels.

Panel with a layer of insulation between 25-30% thinner than single-layer panels, which saves concrete, which is the main material. That's why the construction materials industry is very lightweight, meaning it produces a lot of thermal insulating materials weighing from 25 kg to 600 kg per cubic meter. These include foam concrete, aerated concrete, inosilicate, Rockwool and tiles of molten stone, foam glass, mipora, glass wool, wood chips and shavings , mineral grains and similar materials can be added.

KEY WORDS: Insulation materials,cubic meter, Density of insulation materials, Produces.

I.INTRODUCTION

The thermal conductivity of insulation material is 0.03-0.18 W / m□C. the Low thermal conductivity of such materials is due to the presence of pores, such as many small air bubbles. It is known that the air in the pores does not absorb heat or cold. For example, a hole with a diameter of 1 mm has a thermal conductivity of 0.02 W / m-deg at room temperature, while the dense rock at 100-150 times more.

Insulating materials on the basis of the principal raw materials are inorganic, organic (natural organic materials such as peat, wood fibre materials) the raw materials are made on the basis of various types of mineral raw materials (rock, slag, glass, asbestos).) and the material of the plastic. From the point of view of form and appearance of heat-insulating materials made of granulated solid (plate, shell, segment, brick, cylinder) and a flexible (fabric, cord, braided ties) soft and loose (cotton, sand, perlite, vermiculite) - shares of materials.

The structure of heat-insulating materials are divided into fibrous (mineral wool, glass fibre (granular), perlite, vermiculite), porous (made of aerated concrete, foam glass).

Density of insulation materials:

Divided into 15, 25, 35, 50, 75, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600 brands.

Depending on virginity (relative deformation) materials are soft (South) mineral and glass wool, cotton from kaolin, and basalt fibers, bold (Ya) - staples, based on a synthetic binder, glass fiber plates, etc. B) based on synthetic binders are mineral wool boards, high strength (UB), hard (Q) materials

Insulation materials must meet the following basic requirements:

the materials have sufficient mechanical strength for ensuring reliability during installation and operation;

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the material does not rot and does not cause corrosion in rodents, i.e., has a strong biological resistance;
the material does not decompose under the influence of gases, liquids, i.e. it is chemically stable;
the material must be dry and the least hygroscopic, as it begins to rot when wet, and its conductivity increases
Inorganic insulation materials. Mineral cotton and items from it.

Mineral wool is a thermal insulation material composed of individual fibers that can be sireny of rock or metallurgical slag.

In the production of mineral-cotton raw material is a mixture of marl, shale, limestone, with clay soil and siliceous rocks, and slag (blast furnace slag often). to make the fiber.

Raw materials for production of mineral cotton are usually liquefied in shaft furnaces (cupola furnaces) height from 3 to 6 m and an internal diameter of 0.75-1.5 m. the Liquid flowing through the bottom hole of the furnace 20-30 mm breaks into small drops under the influence of steam flow or pressure of compressed air.After the formation of the fiber drops are stretched in the form of thin fibers with a diameter from 2 to 12 microns and a length of from 2 to 60 mm as they pass through the camera. The fibers fall to the floor of the chamber which consists of a conveyor moving at a certain speed. Formed on the conveyor belt cotton conveyor layer form; When the tape leaves the chamber, it passes through the pitchers and getting a little tighter.

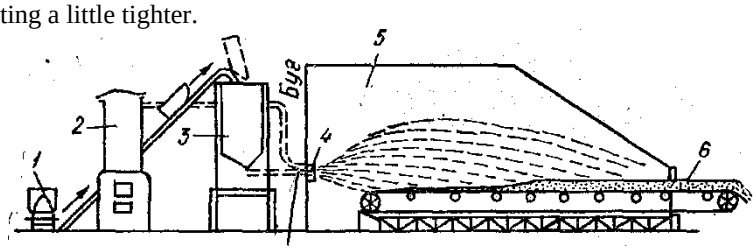

Figure 1.1. Diagram of the device for production of mineral wool:
I - fuel tank; 2 steam boiler; 3— cupola furnace; 4 - nozzle; 5 - spinning camera; 6 - cotton on belt conveyor

The scheme machine from mineral cotton is shown in figure 63. In the process of production of mineral cotton, not all the liquid droplets are stretched and transformed into yarn; some of the droplets penetrate into the sock, silver and the like. Such suffixes are called "yo m b i" l a r. Jombi increase the average density and thermal conductivity of mineral wool, so the content of the mineral wool shall not exceed 25%.

Depending on the density of the mineral cotton is divided into 75, 100, 125 and 150 varieties. It's flammable, non-corrosive, has low hygroscopicity and low thermal conductivity - 0,04-0,05 W / (m ° C).

Since mineral cotton is fragile when the deposition produces a lot of dust, so the cotton is granulated, i.e. converted into rounded pellets. They are used as hollow walls and partitions, as a filler of insulating material. Mineral cotton is itself a semi-finished product made of different insulating materials: Namath, fabric, palubicki and bikr, sinks, cement, and others.

The mineral fabric is a fabric, sheet or roll material made of mineral cotton, sewn on one or both sides with a thin thread covered with bituminous paper. The size of tissue: length 3000-5000, width 500 and 1000, thickness 50-100 m: (figure 17.2 a)

Produces 100 grades of fabrics (density) with thermal conductivity of 0.04 W / (m-° C). Fabrics are used for insulation of residential and industrial buildings, technological equipment and pipelines.

Figure 1.2. Mineral wool

Plates of synthetic mineral wool on a mineral basis (Fig. 65, b) are made 900–900 mm long, 500–1000 mm wide and 40–100 mm thick. By density, the plates are divided into 50, 75, 125, 175, 200 and 300 grades. Their thermal conductivity is 0.044-0.058 W / (m. ° C).

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Plates are used for thermal insulation of building structures, industrial equipment and pipelines.

Mineral wool slabs based on a bitumen binder are formed by mixing mineral wool fibers with a bitumen emulsion or paste, and then molding and drying the molded slabs. Mineral wool plates with a length of 1000-1500 and 2000 mm, a width of 500 and 1000 mm and a thickness of 40-100 mm. Depending on the density of the plate, they are divided into 200 and 250 grades. The thermal conductivity of the plates depends on the brand and is in the range of 0.06-0.076 W / (m. ° C).

Mineral wool slabs based on bituminous binders are used for heating roofing and attic coatings, insulating walls of residential and industrial buildings, and also for insulating the surface of industrial equipment.

Mineral wool products - half-cylinders and cylinders - are widely used for insulation of pipelines (Fig. 66). Their physical and mechanical properties are similar to those of mineral wool boards.

Fig. 1.3 Mineral wool wire pipesthermal insulation.

1 first layer mats; 2 layers of the second mat.

2. Fiberglass and articles thereof

Fiberglass is a fibrous material made up of thin and flexible glass fibers. These threads are obtained from a mass of liquefied glass.

Glass fragments are made from glass fragments or raw materials used in the manufacture of ordinary glass: silica sand, calcium soda and sodium sulfate.

Glass fragments or raw mix are liquefied in glass bakery ovens. A small thread is then passed through the filters through a thin hole through the filters, which is wound around a rapidly rotating drum (filter method). This method allows you to get very long (up to several tens of kilometers) yarn with a thickness of 0.1 microns.

In a method for expanding (resting) a fiber, a short coarse fiber can be obtained by spraying a liquid with a stream of steam or hot gas of high pressure.

The laying method is also used to produce fiberglass.

With this method, the rod-rod is heated in a special candle (burner) until it is liquefied. When a glass droplet comes down, it drags a thin fiberglass and wraps it around a rotating drum.

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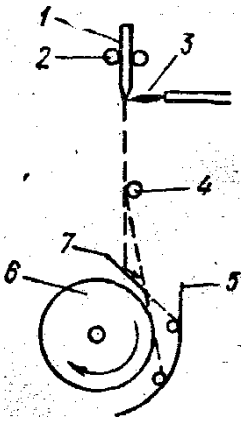

Fig. 1.4 diagram of the receiving optical fiber by the method of rod billet.

Density of crushed wool is 130 kg / m3 thermal conductivity: 0,041 W / m ° C.

Fiberglass is much longer than mineral fiber. The optical fiber characterized by high chemical stability and low thermal conductivity.

Glass plate with excess heat conductivity 0,04-0,005 W / m ° C. Bed length 1000-3000 mm, width of 200-700 mm and a thickness of 10-50 mm. Strip with a length of 500-5000 mm, a width of 30-250 mm and a thickness of 10-50 mm. of the Frame are used for insulation of pipes and equipment with a diameter of 108 mm and strips are used for the insulation of pipes up to 108 mm. the pipes are made in two or one layer with the layers (Fig. 66). Each layer is mounted at a distance of 100-250 mm with retaining rings (depending on the width of the product).

Semi-rigid glass-fibre slabs based on synthetic binder glued to one or both sides with glass or without aluminum foil. The plates have a density greater than 75 kg / m3, thermal conductivity 0,047 W / m ° C. Plate length 1000 mm, width 500-1500 mm and a thickness of 30-80 mm.

Fiberglass products are used not only as insulating material for building structures, industrial equipment and piping at temperatures up to 200 ° C, and for the insulation of industrial refrigerators and others.

Foam glass is non-porous insulating material. Foam glass, which is not mixed with the gasifier (crushed limestone) is the raw material for production of glassware (slabs, blocks). The mixture of raw materials charged into a shape and heated in a furnace to 900 ° C, where particles are liquefied and the gas generator is destroyed. Exhaust gases inflate the glass mass and upon cooling, become solid material with a porous structure.

Foam glass has valuable properties which distinguish it from other insulation materials: foam glass has a porosity of 80-95%, a pore size of 0.1-3 mm, a density of 200-600 kg / m3, heat conductivity is 0,09-0,14 W / m ° C, the compressive strength of foamed glass is 2-6 MPa. In addition, foam glass is characterized by water resistance, frost resistance, non-flammable, absorbs sound, it is easy to cut and handle.Foam glass in the form of plates with a length of 500, 400 and a thickness of 70-140 mm for heating of walls, partitions, roofs and other building parts, and foamed glass in the form of half-cylinders, shells, and segments with a temperature of 300 ° C. is used for insulation of heating units and heating systems not exceeding. In addition, the foam is absorbent and disposable decorative material for auditoriums, cinemas and concert halls.Baked perlite is a highly porous material, mainly in the form of white grains, which is obtained by blowing it in a rotary or blast furnace at 900-1200 ° C to obtain natural perlite. During the cooking process, structurally bound water quickly evaporates from the stone, resulting in highly porous material. During baking, the volume of perlite can increase by 5-12 times or more.

The bulk density of swollen perlite with grains and fragments of 5-20 mm is 250-600 kg / m3, the density of pearlite sand is 100-500 kg / m3, the thermal conductivity is 0.07-0.08 W / m.m ° C

Swollen perlite in the form of sand and small stones is used as a light filler in the manufacture of various thermal insulation products. Portland cement, plastic clay, water glass, petroleum bitumen, synthetic resins and others are used as binders. Products (plates, half cylinders, segments, etc.) have a density of 250-500 kg / m3 and a thermal conductivity of 0.05-0.2 W / (m. ° C).

Inflated pearlite products are used in various industries depending on the heat resistance of the binders used in the manufacture of these products. For example, products based on cement binders or molten glass are used to insulate heated surfaces of factory furnaces, boilers, pipelines, etc., while products based on organic binders (bitumen, synthetic resins, etc.) are used for insulation. building structures and refrigerators. created for

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